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A GUIDE TO MANAGEMENT ACCOUNTING

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MANAGEMENT
ACCOUNTING

by

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and

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PREFACE

In writing this book we have tried to show the problems which may confront an accountant in industry and the principles which should guide him in their solution.

Students for professional accountancy examinations have little opportunity to study industry and its accounting problems. We hope this book will show them how accountancy can help management and the other sections of the business. It may also show them that accounts should help to run a business and are not prepared only for the auditor! This book covers the syllabus on management accounting of each of the accountancy bodies.

After an introductory chapter, the next five deal with the preparation of budgets or plans for the future. Chapters VII and VIII cover the accounting problems found in supplying management with a flow of information on the actual events in each budget period. Chapter IX covers the measurement and appreciation of past results and the elucidation of differences between actual and budget. The last two chapters cover office organization and equipment.

We hope readers will help by sending constructive suggestions on the matters contained herein or which they think should be included.

H.W. BROAD
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London,
August, 1957.

CHAPTER I

AN INTRODUCTION TO MANAGEMENT ACCOUNTING

§ 1. Business Activity

Business is principally concerned with the sale of a product which has been manufactured by the seller or purchased from outside suppliers; or in providing a service. Where manufacturing operations are carried on, some departments may conduct research to discover new products or cheaper methods of producing, selling and distributing existing products. The sales made and expenses incurred are recorded by an accounting department to disclose the profit or loss made. Basically, therefore, a manufacturing business has five divisions; Selling, Buying, Production, Research and Administration. In a business with few employees, one man may be required to work in more than one division, while in the large concern employing hundreds, each division will be self-contained. In a wholesale or retail business the purchase of the goods for sale will assume the same importance as production in a manufacturing business.

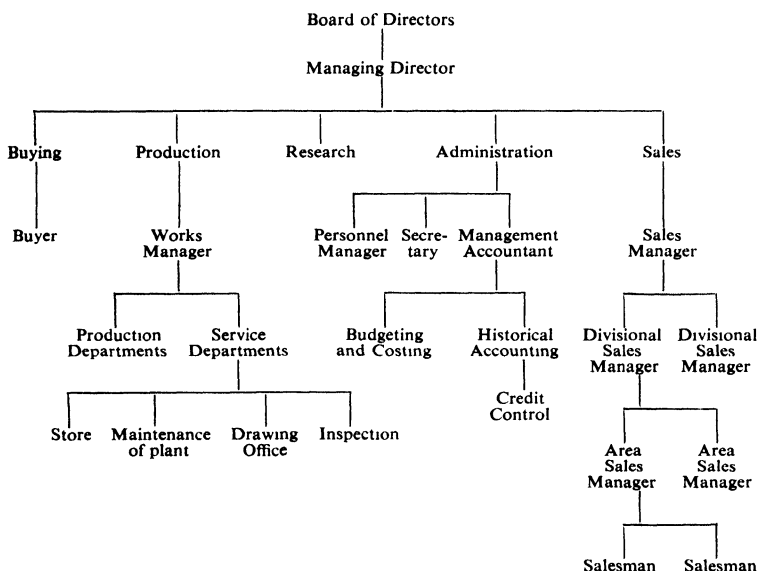
In the small business the sole proprietor can issue instructions to employees and confirm by his own eyes and ears that his orders are complied with. Should any difficulties arise, the employees can discuss the matter personally with the proprietor. In such circumstances the proprietor decides the policy, prepares the plan of future operations of the business and ensures that everybody works to achieve the common target. As businesses grow, however, such personal supervision by the proprietor becomes impossible and something must be substituted.

The functions of policy making, planning and supervision will have to be delegated to a management team. Management has been defined as 'all those activities involving responsibility for the work of others'. Where the business is owned by a limited company the management team normally consists of the board of directors, the managing director, the works manager, the sales manager, the secretary, the accountant, departmental managers, foremen and chargehands. The term 'top management' is often applied to the first two in this list. In a sole trader's business, or in the case of a partnership, the functions of the board and managing director are fulfilled by the sole trader or partners. Whether the latter undertake any of the other functions will depend on the size of the business.

The Board of Directors will approve and lay down broadly the policy of the business. The Managing Director is responsible for the preparation and supervision of the plan of future operations based on that policy. He

may make amendments within the framework of the Board's policy as a result of day to day events. The remainder of the management team will prepare and supervise the plan under the guidance of the Managing Director. As a result, the activities of all employees will be co-ordinated while each employee remains under the personal supervision of his immediate superior.

The organisational chart of a typical manufacturing business would be:



§ 2. Management Accounting

The term 'Management Accounting' covers all those services by which the accounting department can assist top management and the other departments in the formulation of policy, the control of its execution and the appreciation of its effectiveness. In this book will be suggested certain basic principles which can be adapted to any business. The reader must realise, however, that there is no substitute for common sense, and that enterprise, imagination and originality will be required if management accounting is to function successfully.

§ 3. The Cycle

The description of management reveals that there is a definite cycle of events. These are:

- (a) the formulation of a policy;
- (b) the preparation of a plan (or budget) based on that policy;
- (c) the control of the execution of that plan;

- (d) the measurement of the results of the plan;
- (e) the appreciation of such results, particularly of any variations from the plan;
- (f) the modification of the original policy, resulting in a new policy for the ensuing period.

The rapidity of the cycle will depend on the nature of and circumstances affecting the particular business and the policy of its directors. In some businesses the cycle may take a year (long-term); in others a month or a week (short-term). For the purposes of control it is frequently necessary to have two plans running concurrently. The first will be concerned with the immediate future and will be based on the long-term policy set out in the second plan.

§ 4. The Accountant's Attitude of Mind

Management is concerned with policy making and the planning and control of current and future events; past results are of interest only in assisting in the control of current operations and the planning of the future. If, therefore, the accountant is to assist the other members of the management team, he must cease to be interested only in past facts and apply the major part of his energies to considering the present and the future. He will be called upon to provide assistance and information to many departments of the business without delay and regardless of the difficulties caused to the accounting department. He must organize the recording of the information flowing into his department so that any reasonable demand can be met without special research. The provision of information, however, is only part of the accountant's duty. He must be capable of sifting that information, high-lighting the important facts, and presenting them to management in a manner they can understand and use. He is the natural co-ordinator of the budgets of the other departmental heads and prepares the Master budget (*see* Chapter II).

§ 5. Need for Salesmanship

It must be admitted, however, that many businesses have been running for years without the management consciously stating the policy to be adopted and preparing a plan based thereon. This may have resulted in unnecessary losses, but these may have passed unnoticed due to the favourable trade conditions. Often the initiative for introducing management accounting must come from the accountant. Before proposing any changes he must be prepared for opposition. His colleagues may accuse him of trying to increase his own importance in the business, *i.e.* of empire building. Before making any proposals, the following should be considered:

- (a) The scope of the proposals, whether they will affect every department in the business or only one;
- (b) the general advantages and disadvantages of each proposal;
- (c) the special advantages and disadvantages of each proposal to every person affected thereby;

- (d) the psychology of each person involved to anticipate the individual preferences and potential opposition;
- (e) the new policy decisions (*e.g.* estimation of future sales) which will be required as a result of the scheme. (Such decisions may have been avoided in the past);
- (f) whether the proposals can be integrated with the present system without extra cost;
- (g) the additional expense which will be incurred, or the savings which will be made, if the system is adopted;
- (h) the increase or reduction in the staff, equipment or space required;
- (i) whether the complete scheme will be introduced at the same time or in stages; if the latter, the order and times of introduction;
- (j) the losses caused in the past by the non-existence of the suggested scheme;
- (k) the clear layout of the proposals;
- (l) the organisational upheaval involved, especially outside the accounting department.

Only after careful consideration of all the above, should the accountant lay his proposals before the top management. At the resulting discussion, the suggested scheme must be supported with courage and conviction against opposing arguments, but any reasonable amendments should be accepted. After approval by top management every person affected should have a chance to discuss the matter, so that the measures are accepted and not imposed.

CHAPTER II

ANTICIPATION

§ 6. Policy

The term 'policy' covers the objects of a business and the principles upon which it is conducted. Plans for future action can only be made if there is a policy. Unfortunately the latter is rarely so established and co-ordinated that it is written down in a neatly bound volume. Future policy will usually be based on the existing policy, suitably modified for changing circumstances. Management personnel responsible for the preparation of future plans are, or should be, conversant with the current policy relating to their particular section of the business. The sources from which the policy may be obtained include:

- (a) Memorandum and Articles of Association;
- (b) Minute Book of Shareholders' Meetings;
- (c) Minute Book of Directors' Meetings;
- (d) Minute Book of those management committees which are created by the Board of Directors for a limited purpose, *e.g.* the planning of a new sales campaign;
- (e) Service agreements with individual employees and Trade Union agreements;
- (f) Personnel handbooks and literature giving the rules of pension and sickness schemes, factory and office notices, etc.;
- (g) Publicity material indicating sales policies;
- (h) A Business Organisation chart (*see* § 1);
- (i) Managers' 'Charters' (or Policy Manuals) conferring delegated powers;
- (j) Balance sheets of past years, showing the policy as regards investment of monies in fixed and current assets and whether money is borrowed by issues of share capital or loans;
- (k) Profit and Loss Accounts for past years, indicating policy as to items of income and expenditure, *e.g.* pensions, publicity, depreciation.

But many decisions which affect the business are not recorded. Day to day decisions required to overcome particular difficulties are given verbally, especially when made by foremen. The fact that such decisions are necessary may be shown when investigating and codifying the current policy.

Top management assumes current policy is known and understood. Such policy will have evolved over the years. Top management is repeatedly considering whether or not to modify the present policy for the future. The nature of such amendments will depend upon the evaluation of the plans

to realise such policies. The plans may reveal that suggested alterations are financially unsound or physically impossible, in which case the policies will require revision.

§ 7. A Budget

The term 'budget' is used in this book to represent the evaluation of the intentions of management. An adopted budget is the quantitative and monetary statement of the work to be done by an executive and his subordinates and the expenditure which he may incur in the future period. After adoption the budget becomes the means of controlling and measuring the progress made by the executive. To be effective it must be available before the period to which it relates.

The preparation of a budget requires accurate forecasting of the future as the budget lays down, in detail, the future plan. Forecasts for any section of the business must be made only by those people with experience of that section. A budget must be prepared for each main section of the business in reasonable detail so that the responsibility for its achievement can be allocated to and agreed with each individual in the management team. The activities of a typical business would be sub-divided between:

- (a) Sales and Marketing;
- (b) Manufacturing;
- (c) Research;
- (d) Office and Administration;
- (e) Capital.

§ 8. Responsibility for Budgets

- (a) The sales manager will be responsible for the *Sales and Marketing budget* covering:
 - (i) anticipated sales in quantities;
 - (ii) anticipated realisable prices of sales after allowing for discounts, rebates, etc.;
 - (iii) expected turnover, being the product of (i) and (ii);
 - (iv) selling and distribution expenses;
 - (v) the expenditure on publicity;
 - (vi) quantity and value of stock of finished products.
- (b) The works manager will be accountable for the *Manufacturing budget* covering:
 - (i) anticipated output in quantity and value;
 - (ii) purchases of raw materials;
 - (iii) stocks of raw materials, work in progress and sundry stores;
 - (iv) cost of factory direct labour;
 - (v) factory overhead expenses.
- (c) The chief designer will be in charge of the *Research budget* covering:
 - (i) salaries and expenses of research staff;
 - (ii) the degree to which research will be conducted by own staff or

with the aid of outside agencies (*e.g.* Universities, Government research stations).

- (d) The accountant will be responsible for the *Office and Administration budget* covering:
 - (i) salaries and expenses of office management and staff;
 - (ii) policy expenditure, *e.g.* legal expenses, audit fees.
- (e) The *Capital budget* will be prepared by the accountant on the basis of the other budgets and policy decisions of the directors and will cover:
 - (i) development – purchase of new and disposal of obsolete plant and buildings;
 - (ii) the provisions for depreciation of fixed assets;
 - (iii) finance including debtors, stock, cash, dividends.

The co-ordination of the separate budgets requires patience and tact by the accountant but their ultimate integration by him will provide the *Master budget* or estimated Profit and Loss Account for the future period and an estimated Balance Sheet at the end thereof. To be able to act as budget controller, the accountant should acquire a knowledge of those aspects of the business not under his control to be able to appreciate suggestions made by and problems of the other members of the management team. The accountant will assist the other divisional heads by:

- (i) providing data on past results and summarising the state of affairs disclosed thereby;
 - (ii) obtaining for any member of the management team information from another member;
- In his role as budget controller, the accountant will:
- (iii) analyse each budget to determine the facts on which it is based and by assessing the reliability thereof, determine the accuracy of the forecasts;
 - (iv) act as co-ordinator of the personnel engaged in the preparation of the budgets.

§ 9. Effects of Budgets on Policy

It must be emphasised that budgets cannot be prepared without a policy. However, if foreseeable failures are to be avoided, the policy will not be decided without budgets. There is a continuous interplay between the budgets and policy. When preparing the first budget, a certain policy will be agreed, and budgets prepared accordingly. If the prospective result revealed by the budgets is undesirable, the policy or the plan to achieve that result must be varied. Such variations will alter the budgets. If the result is again unsatisfactory, the policy will be further amended and fresh budgets will be prepared. This process will be continued until the budget shows the desired result which is practical.

§ 10. Length of Budget Period

The length of the budget period will depend on the nature of the business. A bridge-building contractor with long-term sales, purchases and employment contracts is able to budget accurately for a longer period than a

garment manufacturer who is dependent on the vagaries of taste and fashion.

The majority of businesses, however, require two main budgets:

- (a) *Long-term*, covering a period of not less than one year and for some aspects several years ahead. Major capital development schemes involving millions of pounds cannot be undertaken without estimating future net profits. Usually the long-term budget exceeding twelve months will be in skeleton form.
- (b) *Short-term*, covering a period of less than one year and stating in detail the expectations for that period. While businesses exist which prepare budgets for each day (prepared one month in advance) or weekly budgets, the majority of short-term budgets cover a month. Often, each 'month' consists of four pay-weeks, to avoid differences resulting from the varying number of days in calendar months.

Frequently, within the framework of the long-term budget, three to six short-term budgets are prepared in detail and revised monthly.

§ 11. Principle of the Governing Factor

Forecasting the future entails the adjustment of past results in the light of anticipated future conditions, and must be based on facts which have been carefully verified. Fortunately for the forecaster, all budgets are subject to certain limits, called in this book, the *governing factors*. Thus where 1,000 units of a product can be sold, but only 600 units can be manufactured, the governing factor is manufacturing capacity. The risk of errors in forecasting can be reduced by an accurate assessment of the governing factor.

In a business many governing factors are present simultaneously. The governing factor for one product may be different from that for another product. The limits most frequently encountered are:

- (a) customer demand;
- (b) plant capacity;
- (c) area of and suitability of buildings available for housing plant, raw materials and finished product;
- (d) raw material supply;
- (e) labour supply, particularly where skilled labour is employed;
- (f) capital available for the acquisition of fixed assets and the provision of further working capital;
- (g) policy decisions, *e.g.* where production is deliberately limited to maintain selling prices;
- (h) government restrictions.

The governing factor for any product will change from time to time, occasionally very rapidly. For example, in the motor car trade from 1945 to 1955 plant capacity was the governing factor. Then early in 1956 customer demand became the governing factor as the demand for cars fell below the productive capacity.

§ 12. Net Probability

The application of the principle of the governing factor will produce the *net probability*. The net probability for any product is the maximum number which can be produced or sold as a result of the governing factor.

Illustration

Assuming the governing factors for products A to E are as shown, prepare a statement setting out the 'net probability' for each product.

Product	Sales		Production	
	<i>Units</i>	<i>Governing Factor</i>	<i>Units</i>	<i>Governing Factor</i>
A	2,000	Customer demand	8,000	Plant capacity
B	10,000	Policy, only sold in England and Wales	15,000	Raw material supply
C	7,000	Customer demand	6,000	Plant capacity
D	5,000	Customer demand	1,000	Skilled labour available
E	3,000	Policy, only exported as purchase tax means negligible sales in United Kingdom	2,000	Capital available to finance purchase of special plant necessary in manufacturing for export trade.

STATEMENT OF NET PROBABILITIES OF PRODUCTS A TO E FOR THE PERIOD ENDED. . . .

Product	Sales	Production	Net Probability
	<i>Units</i>	<i>Units</i>	<i>Units</i>
A	2,000	8,000	2,000
B	10,000	15,000	10,000
C	7,000	6,000	6,000
D	5,000	1,000	1,000
E	3,000	2,000	2,000

§ 13. The Preparation of a Budget

The first stage in the preparation of any budget is the determination of the governing factors and, as a result, the net probability. But the construction of any particular budget will depend, in many instances, on the facts disclosed in the preparation of another budget. Assuming the sales budget is being prepared, the sales division would include the number of units they anticipate can be sold. Unless these units can be produced in the works in the time required by the sales budget some amendments will have to be made. One or more of the following must be adopted:

- (i) the anticipated sales will have to be reduced;
- (ii) the productive capacity must be increased;
- (iii) ready-made parts (called 'bought-out' parts) must be purchased in lieu of own production to speed the manufacturing processes;
- (iv) finished products must be purchased from outside suppliers.

Management will decide, therefore, whether or not the net probability for any product can be improved. An opportunity is given to revise the proposed policy and plan before the budget period.

Illustration

Management, having carefully considered the governing factor for each product shown in the illustration in paragraph 12, decides that:

- (i) 2,500 units of product A shall be produced, the excess being retained in stock;
- (ii) Product B shall be sold in Scotland where the sales are expected to be 3,000 units;
- (iii) Finished goods will be purchased from a sub-contractor, so that customer demand can be met in respect of product C;
- (iv) Production of product D will be doubled by purchasing from outside suppliers parts produced by skilled labour in the factory;
- (v) No change is possible in respect of product E.

The statement of Net Probabilities in paragraph 12 will become:

Product	Sales	Stock Increase	Production	Net Probability
	<i>Units</i>	<i>Units</i>	<i>Units</i>	<i>Units</i>
A	2,000	500	8,000	2,500
B	13,000	—	15,000	13,000
C	7,000	—	7,000	7,000
D	5,000	—	2,000	2,000
E	3,000	—	2,000	2,000

When management is discussing the methods by which the net probability can be improved, the effect on the budgets other than sales and production must be considered. If it is decided to purchase finished goods from a sub-contractor the Buying budget will be amended and the Cash budget checked for available cash resources to finance stock. Where additional plant is to be acquired, the Capital Expenditure and Cash budgets will be altered. The policy and the budgets depend, therefore, on each other. Care must be taken to adjust all the budgets affected by a change in policy or plan.

In Chapters III to VI, the factors affecting the preparation of the various budgets will be discussed. In Chapter VI, the collation of these budgets into a Summary or Master budget will be shown.

§ 14. Marginal Costing

Where marginal costing is used the allocation of expenditure to production is confined to that which is caused by production and sales, *i.e.* to materials, direct labour, direct charges and variable overheads. Fixed overheads are not allocated. The difference between the selling price and the marginal cost of each article is called 'the marginal profit'. The amount of the marginal profit is the sum which a particular article will contribute towards the payment of the fixed expenses of the business and the final profit. The ascertainment of the marginal profit of each product or line manufactured is important, particularly where governing factors are involved. In such circumstances, those products or lines showing the smallest profit can be discontinued, unless their sale assists the sales of more profitable products or lines. Furthermore, the total profit of the business can be ascertained assuming varying levels of activity and different patterns of production and sales.

Where severe competition is being encountered and it is desired to reduce selling prices, the effect of any reduction can be swiftly ascertained. Alternatively, where the reduction in selling prices is intended to increase turnover, the increase necessary to allow the previous total profit to be earned can be computed easily. Where selling prices are reduced for a special order or customer, care must be taken to see that normal selling prices do not also have to be reduced. The effect of increased costs can be quickly assessed.

Illustration

If the marginal cost of a product is £335 per ton, any price obtained in excess of that amount will be a contribution towards fixed overheads. Assuming the fixed overheads amount to £3,475 for the period, the present selling price is £600 per ton and during the period 10 tons will be manufactured and sold, compute the loss for the period:

Fixed overheads	..	..	£3,475
Less: Marginal profit earned: $10 \times £(600 - 335)$	..	..	2,650
		Loss	<u>£825</u>

A salesman has obtained an order for marginal business amounting to a further 5 tons, but the price obtainable is only £500 per ton. Should the order be fulfilled?

The order should be fulfilled providing its acceptance does not depress the normal selling price of £600 per ton. The result will be for the business to break-even, *i.e.*

Fixed overheads	..	..	£3,475
Less: Marginal profit earned on ordinary sales	..	£2,650	
Marginal profit earned on special order,			
$5 \times £(500 - 335)$	..	825	
			<u>3,475</u>
			<u>nil</u>

§ 15. Flexible Budgeting

A *flexible budget* is a budget which is designed to change in accordance with the level of activity actually attained.

Frequently a firm forecast of the future cannot reasonably or safely be made. Such uncertainty does not arise because of the lack of management policy, but owing to outside and uncontrollable influences. Occasions when a firm forecast of the future cannot be made include:

- where sales, by the nature of the business, are dependent upon external influences, *e.g.* a jobbing builder or engineer, luxury trades dependent on political decisions;
- where the venture, or an aspect of it, is so entirely new that public reaction cannot be prejudged, *e.g.* businesses selling fashion products or plastic fittings for the home;
- where violent fluctuations are probable according to the season, and/or the weather, *e.g.* in businesses selling soft drinks, ice cream or raincoats;
- where labour supply is unpredictable, *e.g.* contracting businesses.

It will be noted that three of the foregoing relate to uncertainty as to customer demand. In these circumstances, sales volume is the governing factor in the budget. As a result of the uncertain future, the flexible budget

must show management's intentions and expectations for a number of situations. This is completely contrary to the usual budget which defines the future plan for one foreseeable set of circumstances.

Before a flexible budget can be prepared, each expense must be carefully assessed to determine whether it is fixed, semi-variable or variable in character. The fixed expenses will tend to be unaffected by variations in the volume of output or sales. Semi-variable expenses will vary with but not proportionately to variations in output or sales. Variable overheads will vary directly with alterations in output or sales.

When a fixed budget is prepared the amounts included for variable and semi-variable expenses are computed for a single level of activity. A flexible budget requires precisely the same technique of assessment but for several different levels. The sums included for semi-variable and variable expenses must, therefore, be amended for each level of activity.

Illustration

From the following information prepare a flexible budget for the three months ended 30th September, 19.., showing the estimated profit where the business is producing at the rate of 60%, 80% and 100% of capacity. Assume that all items produced are sold.

<i>Fixed Expenses:</i>						£
Management salaries	..	..	..	..	..	42,000
Rent and rates	..	..	..	..	..	28,000
Depreciation of machinery	..	..	..	..	..	35,000
Sundry office costs	..	..	..	..	..	44,500
						<u>£149,500</u>

Semi-variable expenses at 50% capacity:

Plant maintenance	..	..	..	..	..	12,500
Indirect labour	..	..	..	..	..	49,500
Salesmen's salaries and expenses	..	..	..	..	..	14,500
Sundry expenses	..	..	..	..	..	13,000
						<u>£89,500</u>

Variable expenses at 50% capacity:

Materials	..	..	..	..	..	120,000
Labour	..	..	..	..	..	128,000
Salesmen's commissions	..	..	..	..	..	19,000
						<u>£267,000</u>

Semi-variable expenses remain constant between 40% and 70% capacity; increase by 10 per cent. of the above figures between 70% and 85% capacity; and increase by 15% of the above figures between 85% and 100% capacity. Fixed expenses remain constant, whatever the level of activity. Sales at 60% capacity are £510,000; at 80% capacity are £680,000; at 100% capacity are £850,000.

ANTICIPATION

	LEVEL OF ACTIVITY					
	60 %		80 %		100 %	
	£	£	£	£	£	£
Sales:		510,000		680,000		850,000
Variable Expenses:						
Materials	144,000		192,000		240,000	
Labour	153,600		204,800		256,000	
Salesmen's commissions	22,800		30,400		38,000	
		320,400		427,200		534,000
Semi-variable Expenses:						
Plant maintenance	12,500		13,750		14,375	
Indirect labour	49,500		54,450		56,925	
Salesmen's salaries and expenses	14,500		15,950		16,675	
Sundry expenses	13,000		14,300		14,950	
		89,500		98,450		102,925
Fixed Expenses:						
Management salaries	42,000		42,000		42,000	
Rent and rates	28,000		28,000		28,000	
Depreciation of machinery	35,000		35,000		35,000	
Sundry office costs	44,500		44,500		44,500	
		149,500		149,500		149,500
Total Cost		559,400		675,150		786,425
Profit/Loss		<u>£49,400</u>		<u>£4,850</u>		<u>£63,575</u>

Note: The various expenses may be sub-divided also between Production, Administration and Selling Expenses.

The work necessary to instal a flexible budget for a large departmentalized concern can be considerable. It should be based on durable terms, *e.g.* hours, quantities, and only converted into money where necessary. This will avoid amending the budget at frequent intervals for variations in the value of money. A flexible budget can be used while the physical circumstances on which it is based remain constant.

A variation in the quantity produced and sold may not be the sole factor involved. A separate flexible budget must be prepared for every manufacturing or selling pattern which might occur, as each pattern will produce different results.

Flexible and fixed budgets can be used separately or in combination. There can be circumstances where a fixed budget is possible for a year but the plan within that period must allow for wide fluctuations in the level of activity. A number of flexible short-term budgets will be used within the fixed annual budget. Conversely, a year's forecast may need to be flexible, while the plan for shorter periods can be fixed. This state of affairs is normal in many businesses. Where the circumstances prevailing in the next four weeks can be accurately assessed, but those for the year are uncertain, a fixed budget can be prepared for the four-weekly period within the framework of the annual flexible budget. Thus, the plans of the management can be known in each sphere of responsibility for the succeeding four weeks. By adopting this procedure for successive four-weekly periods, the work involved in preparing detailed budgets can be reduced and repeated management decisions avoided. The flexibility of a budget, however, may not apply to the entire business activity. If manufacture is carried on for stock and is undisturbed for long periods by sales variations, then the production budget can be a fixed budget, while the sales budget is flexible.

For the purposes of control, flexible budgets are useful. The budget will show the anticipated position for the actual level of activity attained, thus facilitating the comparison with the actual results. The explanations required to elucidate differences between actual and budgeted performance will not be confused by facts already known.

§ 16. Break-even Charts

A *break-even chart* shows the profitability or otherwise of an undertaking at various levels of activity, and as a result indicates the point at which neither profit nor loss is made.

A break-even chart is based on the principle that a business must incur certain minimum expenditure on fixed and semi-variable charges. Such expenditure must be paid out of the marginal profit earned on each article. Therefore, a minimum volume of trade is necessary. Each direct variable cost will be covered by every sale made.

In a highly profitable enterprise there is little need of a break-even chart, except, perhaps, when considering a major expansion scheme involving a heavy increase in fixed charges.

Break-even charts are frequently used, and needed, where a business is new or where it is experiencing trading difficulties. In these cases the chart

assists management to appreciate the significance of quantity in relation to price. By using break-even charts, management can consider the advantages or otherwise of marginal sales.

Break-even charts are useful when preparing a budget. They can be prepared assuming varying courses of action, so that the final policy may be decided. Then a firm budget can succeed the decision. A separate chart should be prepared for each possible course of action.

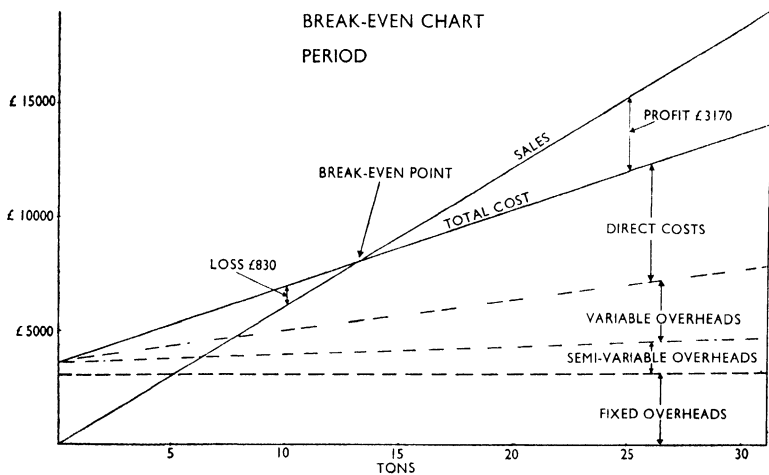
The technique to prepare a break-even chart employs the principle of flexible budgeting in a particular manner. Value is indicated on the vertical axis of the chart, volume on the horizontal axis. The various items should be plotted as follows:

- (a) Fixed overheads: These need not result in a straight line extended fully across the graph, although they will be represented by a straight line within certain limits. Beyond these limits, increased expenditure on fixed charges will be incurred, *e.g.* to cater for additional plant or buildings. Changes in fixed costs will normally take the graphical form of definite steps rather than a gradual curve.
- (b) Semi-variable overheads: These must be computed for several volumes of business as indicated in the paragraph on flexible budgeting, and the appropriate amounts added to the fixed charges to plot each point on the graph. Thus, in effect, semi-variable charges are plotted using the 'fixed charges' line as the horizontal axis.
- (c) Variable overheads: These will vary directly with the volume of business. To plot each point, the variable overheads will be aggregated with the fixed and semi-variable overheads.
- (d) Direct costs: As by nature these are a constant cost per unit of output, they are capable of simple calculation for the respective volumes. To plot each point on the graph, the amount of the direct costs is added to the aggregate of the fixed, semi-variable and variable overheads for that particular volume of activity. Thus for any quantity on the graph the expected total cost is shown by the last line plotted.
- (e) Finally, the sales turnover for the respective quantities should be plotted on the graph. The point at which the 'total cost' line and the 'turnover' line intersect on the graph is the break-even point. The probable profit or loss for any volume of trade can be assessed by measuring the vertical gap between the sales line and the total cost line at that particular volume.

Illustration

Prepare a break-even chart, assuming the following facts where the tonnage produced and sold is between nothing and 30 tons:

- (i) fixed overheads remain constant at £3,000;
- (ii) semi-variable overheads will rise steadily from £500 to £1,500;
- (iii) variable overheads will rise steadily from £0 to £3,000;
- (iv) direct costs are £200 per ton;
- (v) the selling price per ton is £600.



It should be realized that the illustration is over-simplified, *e.g.* semi-variable expenses do not normally rise steadily; a common selling price per ton is employed for all sales. This has been done to illustrate the preparation of a break-even chart simply.

CHAPTER III

THE SALES BUDGET

§ 17. Information required to budget sales

Although the past can provide experience and information which will be of assistance in estimating present and future results, care must be taken when presenting past facts to management, otherwise incorrect conclusions may be drawn therefrom. Where the sales for the last three years have remained constant at £10,000 a year, it would appear that the sales in the following year will be £10,000. How false this conclusion would be if during the last three years there was continuous inflation. The statement of sales would have been more informative if it had set out units sold as well as their monetary value:

Year 1	Sales £10,000	Units 1,000
„ 2	„ £10,000	„ 900
„ 3	„ £10,000	„ 800

If inflation were arrested in year 4 but the quantity sold continued to decline, the sales value for year 4 would show a serious fall.

To assist the accurate preparation of Sales budgets, some large businesses employ expert statistical and market research departments. Market research is the study of all problems relating to the sale of goods and services by a business. It will involve the analysis of sales figures and other information within the business and a consideration of probable likes and dislikes of the consumer. These concerns, however, are in the minority and the guidance given here is intended for those managements whose businesses are not so fortunately situated. While each business or industry will require figures peculiar to itself, the undermentioned matters should be covered:

- (a) whether the geographical scope of the business is local, national or international;
- (b) the main clientele, whether it is one industry or trade, or one group of industries or trades, or a section of the general public, or the general public;
- (c) the number and type of products dealt in and their individual popularity with customers;
- (d) the chief influences on the volume and value of sales of each product or category, distinguishing between external influences and those within the business;
- (e) the current sales and marketing policy.

From the foregoing basic information up-to-date statistics will be compiled covering the following:

- (a) the sales made by the business and by its competitors in each geographical area served;
- (b) the total sales by competitors of products similar to those of the business outside the geographical areas served;
- (c) whether the business' share of the trade with an industry is increasing or decreasing;
- (d) whether the trade of the clientele of the business is increasing or decreasing;
- (e) the trend of sales of the business analysed as to product or group of products;
- (f) details of forward sales contracts;
- (g) where relevant, the movements of population, *e.g.* the movement of people to houses in the suburbs will affect a milk round in the centre of the city;
- (h) details of seasonal fluctuations in sales.

§ 18. Use of Data

Having collected this information, statements must be prepared to enable management to decide the basic facts on which the sales budget can be compiled. These statements offer some security against optimism and pessimism, particularly where a programme of sales expansion is being considered. Although such statements may give only the information ascertained in paragraph 17, they may show in addition comparisons between various facts, *e.g.*

- (a) the trend in the sales of the business can be compared with the trend of sales of the industry to which that business belongs;
- (b) for each of the geographical areas served the total sales of the business can be compared with the sales of competitors to determine the business' share of the total sales of its particular industry;
- (c) the trend of sales in each area may be compared with the trend in the other areas served to determine in which area the greatest effort should be made by the sales staff; and
- (d) where possible, the trend of the sales of customers should be compared with the trend in sales in the industries to which the customers belong, to ensure customers are thriving concerns and will continue to require the products at present sold to them.

§ 19. Degrees of Probability

As indicated in §§ 11 and 12, certainty can rarely be claimed in budgeting, but it is possible to estimate net probability. In compiling the forecast for sales, three factors must be considered:

- (a) Stable business, as a result of:
 - (i) contracts already placed; and
 - (ii) repeat business from old customers.

(b) Unstable business, owing to:

- (i) 'windfalls' in current period; and
- (ii) anticipated repeat business as a result of sales in the budget period to new customers.

(c) Sales expansion or contraction as a result of:

- (i) the trend of the customers' trade, *e.g.* a fall in the number of new cars produced by customers will affect a motor accessory manufacturer;
- (ii) the trend of customer demand for existing products sold, *e.g.* preference of customers for chocolate-coated ices rather than plain ices;
- (iii) the seasonal fluctuations in sales;
- (iv) political decisions or the economic trends of the country, *e.g.* new sales taxes, increasing unemployment;
- (v) selling in new territories or discontinuing sales in a geographical area;
- (vi) introducing new or discontinuing sales of existing products or varying the style or type of existing products;
- (vii) increased or decreased expenditure on advertising and sales promotion.

Management should not discontinue selling an existing product or in a geographical area without considering the following:

- (i) whether by giving fair shares of all lines to all customers in a time of shortage, goodwill will be preserved for a future period when supplies are plentiful and competition is fierce;
- (ii) the advantages of a wide spread of clientele;
- (iii) by selling different products, dependancy on the prosperity of a single industry is avoided;
- (iv) that as a result of being the sole suppliers of a related range of products to certain customers, competition in respect of the profitable lines within that range is reduced;
- (v) the direct selling costs in the area concerned; and
- (vi) the effect on the selling costs of other areas which will have to bear a proportion of the selling overheads previously borne by the area in which sales are being discontinued.

It must be admitted that in many businesses substantial difficulties may be encountered when budgeting sales. Nevertheless, some reasons must exist for investing capital in such concerns. The actual results achieved must be investigated and the underlying influences and conditions affecting them ascertained. This will enable reliable guides to be established for the future. Jobbing concerns, in particular, claim that the difficulties of estimating future sales exceed the advantages of so doing. But there is often specialization in these businesses, *i.e.* they produce articles or perform services for a particular industry or group of industries. The prosperity and trend of the 'parent' industry or the customers supplied in a particular industry will probably be the controlling influence.

§ 20. Programme for Sales Expansion

A long-term forecast will make provision for any intended expansion in sales. But only the sales which it is anticipated will be achieved should be included in the budget.

Each forecast must be carefully examined to confirm the facts on which it is based. Naturally there will be differences of opinion about the conclusions which can be drawn from such facts. By experience, however, the accountant will establish the degree of reliability to be expected from each forecaster. To avoid unreasonable optimism or pessimism each forecaster must be told that actual performance will be measured against his forecast. Where possible the forecasts for each selling area should be compared. Any gross disparity between area forecasts which are based on the same programme should be capable of explanation. This comparison can indicate errors in area budgets.

New lines or ventures naturally present special difficulties. However, certain facts will have been found to support the launching of such schemes. These facts will have been carefully examined before the venture is sanctioned and will form the best basis on which to prepare a budget. There must be a frequent comparison of actual results with budget where new products are introduced as there are more unknowns and variables than in the case of existing products.

§ 21. Unabsorbed Customer Demand

When the manufacturing capacity, buying programme or capital of a business are insufficient to satisfy the demands of customers for its products, sales will not be the governing factor in the budget. Nevertheless, the extent of unsatisfied customer demand should be estimated. Then the cost of overcoming the limitation can be weighed against the potential increase in turnover. Furthermore, the extent of the unsatisfied demand may lead to a planned expansion in production in the long-term budgets. Short-term budgets will not be affected by unsatisfied customer demand as it is normally impossible to increase supplies at short notice.

§ 22. Preparation of Sales Budget

The manner in which the sales department is organized will determine the detailed planning of the sales budget. In general, personnel at all levels will be involved but different grades will be concerned with different aspects of the problem. Those concerned will probably include sales representatives, area and divisional sales managers, the sales manager and the accountant. Each will ultimately be responsible for carrying out his share of the plan. It is not only logical that they should contribute to it but much more effective for subsequent control.

Assuming the organization of the sales department is as shown in the chart in § 1, each salesman will estimate the sales he can make in the budget period, distinguishing between products. He will forward his forecast to his area manager who will collate the forecasts of all salesmen in his area. After carefully considering each forecast, the area manager will prepare his area budget and forward it to the divisional sales manager. The latter

will aggregate the sales shown by each area budget to form the basis of his divisional budget, which he will forward to the sales manager. Thus the sales budget will be built up from the bottom, not from the top. Each salesman in preparing his budget will consider some or all of the three factors in § 19. However, the sales manager may know of facts or influences which will affect the business as a whole and which are not known to the individual salesmen. He must, therefore, inform his divisional sales managers, who will instruct their area sales managers, of variations which are to be made to the salesmen's budgets as a result of these facts or influences. Similarly, if a new line is to be introduced the divisional and area sales managers and salesmen must be informed.

Illustration

In the XY Co. Ltd. the sales department is divided into 3 divisions, and each division is further sub-divided into 4 areas, North, South, East and West. Division 2 sells only product B, which is sold at £6 a unit. For the budget period ended 31st March, 19.., the aggregate budgeted sales of the salesmen in each area are: North – nil; South – 5,000 units; East – 3,000 units; West – 2,000 units. After a budget showing these sales had been prepared the sales manager decided to try to sell product B in the North area. The area sales manager forecasts sales of 3,000 units for that area in the budget period. Prepare from the above information the original and revised divisional sales budget for the period.

SALES BUDGET FOR THE PERIOD ENDED 31ST MARCH, 19..

DIVISION No. 2				PRODUCT B		
Area	Original Budget			Revised Budget		
	Units	Price	Value	Units	Price	Value
East	3,000	£ 6	18,000	3,000	£ 6	18,000
South	5,000	6	30,000	5,000	6	30,000
West	2,000	6	12,000	2,000	6	12,000
North	—	—	—	3,000	6	18,000
Total	10,000	6	60,000	13,000	6	78,000

Prepared by _____ on _____ 19____ Submitted to _____

§ 23. Selling Expenses Budget

The sales manager is normally responsible for the preparation of the Selling Expenses budget. When preparing this budget a clear distinction must be made between fixed, semi-variable and variable overheads. Furthermore the work will be simplified, if the budget is broken down into four parts:

- (i) direct selling expenses;
 - (ii) distribution expenses;
 - (iii) cost of sales office;
 - (iv) publicity expenditure.
- (i) *Direct selling expenses*

When preparing the budget, the following points must be considered:

- (a) the scope of the representation, *e.g.* a planned expansion or contraction of the geographical area served may involve variations in the number of travellers and in travelling expenses;
- (b) the basis of remuneration of travellers, *e.g.* whether travellers are remunerated by a commission on sales only or receive a fixed salary and commission;
- (c) changes in the basis of remuneration to provide an incentive to sell particular products;
- (d) the appointment of agents and their remuneration under their agreements;
- (e) effect of anticipated changes in the volume and/or value of sales, *e.g.* where travellers' commissions are based on units sold, an increase in budgeted sales in units will result in an increase in travellers' commissions;
- (f) seasonal effects, *e.g.* where the majority of the annual sales are made in October and November, the expenditure on commissions to travellers may be heavier in November and December.

(ii) *Distribution expenses*

These expenses are incurred either in the storage of finished products to enable orders to be swiftly fulfilled or after a sale to a customer has been made. When preparing the budget the following must be considered:

- (a) expenditure on rent, rates, insurance, wages, etc., in connection with necessary warehouses;
- (b) handling costs, which may be affected by changes in the products sold, where these will require a variation in the methods of handling;
- (c) transport costs, having regard to the geographical pattern of sales;
- (d) external influences on transport costs, *e.g.* increase in rail freight charges;
- (e) type of transport used, *e.g.* own motor vehicles or those of outside contractors.

(iii) *Cost of sales office*

The expenditure on salaries of office staff, rent, rates, light and heat of the sales office, stationery, postage, etc., will be budgeted. Such expenditure will not vary with sales to the same extent as (i) and (ii) above. A change in the value of sales does not always represent an increase or decrease in the number of transactions; each transaction may have a higher value. Of course, major changes in the number of transactions will affect the number of staff needed and the accommodation they require.

(iv) *Publicity expenditure*

Normally the total expenditure on publicity will have been fixed by management as a matter of policy. Frequently the type of advertising and the expenditure thereon is laid down, *e.g.* press, window displays, posters,

exhibitions, television. In such cases, the budget will show with whom and when the expenditure is to be incurred.

Illustration

The actual expenditure in respect of selling expenses in Division No.2 in the last budget period was:

Description of Expenditure	Area			Total
	East	South	West	
	£	£	£	£
DIRECT SELLING EXPENSES:				
Representatives' Salaries and Commission	800	1,400	800	3,000
Representatives' Expenses	500	800	400	1,700
DISTRIBUTION EXPENSES:				
Carriage Outwards	250	200	350	800
Warehouse Wages	800	1,600	600	3,000
Warehouse General Expenses	300	500	100	900
SALES OFFICE:				
Salaries	400	1,000	400	1,800
Rent, Rates, Light and Heat	150	450	100	700
Miscellaneous Expenses	30	100	20	150
PUBLICITY:				
Advertising Contracts	700	1,000	1,300	3,000
TOTAL	£3,930	£7,050	£4,070	£15,050

During the ensuing budget period the changes to be allowed for are:

- (i) As a result of increased turnover, the representatives' commission in each area is to be increased by £60.
- (ii) On the formation of a new North area, the transfer of a representative from the South area will result in a transfer of £360 in respect of his salary and commission. The employment in the North area of further representatives will cost £1,440.
- (iii) Representatives' expenses in the North area will be £1,000.
- (iv) On a variation in the pattern of sales, the expenditure for carriage outwards will rise by £20 in the East area, rise by £20 in the West area and fall by £40 in the South area. The total cost in the North area is anticipated at £500.
- (v) Sales office salaries will increase by 10 per cent in the East, South and West areas, while the amount to be charged to the North area is £320.
- (vi) In respect of Rent, Rates, Light and Heat of the sales office, £50 is to be transferred from the South area to the North area.
- (vii) Miscellaneous expenses in the East, South and West areas will increase by £10 an area.
- (viii) Advertising contracts will cost an additional £400 in the South area.
- (ix) Apart from the items listed in (ii), (iii), (iv) and (v) above, the following expenditure is chargeable to the North area:

Warehouse Wages ..	£1,000	Warehouse General Expenses	£500
Miscellaneous Expenses ..	£20	Advertising Contracts ..	£1,500

Set out the Selling Expenses budget for the ensuing period.

SALES EXPENSES BUDGET
FOR THE PERIOD ENDED . . .

Division No.2

Description of Expenditure	Area				Total
	East	South	West	North	
	£	£	£	£	£
DIRECT SELLING EXPENSES:					
Representatives' Salaries and Commission . .	860	1,100	860	1,800	4,620
Representatives' Expenses	500	800	400	1,000	2,700
DISTRIBUTION EXPENSES:					
Carriage Outwards . .	270	160	370	500	1,300
Warehouse Wages . .	800	1,600	600	1,000	4,000
Warehouse General Expenses	300	500	100	500	1,400
SALES OFFICE:					
Salaries	440	1,100	440	320	2,300
Rent, Rates, Light and Heat	150	400	100	50	700
Miscellaneous Expenses .	40	110	30	20	200
PUBLICITY:					
Advertising Contracts . .	700	1,400	1,300	1,500	4,900
Total	£4,060	£7,170	£4,200	£6,690	£22,120

Prepared by _____ on _____ 19____ Submitted to _____

The above illustration shows the Sales Expenses budget for a division. A similar budget will be prepared for the business as a whole, substituting the divisions for the areas.

CHAPTER IV

THE PRODUCTION BUDGET

§ 24. Production Pattern

The preliminary Production budget is prepared simultaneously with the preliminary Sales budget. The budgeting personnel compiling the Production budget will assume a pattern of demand for the finished product. Normally, this pattern will be based on the previous requirements of the selling department although major alterations in selling policy will be taken into account, *e.g.* where it is decided to cease manufacturing articles for the special requirements of customers and to produce standard lines only. When the Sales and Production budgets are compared and reconciled, errors made by the budgeting personnel will be eliminated.

§ 25. Application of the Governing Factor

In paragraph 11 the principle of the governing factor was discussed. There are three basic factors controlling the quantity which can be manufactured, raw material supply, labour supply and plant capacity. By considering the governing factor for each product a statement showing the net probability for each so far as the production department is concerned can be prepared.

Illustration

For the future budget period, the buyer informs you that supplies of raw materials for products A, B, C and E are unlimited, but are limited for product D. Calculations show that the supply will enable only 1,000 units of product D to be produced. Plant capacities for each product are:

Product A	8,000 units	Product B	15,000 units
„ C	10,000 „	„ D	10,000 „
Product E 2,000 units			

The personnel manager reports the available labour supply to the works manager who calculates that by allocating that labour in a particular manner, the units of each product which can be produced are:

Product A	10,000 units	Product B	25,000 units
„ C	6,000 „	„ D	10,000 „
Product E 5,000 units			

From the above information prepare a statement showing the net probability for each product.

PRODUCTION BUDGET

STATEMENT OF NET PROBABILITY FOR EACH PRODUCT

FOR THE PERIOD ENDED

Product	Governing Factors			Net Probability	Remarks
	Plant	Raw Materials	Available Labour		
	Units	Units	Units	Units	
A	8,000	Unlimited	10,000	8,000	
B	15,000	"	25,000	15,000	
C	10,000	"	6,000	6,000	
D	10,000	1,000	10,000	1,000	
E	2,000	Unlimited	5,000	2,000	

§ 26. Methods of Extending the Governing Factor

In the illustration in the preceding paragraph, the various governing factors will have been found by investigation. The reasons for each limitation should be clearly stated in the Report of Net Probability, as on the basis of this information management may be able to take action. The plant restrictions affecting products A, B and E may be caused by bottlenecks at certain stages in the manufacturing process. In the immediate future it may be possible to eliminate such bottlenecks by overtime or shift-working. Medium and long term remedies include a re-arrangement of machines or the purchase of new machines. The labour shortage in respect of product C may be the result of a shortage of craftsmen, although there may be a liberal supply of unskilled labour. A training programme may overcome this difficulty. The shortage of raw material may be in respect of one ingredient out of several required to manufacture product D. A different ingredient may be substituted.

The methods of extending the governing factor will fall into two categories, short-term and long-term. The choice of a long-term solution will depend on the continuance of production (or buying of the finished article for resale) as the governing factor and of the prospective sales demand. There is nothing to prevent the adoption of short and long-term remedies simultaneously. Some remedies are:

- (a) working overtime;
- (b) shift-work;
- (c) using alternative raw materials;
- (d) re-designing the product manufactured so that bottlenecks in production can be removed;
- (e) sub-contracting of work either by purchasing the finished product or by purchasing 'bought-out' parts for assembly into the finished product;
- (f) erection or purchase of additional or more convenient buildings;

- (g) acquisition of additional or modern plant;
- (h) improved plant layout;
- (i) better organization of the flow of work through the factory;
- (j) training scheme for employees;
- (k) incentive schemes to employees;
- (l) simplification of work involved in manufacturing products.

Each of the foregoing remedies requires a policy decision.

§ 27. The Standard Hour

So far in this book the number of each product to be sold or manufactured has been given in units. These units may be quoted either in terms of weight, number of articles or in standard hours. A 'standard hour' is the quantity of any product which should be produced in one clock hour. By using the standard hour technique, production can be expressed as x hours work, *e.g.* if 100 lbs of jam can be manufactured in an hour and 600 tins of apples can be filled in one hour, a production programme of 900 lbs of jam and 3,000 tins of apples is equal to $(\frac{900}{100} + \frac{3000}{600})$ 14 standard hours. Thus a manufacturing programme involving products quoted in different units can be stated in one common denominator. The technical staff of the business will ascertain the quantity of any product which can be produced in one hour. It is a relatively simple task to ascertain the number of hours which can be worked in a period. By using the standard hour technique, the probable production in that period can be computed. Costs are incurred in many instances by the passage of time. If output is also related to time, an accurate estimate of costs of production can be made. Furthermore, time is unchanging, unlike the value of money. Therefore, comparisons between the results of different periods, or the actual figures and budgeted figures for a period are facilitated by the use of standard hours.

Illustration

In the XY Co. Ltd., 3,000 jars of mixed pickles can be filled in one hour; 5,000 jars of pickled onions can be filled in one hour; and 10,000 bottles of sauce can be filled in one hour. Therefore, an output of 3,000 jars of mixed pickles equals 1 standard-hour; 5,000 jars of pickled onions equals 1 standard-hour; and 10,000 bottles of sauce equals 1 standard-hour. In April, the anticipated and actual clock-hours were 160. Therefore, as one standard-hour is the output which can be produced in one clock-hour, the budgeted production is 160 standard-hours. The budgeted and actual productions for April were:

	Budget	Actual
Mixed pickles ..	192,000 jars	202,500 jars
Pickled onions ..	300,000 jars	320,000 jars
Sauce	360,000 bottles	400,000 bottles

The above facts could be converted into standard hours, as follows:

	Budget			Actual		
Mixed pickles	$\frac{192,000}{3,000} = 64$	standard-hours.		$\frac{202,500}{3,000} = 67\frac{1}{2}$	standard-hours.	
Pickled onions	$\frac{300,000}{5,000} = 60$	„	„	$\frac{320,000}{5,000} = 64$	„	„
Sauce	$\frac{360,000}{10,000} = 36$	„	„	$\frac{400,000}{10,000} = 40$	„	„
	<u>160</u>			<u>171$\frac{1}{2}$</u>		

As the clock hours have remained at standard, the additional production of 11½ standard-hours must have been due to greater efficiency. Thus, standard-hours are useful in measuring the efficiency of workers.

§ 28. Comparison and Integration of Sales and Production Budgets

Before the Sales and Production budgets can be integrated, they must be quoted in a common unit. The simple illustrations in Chapter III showed sales divided between five products. Similarly production has been shown in this Chapter divided between the same five products. Unfortunately this may not be possible in practice. The products may not be capable of being expressed conveniently at some stages as so many finished articles or the parts being manufactured may be numerous and assembled into several products which are unlike in their final form. Thus the Sales staff consider the actual product to be sold; the Production personnel have to consider the many different manufacturing processes or sub-assemblies required to complete the product in its finished state.

The Sales budget must be converted into main process times, machine loading, man-hours, etc. This can be achieved by expressing sales in terms of standard hours. Where previously illustrations have shown units, the words 'standard hours' may be substituted. A comparison of the Sales and Production budgets may now be made.

In the illustration in paragraph 13, it can be seen that the full productive capacity for products A and B was not required for sales. However, it was decided to increase the finished stocks of product A. The manufacturing programme must take this fact into account. The stock of finished products can be increased or decreased only in the case of products A and B. When production is the governing factor for any length of time, as with products C and D, further diminution of the stock of finished products becomes almost impossible, because such reduction would already have been carried to the point of near exhaustion by the sales demand.

§ 29. Production Budget by Process or Department

The conversion of sales into productive processes was referred to in paragraph 28. The works activity necessary to manufacture the number of finished products equal to the budgeted sales must be expressed in

actions by employees. Therefore, the factory budget will be departmentalised in line with works organization.

The manufacturing department may not be amenable to organization in the same fashion as the sales department. Each of the products being manufactured may pass through the same processes or a varying combination of them. The organization of these processes depends on many factors, including the plant and building layouts needed, and a convenient sub-division of labour skills. The quantity of raw materials required, the hours to be worked by employees and the hours during which the various machines will be used must be ascertained. At each stage the governing factor will be determined.

It will be noted that the budget is expressed in durable terms, *e.g.* for labour, calculations are in hours, not in monetary terms. Next the departmental activity must be assessed in money. The preparation of the Production budget has been divided into sections; Raw Materials, Direct Labour, Indirect Labour and Overhead Charges. These matters will be dealt with in detail in the succeeding paragraphs.

§ 30. Raw Materials Budget

The use of standard costs, when preparing the Raw Materials budget, can simplify the work of the accountant. This does not mean, however, that if standard costs are not in use, a raw materials budget cannot be prepared. Estimates of the quantities of at least the main or key raw materials are necessary to determine whether or not the probable supplies thereof act as the governing factor. Conversion of these quantities into money should offer no insuperable problem.

Frequently the factory will be organized into a number of departments. Either the raw materials will be converted into the finished product entirely in one department or will be passed from department to department going through a further manufacturing process in each. The consumption of raw material by a department will be found by considering the production of each department and the raw material specification for each product.

Each product manufactured will have a design or formula, and a raw materials specification. From these specifications, the quantity of raw materials per product (or sub-assembly) must be multiplied by the quantity of intended production to give the total quantities of raw materials required. Then these materials must be evaluated by the application of the computed raw material unit costs. When fixing the anticipated cost of raw materials, management must consider the future movements of market prices (particularly where available supplies are limited), the extent to which hedging operations have been or will be conducted, the use of different materials from those laid down in the specification, the possible need to buy at disadvantageous times due to lack of finance or storage facilities and the possible modification of products. Where standard costs are available from a previous period, these should be adjusted for anticipated variations in market prices, and multiplied by the quantity of the

intended production. Whether the market price adjustment is made individually to each type of raw material purchased, or en bloc, will depend on the diversity of raw material used and the multiplicity, or otherwise, of finished products made. Having estimated the probable raw material cost of the production for the period, further adjustments are needed in respect of raw material stock policies and contracts already placed. Where the stocks of raw materials are to be reduced, the quantities to be purchased will be less than the quantities of material required by the Production budget. The opposite will be the case if stocks are to be increased. After these adjustments, the Purchasing budget is complete.

Illustration

The production in the future budget period is estimated at: Product A, 8,000 units; Product B, 15,000 units; Product C, 6,000 units; Product D, 1,000 units; Product E, 2,000 units. There are three production departments in the factory, X, Y and Z. All products requiring raw material P pass through Department X. Products requiring raw materials Q and R pass through Department Y, while all products (except product A) pass through Department Z where raw materials S and T are added. The raw material specifications for manufacturing one unit of each product are:

Product	Raw Material				
	P units	Q units	R units	S units	T units
A	1				
B	1	1		1	1
C			2	1	1
D	1	4		1	1
E	2			3	1

Stocks of raw material Q are excessive at the beginning of the period and are to be reduced by 1,000 units.

From the above information, prepare a Purchasing budget.

The budgeted prices per unit are:

Raw Material	P	Q	R	S	T
Price	5s. 0d.	2s. 0d.	6s. 8d.	7s. 6d.	3s. 4d.

§ 31. Direct Labour budget

The method of remunerating direct labour will determine the procedure to be adopted in the preparation of the Direct Labour budget. It is unlikely that a single basis of remuneration will apply in all departments or even in a particular department. The budget must be built up from the bottom of the chain of responsibility. Where the worker is remunerated on a piece-work basis, the production of each worker in the budget period must be estimated. Where the remuneration is on a time basis and where practicable, standard times can be computed for each operation by the use of time and motion methods. Time and motion study is the scientific analysis and study of the methods used in performing tasks. It is based on the desire to develop the best way of doing work and by the use of improved methods wasted energy is eliminated and elementary operations are standardized. The departmental productive time can be calculated by aggregating the times of all operations in the department. Where bonus premium plans are in operation, the bonuses paid during the past period must be considered and an average figure for each operation or each group of operations determined.

Further matters which need consideration include:

- (a) the trend in the rate of productivity;
- (b) the probable effects of modernization schemes (*e.g.* introduction of new plant, etc.); and
- (c) the effect of changes in the design of products.

When evaluating standard times or estimating piece-work rates for the future period, the management will normally take the rates for the last budget period and adjust them in the light of wage agreements recently made; negotiations proceeding or pending with Trades Unions; and trends in National and Trade rates. The rates to be used should adhere as closely as possible to the actual rates in the future period.

Frequently as a result of machines actually producing the particular article, the direct labour consists principally of machine setters or operators. In these circumstances machine capacity may vary but the direct labour hours per batch may be constant. A decision to increase production will not automatically, therefore, increase direct wages in the same proportion. Care must be taken to allow for such factors when preparing the budget.

§ 32. Indirect Labour and Factory Overheads budget

These charges must be divided between variable expenses, semi-variable expenses and fixed overheads. Variable and semi-variable expenses will vary with the level of activity. Fixed overheads may also vary, *e.g.* when it is necessary to increase the size of the factory or the number or size of the machines included therein. The factory will consist of production and service departments. A production department is one in which actual productive operations are performed. Service departments are those ancillary to the production departments and are created to facilitate the manufacture of the products at the factory. Each item of expense should be individually

considered and charged to the appropriate department in which it arises. The overheads apportioned to the service departments will be totalled. The total costs of such departments will be allocated to the production departments on an agreed basis which will be determined by the use made by each production department of the services available. Whether the production departmental charges are allocated to products or operations in the department will depend upon the wishes of management. Each item of expenditure must be the express responsibility of a particular individual. The statement showing the allocation made to him must distinguish between those expenses which he can and those expenses which he cannot control. A discussion on the principles to be adopted in allocating expenses to production is outside the scope of this book and readers are referred to the *Notes on the Allocation of Expense* issued by the Institute of Chartered Accountants or *Cost Accounts* by W. W. Bigg, F.C.A.

When budgeting factory overheads for a future period management must consider the level of activity to be attained so that variable and semi-variable expenses can be forecast accurately; the effect of external influences (*e.g.* a rise in prices); and variations in expenses as a result of capital expenditure or factory re-organization.

Illustration

From the undernoted information prepare a factory allocation statement where there are two production departments (A and B), and two service departments (boiler house and cost office).

FACTORY COSTS FOR THE 13 WEEKS ENDED 31ST DECEMBER, 19..						£	£
Indirect Wages:							
Department A	..	..	..	..	..	26,522	
Department B	..	..	..	..	..	15,484	
							42,006
Boilermen's Wages	..	..	..	..	..		2,018
Cost Office Salaries	..	..	..	..	..		2,596
Depreciation:							
Productive Machines:							
Department A	..	..	..	..	40%		
Department B	..	..	..	..	30%		
Boilers	..	..	..	..	25%		
Cost Office Machines		..	..	..	5%		
					100%	4,000	
Buildings	..	..	..	..	..	600	
							4,600
Repairs: Productive Machines and Boilers						..	7,600
Cost Office Machines						..	174
Buildings						..	3,000
							10,774
Rent of Factory	..	..	..	..	..		2,000
Rates of Factory	..	..	..	..	..		1,600
Insurance: Productive Machines and Boilers						..	760
Buildings						..	500
							1,260
Carried forward							66,854

					Brought forward ..	£66,854
Coal and Water	..	..	..	..		3,842
Printing and Stationery	..	..	..	..		300
Cleaning Materials: Productive Machines and Boilers ..					380	
Buildings	..	..	..	..	600	
						980
						<u>£71,976</u>

Notes:

- (1) The term 'Productive Machines' refers to machines in Departments A and B and does not include cost office machines.
- (2) Allocate repairs, insurance and cleaning materials of productive machines and boilers in proportion to their depreciation.
- (3) The floor space of the factory buildings is occupied as follows: Department A 40 per cent, Department B 40 per cent, Boiler house 10 per cent, Cost Office 10 per cent.
- (4) The Boiler house provides power for the productive machines in Departments A and B and, in addition, space heating and lighting valued at £300. The power consumed in Departments A and B is in the ratio of 2:1 respectively.
- (5) The services of the Cost Office are to be charged to Departments A and B in the ratio of 3:2 respectively.

FACTORY OVERHEAD ALLOCATION STATEMENT
13 WEEKS ENDED 31ST DECEMBER, 19..

Expense	Amount	Basis of Apportionment	Production Departments		Service Departments	
			A	B	Boiler House	Cost Office
	£		£	£	£	£
Indirect Wages ..	46,620	Actual ..	26,522	15,484	2,018	2,596
Rent ..	2,000	Floor space ..	800	800	200	200
Rates ..	1,600	Floor space ..	640	640	160	160
Depreciation:						
Machinery ..	4,000	Basis shown in question ..	1,600	1,200	1,000	200
Buildings ..	600	Floor space ..	240	240	60	60
Repairs:						
Machinery ..	7,600	Departments A, B and Boiler house on basis of depreciation	3,200	2,400	2,000	—
Buildings ..	3,000	Floor space ..	1,200	1,200	300	300
Cost Office Machines ..	174	Actual ..	—	—	—	174
Insurance:						
Machinery ..	760	Depreciation ..	320	240	200	—
Buildings ..	500	Floor space ..	200	200	50	50
Coal and Water ..	3,842	Actual ..	—	—	3,842	—
Printing and Stationery ..	300	Actual ..	—	—	—	300
Cleaning Materials:						
Machinery ..	380	Depreciation ..	160	120	100	—
Buildings ..	600	Floor space ..	240	240	60	60
					9,990	
Space Lighting and Heating ..	—	Floor space (provided by boiler house)	+ 120	+ 120	—270	+ 30
					9,720	
Power ..	—	Provided by boiler house on basis: Department A: 2 Department B: 1	+ 6,480	+ 3,240	— 9,720	
Services of Cost Office ..	—	Department A: Department B 3:2 ..	+ 2,478	+ 1,652		— 4,130
	<u>£71,976</u>		<u>£44,200</u>	<u>£27,776</u>		

CHAPTER V

THE ADMINISTRATION AND RESEARCH BUDGETS

§ 33. The Administration Budget

Normally the accountant will be responsible for the preparation of this budget. He is fortunate in that the majority of administration expenses are fixed in character. Apart from variations caused by changes in other budgets (*e.g.* a decision to sell to retailers instead of wholesalers will result in an increase in the number of invoices to be prepared), the accountant will consider the number and type of the administration staff, their future rates of pay and the office accommodation available. He will also determine the amendments required in the budgeted figures for the last budget period for printing, postage, telephone, etc., due to any different conditions anticipated in the future budget period. Allowance may have to be made for legal and similar expenses which may result from policy decisions.

§ 34. The Research Budget

A programme of research will be prepared, distinguishing between the research to be undertaken by the business' own staff and that to be contributed by outside research organizations, *e.g.* by the research establishment for a particular industry or by universities. The number of research staff, their grades and future rates of pay, the drawing office or laboratory accommodation and the direct expenses resulting from such programme must be estimated.

This budget is frequently prepared initially for several years ahead and then allocated between short-term budgets. Violent fluctuations in the expenditure on research during the period of the long-term budget are unusual.

However, difficulties arising in the research programme may cause errors to arise in short-term budgets. For example, on the basis of the anticipated research programme, certain chemicals costing £1,000 were to be purchased in January. However, research into earlier processes was delayed and the chemicals were finally purchased in April. The actual expenditure in January was, therefore, £1,000 below budget, while the budget for April would have to be amended to include £1,000 for these chemicals.

CHAPTER VI

THE CAPITAL BUDGETS

§ 35. Introduction

As has already been mentioned, it is sometimes impossible to achieve revenue objectives because of a lack of capital resources. Capital budgets, complementary to revenue budgets in every sense, must be prepared for both short-term and long-term periods. Within the framework of a long-term budget subsidiary capital budgets for shorter periods will be prepared. The vital necessity is to remain solvent throughout, and the test of solvency is the ability of the business to pay its obligations when due. Revenue budgets, showing a constantly expanding and profitable trade, could ruin a business in certain circumstances, *e.g.* where goods sold are not paid for immediately but are represented by debts which remain outstanding for a long period while suppliers allow only short periods of credit.

Obviously many entries in the Capital budget will arise as a result of the facts disclosed in the revenue budgets mentioned in Chapters III to V. However, the forecasting of capital needs and availability must not be confined to the consequences ensuing from these revenue budgets. Policies involving the deliberate investment of resources, schemes of expansion and contraction must be planned. Since the creation of new earning capacity must precede the earnings themselves, budgeting such capital intentions must precede the preparation of the revenue budgets for the earnings.

As indicated in the previous Chapters, budgets must be based on defined plans, yet the budget is usually a step in the formation of the plan. Many alternative forecasts may be made and discussed before the final decision on which the Capital budget can be prepared is taken. To participate in following, and at times suggesting, these alternatives the management accountant must be thoroughly and sympathetically in step with the forward thinking of his management.

§ 36. Stock and Work-in-Progress Budgets

A realistic plan for stock must cover raw materials, work-in-progress and finished goods. The quantities of each at any particular time should be the result of deliberate planning. For each, the plan should define:

- (i) the minimum active quantities needed to achieve the budgeted turn-over;
- (ii) the minimum inactive stocks required (*e.g.* the stocks necessary to provide spare parts where the business services products sold in previous periods);

- (iii) the build-up of stocks and work-in-progress required for future expansion, or the anticipated reduction to allow for an expected contraction in business;
- (iv) the effect of seasonal variations, holidays, etc., on production or sales;
- (v) the extent to which hedging or speculative investment in stocks will occur; and
- (vi) the maximum quantity of redundant stocks which is permissible.

The sphere of responsibility is important. It is unlikely that stock policy and control will be the responsibility of one man. Stocks of raw materials, work-in-progress and stocks of finished goods may be the duty respectively of the buyer, works manager and sales manager. But their responsibility may be restricted to (i) to (iv) above, the board of directors or managing director reserving the right to decide and control hedging operations.

The stock budgets will be prepared originally in quantities. The conversion into money values will take place only when the stock policy has been finalised. Variations in market prices will result in the monetary value of stocks and work-in-progress differing from budget. But provided the policy has not changed, actual and budgeted quantities should agree. Merely to budget the total quantities needed under (i) to (v) above is not sufficient. Three more factors must be considered, the time the stocks are to be available, their location and the storage facilities required. Stocks of raw materials must be sufficient at any time to prevent production stoppages from lack of material. The quantity of stocks of finished goods required is dependent upon the length of time between receipt of the customer's order and the desired date of delivery and on the necessity to preserve continuity of supply in the face of normal risks, *e.g.* transport dislocation due to the weather.

Illustration

At 1st January, 19... , stocks of raw material, X, Y and Z, were respectively 6,000 units; 12,000 units; and 9,000 units. The quantities of each to be purchased and the budgeted consumption in the three months to 31st March, 19... , and the standard prices fixed for that period were:

	Purchases	Consumption	Standard Price
	Units	Units	s. d.
X	70,000	62,000	10 0
Y	72,000	80,000	12 6
Z	94,000	94,000	8 0

All stocks, purchases and issues are valued at the standard prices shown above. From the above information prepare a statement showing the budgeted stocks at 31st March.

STATEMENT OF STOCKS OF RAW MATERIALS

AS AT 31ST MARCH, 19...

	X		Y		Z	
	Units	£	Units	£	Units	£
Stock 1st January ..	6,000	3,000	12,000	7,500	9,000	3,600
Budgeted Purchases ..	70,000	35,000	72,000	45,000	94,000	37,600
Carried forward	76,000	38,000	84,000	52,500	103,000	41,200

	Units	£	Units	£	Units	£
Brought forward	76,000	38,000	84,000	52,500	103,000	41,200
Less Budgeted consumption	62,000	31,000	80,000	50,000	94,000	37,600
Anticipated Stock						
31st March	14,000	£7,000	4,000	£2,500	9,000	£3,600

In the above illustration stocks of raw material X are expected to increase during the budget period while those of raw material Y will decrease. It is necessary before deciding to increase or decrease stocks to know the manufacturing policy (which itself will be based on the sales policy) for the period immediately following 31st March. Management must, therefore, think of the future.

§ 37. Debtors Budget

The sales to be made in the budget period will be included in the Debtors budget, not in the month the goods are sold, but in the month in which it is anticipated the customer will pay cash for them, *e.g.* if the normal period of credit is one month from the end of the month of delivery, goods sold in January will be paid for in the last week of February and the first week of March. When deciding the average period of credit taken by customers, the sales budget must be scrutinised for variations from the last period, in sales involving a longer or shorter period of credit than the past average for the business. Jobs involving large sums of money and special credit terms should be dealt with separately from the normal sales. The experience of the business and, if ascertainable, of other businesses in following a particular policy in the past will help in forecasting the average period of credit. In some trades, the season influences payment, in others the frequency of calls by sales representatives.

Before finalising the Debtors budget, management should consider the desirability of a change in credit policy. Matters to be discussed include:

- the incidence of bad debts in past periods;
- the cost of collection of debts;
- whether there is a shortage of cash;
- the loss of business caused by a longer credit period being granted by competitors; and
- the possible expansion of business as a result of increasing the period of credit allowed.

Where the credit policy is varied, other budgets may require amendment, *e.g.* cash discounts may result in debts being paid more rapidly but unless selling prices are raised sufficiently the actual cash received will decrease.

§ 38. Cash Budget

Entries in the other budgets involving monetary transactions will affect the Cash budget. Cash receipts will depend mainly on the collection of debts which will be revealed by the Debtors budget. In practice, as a result of past experience, the estimation of the sums to be received in a particular period is not difficult. Initially, when the credit policy of the business is

altered, errors may arise but these should be limited by using commonsense and business experience. The date of receipt and sum receivable in respect of other cash income are predictable. Such income will include rents, dividends and remittances from subsidiary and associated companies.

Cash payments can be manipulated by delaying payments for a short period, to achieve the cash balance desired by management. However, where possible, provision should be made for the payment of creditors on their due dates; such dates providing for securing the maximum discounts. From the Raw Materials budget, the budgeted purchases will be known. The length of credit extended by suppliers can be established from past experience and the terms of contracts. After allowing for a lapse in time equal to the expected credit period, the amount of purchases will be inserted in the Cash budget at the date on which the liability is to be discharged.

Payments in respect of wages and expenses can be ascertained from the Labour and Expense budgets. In the case of wages and salaries, the Departmental Labour budgets will have defined the expected amount and period of payment. Although expenses may relate to a particular period, they are not necessarily paid in the same period. For example, insurance premiums are payable yearly in advance; rates, six months in advance; electricity, two months after each consumption period. Expenses must be included in the Cash budget in the period in which they are to be paid.

Capital payments can be ascertained from the Capital Expenditure budgets (*see* § 41). Dividends, tax and other special items having predetermined dates of payment provide no budgeting problem when their amounts are known. Where short-term Cash budgets are prepared difficulties are unlikely to arise, but long-term budgets may become worthless as a result of unexpected decisions by the board.

For each budget period the closing balance of cash in hand will be found by adding the expected cash receipts to the commencing balance and deducting the anticipated cash payments.

Illustration (1)

From the following forecasts of income and expenditure prepare a Cash budget for the six months commencing 1st June, when the bank balance was £110,000.

	Sales	Selling Over- heads	Pur- chases	Wages	Factory Over- heads	Admini- stration Over- heads	Research Expen- diture
	£	£	£	£	£	£	£
April ..	88,500	3,250	37,000	8,000	5,680	2,500	2,400
May ..	84,000	4,100	40,000	8,400	5,920	2,760	2,400
June ..	93,000	3,710	39,060	8,800	5,440	2,480	2,400
July ..	72,000	3,210	39,900	6,000	5,880	2,600	2,400
August ..	82,500	3,600	35,000	9,600	6,000	2,520	2,600
September ..	98,600	3,450	36,400	8,000	5,680	2,700	2,600
October ..	92,800	3,210	36,574	8,400	5,360	2,560	2,600
November ..	104,400	3,200	32,800	7,600	5,850	2,620	2,400

A sales commission of 5% on sales and due two months after sales, is payable in addition to the above selling overheads. Capital expenditure: plant purchased, June £38,000 payable on delivery; building purchased June for £80,000, payable in two half-yearly instalments, the first in July.

A dividend of £10,000 (net) will be paid in September.

Period of credit allowed by suppliers and to customers – 2 months.

Lag in payment of wages – $\frac{1}{4}$ th month

” ” ” ” Factory Overheads – 1 month.

” ” ” ” Administration Overheads – 1 month.

” ” ” ” Research Expenditure – 1 month.

” ” ” ” Selling Overheads – 1 month.

CASH BUDGET

FOR THE PERIOD ENDED 30TH NOVEMBER, 19..

	June £	July £	August £	September £	October £	November £
Opening balance ..	110,000	95,145	74,565	100,615	96,195	116,790
Cash received from debtors ..	88,500	84,000	93,000	72,000	82,500	98,600
	<u>198,500</u>	<u>179,145</u>	<u>167,565</u>	<u>172,615</u>	<u>178,695</u>	<u>215,390</u>
Payments:						
Purchases ..	37,000	40,000	39,060	39,900	35,000	36,400
Wages ..	8,750	6,350	9,150	8,200	8,350	7,700
Factory Overheads	5,920	5,440	5,880	6,000	5,680	5,360
Administration Overheads	2,760	2,480	2,600	2,520	2,700	2,560
Research Expenditure	2,400	2,400	2,400	2,600	2,600	2,600
Selling Overheads	4,100	3,710	3,210	3,600	3,450	3,210
Selling Commission	4,425	4,200	4,650	3,600	4,125	4,930
Capital expenditure	38,000	40,000	—	—	—	—
Dividend ..	—	—	—	10,000	—	—
TOTAL PAYMENTS	<u>103,355</u>	<u>104,580</u>	<u>66,950</u>	<u>76,420</u>	<u>61,905</u>	<u>62,760</u>
Closing balance ..	95,145	74,565	100,615	96,195	116,790	152,630
	<u>198,500</u>	<u>179,145</u>	<u>167,565</u>	<u>172,615</u>	<u>178,695</u>	<u>215,390</u>

The payments for wages reflect the time lag on payments *viz.*, June, ($\frac{1}{4}$ th of £8,400 =) £1,050 + ($\frac{3}{4}$ ths of £8,800 =) £7,700 = £8,750.

An alternative method of cash budgeting is the ‘Balance Sheet change’ method. The opening cash balance is adjusted by the anticipated increase or decrease in debtors, stocks, work-in-progress, payments in advance, provisions for depreciation, special receipts (*e.g.* fixed assets sold) and the net profit for the year before appropriations and taxation. From the aggregate amount of these are deducted the estimated taxation payable, dividends payable, expenditure on fixed assets, special payments (*e.g.* abnormal advertising expenditure to be written off over a number of years) and the decrease in the amount due to creditors. The resulting balance is the anticipated cash in hand at the end of the budget period.

This method does not involve consideration of each individual expense but to be accurate does require a regular pattern of payments. The ‘Balance Sheet change’ method is frequently used where a long-term cash budget, involving several years, is being prepared.

Illustration (2)

Prepare from the following budgeted information a Cash budget for the two years ended 30th April, 1959:

	1st May 1957		30th April, 1958		30th April, 1959	
	£	£	£	£	£	£
Issued Share Capital in Ordinary Shares of £1 each						
Share Premium Account		150,000		150,000		200,000
Profit and Loss Account:		50,000		50,000		75,000
balance at start of year	70,600		84,000		97,500	
profit for year	42,000		46,000		54,000	
	<u>112,600</u>		<u>130,000</u>		<u>151,500</u>	
<i>Less</i> taxation	20,600		24,500		23,500	
dividends	8,000		8,000		10,000	
	<u>28,600</u>	84,000	<u>32,500</u>	97,500	<u>33,500</u>	118,000
Reserve for Future In.Tax		17,000		18,500		16,500
Current Liabilities:						
Sundry Trade Credr's	92,250		78,250		83,250	
Current Taxation	4,000		5,000		5,500	
Dividends (proposed)	8,000		8,000		10,000	
	<u>104,250</u>		<u>91,250</u>		<u>98,750</u>	
	<u>£405,250</u>		<u>£407,250</u>		<u>£508,250</u>	
Fixed Assets:	Cost	Depn.	Cost	Depn.	Cost	Depn.
	£	£	£	£	£	£
Freehold						
Buildings	115,000	35,000	80,000	40,000	80,000	44,000
Plant and Machinery	40,000	28,000	78,000	41,200	36,800	52,000
Motor Vehicles	10,000	8,000	2,000	9,800	1,200	12,000
	<u>165,000</u>	<u>71,000</u>	<u>94,000</u>	<u>91,000</u>	<u>118,000</u>	<u>108,000</u>
			209,000	118,000	336,000	228,000
Current Assets:						
Stock in trade	80,000		96,000		84,000	
Sundry Debtors	110,000		69,000		79,000	
Quoted Investments	9,000		9,000		—	
Payments in Advance	6,250		10,250		15,250	
Balance at Bank	106,000		105,000		102,000	
	<u>311,250</u>		<u>289,250</u>		<u>280,250</u>	
	<u>£405,250</u>		<u>£407,250</u>		<u>£508,250</u>	

In preparing the above figures, the following adjustments have been made to allow for anticipated sales of investments and plant. The Profit for the year ended 30th April, 1959, includes £1,000 profit on sale of investments. The plant scrapped in the year ended 30th April, 1959, and sold for £5,000 had originally cost £18,000 and depreciation written-off to date of sale was £11,000. The loss on sale has been written-off against the profits for the year. Normally the information would not be known in the form of Balance Sheets. It is given in this form in this book for the sake of simplicity.

CASH BUDGET 2 YEARS ENDED 30TH APRIL, 1959

	1957/58		1958/59	
	£	£	£	£
Opening Balance	..	106,000	..	105,000
Decrease/Increase in Debtors	..	41,000	..	10,000
Decrease/Increase in Stocks	..	16,000	..	12,000
Decrease/Increase in Payments in Advance	..	4,000	..	5,000
Increase in Provision for Depreciation	..	20,000	..	28,000
Net Profit for year (before taxation)	..	46,000	..	55,000
Proceeds of Plant scrapped	..	—	..	5,000
Sale of Investments	..	—	..	10,000
Issue of Share Capital	..	—	..	75,000
		<u>193,000</u>		<u>275,000</u>
Carried forward				

	Brought forward	£193,000	£275,000
<i>Less: Expenditure on Buildings, Plant and</i>			
Vehicles	44,000	145,000	
Taxation payments	22,000	25,000	
Decrease/Increase in Creditors	14,000	5,000	
Dividends paid	8,000	8,000	
	<u>88,000</u>	<u>173,000</u>	
Closing Balance	£105,000	£102,000	

Notes:

(1) The net profit for the year 1958/59:		£
Balance per question		54,000
<i>Less: Profit on sale of investment</i>		<u>1,000</u>
		53,000
<i>Add: Loss on sale of plant</i>		<u>2,000</u>
Balance as in Budget		<u>£55,000</u>
(2) Expenditure on Buildings, etc.:		£
Balance 30th April, 1958, at cost		209,000
<i>Less: Sales at cost</i>		<u>18,000</u>
		191,000
Balance 30th April, 1959, at cost		<u>336,000</u>
Expenditure as in Budget		<u>£145,000</u>
(3) Taxation:		£
Balance 1st May, 1957		21,000
Charge to Profit and Loss Account 1957/58		<u>24,500</u>
		45,500
Balance at 30th April, 1958		<u>23,500</u>
Expenditure 1957/58 as in budget		<u>£22,000</u>
		£
Balance 30th April, 1958		23,500
Charge to Profit and Loss Account 1958/59		<u>23,500</u>
		47,000
Balance at 30th April, 1959		<u>22,000</u>
Expenditure 1958/59 as in budget		<u>£25,000</u>
(4) Provision for Depreciation 1958/59:		£
Balance, 30th April, 1958		91,000
<i>Less: Depreciation on plant sold</i>		<u>11,000</u>
		80,000
Balance, 30th April, 1959		<u>108,000</u>
Increased provision as in budget		<u>£28,000</u>

The Cash budget may reveal a cash surplus or deficit during the budget period. Such surplus or deficit may exist for a short time only or it may still exist at the end of the period.

The accountant will be expected to suggest the course of action which should be adopted having regard to the prospective situation revealed in the budget. Naturally, the directors will not shelve their responsibility for deciding policy but they are likely to be guided by the views of the accountant.

§ 39. Borrowing

The cash budget may show a deficiency in cash resources. Management must decide whether this deficiency is temporary or will continue over several years. A temporary shortage may be caused by:

- (a) seasonal fluctuations in business, *e.g.* an increase in stocks in a retail business to meet the Christmas rush;
- (b) abnormal fluctuations in cash requirements, *e.g.* caused by hedging operations;
- (c) isolated or single ventures, *e.g.* a purchase of a special line in fur gloves by a shop normally selling stockings, possibly to test the market for gloves.

The usual sources of short-term borrowing are bank overdrafts and acceptance credits. These fulfill the two essentials of:

- (i) fluidity, *i.e.* the ability to increase or decrease the obligation within permitted limits from day to day; and
- (ii) floating security (if any is required), *i.e.* assets may be bought or sold without reference to the lender.

Long-term borrowing will be considered where a permanent increase is to be made in the amount invested in fixed assets or working capital; or where sums originally borrowed for a short period are now expected to be required for a longer period.

Borrowed money is not risk capital, as are shares. Whilst, therefore, money may safely be borrowed to erect a new building, loans should not be raised to purchase the goodwill of a business. Where the loan is for the acquisition of specific assets, any restriction imposed by lenders as to their use and disposal must be considered. While the lenders require security for their loan, the earning capacity of assets must not be reduced. Furthermore, to attract loan capital at a reasonable rate of interest, there must be an adequate margin between:

- (a) the net assets and the sum borrowed; and
- (b) the earnings and the interest payable to provide a margin for business risks.

Sources of long-term borrowing include:

- (a) debenture issues;
- (b) private loans, possibly from insurance companies;
- (c) loan stock issues; and
- (d) mortgages.

§ 40. Investment

Where the Cash budget reveals a surplus of cash, management is faced with the problem of investment. Where there is a temporary surplus only, any investment must provide for rapid liquidation and security of capital. Sources satisfying these requirements include:

- (a) a Bank deposit account, which can be used where very rapid repayment may be required;
- (b) Building Society Deposits, where notice terms can be arranged to suit the lender's requirements;
- (c) short-dated Government securities, where a suitable stock is maturing at a date which meets the lender's needs;
- (d) Finance House loans which usually require three to six months' notice, but which give a relatively high return;
- (e) Treasury Bills, where an investment of up to three months is satisfactory;
- (f) Stocks of materials that will require the Stock budget to be reopened to provide for a temporary increase; unfortunately this is a speculative investment and would not be satisfactory if forced realisation might arise;
- (g) Tax Reserve certificates, but only if it is unlikely that surrender will be required before the certificates can be used in payment of taxes, otherwise all interest would be lost; and
- (h) Bills of Exchange retained for their full duration.

If the surplus is not temporary but permanent or long-term then any investment made must:

- (a) ensure security of capital;
- (b) ensure a continuing income;
- (c) in the case of a company, be in accordance with its Memorandum of Association;
- (d) further the earning capacity of the business; and
- (e) give an adequate return on the sum invested. The return considered adequate will be laid down as a matter of policy.

The chief outlets for long-term investment are:

- (a) the expansion of own business by the purchase of additional shops, factories, stocks, etc.
- (b) the expansion of businesses of subsidiary companies;
- (c) investment in allied activities;
- (d) the acquisition of control of allied activities;
- (e) purchase of businesses to limit competition;
- (f) the replacement of wasting assets; and
- (g) the purchase of assets to enable increased efficiency in existing production to be achieved.

Surplus funds should be used by the business as far as possible and not passed to another concern to exploit. A long-term investment should not be made unless the requirements of the long-term plan of the business are fulfilled.

§ 41. Capital Expenditure

As indicated in § 40, capital development schemes may be started because a surplus of cash resources is revealed by the Cash budget, but usually management decide on a capital development scheme and then seek the means to finance it. Alternatively, production may be the governing factor and on discovering surplus cash resources management may decide to purchase plant and buildings. The preparation of each Capital Expenditure budget will depend on the particular project. However, the facts and assumptions on which the budget is based must be clearly stated. Then management can appreciate the risk being taken and probable sources of error. It is preferable to prepare a plan rather than 'to hope for the best'.

(a) *Plant, Machinery and Buildings.* A statement will be prepared showing the output and cost of running the new machines. The profitability of each machine must be found by evaluating output at selling price and deducting therefrom the cost of raw materials, direct labour, overheads applicable to and depreciation of the machine. This statement will enable management to decide whether the investment of monies in the new machine will give an adequate return. Where the project under review is the replacement of a machine by an up-to-date one (which will normally cost more than the plant it replaces), it must be remembered that the higher output of the new machine must pay for an increased charge for depreciation and interest on the additional capital employed. New buildings will be erected or purchased where by so doing the manufacturing costs can be reduced by a sum greater than or equal to interest on the cost of the building, or if greater manufacturing capacity is required.

(b) *Acquisition of an Existing Business.* The purpose for which the business is being acquired will determine the nature of the report to be prepared by the accountant. If the existing business is being acquired to reduce competition, but otherwise will continue to function, the results of past years, amended to allow for known variations in future circumstances, will give an indication of the profits which may accrue to the purchaser. Where, however, the business to be acquired will cease to manufacture and will become an additional sales outlet for the buyer, the figures for past years will rarely give any indication of the future profits. The report will be prepared on the principles indicated in Chapters III to V and will show the anticipated profits of the new business. By comparing these profits with the purchase price, top management can decide whether or not to complete the purchase.

(c) *Manufacturing Abroad.* Schemes involving development require an estimate of capital expenditure, probable sales and operating costs. Forecasting conditions abroad involves more difficulties than forecasting conditions in the United Kingdom. This is partly due to differences in currency. Estimates should be prepared, where possible, in quantities of materials, hours of work, etc.

The estimated sales will be budgeted by the methods indicated in Chapter III. Prices will normally be known because goods will have been exported to the overseas territory. Operating costs are more difficult to

estimate. Data may be obtained from other firms trading in that area and from manufacturing associations. Unless revolutionary methods are to be employed, in the initial period of manufacture efficiency will probably be at a lower level than in the established home industry.

The report will indicate the net profitability of manufacturing abroad after adjusting for any loss of exports. If import restrictions in the country of destination force the business to decide to manufacture abroad, management may have to budget for a lower level of profits than they would normally wish.

(d) *New Products.* The matters involved in budgeting for an expansion of sales have been considered in Chapter III. Having decided the probable level of activity, an estimation of the raw material, labour and overhead costs must be made. Then the profits to be expected in producing and selling a new product can be computed. By comparing the profits with the expected capital expenditure, management can decide whether or not to proceed with the new line. Frequently flexible budgets are prepared when budgeting profits on new products. Where extreme uncertainty exists a flexible capital investment and development scheme may be prepared. Alternatively a pilot scheme may be tried out with limited capital expenditure to test the ground.

Illustration

The works manager has supplied you with the following information regarding his minimum requirements during the next 3 calendar years:

	1957	1958	1959
	£	£	£
Plant in production departments	14,000	60,000	41,000
New boiler in boiler house	—	—	25,000
Fire fighting equipment	1,000	—	—

The distribution department will require 5 new vans in 1957, costing £5,200. In 1958, 12 vans, estimated cost £12,720, will be purchased to replace 12 existing vans. The proceeds of sale of the latter are estimated at £1,200.

The administration division will require in 1959 office furniture costing £1,800 to replace existing furniture, which has no scrap value.

The board of directors have decided as a matter of policy that in 1959 a new factory must be purchased or erected. The anticipated cost is £106,000. Further plant costing £50,000 will be required.

The board have also indicated that at a later date they made decide to purchase further shops at an estimated cost of £80,000.

Prepare a Capital Expenditure budget for the 3 years ended 31st December, 1959.

CAPITAL EXPENDITURE BUDGET

Year ended 31st December	1957	1958	1959
	£	£	£
Plant in production department	14,000	60,000	41,000
New boiler in boiler house	—	—	25,000
Fire-fighting equipment	1,000	—	—
New Vans	5,200	11,520	—
Office Furniture	—	—	1,800
Carried forward	20,200	71,520	67,800

				Brought forward	£20,200	£71,520	£67,800
New Factory	..	..	..	..	—	—	106,000
Plant	..	..	..	..	—	—	50,000
					<u>£20,200</u>	<u>£71,520</u>	<u>£223,800</u>

Note: For later consideration:

Purchase of further shops, £80,000.

It is anticipated that finance for the above expenditure will be found out of existing resources and profit retentions.

Date prepared

Submitted to

Prepared by

§ 42. The Master Budget

When the individual budgets covered in Chapters III to VI have been finalised and approved, the accountant will prepare the Master budget. This will provide a summarised Profit and Loss account for the future period and a Balance Sheet at the end thereof. Only summarised figures will be shown as each item in this budget will be referenced to the particular budget in which the detailed results can be found. The Master budget will be supplied to top management only. After approval by them, the other budgets may be put into operation. The layout of the budget will depend on their wishes but in respect of the Profit and Loss Account the following is suitable. (Note, all figures have been assumed for the sake of the illustration only.)

Illustration

PROFIT AND LOSS ACCOUNT FOR THE MONTH OF APRIL

	April £	Year to Date £
Sales at budgeted prices	46,800	188,720
Less: Budgeted cost of Materials, Wages and Factory Overheads based on sales	32,175	130,920
Gross Profit Margin	14,625	57,800
Less: Budgeted cost of Administration based on Sales	2,925	11,795
Standard profit on actual sales	<u>£11,700</u>	<u>[£46,005]</u>

§ 43. Conclusion

From the foregoing chapters, it should be clear that the facts on which each budget is based must be known and the degree of error clearly indicated. 100 per cent accuracy is impossible in many cases, but if management are to take decisions regarding the future, they must not be misled. Where any policy amendment is made, its effect on *all* budgets must be appreciated and the necessary alterations made therein.

Having planned the physical side of the business, management must not forget the personnel. Top executives must be given time to consider the long-term future and not be concerned only with the short-term possibilities. Assistants must be trained to relieve them of detailed work, while being prepared for promotion on their senior's retirement.

CHAPTER VII

OPERATING STATEMENTS

§ 44. Introduction

The previous chapters have dealt with the creation of plans or budgets for a business based on the prescribed policy. Such budgets will, if properly enforced, ensure that the efforts of managers and supervisors will be co-ordinated. Day-to-day management raises many problems which require immediate action. This leaves little time for long-term thinking and for ensuring the business reaches long-term objectives. The plan encourages long-term thinking, but management must ensure the plan is operated.

Each section must be responsible for its own achievements. Thus, the accountant will be responsible for achieving his department's budget. In addition, however, he must organize and maintain the information services of the business. These will take the form of operating statements or reports on the basis of which action can be taken by management. Although the annual accounts are a form of operating statement they are useless for control purposes as the accounts are rarely available to the Board of Directors until at least one month after the end of the financial year. Even short-term Profit and Loss accounts and Balance Sheets prepared monthly may be prepared too late for control. Naturally reporting on an event must take place after the event has occurred, but the time interval between the event and reporting thereon must be reduced to a minimum. To prepare exact figures may delay the submission of reports. The figures must be sufficiently accurate to enable control to be exercised but they need not be exact, *e.g.* to inform the works manager that 176,000 units were produced last week in department 'A' at 9.30 a.m. on Monday may enable corrective action to be taken in the current week; to inform him at 3 p.m. on Tuesday, when the exact figure of 175,832 units is available, may be too late.

§ 45. Form of Operating Statements

An attractive shop window with a limited choice of well displayed products arrests the attention of passers-by and quickly conveys its message to prospective customers. The management accountant must plan the operating statements on similar lines. The form of presentation may be tabular or diagrammatical. The choice depends on the extent of the information to be given in the report and the likes and dislikes of the recipient. There are some directors to whom charts are an anathema and many foremen who prefer not to understand them. Other executives find that charts reveal a situation or trend more clearly than figures. While, therefore, there is no single form in which an operating statement should be prepared, certain

principles must be observed in their preparation. Any statement must:

- (a) have a title which is self-explanatory;
- (b) state the period of time to which it relates;
- (c) bear the date of preparation and the name of the person responsible for its preparation;
- (d) clearly indicate the units in which any quantitative information is expressed (*e.g.* £, tons and hours);
- (e) bear the names of all persons receiving a copy of the statement;
- (f) reveal the principal matters for consideration at a glance;
- (g) be prepared as soon as possible after the event or events to which it relates;
- (h) be accurate, bearing in mind the purpose for which it is to be used; that unnecessary detail (*e.g.* shillings and pence) can frequently be suppressed; and that the cost of preparation must not be excessive;
- (i) where comparisons are made ensure both sets of figures are prepared on the same basis; and
- (j) distinguish clearly between those matters controllable and those uncontrollable by the recipient of the report.

Operating statements must be prepared for each executive in the chain of management, from the works foreman to the managing director. The statement submitted to each executive, apart from the lowest in the chain, will include an aggregation of the results of subordinates. Thus, the statement submitted to the factory foreman may show the units produced, the hours worked, the raw material wastage and power units consumed in his section in the budget period. The statement for the departmental manager will include the details shown in the foreman's statement. In this manner each level of responsibility will receive a report, the contents of which it can assimilate, with an opportunity to obtain further details if required. Each higher level acquires a wider perspective, and yet is informed of the success or failure of lower levels to achieve budget. As a result each level of responsibility may be able to take action to control fast-moving events. In the remainder of this Chapter the various types of operating statement which may be prepared are discussed.

§ 46. Tabular Statements

The common fault found in tabular statements is that too many figures are shown in too many columns. The following illustrates this very clearly:

Sales		Product				Total	
Branch	1	2		3			
	30	700	1,000	5,000	70	600	1,100 6,300
L	(40)	(680)	(750)	(4,000)	(50)	(300)	(840) (4,980)
	20	250	700	2,100	200	650	920 3,000
M	(20)	(260)	(680)	(2,000)	(190)	(550)	(890) (2,810)
	100	300	800	3,500	10	30	910 3,830
N	(130)	(500)	(700)	(3,700)	(5)	(10)	(835) (4,210)
	150	1,250	2,500	10,600	280	1,280	2,930 13,130

Sales		Product				Total	
Branch	1	2		3			
A Divn	(190)	(1,440)	(2,130)	(9,700)	(245)	(860)	(2,565) (12,000)
	80	400	500	3,000	150	900	730 4,300
O	(150)	(600)	(600)	(2,000)	(135)	(800)	(885) (3,400)
	140	750	1,200	5,000	30	180	1,370 5,930
P	(100)	(480)	(1,300)	(5,500)	(50)	(190)	(1,450) (6,170)
	220	1,150	1,700	8,000	180	1,080	2,100 10,230
B Divn	(250)	(1,080)	(1,900)	(7,500)	(185)	(990)	(2,335) (9,570)
	30	90	200	1,000	250	1,100	480 2,190
Q	(35)	(150)	(120)	(800)	(200)	(700)	(355) (1,650)
	40	400	900	4,000	50	250	990 4,650
R	(35)	(300)	(800)	(3,600)	(70)	(400)	(905) (4,300)
	110	500	600	2,000	100	600	810 3,100
S	(140)	(650)	(550)	(1,800)	(60)	(500)	(750) (2,950)
	180	990	1,700	7,000	400	1,950	2,280 9,940
C Divn	(210)	(1,100)	(1,470)	(6,200)	(330)	(1,600)	(2,010) (8,900)
	550	3,390	5,900	25,600	860	4,310	7,310 33,300
	(650)	(3,620)	(5,500)	(23,400)	(760)	(3,450)	(6,910) (30,470)

The budget figures are shown in parenthesis.

The above statement suffers from the following disadvantages:

- (1) The heading of the statement is inadequate.
- (2) The period of time to which it relates is not defined.
- (3) The date of presentation is not shown, thus preventing the recipient from knowing the time interval between the end of the period to which the report relates and the date of preparation.
- (4) The person responsible for the preparation of the report is not shown.
- (5) The headings of each column are inadequate. In particular no information is given as to whether the figures relate to money, weight or time.
- (6) No details are given of the persons to whom the report is sent.
- (7) The layout makes the form almost unreadable. Considerable research is necessary before the facts behind the figures can be ascertained.
- (8) As the form embraces the results of each section of the business, many details are included which are not required by top management.
- (9) The recipient will have to do his own arithmetic if he is to ascertain the amounts and percentages of any increases or decreases.

Obviously the best place for a statement presented in the above form is the waste-paper basket! A busy executive could not be bothered with this jumble of figures. It is proposed to show the above information for Branch L, for Division A and for the whole business, assuming the figures shown above are quoted in pounds sterling. The reports for the other branches and divisions will be similar to those for Branch L and Division A. In the following illustration only sales value is shown. Additional information as to quantities sold and variations in the price per unit could be added if desired.

Illustration (1)

Assuming the facts in the foregoing statement, the operating statement for Branch L could appear as follows:

XYZ Co. LTD.**COMPARATIVE STATISTICS OF SALES VALUE**

BRANCH L. DIVISION A. FOR MONTH ENDED 31ST MAY, 1957

Product	Variation				May		Cumulative to date for 1957	
	May		Cumulative		Budget	Actual	Budget	Actual
	£	%	£	%	£	£	£	£
1 ..	10	25	20	3	40	30	680	700
2 ..	250	33	1,000	25	750	1,000	4,000	5,000
3 ..	20	40	300	50	50	70	300	600
	£260	31	£1,320	26	£840	£1,100	£4,980	£6,300

Remarks: The sales of product 3 include an exceptional non-recurring sale of £150 in March, 1957.

Copies to: Divisional Sales Manager; Branch Manager.

Form No.

Date prepared

Signed

The next level of authority is the Divisional Sales Manager to whom a copy of each of the Branch returns for his division will be sent. In addition, however, a summary of these returns will be required by him.

Illustration (2)**XYZ Co. LTD.****COMPARATIVE STATISTICS OF SALES VALUE**

DIVISION A FOR THE MONTH ENDED 31ST MAY, 1957

Product	Variation				May		Cumulative to date for 1957	
	May		Cumulative		Budget	Actual	Budget	Actual
	£	%	£	%	£	£	£	£
1 ..	40	21	190	13	190	150	1,440	1,250
2 ..	370	17	900	9	2,130	2,500	9,700	10,600
3 ..	35	14	420	49	245	280	860	1,280
	£365	14	1,130	9	2,565	2,930	12,000	13,130
Branch								
L ..	260	31	1,320	26	840	1,100	4,980	6,300
M ..	30	3	190	7	890	920	2,810	3,000
N ..	75	9	380	9	835	910	4,210	3,830
	£365	14	1,130	9	2,565	2,930	12,000	13,130

Remarks:

- (1) The sales of product 3 include an exceptional non-recurring sale of £150 in March, 1957.
- (2) Lower prices by local competitors continues to make sales of product 1 difficult for branches M and N.

Copies to: General Sales Manager; Divisional Sales Manager.

Form No.

Date prepared

Signed

The general sales manager requires, in addition to the divisional returns, a summarised return for all divisions.

Illustration (3)

XYZ Co. LTD.
COMPARATIVE STATISTICS OF SALES VALUE
FOR THE MONTH ENDED 31ST MAY, 1957

	Variation				May		Cumulative to date for 1957	
	May		Cumulative		Budget	Actual	Budget	Actual
	£	%	£	%	£	£	£	£
Product								
1 ..	100	15	230	6	650	550	3,620	3,390
2 ..	400	7	2,200	10	5,500	5,900	23,400	25,600
3 ..	100	1	860	25	760	860	3,450	4,310
	£400	6	£2,830	9	£6,910	£7,310	£30,470	£33,300
Division								
A ..	365	14	1,130	9	2,565	2,930	12,000	13,130
B ..	235	10	660	7	2,335	2,100	9,570	10,230
C ..	270	13	1,040	12	2,010	2,280	8,900	9,940
	£400	6	£2,830	9	£6,910	£7,310	£30,470	£33,300

Remarks:

- (1) The sales of product 3 include an exceptional non-recurring sale of £150 in March, 1957.
- (2) Lower prices by local competitors continues to makes sales of product 1 difficult for branches M and N in Division A.

Copies to: Managing Director; General Sales Manager; Management Accountant.

Form No.

Date prepared

Signed

Although three reports have now been prepared instead of the single sheet shown on pages 49-50, the results can be grasped and appreciated at a glance. The fact that the Managing Director does not receive individual branch figures is not important. If the chain of responsibility, as shown in the Management Chart in § 1, is to function satisfactorily, the Managing Director should not by-pass his Sales Manager and Divisional Sales Managers. If circumstances warrant it, the senior executive can always demand further information from his subordinates.

§ 47. Diagrams

With tabular presentation, however, it is difficult to show trends and comparisons. These difficulties can be overcome by the use of graphs and area or bar charts. Graphs should be prepared when it is desired to show the trend of figures. However, it must not be forgotten that the graph merely gives a 'picture' of the position. Where the trend shown in the diagram indicates that action should be taken, it would be necessary to peruse the data on the basis of which the graph was prepared. Where, therefore, the oscillation of lines on the graph merely shows that violent fluctuations are occurring, the preparation of a graph is unnecessary. Such fluctuations will be obvious from the data itself.

§ 48. Graphs

Graphs can convey a picture of the events of a period and show comparisons. One line may show the actual results, another the budgeted results and another the cumulative results to date. However, while the use of different colours can distinguish lines on a graph, too many lines should be avoided. The graph should tell its story simply and directly and not require minute study to elucidate the facts. To increase the number of comparisons which may be made, the following simple device can be used with graphs or bar charts. The graphs can be plotted on transparent paper and by superimposing one graph on another comparison may be effected. Of course, the scales of the various graphs must be identical.

Certain conventions are adopted when preparing graphs. These are:

- (i) read the graph from left to right;
- (ii) the vertical scale is numbered on the left-hand side;
- (iii) the horizontal scale is numbered at the foot of the graph;
- (iv) the intersection of the vertical and horizontal axis is normally zero;
- (v) where money and quantity are being plotted, the vertical scale is quoted in monetary units and quantities are plotted on the horizontal scale.

Any departure from these conventions must be clearly shown on the graph. Preferably a special note should be sent to the recipients of graphs not complying with the conventions, describing the departures therefrom. Alternative or amended methods of graphical presentation include:

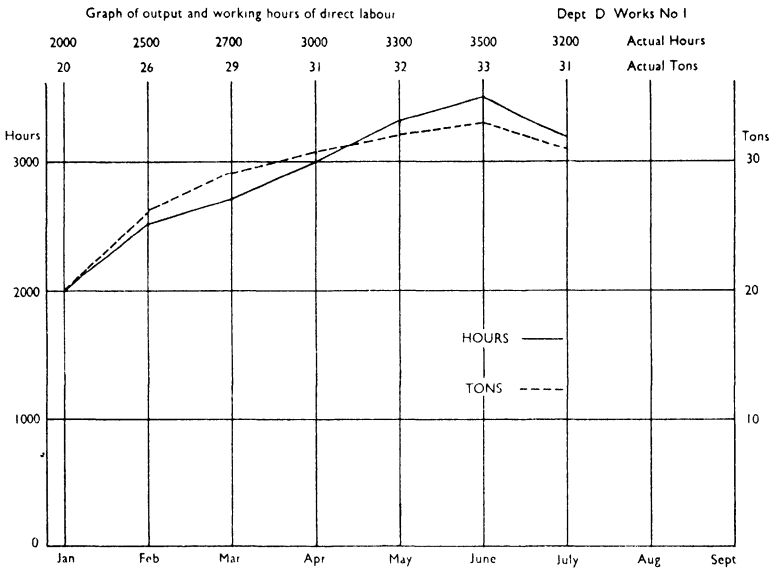
- (i) Where two graphs founded on different bases are drawn on the same sheet of paper for comparison purposes, the different scales can be placed on the opposite sides of the graph (*see* illustration (1) below where hours are plotted on the left-hand vertical scale, while tons are plotted on the right-hand vertical scale.)
- (ii) The actual figures can be written down along the top horizontal scale (*see* illustration (1) below).
- (iii) It may be inconvenient or inappropriate to commence at zero (*see* illustration (2) below).
- (iv) Where the horizontal axis of the graph is very long and the right-hand vertical scale is not otherwise required, the details shown on the left-hand scale can be restated on the right-hand side (*see* illustration (2) below).

Illustration (1)

From the following facts prepare a graph showing the hours worked and tons produced in Department D of No.1 Works in the period 1st January to 31st July, 19...

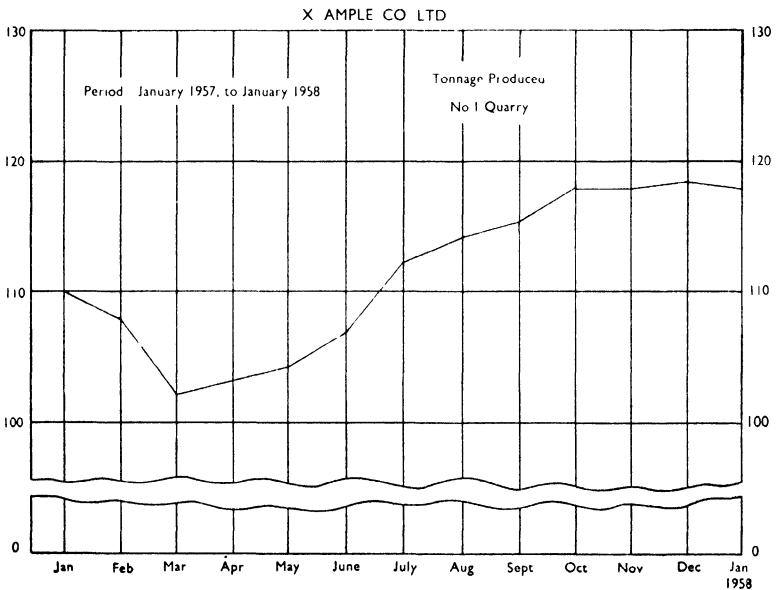
Month	Hours Worked	Tons Produced
January ..	2,000	20
February ..	2,500	26
March ..	2,700	29
April ..	3,000	31
May ..	3,300	32
June ..	3,500	33
July ..	3,200	31

XYZ CO LTD

**Illustration (2)**

19

The information given on p.55 relating to tonnage produced at the No.1 Quarry of X Ample Ltd. would appear as under:



January, 1957 . .	110 tons	July, 1957 . .	112 tons
February, 1957	108 „	August, 1957 . .	114 „
March, 1957 . .	102 „	September, 1957	115 „
April, 1957 . .	103 „	October, 1957 . .	118 „
May, 1957 . .	104 „	November, 1957	118 „
June, 1957 . .	107 „	December, 1957	118½ „
January, 1958		118 tons	

§ 49. The Z Chart

This graph is so named because when complete, at the end of a period, its shape is that of the letter Z. The graph contains the detailed figures for a short-term period, cumulative figures for the long-term period to date and the trend. Normally comparative figures are shown, *e.g.* the budgeted or preceding year's figures. As can be seen from the following illustration, the trend is clearly shown. The main disadvantage of the Z chart is that in arranging the scale to suit the cumulative figures the extent of the variation of monthly and trend statistics is graphically minimised. The trend line commences at the point where the cumulative line for the last period ended. Thus, if the total sales for last year were 3,000 units, the first point to be plotted on the trend line for the current year is opposite 3,000 on the vertical scale. To ascertain the 'trend' figure at the end of each month, the sales for the month are added to the 'trend' figure at the beginning of each month, then the sales for the corresponding month last year are deducted.

The 'trend' figure for January is calculated, therefore, as follows:

'Trend' figure at end of last year	..	..	..	1,060 units
Sales for January in current year	..	..	..	100 „
				<u>1,160</u> „
Less: Sales for January in previous year	..	..	..	90 „
'Trend' figure at end of January in current year	..	..	..	<u>1,070</u> „

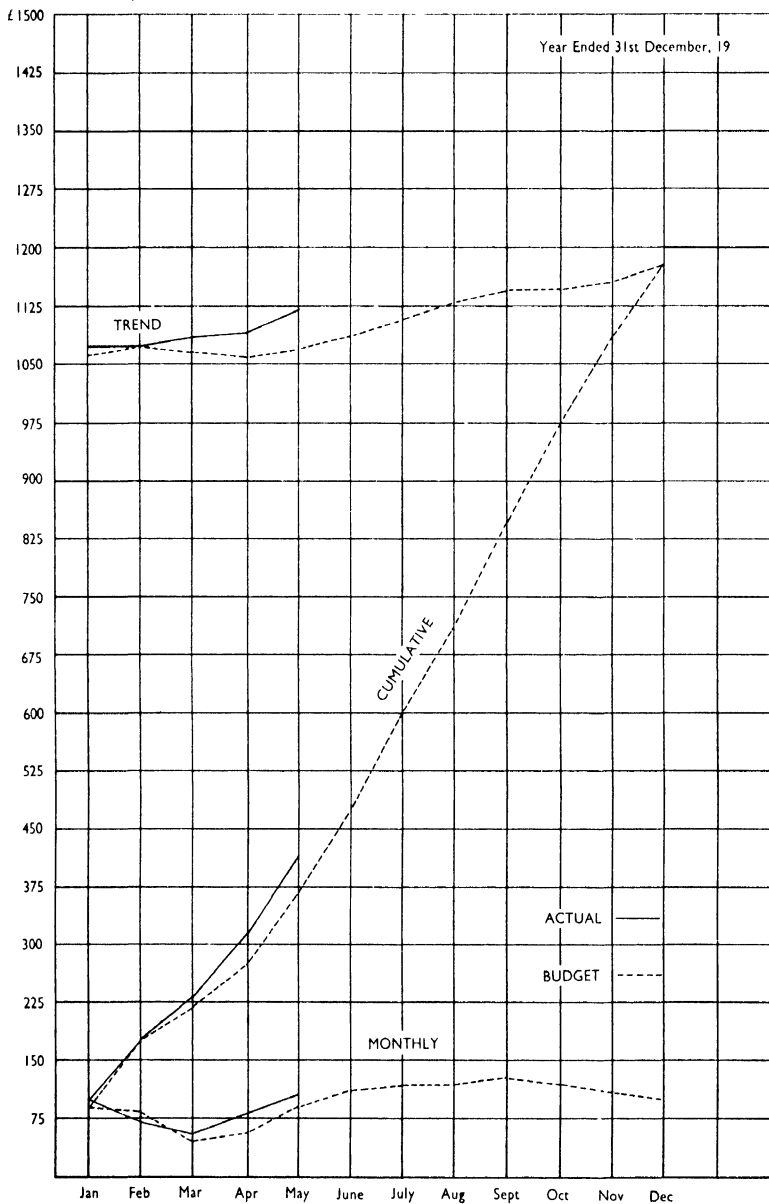
Illustration

From the following information plot a graph to show the comparison between actual monthly sales, the actual cumulative sales and the trend for the current year with the corresponding budgeted figures for that year.

Month	Actual Sales				Sales Budget		
	Previous Year	Current Year	Current Year Cumulative	Current Year Trend	Current Year	Cumulative	Trend
	Units	Units	Units	Units	Units	Units	Units
January ..	90	100	100	1,070	90	90	1,060
February ..	70	70	170	1,070	80	170	1,070
March ..	50	60	230	1,080	50	220	1,070
April ..	70	80	310	1,090	60	280	1,060
May ..	80	110	420	1,120	90	370	1,070
June ..	90				110	480	1,090
July ..	100				120	600	1,110
August ..	100				120	720	1,130
September ..	110				130	850	1,150
October ..	120				120	970	1,150
November ..	100				110	1,080	1,160
December ..	80				100	1,180	1,180
	<u>1,060</u>				<u>1,180</u>		

X Y Z CO LTD

Graph of sales value (Monthly, Cumulative and Trend) with actual sales compared with budget



§ 50. Rate of Change Chart

An erroneous impression may be given where comparisons are made on graphs between two or more sets of data which, although related, are very dissimilar in amount or quantity.

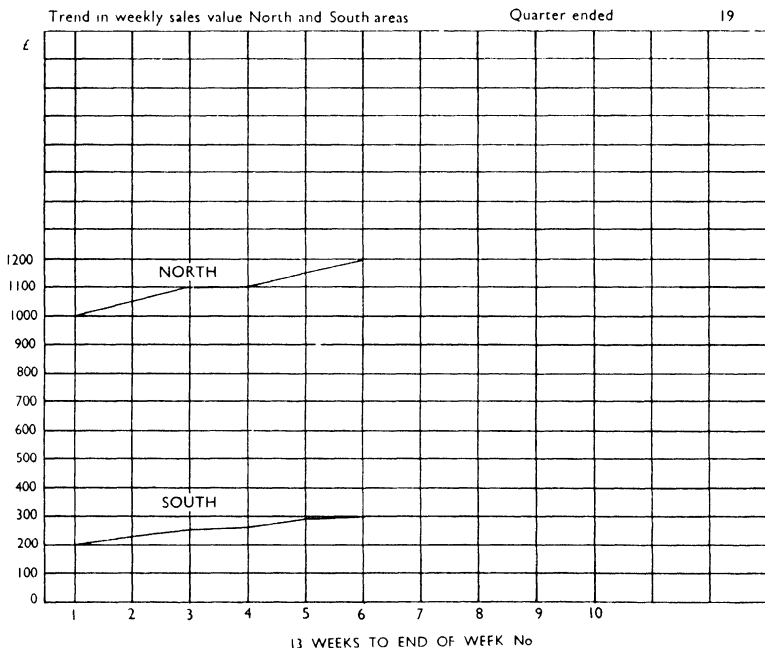
Illustration (1)

The sales manager wishes to compare the trend of sales in the North and South areas. The details are:

19..		North £	South £
13 weeks to end of Week No.1		1,000	200
" " " " " "	2	1,050	220
" " " " " "	3	1,100	250
" " " " " "	4	1,100	260
" " " " " "	5	1,150	290
" " " " " "	6	1,200	300

You are required to prepare a graph to show the comparative changes in sales achieved in the two areas.

X AMPLE CO LTD

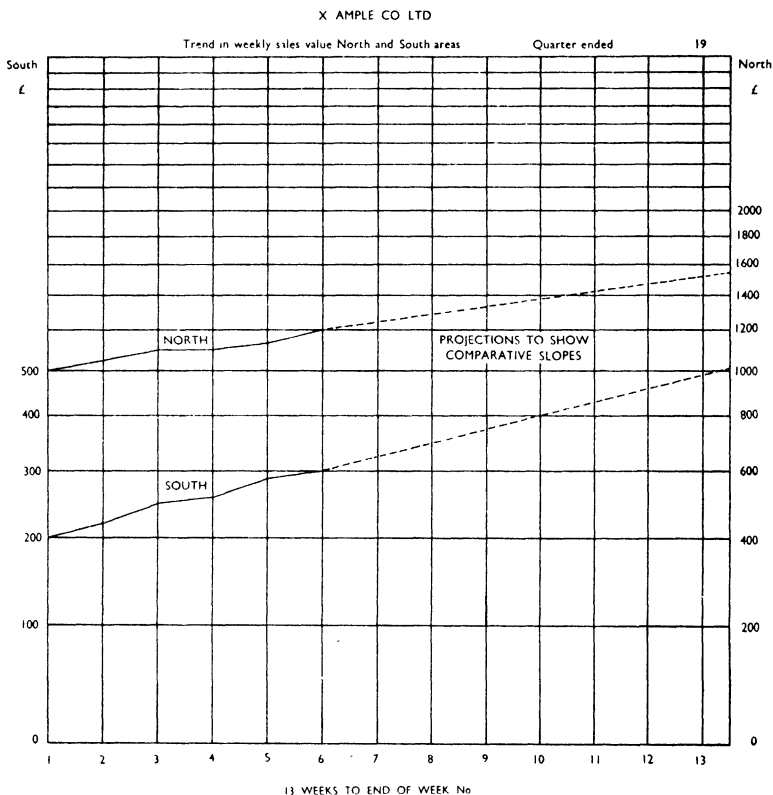


It is obvious, however, that the sales manager will have some difficulty in comparing the rate of change achieved by the areas as the unit of measurement chosen in such circumstances tends to exaggerate the variances in the North area in comparison with those in the South. To overcome this disadvantage, a Rate of Change graph is prepared. The

logarithm of the data will be plotted instead of the absolute figures. The calculation of the logarithms can be avoided by the use of semi-log graph paper. Such paper is logarithmic in the vertical scale and normal in the horizontal scale. On a Rate of Change graph unequal figures are brought closely together. The respective slopes of the lines indicate the relative rates of changes.

Illustration (2)

From the facts given in illustration (1), plot a Rate of Change graph.



Notes to illustration:

- (1) It should be noted that although dissimilar scales are used for the two areas, the comparative rates of change are clearly shown.
- (2) As would be expected from the figures given in illustration (1) the rate of change is greater in the South area. This is shown by the steeper line in respect of the South area.
- (3) The inner figures on the vertical scales are logarithmic, and have been retained merely to show the effect of using semi-logarithmic graph paper.

§ 51. Bar Chart

A Bar chart consists simply of straight lines, or rectangles, of varying lengths drawn to the same scale. Care must be taken when choosing the scale of the chart; that not more than three components appear in each bar; and that bars are of different lengths, not widths. All charts start at zero, otherwise the perspective of the graph is destroyed and the chart is useless. Although frequently used in the annual report and accounts sent to shareholders, these charts do not normally show sufficient details for managerial purposes. Frequently bar charts are used to show totals for various periods with an analysis of those totals shown inside the bars. However, as can be seen from the following simple illustration, the comparison of the monthly home and export sales is difficult. The trend of results is normally unobtainable from a bar chart.

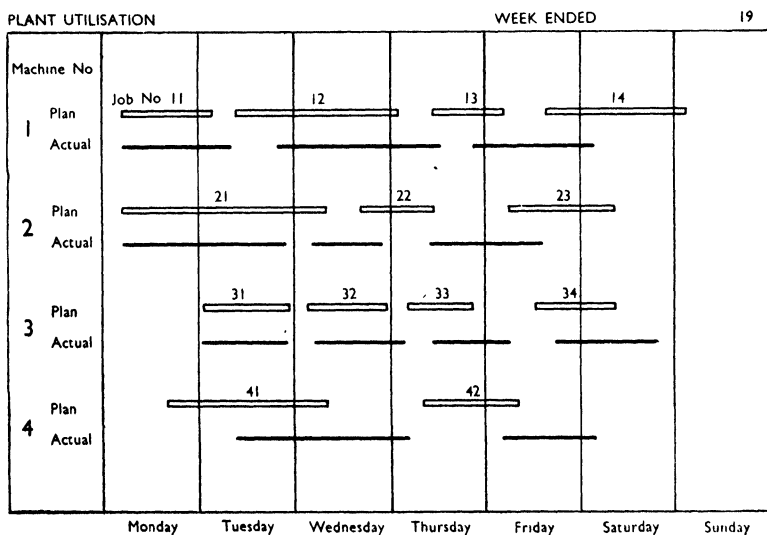
Illustration

The bar chart on page 60 was prepared from the following information relating to monthly home and export sales.

					Total £	Home £	Export £
July ..	..	..	..	..	43,000	20,500	22,500
August ..	..	..	..	..	46,000	24,000	22,000
September ..	..	..	..	..	42,000	23,000	19,000
October ..	..	..	..	..	46,500	21,500	25,000
November ..	..	..	..	..	49,000	23,500	25,500
December ..	..	..	..	..	38,000	23,500	14,500

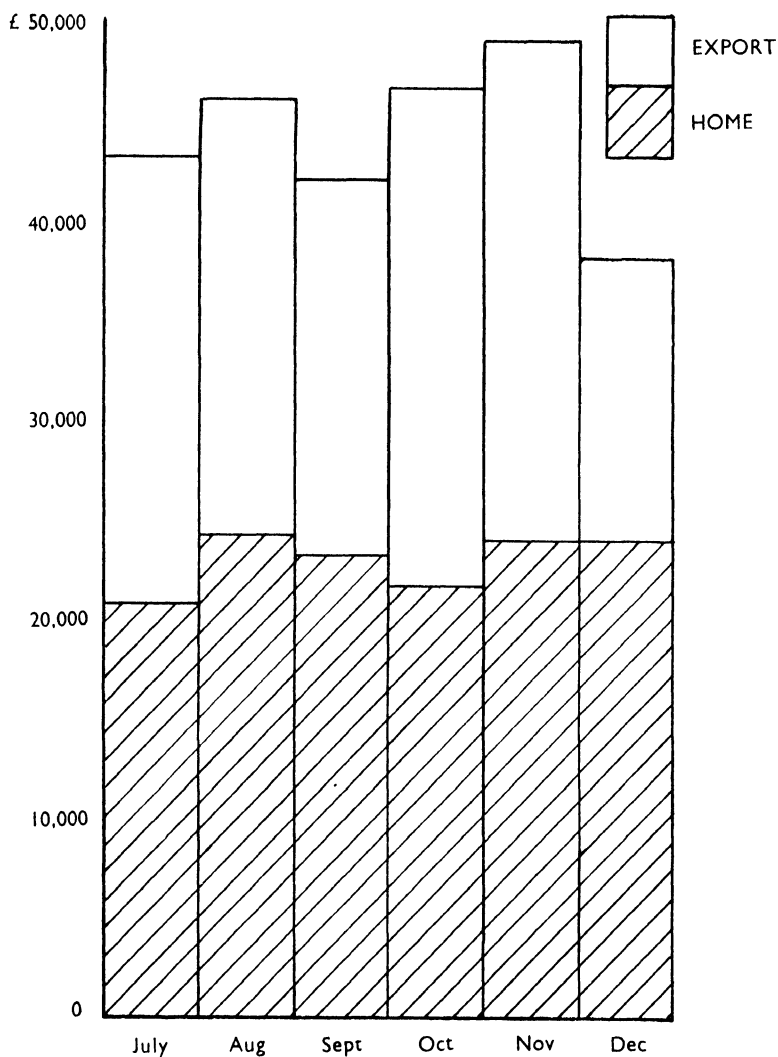
§ 52. Gantt Charts

Gantt charts are a form of bar chart, except that the bars are plotted horizontally instead of vertically. These charts are widely used in industry,



X.Y.Z. CO. LTD.

Home and Export Sales, Six months to 31st December 19...



particularly for production planning and plant utilisation. When the chart is prepared bars are plotted representing the plan; other bars are later plotted parallel to the original bars to show actual performance. Comparison between the 'plan' and 'actual' bars indicates whether performance was better or worse than plan. The bar lengths can represent any unit of measurement, *e.g.* quantity, value or time. Individual or cumulative figures or a combination of them may be shown.

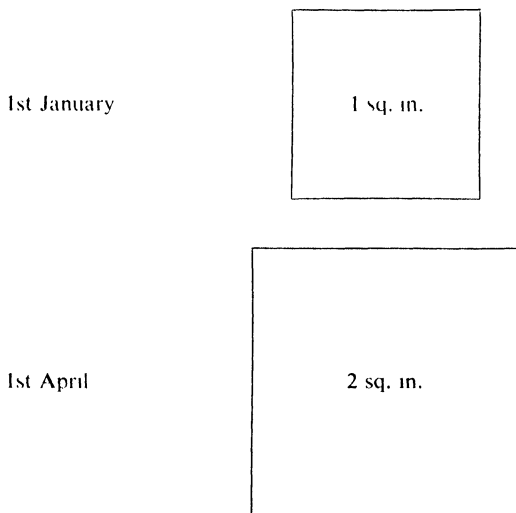
§ 53. Area Charts

These can be prepared in the form of rectangles or circles. The latter are often referred to as 'Cutting the Cake' diagrams or 'Pie' charts. While popular for illustrating facts in annual reports, area charts have a very limited use in industry. Frequently the visual impression is misleading. Where rectangles are used it must be remembered that if an area of $1'' \times 1''$ (1 sq. inch) represents 100 units, the area representing 200 units is not $2'' \times 2''$ but $\sqrt{2''} \times \sqrt{2''}$ (2 sq. ins.).

Illustration

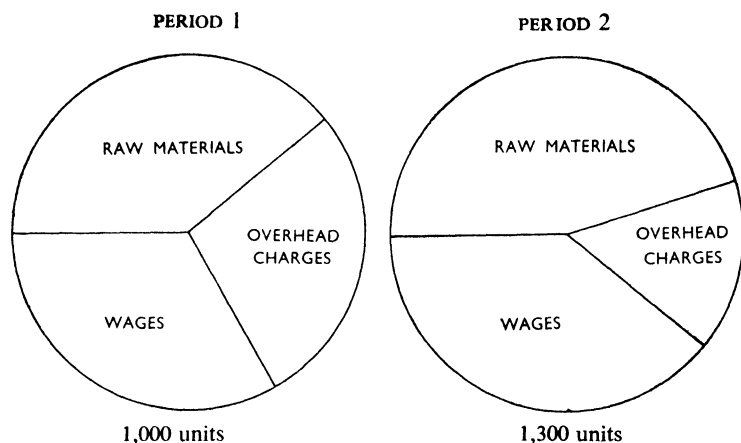
Prepare a chart to illustrate the orders on hand at 1st January and 1st April, which were 100 units and 200 units respectively. You may assume a rectangle 1 sq. inch in area represents 100 units.

CHART OF ORDERS ON HAND (QUANTITY)



A Pie chart showing the manufactured cost of Product Q in periods 1 and 2 where 1,000 units were sold in period 1 and 1,300 units in period 2, would appear as follows:

CHART OF MANUFACTURED COST OF PRODUCT Q. WORKS No.7



As can be seen from a study of the above rectangles and circles it is impossible to judge accurately the relative positions from the charts alone. They are, therefore, useless for control purposes.

§ 54. Statistics

Only a few large concerns have statisticians and economists, the majority rely on their accountants for any necessary statistics. Fortunately, in the majority of businesses only simple statistical techniques are necessary. Percentages are frequently used, as shown in § 46. But 'like must be compared with like'. If the sales of the London division rise from 200,000 units to 300,000 units and the sales of the Bath division from 2,000 to 3,000 units, the percentage increase in both divisions is 50 per cent. It is, however, obvious that the number of customers in each division is different and no conclusion can be drawn as to the relative efficiency of the sales staffs. To enable accurate comparisons to be made by management, the 'base' on which percentages are being calculated must be stated in the report.

Illustration (1)

The sales of a product in succeeding months were; January 50,000 units; February 80,000 units; March 100,000 units; April 87,500 units; May 122,500 units. Show the percentage increase in sales in each month using as the basic figure (a) the sales in January; and (b) the sales in each preceding month.

	February	March	April	May
	Per cent.	Per cent.	Per cent.	Per cent.
(a)	+ 60	+ 100	+ 75	+ 145
(b)	+ 60	+ 25	— 12½	+ 40

Where comparison is to be made between two figures and the data from which the figures are derived are not 100 per cent. accurate, or it is desired to emphasize the underlying facts, it is normally preferable to approximate figures. This is achieved by rounding off the figures either to the nearest ten,

hundred, thousand or million, or by reducing all figures to the next lower or increasing them to the next higher ten, hundred, thousand or million. Both methods will mean differences between the true figures and the approximations. Such differences are called 'errors'. Where the approximation is to the nearest ten, hundred, etc., the error is called 'unbiased'. Where the approximation is to the next lower or higher ten, hundred, etc., the error is called 'biased'. The final total of approximations usually conforms closely to the true total where unbiased errors are used. However, biased errors may be used where the actual figures are themselves biased in one direction. The use of biased errors in the opposite direction will give a result nearer the truth.

Errors may be measured either absolutely or relatively. The absolute error is the arithmetical difference between the total of the original figures and the total of the approximations. The relative error is the fraction which the absolute error bears to the total of the approximations. The relative error is frequently expressed as a percentage.

Illustration (2)

Absolute and relative errors are computed as follows:

Exact numbers	Unbiased to nearest hundred	Biased to next higher hundred	Biased to next lower hundred
19,763	19,800	19,800	19,700
23,259	23,300	23,300	23,200
1,712	1,700	1,800	1,700
86,985	87,000	87,000	86,900
33,448	33,400	33,500	33,400
<u>165,167</u>	<u>165,200</u>	<u>165,400</u>	<u>164,900</u>
Absolute error:	+ 33	+ 233	— 267
Relative error:	·02%	·14%	·16%

In illustration (2) the error can be easily calculated because the 'exact numbers' have also been stated. But in practice the 'exact numbers' might themselves be approximations, in which case it must be possible to estimate the margin of error in the approximations. This estimation is computed by assuming that all figures range themselves evenly on either side of the 'middle' of the approximation interval. Thus, if biased approximations have been used to the next 100 (up or down), it is assumed the figures range equally either side of 50 of each interval of 100. The assumed average error is, therefore, 50. If, as in illustration (2), there are five items, the approximate error will be $5 \times 50 = \pm 250$ according to whether the next upper or next lower 100 is used. The figure of 250 compares with + 233 and — 267 shown in illustration (2).

If unbiased errors to the nearest hundred have been used, the average error will become 25. The maximum error from the nearest hundred cannot exceed 50, and the average error is, therefore, $\frac{50}{2} = 25$. Finally the average error must be multiplied by the square root of the total number of items. In illustration (2), therefore, the approximate error will be $25 \times \sqrt{5} = 55.9$ (say 56), compared with the actual figure of 33.

It will be possible, therefore, to use approximations and yet, by adjusting for the approximate error, ensure the total of the approximations is near to the true figure.

Illustration (3)

Using the facts in illustration (2), show the absolute and relative errors, where the approximations are adjusted by the approximate error.

	Unbiased to nearest hundred	Biased to next higher hundred	Biased to next lower hundred
Total as in illustration (2)	165,200	165,400	164,900
Approximate error ..	— 56	— 250	+ 250
Approximate true number	<u>165,144</u>	<u>165,150</u>	<u>165,150</u>
Absolute error ..	23	17	17
Relative error ..	·014 %	·01 %	·01 %

A further method by which the accountant can avoid confronting management with a large volume of figures, which cannot be assimilated easily, is averaging. The three averages normally used are the Arithmetic Mean, the Median and the Mode.

The *Arithmetic Mean* is the figure computed by aggregating a series of figures and dividing by the number of items included in the series. However, this average suffers from the defect that each item in the series is given equal importance and will have the same effect on the resulting average. For some types of information (*e.g.* when the trend of figures is upwards) this would be unsuitable. The figures are, therefore, frequently 'weighted' by multiplying the separate items in the series by the frequency with which each appears therein.

Illustration (4)

The sales of the individual salesmen in the London area during the week ended 17th May were:

No. of Salesmen (Col. 1)	Sales per salesman in units (Col. 2)	Products (Col. 1 × Col. 2)
6	20	120
3	21	63
9	22	198
8	24	192
4	26	104
35	27	945
14	30	420
21	32	672
10	35	350
<u>110</u>	<u>237</u>	<u>3,064</u>

The Arithmetic Mean, without 'weighting' is $\frac{237}{9} = 26$ to nearest unit.

The Arithmetic Mean, after 'weighting' is $\frac{3,064}{110} = 28$ to nearest unit.

The *Median* is the middle figure of a series where the items are listed in order of magnitude, and in illustration (4) is 26.

The *Mode* is the figure which appears most frequently in a series, and in illustration (4) is 27.

Before deciding which average figure is to be used, the following remarks should be borne in mind.

Arithmetic Mean:

- (i) Although every value is included, extreme items may have a disproportionate effect;
- (ii) Where there are no extreme items, the Mean is fully representative as it is based on every value in the series;
- (iii) It is simple to compute and easily understood by the layman.

Median:

- (i) The Median can be found even if some of the data is missing; it is not possible to compute the Mean in such circumstances;
- (ii) The Median gives no indication of the range of or spread of values in the series;
- (iii) If the frequencies of values cluster around the middle of the series or items are spread evenly throughout the series, the Median is representative.

Mode:

- (i) Unlike the Mean, the Mode is not affected by extreme items;
- (ii) Like the Median, no indication is given of the range of items in the series;
- (iii) It can frequently be ascertained by a perusal of the series of figures.

In certain circumstances, particularly when trends are to be shown, moving averages may be calculated. The same method is employed in computing the moving average as is described in § 49, dealing with trends and 'Z' charts.

Frequently, however, the data will have already been allocated to classes or groups. Formulae exist to enable the Median and Mode to be computed and are briefly shown in illustration (5) below.

Illustration (5)

Output Group Units	No. of Workers in Group	Cumulative Total
930 - 939	1	1
940 - 949	2	3
950 - 959	2	5
960 - 969	3	8
970 - 979	6	14
980 - 989	7	21
990 - 999	4	25
1,000 - 1,009	1	26
	26	

Median. The formula needed to find the group in which the Median can be found is $\frac{N}{2}$, where N equals the total number of workers in all groups. In the above, this formula will give a figure of $\frac{26}{2} = 13$, which deducted from the final cumulative total shows that the Median is located in the group 970-979. As up to the previous group there are 8 men, the Median must be the fifth item in the group 970-979. To find the exact figure within that group, the following formula should be used:

Highest number) in group below that in which the Median is located) + $\left(\frac{\text{Position in group containing Median}}{\text{Number of items in the group}} \right) \times \text{the class interval.}$

Thus the Median is $969 + \frac{3}{8} \times 10 = 978$.

Mode. To calculate the Mode where the data have been grouped, the formula is:

$$\text{Mode} = L + \left[\frac{M - B}{M - B + M - A} \right] \times I \text{ where}$$

L = lower limit of modal group.

M = number of items in modal group.

A = number of items in group following the modal group.

B = number of items in group preceding the modal group.

I = group interval.

Thus, the modal group is 980 — 989, and using the above formula the Mode is 983, viz.

$$980 + \frac{7 - 6}{(7-6) + (7-4)} \times 10 = 983 \text{ to nearest unit.}$$

Readers requiring a fuller discussion of the use of statistics in commerce are referred to *Statistics and their Application to Commerce* by A. R. Ilersic.

§ 55. Indices

Index numbers are useful in summarising in a single figure the variations which occur over a period of time in a group of related items. Index numbers will be prepared for a specific purpose. When establishing an index, the accountant must:

- (a) bear in mind the purpose for which the index is being prepared;
- (b) decide the base period;
- (c) determine the items to be included in the computation of the index;
- (d) decide the weight to be given to each item; and
- (e) determine the sources of the variable data.

The purpose for which the index is being prepared will determine the sources from which data are to be derived and the persons to whom the finished result will be communicated. The base period selected should be as stable as possible and the conditions in the base period must be comparable with those existing in the actual period. Great care must be exercised in deciding the number of items to be included in computing the index. The items chosen should be representative of the class which they purport to represent; of sufficient importance (either quantitatively or monetarily) to be significant; be actively dealt in; and clearly defined. Having decided upon the items to be included each may be 'weighted' on the basis of its relative importance in the whole. The sources from which data are derived must remain constant. If a raw material cost index is being calculated, the source will either be the cost of actual purchases or the market value at a recurring date, e.g. first day of each month. If the cost of actual purchases is used to compile the index number for the base period, then the cost of purchases must always be used in future.

Once an index has been constructed with a fixed base period, the passage of time may make the index less representative. Periodically, therefore, each index should be reviewed to determine whether:

- (i) the purpose of the index has changed;
- (ii) the items included therein remain representative;
- (iii) the weighting of the constituent items corresponds with the current pattern;
- (iv) the sources of the data remain reliable; and
- (v) the base period should be amended.

§ 56. Sampling

Information for control purposes must be provided rapidly. To analyse and summarise hundreds or thousands of items is either impossible or extremely difficult in a short period of time. It may be necessary, therefore, to sample. This is done by selecting and recording a small number of items out of the hundreds or thousands available and regarding the results shown as the result which would have been obtained if every item had been recorded and analysed. Obviously, therefore, the items chosen must be representative of the whole. If the number of items selected is excessive, then there will be an insufficient reduction in the necessary work. If a very small choice is made, exceptional items will have an exaggerated effect on the final result, which consequently will not be representative. In ideal circumstances, to establish the basis of the sample every item should be analysed and summarised. Then only a proportion should be analysed and summarised and the result compared with that derived from all items. The proportion taken will be reduced until the smallest number is found which will give a result similar to that derived from all items. That proportion will be taken in future periods and the results computed therefrom will be considered to be representative of the results if all items were recorded. But this method would in many instances be impracticable. In such circumstances 'random' or 'systematic' sampling might be employed. Random sampling consists of giving every item an equal chance to be included. Thus every invoice would be taken and invoices would be withdrawn at whim to form the sample. Systematic sampling involves the selection of invoices at stated intervals, *i.e.* every tenth invoice. Alternatively, start sampling with a small number of items and increase the number taken until little variation occurs from the previous sample.

The technique of sampling may be used, with advantage, when preparing the majority of statements for control purposes. Sampling is frequently used when preparing an analysis of orders received, outstanding orders, complaints, rejects and scrap.

CHAPTER VIII

CONTROL INFORMATION

In Chapter VII the various methods by which information can be supplied promptly and clearly to management have been outlined. In this Chapter the information which must be supplied to management will be discussed if day-by-day control is to be exercised by them.

§ 57. Sales Control

Statistics should be prepared for any or all of the following:

- (a) orders received;
- (b) outstanding orders;
- (c) forward contracts;
- (d) complaints, returns and cancelled orders; and
- (e) goods despatched.

The degree to which any of these statistics will require analysis (*e.g.* between products, geographical areas etc.) depends upon the organisation of the business, the origin of the figures and the sub-division of the sales budget. If the budget has been built up by product within each area and sales division, control statements should be prepared for the same sub-divisions. Each area can accumulate the figures for each product and forward the various totals to divisional headquarters weekly. The divisional sales office will aggregate the totals for all areas, and forward this information to sales headquarters periodically for consolidation with the results for the other divisions. Each area or division will know whether it is falling short of or exceeding budget. Reasons can be found for variations and, where possible, appropriate action taken. In this manner corrective action will be started at the earliest possible moment.

The following statistics should be prepared initially in quantities (tons, feet, tins, etc.). This will facilitate comparison with budget. The preparation of statistics in both quantities and money is usually a duplication of effort, which in view of the need for prompt information should be avoided. Where money values only are given a comparison of the value of actual sales with budget may show that the latter is being achieved. But this comparison may conceal a variation in prices and a variation in the pattern of products sold. Unfortunately in some industries, *e.g.* jobbing, money may be the only possible unit on which to base the statistics. In such circumstances care must be taken when comparison is made with budgets.

(a) *Orders received:* The sales manager requires details of orders received at the earliest possible moment to ascertain whether his department

is complying with budget. If orders are below budget, then he will have to take action to attempt to increase them in the future. Where the orders received are in excess of budget and production facilities are limited, he will have to 'ration' salesmen in the future and/or inform the managing director. The managing director needs the information to plan any necessary variation in the activities of the manufacturing or purchasing department to ensure prompt service to customers.

(b) *Outstanding orders*: The total outstanding orders analysed into age groups must be known at frequent intervals. Firstly, it is an important factor in measuring customer despatch service. Secondly, it may have an effect on the current or future budgets. If a substantial volume of outstanding orders is carried over from the last budget period, the manufacturing programme can be maintained, despite a fall in orders received in the current period. Conversely, incoming orders may be exceeding the productive capacity. Both situations are reflected in statistics showing outstanding orders.

(c) *Forward contracts*: Details of these will assist in the preparation of future budgets.

(c) *Complaints, returns and cancelled orders*: Normally complaints are dealt with by a special staff. But statistics should be prepared showing for each product the number of complaints, the reasons for returns and the quantities returned. Where possible, alterations may be made in the product sold to avoid complaints and returns in future. Cancelled orders are the penalty of delay between the receipt of the customer's order and despatch. As they should not arise in normal circumstances, details must be known when they occur.

(e) *Goods despatched*: This information may be obtained from invoices rendered to customers. For each product, details of the quantities despatched should be accumulated immediately after the goods have left the factory or warehouse. The monetary value may be ascertained simultaneously, otherwise a separate operation is required to find the value of sales. Such information will indicate where the budgeted sales are being achieved and will also assist in controlling the Cash budget.

§ 58. Production Control

Whilst the management accountant is not required to control production, if he is to provide data upon which that control will be based, he must know something of the methods employed by works management. When the production budget was prepared it was necessary to assess the production achievable in the period by each workman and cost-centre, and by aggregating the results of all cost-centres and departments to compute the productive capacity of the business. The recording of data for control purposes must be so organised that the actual results can be swiftly compared with the budget.

To achieve the budgeted production, it is necessary to avoid or minimise the effects of:

(a) strikes or 'go-slow' working in own factory;

- (b) strikes or 'go-slow' working in suppliers' factories or amongst transport undertakings employed;
- (c) fire and flood in own or suppliers' factories;
- (d) national crises (*e.g.* fuel shortage);
- (e) political embargoes;
- (f) epidemics;
- (g) losses caused by use of unsuitable or faulty raw materials;
- (h) wastage arising in manufacturing operations;
- (i) shortage of key personnel;
- (j) failure of suppliers either to deliver raw materials or deliver on time;
- (k) late delivery and installation of new plant;
- (l) unexpected demand or lack of demand for a given product;
- (m) plant breakdown.

If production supervisors are to minimise the effects of any of the above they must know the plant and labour capacity of the works, and be supplied daily with information on:

- (i) the quantity of production achieved;
- (ii) raw material supplies;
- (iii) the direct labour hours;
- (iv) plant utilisation;
- (v) losses caused by inspection rejects;
- (vi) hold-ups in the flow of production in other cost-centres or departments;
- (vii) those changes in the sales demand for products which will affect the budgeted figures for production.

Instead of supplying the actual figures for (i) to (iv) above, only the variations from budget may be given, *e.g.* details of delays in raw material supplies; direct labour hours not available.

Where productive capacity is the governing factor, special statistics must be prepared on the actual use of limited resources. For example, where the shortage of labour is the governing factor, details of the daily apportionment of tasks, idle time and absenteeism must be supplied to the responsible manager. Data will be supplied to the departmental manager for direct control by him and to the works manager for information.

(i) *The quantity of production achieved:* Information as to the total quantity manufactured is insufficient; details of deficiencies and excesses in each cost-centre and department must be supplied, as a deficiency in week 4 in department A can result in a loss of production in week 5 in department B. Where a miscellany of products is manufactured, standard hours may be used to enable the production of adjoining departments to be compared. The reasons for any deficiencies or excesses must be ascertained promptly and, where possible, corrective action taken daily.

(ii) *Raw material supplies:* Where stocks are properly controlled, production should not be hampered by a lack of raw materials. Human

failings, however, may result in a shortage in certain raw materials or alternatively there may be a general shortage common to the industry. Details can be ascertained from materials requisition slips which cannot be honoured by the stores. The buyer and works manager must be informed, so that the former can endeavour to take corrective action and perhaps increase minimum stocks to avoid a recurrence, while the works manager may have to adjust his production programme.

Where the standard quantity of raw material required to produce a given article or batch of articles is known, information as to excess usage of raw material can be found by listing and totalling all 'excess usage' materials requisition slips.

(iii) *Direct labour hours*: The anticipated and actual working hours in each period, the hours for which employees are paid and the productive hours, should be listed to give details for each department of:

- (a) loss of working hours due to sickness, accident, absenteeism and holidays;
- (b) the overtime worked in the period;
- (c) losses in productive hours caused by material shortages, plant breakdown, power cuts etc.;
- (d) loss of time due to excessive 'setting-up' time;
- (e) the time spent in rectifying faulty work;
- (f) the efficiency of workers by measuring the actual production with the actual time taken and comparing it with the anticipated or budgeted time for such production;
- (g) piecework and/or bonus efficiency.

The hours lost through the inefficiency of workers and those lost through lack of management decisions must be distinguished.

Illustration

In the week ending 17th May, 19.., the workers in departments D, E and F nominally worked for 10,000, 8,800 and 14,400 hours respectively. The anticipated working hours for each department were – D 9,800; E 8,900 and F 14,680. The additional hours in department D were the result of overtime. The hours lost were:

<i>Cause of loss of hours</i>					<i>Department</i>		
					D Hours	E Hours	F Hours
Sickness	..	..	..	..	—	100	280
Tea breaks	..	..	..	..	80	90	110
Machine breakdowns	..	..	..	..	—	70	1,890
Shortages of materials	..	..	..	..	410	410	10
Power cuts	..	..	..	..	10	10	10
Late arrival of workers	..	..	..	..	200	—	70
Excess setting-up time	..	..	..	..	210	10	820
Rectification of faulty work	..	..	..	..	—	50	810

Prepare a suitable report for the week showing the anticipated, actual and productive hours and the variations between them.

XYZ Co. LTD.
WEEKLY LABOUR UTILISATION REPORT

WEEK ENDING MAY 17TH 19..

Unit of Measurement: Hours

Department	Budgeted Working hours	Over-time	Sickness	Nominal Working hours	Workers Controllable Variance				Management Controllable Variance			Uncontrollable Variance			Productive Time
					Total	Time Keeping	Excess Setting up time	Rectifying Faulty Work	Total	Tea Breaks	Material Short-ages	Total	Power Cuts	Mach-ine Break-down	
D	9,800	270		10,000	410	200	210	—	490	80	410	10	10	—	9,090
E	8,900	—	100	8,800	60	—	10	50	500	90	410	80	10	70	8,160
F	14 680	—	280	14,400	1,700	70	820	810	120	110	10	1,900	10	1,890	10,680

Remarks: In department F one machine broke down and on another machine a part was broken which increased setting-up time.

Copies to: Managing Director; Works Manager; Management Accountant.

Form No.

Date prepared

Signed

Information relating to (a) to (g) above must be provided promptly if control is to be exercised. For example, the loss of working hours caused by any of the items in (a) above, might be reported to each departmental manager daily within one hour of work commencing; details regarding overtime should be reported for authorisation not later than one hour before the normal close of work. If the above procedure is adopted, the available labour hours will be known in time for works management to attempt to apply remedial action by:

- (h) transfers of labour from unembarrassed departments to bottlenecks;
- (i) requesting specific employees to work overtime or adopt shift work;
- (j) sub-contracting work, where the labour shortage is prolonged;
- (k) increasing the production of workers by incentive schemes etc.;
- (l) staggering of labour's normal stoppage time to maintain continuous machine operation (*e.g.* staggering lunch hours and tea breaks);
- (m) holding up the manufacture of products, stocks of which are sufficient, and giving priority to production at the bottleneck.

The hours lost for reasons indicated in (c) must be known, as these represent a loss which might be avoided by increased efficiency of management.

(iv) *Plant (machine) utilisation*: Machines must not stand idle if their heavy initial cost and upkeep are to be justified. The works, when preparing the budget, will have planned the flow of production to reduce idle time to a minimum. Unavoidable idle time will be allowed for in the production budget. To avoid delays, 'progress chasers' are frequently employed. They work continually in the factory and their job is to watch for delays and do everything possible to eliminate them. Methods similar to those indicated in paragraph (iii) may be adopted, alternatively the maintenance of machines may be confined to overtime.

Daily returns showing the effective working hours of machines and the reasons for any extensive loss of productive time must be sent to works management. In large concerns the works manager will normally receive only summarised returns weekly.

Where a machine breaks down, in addition to cancelled orders and the loss of customer goodwill, the loss suffered by the business is the cost of time and materials required to repair the machine, the cost of idle labour, the cost of unrecouped overheads and the profit lost on articles not produced. Losses may be reduced by the regular maintenance of machines. The cost of such maintenance will be budgeted prior to the budget period. The works engineer should be supplied with reports regularly during the budget period showing the comparison between actual and budgeted expenditure. Where repairs have to be effected, as distinct from the regular maintenance, reports must be supplied to works management of the cost of such repairs. Heavy expenditure on repairs will indicate either that machines require replacing; that the planned maintenance is insufficient; that there is a lack of skilled operators; or that there is poor supervision.

(v) *Rejections and scrap*: Where products are rejected the cost of materials, labour and plant and the other overheads applicable thereto is lost. Alternatively further expenditure is required to rectify the faulty work. Unless rigid control is enforced the business may lose large sums of money. The organization of personnel in the works must provide for rigorous inspection at each stage of manufacture. Faulty work must be discovered at the earliest possible stage to avoid further expenditure of materials, labour and overheads on unsaleable articles; and to inform management promptly of the reason for rejection to enable them to eliminate the cause, if possible. At regular intervals the management accountant must ensure that works management are provided with statements showing:

- (i) the actual volume of rejects, distinguishing between different products;
- (ii) the percentage of rejects to total production;
- (iii) an analysis by reason for rejection which will also indicate the responsibility for the loss;
- (iv) the manufacturing stage at which rejection occurred.

Scrap is not always a matter of rejection although this may be involved. In many manufacturing processes scrap must arise. Some scrap is valuable and must be carefully recovered and recorded. When the output and raw material budgets are prepared an allowance will be made for scrap. During the budget period reports must be sent to works management comparing actual and budgeted scrap.

§ 59. Stock Control

The purpose of stock holding is the maintenance of continuity in manufacturing operations and in distribution. The quantity of stocks of raw materials which is required depends on the reliability of supplies and the time interval between ordering and receipt. In the case of work in progress and finished goods the reliability and capacity of labour and plant, the probable customer demand and the extent of fluctuations in demand will have to be considered. A break in continuity can be very expensive as it may result in panic purchases at excessive prices; idle labour, plant and buildings; excessive overtime or sub-contracting in an effort to correct the position; a loss of sales; and a loss of goodwill. While shortages receive more prominence than surpluses, the latter can be costly. Adverse market price movements will cause losses. Moreover, stocks can deteriorate and become unsaleable.

The Raw Materials budget will have laid down the necessary stocks. If the budget is to be complied with, continuous supervision is required. The effect of suppliers failing to deliver goods at the anticipated times must be minimised. Orders may be placed with two or more suppliers for similar goods. Reports must be prepared for the buyer showing failures to deliver on time. As a result of these reports action can be taken to speed up supplies or the minimum quantities of stocks may be increased. Shortages and surpluses may arise, however, due to errors in stock policy or lapses in operating the system of stock control. The latter may occur owing to failure to relate the actual physical stock with the minimum level; posting

errors, either in quantities and/or to the wrong account; unrecorded usage; out of date minimum stock and re-ordering figures; and arithmetical errors in stock records. A regular system of agreeing physical and book stocks should be adopted. A full review of all stocks at the same time is normally impossible, but if a different section is reviewed each day or week, over a period of weeks no part of the stocks will escape attention. Maximum and minimum stock figures should be regularly reviewed on the basis of anticipated consumption. Subject to any information to the contrary past consumption should be regularly reviewed by management and maximum and minimum stock figures revised where necessary.

Work in progress is probably the most difficult item to control. Naturally the size of the problem must depend on the number of processes and sub-assemblies required and the length of the manufacturing cycle. Articles may move rapidly through the factory and the works problem is to have adequate supplies ahead of each operation to ensure continuity of work. Obviously the ideal situation is to have an uninterrupted flow of work with a minimum of work in progress. Any records showing the flow of work must not slow up the manufacturing processes. If a work ticket is prepared for each article or batch thereof, as the work tickets pass through an information control point they can be counted and an hourly, daily or weekly summary of the position prepared. No attempt should be made to evaluate these summaries, except at the end of budget periods. The quantities of work in progress are all that is required for control purposes. Progress chasers will base their activities on the hourly or daily summaries. Where work is falling behind programme, they will take steps to attempt to accelerate production.

When the budget was prepared, the minimum stocks of finished goods to be held will have been fixed. The demand for goods may, however, exceed or fall short of expectations. If, therefore, shortages or surpluses are not to be experienced, a rigid control based on the rate of consumption must be enforced. Where there are numerous sales lines, it will be necessary to group similar products and to find a common unit of measurement for each group. Where stock is distributed to a number of depots and branches, the problems of central stock control must be mastered. As far as possible shortages at one branch and surpluses at another must be avoided possibly by arranging transfers of stocks.

Where goods are returned summaries must be prepared, normally from the credit notes issued, showing the quantity of each product returned and the reason therefor. From this information, management will be able to take action to reduce returns. Control accounts should be opened, usually for each product, and the total quantity and value of credits given debited thereto. If the goods are immediately destroyed on return, these accounts will show the cost of so doing. But if the goods are salvaged, these accounts provide a means of control. Thus failure to salvage materials quickly and adequately can be noted and responsibility fixed.

Most executives involved with returnable containers regard them as a necessary nuisance. In such circumstances, unless the management insist on the accurate recording of returnable containers, the primary

information may be inaccurate. A system of physical and accounting control must be organized to ensure that no container is destroyed unnecessarily and that purchases of new containers are kept to those anticipated in the budget.

§ 60. Control of Cost

Readers will have realised that effective management is concerned with the present and future position, not with post-mortem examinations. The scrutiny of purchase invoices or the initialling of the wages sheets does not control expenditure. For control to be effective, either it must anticipate the act or event which results in cost being incurred or must be exercised at the time the liability is incurred, *e.g.* when an order is placed for raw materials, the worker is engaged, or a motor car is used by an employee. As control must be exercised by people, the persons authorised to incur expenditure and the extent of their authority must be defined. The budgets will have been built up from the lowest to the highest level of responsibility. Each person having a budget will be responsible for controlling some part of cost. Fixed costs (*e.g.* rent payable under a lease) will not require frequent attention, although they must be regularly reviewed. Variable costs must be carefully watched. The management accountant must examine each item of expenditure and ask two questions: how is the expenditure incurred and when? The answers will reveal the point at which control can be enforced. For any system of control to be effective it must operate at the time the expense is incurred in respect of:

- (i) quantity;
- (ii) quality; and
- (iii) price.

The control of (i), (ii) and (iii) will not necessarily be in the same hands, *e.g.* the works manager may control the quantity of consumable stores, while the buyer is responsible for quality and price. When introducing or revising any system of control the fact that control of the different aspects of cost is usually in different hands or with different levels of management must be recognised.

Obviously quantity control does not mean that each sheet of paper used must be counted or people continually moving round the factory turning off the electric light. The cost of such control would exceed the potential saving in stationery and electricity costs. Similarly control must not result in unnecessary delay. The saving in expenditure must be compared with the cost of control. Raw materials cost is incurred at the time materials are consumed. Primary quantity control can usually be exercised at the time of their release to the factory. Secondary control may be enforced when scrap or by-products are recovered. Where work is performed by outside contractors, control must be exercised at the time the order is placed. In certain circumstances, *e.g.* the use of stationery, post-consumption control may be enforced, when actual usage will be frequently reviewed and action taken to eliminate excessive usage in the future. But effective post-consumption

control can only be achieved in respect of a limited area or a few people.

As a matter of production control it is customary to inspect the quality of raw materials on arrival at the goods inwards bay, work in progress at various points in the factory and finished goods before placing them in store. The quality of the labour employed is frequently the responsibility of the personnel manager. But the quality control of other goods and services purchased by the business is often neglected. Management must establish the person who is responsible, at any given point in the organisation of the business, for certifying and controlling quality in respect of any particular item of expenditure. Somebody other than the junior typist must be responsible for deciding the quality of the stationery used.

Having controlled quantities and quality the price to be paid for goods and services must be considered. Where possible, the policy as to new engagements of employees and the review of salaries should be laid down. Apart from internal reviews, the business may be party to a national agreement between the industry and one or more Trades Union. Departures from the normal principles can be the subject of special authorisations from top management. Regular checks should be made to ensure that variances from the defined policy do not arise. In many large business organisations the purchasing department will agree prices of goods and services other than labour. Many variations occur in practice, however. The works manager may authorise the price to be paid for plant repairs; the estates department, the expenditure on rent and rates; and the transport department, the carriage charges. But, in any business, control of prices in respect of goods and services purchased can be exceedingly difficult. The methods commonly employed to assist control include:

- (a) concentration of authority to purchase;
- (b) authorising different persons to control expenditure depending on the value of each purchase;
- (c) insisting on competitive quotations being obtained;
- (d) comparing the prices paid with regular reports of market prices; and
- (e) comparing existing prices with those accepted previously.

But whichever method is used the economies achieved will depend on the business acumen and ability of purchasing personnel.

The accountant will be required to provide data as to the stock of materials on hand, their consumption, the quantity required and the prices paid in the past. From this information, the budget and his own knowledge of market conditions, the buyer should be able to purchase goods at the lowest possible price. If the purchase of quantities larger than those requisitioned will enable lower prices per unit to be obtained, the figures of average consumption over a period would indicate whether or not the larger quantities can safely be purchased. Where prices change during the budget period indices can be evolved for comparison purposes. The methods by which such indices can be prepared were discussed in Chapter VII. They can be useful in measuring and anticipating the trend of raw material, labour and overhead costs.

§ 61. Cash

The control of the cash position is frequently the responsibility of the accountant. In many ways he can ensure the prompt collection of debts. The payment of creditors can, within limits, be directly controlled by him. The management accountant will know from the Cash budget the estimated payments to be made in each period. In order to control the payments, he must know of those occurrences and conditions which can seriously affect the Cash budget. He must have details of:

- (a) the value of goods and services ordered, analysed into probable payment periods;
- (b) changes in credit terms;
- (c) the discounts obtainable for prompt payment on delivered goods and services and on forward orders;
- (d) the trend of market prices; and
- (e) taxation changes.

In respect of (a) to (e) he must know the total indebtedness incurred and the rapidity with which the obligation must be discharged. This information should be readily available from the existing accounting system. Unfortunately suppliers' invoices frequently reach the bought ledger clerk a considerable time after the receipt of the goods. Part of the credit period will have elapsed, therefore, before any action can be taken. Either the accountant can, within the limits fixed by the nature of the business, with the co-operation of the staff attempt to accelerate the passing of invoices to the ledger clerk or he can institute a system of cost control. As already indicated cost is incurred when goods or services are ordered. If details of all orders are summarised and analysed between expenses and probable periods of payment, a continuous picture of the future cash payments will be obtained. This summary is prepared during the budget period and operates as a control document in achieving budget. Probable variations between the actual and budgeted cash payments will be known in advance, and any necessary remedies may be effected.

§ 62. Control of Credit

When preparing the Debtors budget the policy of the business in the field of customer credit will have been established. Whether or not that policy will be fulfilled depends on:

- (i) vigilance in granting new credit;
- (ii) following up overdue accounts;
- (iii) concessions given to debtors;
- (iv) the speed with which complaints are settled;
- (v) the time interval between the despatch of goods and the rendering of invoices to customers; and
- (vi) customer resistance.

The sanctioning of credit to customers will be carried on continuously throughout the budget period. When investigating the customer's credit

status and having regard to anticipated business with him, it is usual to establish that he is 'good for £x'. After this initial stage, the credit allowed must not exceed the established figure without further review or sanction. Such reviews must be made regularly to avoid unnecessary delays being imposed on future orders received. If credit is controlled at the ledger posting stage, then without realising it, excess credit may be given. Control should be effected when the customer's order is received. The addition of the value of the order to the balance outstanding will reveal whether or not the allowable credit will be exceeded. Delivery of the new order can be withheld, if desired, until the outstanding balance has been reduced by the receipt of cash. If this system of credit control is to be enforced, invoicing and ledger posting must be up-to-date. Whether the above system is practical depends on the nature of the business, the number of transactions and their value. If orders for small values are obtained by travellers visiting customers once a month, the estoppel of overdue accounts will ensure sufficient control. Where orders are irregular and for widely varying values, control may be exercised on the receipt of orders by verifying the credit position only where orders exceed a certain value. If each order has a considerable value, control should be exercised at order stage.

Information as to the total sum due from customers at any particular date is inadequate for control purposes. Details are required of the total sum due in respect of debts within the permitted period of credit and that in respect of debts where the credit period has been exceeded. The latter must be analysed into 'age groups', *e.g.* one month overdue, two months overdue. Action should not be taken impersonally or indiscriminately in respect of overdue accounts. When the account becomes overdue, while caution will have to be exercised in respect of future sales to the customer, the reasons, if any, for the need for additional credit must be investigated. Special circumstances can exist which justify the extension of credit. The customer should be given extended credit only after consideration of all relevant facts and for an adequate reward. Ill-informed and indiscriminate action or inaction may lose a customer. Statements showing the additional credit allowed must be prepared as the figures shown in the Cash budget will be affected.

Delays in settling complaints can result in an unintentional extension of credit. Customers normally withhold the payment of invoices for disputed goods. The number of complaints will indicate any unsatisfactory feature in the system of quality control. Similarly any delay occurring between the despatch of and invoicing for goods extends the period of credit allowed to customers. Frequently a delay will result in a proportion of each month's sales being excluded from the settlement at the end of the credit period. The prompt rendering of invoices must be organized if control is to be exercised in respect of debtors.

Some daily control figures are advisable to assist management, *e.g.* the number of unsettled complaints analysed by age; number of orders despatched awaiting invoicing.

But there must remain one factor outside the accountant's control, customer resistance. Stereotyped letters normally evince little response from

customers. Where possible, the personal approach of travellers, who have been supplied with full details of the customer's account and credit status, will in many cases produce satisfactory results.

§ 63. Capital Expenditure

Reports should be submitted regularly (probably monthly) to top management showing the expenditure authorised to date, the actual expenditure on authorized projects, whether the time table laid down for the work is being achieved and reasons for any failures. Such reports may include, in respect of authorised projects, the anticipated expenditure in future periods, particularly where the original forecasts have had to be revised due to inflation, etc. On the basis of these reports, top management will be able to take any necessary action to vary sales or production budgets for future periods.

Illustration:

A new factory is being built to increase production and anticipating that the factory would be ready in May, 1957 top management informed the sales manager in September, 1956 that he could expect a big increase in supplies in June and July 1957. But the capital expenditure report for January, 1957 revealed that the factory would not be ready until July, 1957. Top management will be able to issue fresh instructions to the sales manager before the position becomes irretrievable.

CHAPTER IX

MEASUREMENT AND APPRECIATION

§ 64. Introduction

Day-to-day control makes it difficult for management to comprehend the differences between the actual and budgeted results in any department in relation to those of other departments, or to decide the relative importance of differences between actual and budget. In many instances operating statements will be quoted only in hours, units of weight or numbers of articles. It is necessary, therefore, during each budget period to summarize and convert the results shown by the operating statements into monetary terms. The summarizing of results will be carried out *after* the operating statements have been forwarded to management. The summaries will be rendered to the higher levels of management during the budget period or at the end thereof, depending on requirements. When the budget period is short (*e.g.* a week or a month) the summary may be submitted at the end of the budget period. Where the budget period is longer (*e.g.* a year or five years) summaries should be prepared for shorter periods (*e.g.* monthly or quarterly) within that longer period. Management must review the results of all sections of the business at frequent intervals and have up-to-date information if difficulties are to be foreseen and overcome and the position corrected for future periods.

Operating statements assist management in their attempt to achieve budget. If the attempt were completely successful, the Profit and Loss Account and Balance Sheet prepared at the end of the budget period would be a copy of the Master budget prepared before the commencement of that period. However, with any business, many events occur which are outside the control of management, *e.g.* strikes in suppliers' factories. Alternatively perfect control within the business may not be practicable, as the cost of control may exceed any saving in expenditure. A study of the differences (called variances) between actual results and those budgeted may enable management to learn from past achievements, mistakes and difficulties. The policy of the business may be amended for future periods as a result of the appreciation of management of the variances which have arisen. Furthermore, future budgets or plans may allow for unexpected difficulties which arose in the last budget period and which were disclosed by the variances.

The major part of the information required for measurement and appreciation will be available in the operating statements prepared for the purposes of day-to-day control; only in a few cases will a special investigation be necessary. Thus the principal work at the measurement stage is the

summarizing and collating of the operating statements outlined in Chapter VIII. The presentation of the summaries must follow the principles laid down in Chapter VII. In the summaries a yard-stick with which actual results can be compared must be provided, otherwise the recipients of the summaries will provide their own and widely differing conclusions may be drawn by different people from the same facts. The comparative data chosen must be unbiased and should be based on the same underlying conditions as those ruling in the actual period, *e.g.* in a seaside hotel the takings for August this year may be compared with those for August last year, but never with the January results. The actual results may be compared with:

- (a) the budgeted figures;
- (b) the optimum results;
- (c) the results for the preceding period in the current year;
- (d) the figures for the corresponding period in the previous year;
- (e) national or trade statistics; and
- (f) the standard amounts.

Also, within a business, the results for one factory or sales division may be compared with those of another. A rate of change graph will be particularly useful when making this comparison.

§ 65. Variances

The accountant will ascertain which of the anticipated governing factors (*see* § 11) applied during the period, which ceased to apply and the new governing factors which have arisen. This information will be disclosed by the operating statements. When reporting the position to management the times when factors ceased or started to apply will be shown. This information will assist the higher levels of management to revise future budgets.

Variances should be linked to the original cause as far as possible. This enables management to take corrective action in respect of the basic cause of variations from budget. Variances will arise under four main headings:

- (a) Volume;
- (b) Value;
- (c) Efficiency;
- (d) Uncontrollable.

(a) *Volume variances.* A volume variance is the difference between the actual and budgeted sales and costs (which have been expressed in terms of money) because the actual *quantity* of sales and/or output varies from budget. Changes in the quantities sold and/or produced will have an effect on profits, stocks, creditors, debtors and cash. Volume variances are, therefore, of major importance when reporting to management.

Illustration (1)

The budgeted and actual sales for a period were 200,000 units and 240,000 units respectively. The budgeted and actual selling price was 1s. a unit. The volume variance was:

Budgeted sales 200,000 units at 1s.	..	..	..	..	£10,000
Actual sales 240,000 units at 1s.	..	..	..	..	12,000
Volume variance	..	..	..	..	<u>£2,000</u>

In addition to the volume variance arising on a variation in *total* sales or production, there will be variances arising from variations in the *pattern* of sales and production. A sales mix variance is that part of the sales variance which is due to the actual sales of the various products being in a different proportion to the budgeted sales. Mix variances in respect of materials and labour will be dealt with later.

Illustration (2)

The actual and budgeted sales of the various products for a particular period were:

Product	Budget	Actual	Selling prices
A	100,000 units	140,000 units	£1 a unit
B	80,000	60,000	15s. "
C	75,000 "	90,000 "	10s. "
D	60,000 "	25,000 "	5s. "
	<u>315,000</u> "	<u>315,000</u> "	

The actual selling prices were as budgeted.

Sales variances:

Product	Variance	Budget	Actual
A	£40,000	£100,000	£140,000
B	(15,000)	60,000	45,000
C	7,500	37,500	45,000
D	(8,750)	15,000	6,250
	<u>£23,750</u>	<u>£212,500</u>	<u>£236,250</u>

Volume variances may arise due to the *calendar*. Where the budget ignores the fact that the results for some budget periods will be affected by bank holidays or holidays falling therein, the volume of sales and production in such periods will be lower than the budgeted figures, while the volume in other periods will be higher. The negative and positive variances will be computed and the budget adjusted thereby so that management will not be worried by facts outside their control. In theory, calendar variances should not arise as the budget for any period should allow for holidays.

(b) *Value variances*. A value variance is the difference in respect of sales or costs which is caused by the actual price varying from that budgeted. Value variances must be known in respect of the sales of each product, raw materials, labour and overheads (usually for each overhead). In practice, volume and value variances are encountered simultaneously. Value variances are assessed on the changed volume. As illustrated in (a) the volume variance shows the difference due to a quantity change, assuming there is no price change.

Illustration (3)

The budgeted sales of products A and B for a period were 180,000 units at 1s. a unit and 200,000 units at 1s. 6d. a unit respectively. The actual sales were, product A, 160,000 units at 1s. 3d. each; product B, 260,000 units at 1s. 9d. each.

The variances would be:

	£
Product A:	
Actual sales, 160,000 units at 1s. 3d.	10,000
Value (price) variance, 160,000 units at (1s. 3d. — 1s.) 3d. ..	2,000
Actual sales at budgeted price	8,000
Volume variance, (180,000 — 160,000) 20,000 units at 1s. ..	1,000
Budgeted sales, 180,000 units at 1s.	£9,000
Product B:	
Actual sales, 260,000 units at 1s. 9d.	22,750
Value variance, 260,000 units at (1s. 9d. — 1s. 6d.) 3d. ..	3,250
Actual sales at budgeted price	19,500
Volume variance, (260,000 — 200,000) 60,000 units at 1s. 6d. ..	4,500
Budgeted sales, 200,000 units at 1s. 6d.	£15,000

(c) *Efficiency variances.* Although the major portion of the differences between the actual results and those budgeted arise as a result of changes in volume and value, the accountant must watch for variances arising because of greater or lower efficiency than that budgeted. Efficiency variances arise where actual production in a given period of time varies from the budgeted production for that period. They are distinguished from volume variances by the fact that the period of time remains constant. Volume variances arise where the hours worked differ from the budgeted hours. Labour and machine utilization reports are the principle source of information regarding efficiency.

Illustration (4)

In the period the actual hours worked were 2,000 hours. The budgeted production in that time was 2,000 standard hours; the actual output was 2,100 standard hours. If overheads are being considered, there is an efficiency variance of 100 hours at the overhead recovery rate per standard hour.

(d) *Uncontrollable variances* arise usually as a result of events outside the control of management. Such variances will be evaluated and full information given so that management will know the position. In some instances the future policy or plan may be varied, *e.g.* where a supplier has failed to supply the component parts required, management may decide that in future such parts will be manufactured by the business.

§ 66. Ascertainment of Variances

As indicated previously, variances will be ascertained from the operating statements used for control purposes. Reports showing the variances will be built up in the same manner as that employed when preparing the original budget and the control information. In a book of this size it is impossible to cover every possibility, but the following chart shows some variances which may arise, the control reports from which information thereon will be derived, possible reasons which may be given for the variance disclosed, the further control reports which should be consulted to support or reject the reasons given and the heading under which the particular variance will be shown in the final Profit and Loss Account.

VARIANCE REPORT CHART

Variance	Variance shown in under-mentioned Control reports	Possible reasons given for variances	Control reports supporting or rejecting reasons	Report to Top Management	
				In Profit and Loss Account	Supporting Schedules might show:
SALES, Quantity	Salesmen, area and divisional reports. (Reports similar in layout to those in § 46).	Poor or improved delivery.	Comparison of volume of sales with statistics of volume of goods despatched.		Variance divided between increase or decrease in cost of manufacturing programme.
			Outstanding orders reports which are analysed into age groups.	Sales quantity variance.	Variance divided between divisions, if only arising in certain divisions
		Poor or improved presentation of product.	Reports of complaints. Improvements will be shown in cost of production compared with preceding period.	Sales quantity variance.	—
SALES, Pattern	Product quantity sales reports for each salesman, area and division. (Reports similar in layout to those in § 46).	Obsolete product.	Reports of orders received showing a decreasing tendency for one particular product [After the end of the budget period special reports may be prepared showing estimated sales for the market and the extent of substitution of products by own customers.]		Proportion of profit earned by sales of obsolete product, effect on costs of stopping manufacture
		High price	Statistics of unsuccessful quotations and lost accounts	Sales mix. variance.	—
		Faulty material. Machine breakdowns	Inspection and rectification reports Machine utilization reports.	Raw materials usage variance.	—
RAW MATERIAL, Usage	Summaries of replacement requisitions. Summaries of spoil batch records.				
RAW MATERIAL, Price	Summaries of price variances extracted from suppliers' invoices.	General increase or decrease of suppliers' prices.	Market intelligence reports.	Raw materials price variance.	Decrease or Increase in profit per article as a result of price increase or decrease.
FIXED OVERHEADS, Efficient use of Plant.	Summaries of weekly machine utilization reports.	Abnormal machine breakdown.	Engineer's report of estimated cost of repairs.	Factory overheads efficiency variance.	
		Shortage of material or breakdowns from previous process.	Process production report for previous period showing loss variance on output		

The chart shows for five variances the connection between the original control reports and the final entry in the Profit and Loss Account submitted to top management. By following this method the accountant will provide management with the required information rapidly while ensuring the maximum accuracy which is practicable. In the following paragraphs the various variances are discussed in more detail.

§ 67. Sales Variances

The investigation of sales variances should not be confined to negative variances. The failure to anticipate success can subsequently reveal shortages in production facilities and financial resources, which will prevent full advantage being reaped from possible sales. An increase or decrease in turnover may be caused by a variation in volume and/or value of sales. Such variations should be analysed between sales divisions, areas, products and customer industries. The comparison of the results of different divisions and areas will assist the sales manager in planning future budgets and controlling his subordinates. A report showing a fall in the volume of sales of a product or sales to a particular industry will enable management to decide which of the following alternatives to adopt:

- (a) to institute a vigorous sales and advertising campaign;
- (b) to reduce expenditure on sales promotion;
- (c) to change the sales representation;
- (d) to decide whether amendments should be made to the product to increase its popularity; or
- (e) to discontinue production.

Having ascertained the variance, the next stage is to determine the cause thereof. Possible causes and the control reports which should be seen for confirmation or rejection of the reasons given are:

<i>Cause</i>	<i>Control Report</i>
(a) Poor or improved delivery by product.	(i) Statistics comparing the figures shown in the orders on hand and goods delivered reports. (ii) Analysis of outstanding orders by age. (iii) Report showing increasing or decreasing average age of outstanding orders.
(b) Poor or improved quality.	(i) Reports of customer returns, complaints and allowances. (ii) Summaries of reasons for the loss of business or reports showing failure of samples (due to poor quality) to secure additional business.

*Cause**Control Report*

- | | |
|---|--|
| (c) High price. | (i) Reports of unsuccessful quotations due to price and reports of lost business.
(ii) Reports stating competitors' prices for comparable quality.
(iii) Statistics showing proportion of total trade. |
| (d) Low price. | (i) Reports of successful quotations due to price and reports of gained business.
(ii) and (iii) as in (c) (ii) and (iii). |
| (e) Inadequate customer service. | (i) Reports of customer complaints and lost business. |
| (f) Improved customer service. | (i) Reduction in complaints in control reports for this period in comparison with previous periods. |
| (g) Obsolete products or progressive modernization of products. | (i) Reports of orders received showing a tendency to fall or rise.
(ii) Report showing share of estimated total market.
(iii) Report showing extent of substitution of products by own customers. |
| (h) Poor or improved presentation or packing. | (i) Reports of complaints, returns and allowances.
(ii) Market research reports. |
| (i) Inadequate or successful publicity. | (i) Market research reports.
(ii) Reports of complaints from distributors. |
| (j) Improvement by competitors. | (i) By comparison of goods despatched reports showing quantity despatched has not fallen and lost business reports. |
| (k) Governing factor is production. | (i) Reports of machine breakdowns or failure to obtain raw materials. |

When the above causes have been investigated, an unexplained variance may remain. This variance is probably due to personal qualities of the salesman. Obviously evidence of increasing efficiency in salesmen can be seen from their individual sales returns. To compare the results of different salesmen is difficult, however, as there are differences in the territory

covered, the proportion of established clientele and the amount of development work which is in progress. The personal opinions of superiors will be required.

The accountant must report on the variances and their causes and, on the basis of his appreciation of their effects, indicate future possibilities. He may be invited to discuss these matters with the sales director or manager, who is responsible for taking action.

§ 68. Variances in Selling Expenses

When preparing the Selling Expenses budget a clear distinction will have been made between fixed and variable selling expenses. A simple report, possibly prepared at monthly intervals, showing the budgeted and actual expenditure on fixed overheads is usually sufficient. The only variance not known to management will be the expenditure variance. Other variances arise as a result of definite managerial actions, which normally vary the assumptions made when preparing the budget. The appropriate minute book will provide the necessary reasons for the action taken.

Management will spend, therefore, more time in controlling variable selling expenses than in controlling fixed selling expenses.

Variations between actual and budget will arise because of:

- (a) a change in volume of sales;
- (b) a change in value of sales;
- (c) variations in rate of cost of expense items; and
- (d) variations in efficiency and effectiveness.

Details of variations in volume and value of sales will be known from the summaries prepared when ascertaining the sales variances. Variations in the rate of cost will be found by summarizing the price variances extracted from salary sheets, expense claims and suppliers' invoices.

Illustration (1)

The X. Ample Co. Ltd. remunerates its salesmen by a commission based on the value of sales made. If there is an increase in the volume of sales but not in the total value of sales, the commissions payable will remain constant while distribution costs will rise. Alternatively, if selling prices are increased but the volume of sales is unchanged, the commission payable will increase in the same proportion, but distribution costs will not vary.

The Selling Expenses budget was prepared from the estimates of each division and area. Measurement and appreciation of variances must follow the same pattern. Then praise or blame can be apportioned fairly and expense variances correctly explained. The explanation may disclose facts which will result in major changes in future budgets.

Illustration (2)

Control reports disclose that the actual volume of sales exceeded budget in the North area, but fell short of budget in the South area of Division A. This variation was caused by the building of a new town. The actual distribution costs in the North area exceeded budget, while those in the South area were below budget. Future budgets of distribution costs must allow for this change in population.

§ 69. Production Variances

The accountant must ensure that the work of measuring and appreciating production variances concentrates initially on the variations which have arisen because of:

- (a) new or changing governing factors;
- (b) uncontrollable and unexpected events;
- (c) changes in volume and pattern of sales;
- (d) changes in the pattern of production; and
- (e) efficiency.

These variances will be measured in quantities and hours. Only after these have been fully investigated will monetary variances be considered. The control information will have been prepared for cost-centres, departments and the works. The production variances disclosed by the control reports must be summarized as to both cause and effect.

§ 70. Raw Material Variances

Raw material variances arise under two headings, (a) purchases and (b) consumption. The relationship of each to one another will be evident by the rise or fall of raw material stocks. As for sales, details are required of the variances due to variations in quantity purchased and used and variations in the price paid for the raw material.

Information relating to raw material purchases will show where raw materials are, have become, or have ceased to be, the governing factor. Such information will be useful in preparing the budget for the new period. The actual quantity of raw materials purchased should be compared with the buying budget to disclose excess purchases or where purchases have fallen below budget. The variations may be caused by:

- (a) a lack of finance and storage, thus reducing the quantities which can be bought; or
- (b) a failure by the buying department to acquire the quantities required due to its ineffectiveness; or
- (c) variations arising from the redesign of the product manufactured (this may have been done to allow for difficulties in purchasing the required raw material); or
- (d) excessive consumption which has forced additional purchases to be made (the accountant should ascertain if comparable sales quantity variances arise).

The cost of purchases may have varied from budget due to a change in market prices or a change in the quality of the raw materials purchased and used. The price variance can be extracted from the original purchase invoices. A summary at monthly intervals of the price variances will normally be all that is required by management. To enable management to confirm the effectiveness of the buying department, reports should be prepared showing the raw material cost index for the industry. A rise in that index will confirm a rise in the material prices shown by the price variance. Where there has been substitution of raw material on a re-design

of the product, management will normally have been informed of this fact already. A special report showing the recomputation of the standard or normal product cost will be made and the extent of the variance established. A change in the quality of the raw material purchased will increase or decrease the market price per article purchased and the effect thereof should be shown separately on the summary of price variances so that management can clearly distinguish between increased or decreased market prices on the products they expected to purchase and the additional cost of purchasing better quality materials or the reduced cost of purchasing cheaper materials than were budgeted. Value variances can also arise in respect of speculative purchases. Transactions involving speculation in the purchase of raw materials should be kept separate from normal purchases. This will be done in order to supervise the authorization of the transactions. By comparing the cost of actual purchases against the special authorizations any value variances arising will be shown.

As value variances are usually extracted at the time of purchase, only volume variances arise in respect of the consumption of materials. One method of determining variances in the consumption of raw materials is to prepare, as in the illustration below, an analysis of the quantity of material required to achieve the actual production.

STATEMENT OF RAW MATERIAL CONSUMPTION VARIANCES

For the four weeks ended 31st May, 19... Dept: 1 Cost-Centre 2

Type of material used	Production in quantity of finished product	Actual quantity of raw material required	Standard quantity of raw material required	Quantity Variance from Standard	Standard Cost Variance	Percentage Variance	Explanation of Variances
A .	lbs. 500	lbs. 550	lbs. 500	lbs. 50	£ 5	% 10 0	Poor quality material, below standard shown in budgeted material specification.
B .	450	1,290	1,350	(60)	(30)	(4 4)	Saving in material due to superior workmanship.
C .	100	200	150	50	30	33·3	Bad workmanship resulting in excessive spoilage.

Prepared by .. Date prepared .. Submitted to

Various explanations of the variances which have arisen are shown in the above statement. However, positive or negative variances may arise for several reasons. The probable causes of variations and the control information which will indicate that these variations arise are:

*Cause**Control Information*

(a) Spoilage

Excess usage or replacement requisition summaries; spoilt batch records.

(b) Rejection

Inspection records analysed periodically by cause and stage of manufacture. Sampling methods (*see* § 56) are frequently used when analysing inspection records.

(c) Scrap

Reports of the weight disposed of, analysed departmentally or by process. This report will frequently include the price received for the scrap.

(d) Substitution

The measurement of the variance arising from the use of different raw materials to those shown in the budget will depend upon the method by which substitution is authorized. Where the authorization is by a senior executive, measurement is unlikely to be difficult; where a large miscellany of products are manufactured and substitution is permitted at a low level of authority, the measurement of the variance arising may be more difficult. However, some system whereby a document called a 'substitution note' is prepared when the substitution is agreed upon and which shows the cause of the substitution, full details of the new material to be substituted, details of the raw materials which are not now to be used, the number of units in which substitution is to occur and authorized by an executive of either the design office, the laboratory or the works should be provided. A summary can be prepared periodically from these substitution notes to show the variance which is arising from substitution.

*Cause**Control Information***(e) Redesign**

Where it is decided to redesign the product being manufactured, there may be a change in the materials required to produce the product. Normally the standard product cost will be re-established and the variance from the original budget which will now occur will be known.

(f) Bad Storage

Reports of stocktaking differences between book and physical stocks will disclose losses due to bad storage.

(g) Abnormal process losses

These can be ascertained from either:

- (i) reports of spoilage and scrap which will show the material which has been lost. (In the statement of raw material consumption shown on page 90 this is illustrated in respect of product C.); or
- (ii) where the material disappears (*e.g.* evaporation in chemical manufacture) details will be found by comparing the raw material usage reports with the finished product manufactured report.

§ 71. Direct Labour Variances

It is obvious from § 58 that a great deal of information is collected in respect of the activities of direct labour when controlling the position during the budget period. The basic problem at the measurement and appreciation stage is, however, the analysis of the variances from budget by cause. Direct labour variances can arise in the manner shown below.

*Cause**Control Report***(a) Rejected and Spoilt Work.**

The labour utilization reports will show the time spent in rectifying faulty work.

(b) Redesign

Redesign reports will show the additional or reduced time which labour has to spend as a result of the redesign of the product.

*Cause**Control Report*

(c) Idle Time

Idle time will be shown by the labour utilization reports and should be summarized between plant breakdown, scarcity of materials, excess setting up time, bad time keeping etc.

(d) Overtime

Overtime will be shown by the payroll and the cause by authorization reports approved by the works manager or one of his subordinates.

(e) Changes in pattern

Gang reports will indicate the actual composition of each gang working in the factory and these will be compared with the budgeted gang to be employed. An example of this is shown in the illustration below.

(f) Changes in number of workers

Details will be shown on the personnel records for each department.

(g) Efficiency

Details of the efficiency of workers will be ascertained from reports showing the production of workers and comparing that production with the hours it was anticipated such production would take against the hours which it actually did take. An example of this is shown in the illustration below.

Illustration

In a cost centre in a factory the normal labour force consists of a group of 16 men, 18 women and 6 boys payable at 6s., 4s. and 2s. per hour respectively. During a particular week the actual labour force employed was 24 men, 12 women and 4 boys who actually worked and were paid for 800 hours in a week. They produced, according to work-in-progress reports, an output of 900 standard hours. The workers were paid £220. Show in statement form the variances arising due to the composition of the gang, the efficiency of the operation and the rates of pay.

STATEMENT OF DIRECT LABOUR VARIANCES

For the week-ended 31st May, 19..

Dept : A	Cost-Centre: 6	Output: 900 Standard Hours	£ s. d.	
1. Standard wages value of output at standard rate, $900 \times 4s. 6d.$ (see note 1)			202	10 0
2. Actual hours worked at standard wages cost, $800 \times 4s. 6d.$..			180	0 0
3. Actual hours worked at wages cost of actual gang, $800 \times 5s.$..			200	0 0
(see note 2)				

4. Actual wages	220	0	0
Variances:			
Efficiency (1 - 2)	22	10	0
Composition of gang (2 - 3)	(20)	0	0)
Rates of pay (3 - 4)	(20)	0	0)

Prepared by

Date prepared

Submitted to

Notes:

(1) The standard labour force wage rate:

	£	s.	d.
16 men at 6s. per hour	4	16	0
18 women at 4s. per hour	3	12	0
6 boys at 2s. per hour		12	0
40	£9	0	0

$$\text{Wage rate of standard gang} = \frac{\text{£9 } 0 \text{ } 0}{40} = 4\text{s. } 6\text{d. per hour}$$

(2) The actual labour force wage rate at standard rates of pay:

	£	s.	d.
24 men at 6s. per hour	7	4	0
12 women at 4s. per hour	2	8	0
4 boys at 2s. per hour		8	0
40	£10	0	0

$$\text{Wage rate of actual gang} = \frac{\text{£10 } 0 \text{ } 0}{40} = 5\text{s. per hour.}$$

§ 72. Variances on sub-contracted work

The measurement of such variances should not prove difficult as reports can be prepared during the budget period showing the actual deliveries by the sub-contractor and the budgeted deliveries. Variations from budget are likely to arise because of:

- value changes;
- delivery failures of sub-contractors;
- increases or reductions in the total order to the sub-contractor;
- increases or reductions in the rate of supply by the sub-contractor; and
- rejection of work done by the sub-contractor.

The value or price changes can be ascertained by comparing the actual invoice prices with the budgeted invoice prices. If the price variances are extracted on the receipt of each invoice the total price variance for the period can be easily ascertained. Where the variation is caused by a failure to deliver by the sub-contractor the reason behind that failure must be established. It may be due to the sub-contractor, but on occasions may be due to the main contractor failing to forward to the sub-contractor specifications or drawings in time; failing to provide adequate jigs or tools in time; failing to provide raw materials or sub-assemblies in time; or forwarding raw materials and sub-assemblies in an erratic flow, thus

causing delays in the manufacturing processes of the sub-contractor. Where the total order is increased or decreased this will be the result of some other event. The other event will normally be known but may usefully be reported again to management. For example, lack of raw materials, a scarcity of required labour or excessive plant loading in the factory of the main contractor may cause work to be sub-contracted to another firm. Management will have been informed already of the lack of raw materials etc., but when reporting on sub-contracted work the fact may be reiterated. A further report to management showing the changes in the total orders to sub-contractors may result in additional capital expenditure. Where there is a change in the rate of supply this may also be caused by a temporary scarcity of labour or raw material or changes in the plant loading in the supplier's main factory. Full details should be given to management to enable them to appreciate the temporary nature of the change in the rate of supply. Details of all sub-contracted work which is rejected must be provided to management to enable them to decide whether or not to change sub-contractors.

§ 73. Factory Overheads

As with selling expenses, a clear distinction must be maintained between fixed and variable overheads. For fixed overheads a monthly report showing the variances between the budgeted and actual expenditure is frequently sufficient. A substantial rise or fall in expenditure will reflect a major event already known to management, *e.g.* the early delivery of new plant giving rise to additional depreciation.

In respect of variable factory overheads, however, variances will arise from numerous causes. In such circumstances only major variances should be considered. Initially, expenditure variances will be deleted. In order that management will not be misled by variations in the volume of production, the budgeted or allowed expenditure should be adjusted for the increase or decrease in the volume of production as compared with budget. Then attention can be focused on the following possible causes:

- (i) changes in the pattern of production;
- (ii) rejection of work;
- (iii) rectification of work;
- (iv) lack of control of cost, *e.g.* waste;
- (v) uncontrollable events;
- (vi) efficiency; and
- (vii) incorrect budgeting.

From the reports relating to raw materials and direct labour a picture will have been obtained of the main factory events and the causes of variances. To ascertain factory overheads variances, the causes shown by these reports can be investigated first and only if substantial variances still remain is any further investigation necessary.

Reports will be prepared for each person who has control of cost, showing the budgeted and allowed cost and the actual cost of factory overheads for the period.

Illustration

A typical report for the works manager would appear as follows:

STATEMENT OF FACTORY OVERHEADS VARIANCES

For the period ended 31st May, 19. .

Actual production: 80 per cent of normal

Fixed (F) Semi-Variable (S) Variable (V)			Budget (note 1)	Allowed Cost (note 2)	Actual Recovery from Production (note 3)	Actual Expenditure	Expenditure Variance	Volume Variance
			(1)	(2)	(3)	(4)	(5)	(6)
			£	£	£	£	£	£
Supervision	..	F	440	440	352	420	20	88
Indirect Labour	..	S	300	276	240	290	(14)	36
Stores	..	S	150	138	120	106	32	18
Scrap	..	V	40	32	32	30	2	—
Power	..	V	190	152	152	146	6	—
Carriage	..	V	60	48	48	50	(2)	—
Stationery	..	F	25	25	20	23	2	5
			£1,205	£1,111	£964	£1,065	£46	£147
Semi-variable expenses are 60% Fixed and 40% Variable								

Notes:

- (1) The figures in column (1) are those included in the original budget which was prepared on the assumption that the normal number of hours would be worked in the period at normal efficiency.
- (2) The figures in the 'Allowed Cost' column are computed on the basis that only 80 per cent. of the normal production was achieved in the period. The allowance for variable overheads is reduced to 80 per cent. of budget, but the fixed overheads are unaffected.
- (3) As the actual production was only 80 per cent. of budget, the fixed overheads can only be recouped to the extent of 80 per cent. of budget. The sums which can be recouped are shown in column (3).
- (4) The actual expenditure in the period is shown in column (4).
- (5) The expenditure variances are shown in column (5). These variances are computed by comparing the sums in column (2) and column (4). The figures in column (2) must be considered instead of those in column (1), as the variable expenses will have fallen as a result of the lower production.
- (6) The volume variances are the differences between the figures in columns (2) and (3). They arise because of lower production and relate, therefore, to the fixed overheads or the fixed portion of semi-variable overheads.

§ 74. Variances on Research Expenditure

Apart from important changes in plan, in prices or rates of pay, expenditure is unlikely to vary substantially from budget in the short budget period. Of course, over a long budget period there may be a substantial variation between actual and budget. A failure to conclude a research project by an expected date will usually postpone expenditure, rather than change its rate. Frequently the research undertaken depends entirely on an adequate supply of qualified and experienced people. In such circumstances considerable under-expenditure on own research will reveal a lack of ade-

quate personnel. This state of affairs will be confirmed if there is expenditure in excess of budget on contributions to outside research institutions.

§ 75. Administration Overheads

The majority of items under this heading are fixed in nature. The computation of expenditure variances is, therefore, the chief task. Only if a substantial increase or contraction of administration facilities has occurred, due to variations in the level of activity, will the accountant need to go into more detail. Then, each difference between actual and budget must be considered carefully. In reviewing variations the accountant must decide whether the cause of the variation is such that future budgets must be amended or whether such expenditure can be prevented in future.

§ 76. Stock and Work-in-Progress Variances

The actual figures must be compared with budget for value and for quantities. Variations in price levels will cause variations in the quantity of stocks held, *e.g.* if the management are of the opinion that in the near future there will be a fall in raw material prices, the quantity of raw material stocks will be deliberately reduced. Where price (or value) variances are deleted as they arise or are known from perusal of revenue budgets, the major variation will arise in the volume of stocks and work-in-progress. At this stage, therefore, the matters to which attention should be paid are:

- (a) whether or not the stock of any item is below the minimum level having regard to the consumption thereof;
- (b) those items in which over-stocking has occurred;
- (c) those items of stock which have not moved or appear to be redundant and obsolete;
- (d) where shortages or surpluses have arisen due to faulty stock control;
- (e) whether the pattern of stock is altering, resulting in an increase or decrease in the investment in stocks.

The proper appreciation of the above matters will enable management to plan any liquidation of stocks which may be necessary or to remedy any shortages.

As indicated in § 59, work-in-progress is a most difficult item to control. Similarly the appreciation of any variances which have been shown by the control information may be difficult, as work-in-progress is changing so frequently that by the time the variances are known the situation in the factory may have changed substantially. Frequently it will be necessary to consider each section of the business which has failed to reach or has exceeded budget (as shown by the control information) and then follow through the variances in the later processes, appreciating these have been caused by the deficiency or surplus at an earlier stage. Control reports should be perused to trace any lack of movement in any given items of work. From time to time changes in specifications, cancellations of orders and lack of orders for a given product render partly manufactured goods redundant or immobile. Unless this situation is deliberately searched out, there will be a tendency to accumulate work which is useless. If manage-

ment is able to determine that any partly manufactured goods are becoming redundant at an early stage in the manufacturing process the loss which will be sustained on such work can be reduced. Partly manufactured products may be sold to other manufacturers or converted into different finished products from those originally intended.

Special hedging or speculative stock purchases will only occur under direct management authority. A report showing the actual cost of the actual quantity purchased as compared with the budgeted figures should be prepared, as substantial variances can arise with such transactions.

§ 77. Debtors

The information disclosed in the control reports (mentioned in § 62) will be compared with the budget. Variations between actual and budget must, of course, be analysed between their causes. After allowing for any variations in the total credit allowed to customers due to an increase or decrease in the volume or value of sales, the accountant should inform top management of any extension of credit beyond that anticipated; of any lack of efficiency in debt collection or account approval; and of any slowness by debtors to pay as a result of inefficiency in the invoicing procedure. Readers will appreciate that the pattern of sales is always changing and as a result the credit pattern may also change. The accountant should indicate this to top management.

§ 78. Cash

Variations from the Cash budget arise principally as a result of variations which have already been indicated. However, care should be taken to show where the borrowing of money or the investment of surplus funds has varied from the original plan laid down.

To enable management to appreciate the movement in liquid assets between two dates, a Movement of Funds Statement may be prepared. This statement will be prepared by comparing the fixed and current assets, the long term and current liabilities and the issued share capital at the two selected dates. Increases and decreases in these items will be shown together with the adjusted profit before taxation for the period between the two dates, the depreciation charged for, and the taxation and dividends paid in that period. In regard to the sale of fixed assets only the actual cash received must be included. The sources of liquid capital and its application should be distinguished. Where it is desired to show the movement in liquid assets, the last line of the Movement of Funds Statement will show the increase or decrease in the bank balance. Such a statement can, however, be prepared so as to show on the last line any information which is particularly required by the recipient of the statement, *e.g.* if a director requires to know the increase in fixed assets and the method of financing such an increase, then the last line will reveal the increase in fixed assets.

Illustration

From the following balances at 1st January and at 31st December, prepare a Movement of Funds Statement showing on the last line the increase or decrease in the bank balance between the two dates.

	<i>1st January</i>	<i>31st December</i>
	£	£
Ordinary Share Capital	400,000	500,000
Share Premium Account	—	20,000
Profit on Sale of Leasehold Property ..	—	5,000
Profit on Redemption of Debentures ..	—	800
Profit and Loss Account, balance brought forward	90,000	90,000
Profit for year, before taxation	—	97,000
4% Debentures	100,000	80,000
Sundry Trade and Expense Creditors ..	128,000	118,000
Taxation	62,000	6,240
Proposed Dividend (net)	20,000	—
	<u>£800,000</u>	<u>£917,040</u>
Freehold Property, at cost	290,000	370,000
Leasehold Property, at cost	10,000	—
Plant and Machinery, at cost	£360,000	£420,000
Less Depreciation to date	144,000	186,000
	<u>216,000</u>	<u>234,000</u>
Shares in Subsidiary Company, at cost ..	32,000	32,000
Loan to Subsidiary Company	—	12,800
Work-in-Progress	34,000	30,000
Stock in Trade	54,000	72,000
Debtors	124,000	129,440
Balance at Bank	40,000	36,800
	<u>£800,000</u>	<u>£917,040</u>

During the period, plant costing £26,000 (depreciation provided to 1st January, £18,000) was sold for £6,000. This transaction has been allowed for in preparing the list of balances at 31st December, the loss on sale having been charged against the profit for the year.

MOVEMENT OF FUNDS STATEMENT

Year ended December, 31st, 19..

<i>Increase in Funds Available:</i>	£	£
Profit for the year, before taxation	..	99,000
Depreciation charged in the Accounts	..	60,000
Increase/Decrease in Sundry Creditors	..	10,000
Increase in Share Capital	..	120,000
Increase/Decrease in Debentures issued	..	19,200
Sales of Fixed Assets	..	21,000
		<u>270,800</u>
<i>Less Amounts Applied in:</i>		
Loan to Subsidiary Company	12,800	
Increase/Decrease in Work-in-Progress	4,000	
Increase/Decrease in Stock in Trade	18,000	
Increase/Decrease in Debtors	5,440	
Expenditure on Freehold Property	80,000	
Expenditure on Plant and Machinery	86,000	
Payment of Taxes £(62,000 - 6,240)	55,760	
Proposed Dividend	20,000	
	<u></u>	<u>274,000</u>
Increase/Decrease in Bank Balance		£3,200

Notes:

(1) Profit for the year before taxation:

Profit per question	£97,000
Loss on Sale of Plant	2,000
	<u>£99,000</u>

(2) Depreciation charged in the Accounts:

Provision for depreciation 31st December	£186,000
Less Provision at 1st January	£144,000
Less Depreciation on Plant sold	18,000
	<u>126,000</u>
	<u>£60,000</u>

(3) Sales of Fixed Assets:

Leasehold Property, cost	£10,000
Profit	5,000
	<u>15,000</u>
Sale Price	15,000
Plant	6,000
	<u>£21,000</u>

(4) Expenditure on Plant:

Balance at cost 31st December	420,000
Less Balance at cost 1st January	£360,000
Less Cost of Plant sold	26,000
	<u>334,000</u>
	<u>£86,000</u>

§ 79. Capital Development

Budgets for capital development schemes frequently cover a period of several years. Problems arise during the course of any given project and these must be shown so that management may revise their future budgets. Naturally the information to be supplied to management will depend upon the particular capital development scheme. But if a building is being constructed on behalf of the firm, information should be provided showing the amount of work certified to date in comparison with that which it was estimated would be certified to the present time; details of any known increases in cost (*e.g.* if there has been a general increase in wages in the building trade the effect of this upon the original budget should be shown); and details of any extras which have proved necessary and their probable cost. With this information management will be able to plan the future cash expenditure more accurately. Care should be taken where the delivery of plant may occur a long time (*e.g.* two years) after the date of the order. The lack of any activity on the part of the suppliers in the interim period may be overlooked, but increases in cost may cause financial embarrassment when the plant is finally delivered. In one firm known to one of the authors plant was ordered in 1951 at an estimated cost of £12,000. When the plant was finally delivered in 1956 the cost had risen to £16,000. Fortunately the increase in price had been foreseen by the directors and sufficient cash was available to meet the increase.

§ 80. Master Budget

The results for the budget period and the variances arising therein will be summarized for top management in a Profit and Loss Account for the period and a Balance Sheet at the end of the period. The particular form of these statements will depend on the requirements of top management, but the following layout might be used for the Profit and Loss Account. Readers may like to refer back to § 42 to see how this Profit and Loss Account stems from the Master budget. To make this obvious it has been assumed that the budgeted and actual quantity of sales for April were equal.

Illustration

PROFIT AND LOSS ACCOUNT FOR THE MONTH OF APRIL, 19..

	<i>April</i> £	<i>Year to Date</i> £
Sales at budgeted prices	46,800	188,720
<i>Less</i> Budgeted cost of Materials, Wages and Factory Overheads based on sales	32,175	130,920
Gross Profit Margin	14,625	57,800
<i>Less</i> Budgeted cost of Administration based on sales	2,925	11,795
Standard profit on <i>actual</i> sales ..	11,700	46,005
<i>Increased</i> prices realised on sales ..	1,950	1,700
	13,650	47,705
Raw Material prices were <i>higher</i> by ..	1,200	4,620
Wages rates <i>exceeded</i> budget by ..	600	780
Factory expenses <i>exceeded</i> budget by ..	450	940
Administration expenses <i>exceeded</i> budget by	60	210
<i>A decrease</i> in output resulted in an under- recovery of overheads of	147	86
<i>Increased</i> factory efficiency produced ad- ditional profit of	1,182	1,280
	1,275	5,356
Balance, being actual net profit for period	£12,375	£42,349

Note:

Readers will appreciate that the standard profit on actual sales should be shown. If management wish to know the difference between actual and budgeted sales, this information may be shown at the top of the account. Otherwise a separate report may be prepared.

§ 81. Appreciation of Results

Hitherto the emphasis in this book has been on forward thinking and the control of events before or as they occur. But the only guide to future events is to make a proper assessment of the past. Ignorance of the future is happily universal, but ignorance of the past is inexcusable. The assessment of past events must be made rapidly. Every day of delay in ascertaining and understanding the results of the past is another day lost in applying in the future the lessons learned. Furthermore, the activity and costs of the

immediate past are frequently the best guide to those of the immediate future. Every accountant must insist that no delays occur in providing information.

Normally the review of the past will be on the basis of comparing the actual results with budget. But periodically it may be necessary to ignore the budget and assess the position on the facts themselves. Management may need to compare the company's position with those of other concerns on the basis of trade, national or international statistics. The latter includes the published results of competitive concerns through trade associations, Board of Trade Statistics (including the Census of Production and the Census of Distribution), Ministry of Labour information regarding supply and earnings of labour and national statistics of foreign countries usually obtainable from banks. Alternatively, it may be necessary to forecast future business trends by considering possible changes in fashions. Economic facts cannot be ignored and the accountant is frequently the person who will be required to give an opinion thereon. A working knowledge of Economics can be useful.

Any appreciation of the results of past periods requires common sense and an open but active mind. The accountant will commence with such information as he has regarding the particular problem to be considered and, by acquiring more information, steadily reduce the unknown. Normally the review can be made under three headings:

- (i) the effectiveness of investment;
- (ii) the effectiveness of past policies; and
- (iii) the effectiveness of the business organization (including the executives).

§ 82. Review of Investment

In reviewing the profitability of the investment of the capital of the concern, ratios may be useful. Ratios in common use include earnings to capital employed; one category of assets or liabilities to another; raw material costs, direct labour cost and manufacturing overhead cost to one another and to the quantity and/or value of sales; selling expenses to quantity and/or value of sales; and the individual costs of the business to those revealed by the trade.

In calculating the ratios, however, care must be taken in deciding on the basis to be adopted for the calculation. When comparing profits with the amount invested in the concern, the following alternatives exist:

- (a) the total net profit may be compared with the nominal issued capital;
- (b) the total net profit may be compared with the total capital employed;
- (c) the net trading profit may be compared with the capital used in earning those profits, *i.e.* excluding amounts invested in Government securities and other concerns.

Except in the first year of the business the comparison of net profit with nominal issued capital is unwise for management purposes. The accumulation of profits and losses will immediately alter the value of the assets being used to earn profits. If the ratio in (b) above for any period is to be compared with that for another period then the basis adopted in computing

the capital employed must be constant. Depreciation is an important factor, as this can be varied by policy decisions. Similarly in ascertaining the net profit for the period, any variation caused by policy decisions in the charges debited to Profit and Loss Account must be adjusted. Obviously, if loan capital (debentures) is issued instead of risk capital (shares), the interest charged to Profit and Loss Account will increase. In the latter circumstances, the actual assets employed may be the same, but the net return will be different. Either interest on capital should be ignored or an arbitrary rate fixed for all capital employed. Sums invested in other concerns (including subsidiaries) should be separated from the trading assets. Fluctuations in the net return from investments and trading assets arise from different causes.

Basically, current assets should exceed current liabilities, but if the concern is to remain solvent the creditors must be paid when due. The definition of 'current' in both cases is important. The term 'current assets' usually includes stocks, debtors and cash. Of the latter, nothing need be said. From the reports prepared in connection with stock control, obsolete, slow moving, excessive, speculative and properly rotating stock and returned materials in suspense will be known. Although the basis of valuation will discount any loss of value of the above items, only speculative and properly rotating stocks should be included in the computation of current assets. Similarly, debtors will take varying periods of credit and the accountant must predict the probable dates of payment. Liabilities will be divided into those payable in the immediate future and those payable later. From the above information the accountant will prepare a statement showing for future periods the cash receivable and payable therein. The degree of solvency expected at the Balance Sheet date will be known from this statement. If the excess of current assets over current liabilities shown by the statement is insufficient for the type of business, steps may be taken before credit stringency forces the business to reduce operations. Alternatively, if the cover is ample capital development or short-term investment schemes may be considered.

Management aims at running a business which is stable in character and which will continue operations from year to year. To do this the value of the fixed assets should exceed by a substantial margin the amount of the fixed liabilities. Any tendency for the average age of fixed assets to increase may show that the production methods are not up-to-date, which may handicap the business. Periodically the total figure for fixed assets should be analysed into age groups to show that wastage caused by wear and tear is replaced and the amount of new development which has occurred.

Capital development schemes are normally spread over several years. From time to time the original scheme should be examined and, so far as possible, a report prepared to compare the benefits which have accrued from that scheme with those claimed when the scheme was prepared. Unfortunately in many instances it is impossible to isolate the effects of any one scheme. Trading conditions may change while the capital development scheme is being introduced. But to assist top management when considering future proposals, an attempt should be made to prepare the

report. In § 57 it was suggested that statistics of orders outstanding and cancellations should be prepared for control purposes. These statistics, particularly if they show a tendency for orders outstanding etc. to increase, should be incorporated into a special report to top management to show the pace of development in comparison with the needs of the business.

§ 83. Review of Policy and Plan

In the opening chapters of this book the problems associated with deciding upon a definite policy and plan were discussed. At this stage the accountant is responsible for providing facts by which top management can decide whether or not the best policy and plan were laid down. Such review will normally be made under the following headings:

- (i) Sales;
- (ii) Production and Buying;
- (iii) Finance and Development;
- (iv) Personnel.

All reviews must distinguish between variations arising from policy decisions and those arising from the success or failure of individuals.

The effectiveness of the sales policy and plan will be known by the comparison of actual and budgeted sales. But the success of the company's policy will be shown by comparing the company's sales with the total market. A ten per cent. increase in sales appears satisfactory until it is realised that the sales of the entire market have increased by thirty per cent. For the full benefits to be obtained this comparison should be made by product, for each geographical area and industry.

Manufacturing policy and plan will be considered next. The review will cover raw materials, labour, plant and buildings and organization. The future supply of raw materials must be considered. Where there is expanding use of raw materials by business generally, it may be necessary to ensure future supplies by long-term contracts. Any review of raw material buying policies must include the mistakes and successes of the period. When subsequent events show that purchases were made in bulk at the wrong prices, the reasons for this action should be ascertained. Market intelligence may need to be improved. With labour, as with raw materials, the long-term view must be taken to obtain the maximum advantages of continuity, expansion and profitability. Plant will be considered in conjunction with the capital development schemes. The review will be primarily concerned with deciding whether or not the plant is obsolete or that the layout of plant might be improved. The history of motor car manufacturers clearly indicates the dramatic changes in efficiency and costs which have resulted from the revision of plant layouts. The unsuitability of buildings is obvious when a more appropriate one is in use to prove it. However, the changing of buildings is extremely costly. Special reports, normally prepared by the works manager and engineer, will be necessary. Management can never look back on a past period and truly declare that no problems were encountered and no mistakes made. The nature and frequency of failures must be known (*e.g.* from plant and labour utilization reports).

The financial policy must be considered and compared with alternative courses of action. Other sources of borrowed money should be solicited to find if the rate of interest payable can be reduced. The use to which borrowed money is put must be considered. The money may be required to finance slow moving stocks earning little profit. A statement showing the loss resulting from this policy frequently compels the sale of stocks when other arguments have failed. Development schemes which have been authorized should be reconsidered to see if any amendments are required due to changed conditions. New problems may have arisen. To solve these a capital development scheme may be required. Where raw materials supplies are becoming scarce vertical development by the purchase of a supplier may be advisable. Surplus manufacturing capacities may be used by purchasing or obtaining the control of similar concerns with insufficient productive resources, *i.e.* horizontal expansion.

The methods of remuneration, selection, training and measurement of effectiveness of all personnel is important. Methods of remuneration will evolve slowly, but those of other businesses in the area must be watched. Otherwise there may be a shift of labour away from the business. Errors may have been made in selecting staff responsible for the work of others. Where possible these must be corrected. While in many instances the effectiveness of an employee must be left to the personal opinion and judgment of his superior, the accountant should provide such facts as are available about the employee's efficiency. For example the efficiency of production executives may be compared on the basis of the output of their sections, details of which should be supplied to top management.

§ 84. Review of the Organization

For the management accountant to act efficiently as co-ordinator and interpreter of the information services of the business he must understand how the business operates from the factory floor and individual salesmen to the Board of Directors. Before any review of the existing organization can be made, the accountant and top management must be clear as to the basic principles which govern the structure of the organization of a business. Such structure can be created on the basis of:

- (a) functions (*i.e.* vertical);
- (b) geographical area (*i.e.* horizontal); or
- (c) a mixture of (a) and (b).

If the business is controlled vertically then control is by function from top management to the lowest level, *e.g.* the newest accounts clerk in any sub-division of the concern is responsible through the area accounts clerk to the chief accountant and the financial director. The advantages claimed for this method of control are:

- (i) full integration of all accounting work;
- (ii) direct control of method and progress; and
- (iii) flexibility of use of accounting personnel.

But there are disadvantages, namely:

- (i) dispersal of personnel;

- (ii) dependence upon local managements for discipline with a consequent crossing of the lines of control;
- (iii) conflict between local and head office requirements; and
- (iv) possible lack of local flexibility of personnel during sickness or holidays, as local accounting staff will not do the work of other staff relating to different office functions.

Where the business is organized by geographical area, all functions (including accounting) come under the control of the manager of that area. Each manager will be responsible direct to the Managing Director. The advantages are:

- (i) local *esprit de corps*;
- (ii) firm discipline of all staff by the manager;
- (iii) maximum interchangeability of staff for the benefit of the local unit;
- (iv) easier pursuit of local targets or budgets; and
- (v) rapidity of decision where any employee has any difficulty.

The disadvantages of this method of organization are:

- (i) any executive will be unable to concentrate his abilities on any one function and few people are efficient in all;
- (ii) difficulties may arise in co-ordinating with other areas and headquarters;
- (iii) employees will tend to remain in one area which will restrict their outlook and increase the staff recruitment problems both locally and at head office; and
- (iv) while rapid decisions are possible they may not be based on the best advice.

Alternatively, the business may be organized basically by geographical area with the Managing Director being served by functional staff officers (chief accountant, sales manager, etc.). These officers would advise on his behalf the area manager on matters falling within their respective functions. While advice is not as strong as control, any remote control not based on agreement and respect is precarious. This method should have the advantages, but not the disadvantages, of both the functional and the geographical methods outlined in the two preceding paragraphs.

In any organization, however, the following minimum requirements should be met:

- (a) not more than one person should be responsible for any one section of the business;
- (b) each aspect of the business must be the responsibility of some person;
- (c) the extent of each executive's responsibility should be clearly defined;
- (d) each person whose work integrates with that of others should understand the scope of the responsibility of those other persons;
- (e) all employees should know to whom they are responsible;
- (f) each employee should be responsible to only one superior;
- (g) all supervisors should know for whom they are responsible;

(h) no supervisor should be required to control directly the work of more than a few employees. In practice any number between two and seven will usually be found. In the authors' opinion an organization requiring any executive to control the work of more than five persons with integrating responsibilities would be suspect. With human nature as it is, the solving of five persons' difficulties is a full-time job!

Each employee should have an understanding of the organization of the business. Organization charts, similar to that in § 1, may be prepared. Top management insists in many businesses that the duties of employees are defined in detail. Whether such a scheme is successful will depend largely on the spirit of the employees. Providing every job is allocated nothing can be neglected on the grounds that it is the work of some other person. But employees may consider that if a job is not allocated to them, it must be the responsibility of somebody else and do nothing although the job is obviously neglected. As the allocation can only be accurate at the date of preparation, this precise definition of duties may lead to neglect in future periods. It is suggested, therefore, that any statement allocating duties should be couched in general terms.

The stresses in the business structure arising in the past period will be known. Management has to decide whether adjustments will have to be made in the organization of the business. Some businesses build their organization around personalities, relying on their natural abilities and experience. This may be a risky procedure, as the health and span of life of that individual may be short. Greater stability is usually found where the structure of the organization is built up and the right men are found to fill the executive positions. In some instances, an individual may be able to fill more than one appointment at any moment.

The organization of the sales and production departments is outside the scope of the accountant. He is interested, however, in the office organization. The matters to which he should pay attention are outlined in the succeeding Chapter.

CHAPTER X

OFFICE ORGANIZATION

§ 85. Introduction

In Chapters I to VI the various problems arising in budgeting were discussed. In Chapters VII, VIII and IX the information required during the budget period to assist management in achieving budget and in the measurement and appreciation of any variances was outlined. Unless, however, the office organization is adequate none of the figures required by management will be available on time. In this Chapter the steps to be taken to achieve a high degree of efficiency in administration will be outlined.

The accountant may undertake the duties of office manager; the office manager may be responsible to him; or office management may be divorced from the accountant's duties. But in any business the accountant is vitally interested in the speed and accuracy with which information is supplied to management. He must, therefore, be prepared to give advice and, if necessary, re-organize the existing methods. Any defects in the existing office organization will be caused by one or more of the following:

- (i) unsuitable methods;
- (ii) use of unsuitable machines;
- (iii) defects in methods of work or office management; and
- (iv) inadequate personnel, either in quantity or quality.

To overcome these defects, the accountant must ascertain precisely the existing system, ~~decide whether the work being done is necessary~~, and eliminate or simplify wherever possible. The introduction of efficient methods does not imply that machines must be purchased. The best method of simplification is elimination. An example of elimination encountered by one of the authors is an unusual, but useful solution to the problem of receipts. A business had a large number of customers who paid their accounts monthly against a statement. A receipt was sent to all customers as an acknowledgement of their remittances and although the sums received were small they did exceed £2. Counsel's opinion was sought as to the necessity of sending a receipt to customers. As a result, customers were asked whether they would dispense with receipts. All but an insignificant minority (who were specially catered for) agreed. A saving in expenditure on postage stamps and clerical salaries of several thousand pounds per annum has resulted. While this solution will not apply in many businesses, it does show the advantages which may be gained by departing from convention.

Having decided that the work is necessary, the next step is to decide the best method of doing it. Wherever possible the flow of information from stage to stage must be uninterrupted. Certain types of office machines are suitable only for bulk runs, so that work must be accumulated at the machine stage. Where such accumulation will mean delays which are not acceptable, hand methods or the use of different machines will be preferable. The cost of idle employees and machines is heavy. Therefore, not only must there be no delay when each document reaches each employee or machine but where possible no person or machine must ever be without work. The time (hour, day and week) when the work is to be done should be laid down. Thus each employee will know what he is required to do and when.

In the majority of cases the accountant will be concerned with whether or not to amend an existing organization. His work will cover three stages:

- (i) the investigation of existing methods;
- (ii) the consideration of the present procedure ascertained in (i) to decide where defects arise;
- (iii) the devising and introduction of new methods.

§ 86. Investigation of existing methods

Obviously the characteristics of every business are different so that the general guide given here may have to be adapted. It is possible that arrears of work are accumulating in one section and not in others. In which case, the first step is to investigate the work of that section. Failing this situation, however, the steps to be taken are:

(a) *An organization chart*, similar to that in § 1 of this book, should be prepared. All related clerical functions should be included, so that the accountant can see the department in which a document originates, the departments through whose hands it passes, and the final point of disposal. The numbers of employees in each department may be recorded on the chart. When preparing the chart, the accountant should approach the other departmental heads and obtain their co-operation. Otherwise it is unlikely any suggestions for improvements made by him will be adopted.

(b) *The work done by employees* must be determined. A comprehensive report can be prepared only by giving each employee an opportunity to describe his or her own work and to express his or her views thereon. It is preferable to ask the employee, rather than the supervisor, as many 'un-official' books, record cards and slips of paper are kept by employees to assist them in their work. Entries thereon represent additional work and may be caused by defects in the 'official' system or by the deficiencies of the employees. In either case, these matters must be known if the revised methods are to be applied successfully.

(c) *The work actually done* in the factory, warehouse or shop must be understood. The written documents purport to be a record of physical events. If a clear picture of the activities of the business is not obtained, any methods devised for recording events must fail.

(d) *The work required to record a whole transaction must be ascertained.* In large concerns, particularly, there is a tendency to treat a single transaction as four or five transactions. As the business grows, work will be departmentalized and security measures added. Each department may devise its own records without regard to the requirements of the remainder of the business. As a result the business may be suffering from bureaucracy with its excess of documents. The office methods can often be simplified if the accountant realises that there are very few types of transaction in business, but each of them has several stages. In the majority of businesses the basic transactions are buying, selling and manufacturing.

Illustration

The decision to buy raw materials may result in the following documents being prepared or entries made:

- (i) An entry on the stock record card which causes the balance to reach the minimum stock level, resulting in the storeskeeper preparing
- (ii) a requisition, which will be passed to the buying department who will complete
- (iii) a purchase enquiry. In due course
- (iv) a purchase order will be prepared. When the goods arrive at the goods inwards bay,
- (v) a goods received note and
- (vi) an inspection note will be prepared. If the goods are satisfactory their quantity will be entered on
- (vii) the stock record card.
- (viii) From the supplier's invoice (after it has been checked with (iv), (v) and (vi) and all additions and extensions have been verified)
- (ix) the appropriate entry will be made in the Purchase Day Book and
- (x) the Purchase Ledger.
- (xi) The supplier's statement will be checked with the Purchase Ledger account, then
- (xii) the cheque will be prepared and, after signature,
- (xiii) the necessary entry will be made in the Cash Book and
- (xiv) the Purchase Ledger.

Separate documents, each with a different design and numerical sequence, may be used for (ii), (iii), (iv), (v), (vi) and (xii). Yet the purchase of goods is not six transactions but only one. Furthermore, cross-referencing will be required, if the above documents are to be connected.

The above illustration shows a situation still frequently found in practice. But a purchase may be made efficiently without the excessive use of paper. A housewife buying goods in the market having decided she requires a bunch of flowers, selects a supplier, agrees the price, inspects and receives the goods and pays cash. It is not suggested that every business could buy goods as simply as this, but if the office organization is to be simplified, the work required to complete each transaction must be reduced to its basic elements.

(e) *Each basic transaction must be analysed.* Having decided which transaction shall be investigated, the accountant must analyse that transaction so that he knows precisely what documents are filled up and what work is involved in so doing. Data showing the existing methods must be acquired, *e.g.*

- (i) a copy of each form used;
- (ii) the number of copies of each form used for the transaction and their distribution amongst departments;
- (iii) the method of obtaining copies, *e.g.* carbon paper;
- (iv) the clerical work performed on each form and the sequence thereof.
(N.B. clerical work includes all additions to the form whether by hand or machine);
- (v) the checking work which is necessary in respect of (iv);
- (vi) the books written up from all forms used, together with the details entered in such books;
- (vii) the number of transactions per day or week;
- (viii) the approximate daily output of clerical labour and machines for each main group of clerical work, *e.g.* the number of sales invoices or statements which can be prepared by each employee or machine in a day;
- (ix) the important time factors in the flow of documents, *e.g.* that goods must be despatched and invoiced on the same day as customer's order is received;
- (x) the type of clerical personnel required at each stage with particular reference to any special skills required; and
- (xi) the disposal of documents at the termination of, or at any stage in, each transaction, *e.g.* whether filed or destroyed.

On the basis of the information obtained, the transaction should be analysed on analysis paper. The contents of each form will be written in the description column and the name of the form used will be written at the top of each analysis column. The analyses columns will be completed by inserting in the appropriate column opposite the particular 'contents' in the description column, a symbol to illustrate the operation performed, *e.g.* W for write; T for type; C for check; P for print, etc.

Illustration

The following chart shows the analysis for some of the stages in the purchase of raw materials.

Usually management will deny there is any duplication of work, yet from the above illustration it is obvious that triplication and even quintuplication occurs frequently. At this stage, however, the investigator must resist the temptation to criticize the existing system. He should note ideas for improvements on his investigation sheet, but until all facts have been gathered and comprehended, remedies for defects should not be stated.

(f) *Clerical operations.* The analysis of transactions while providing a simple and useful picture of repetition does not provide all the necessary facts. The total quantity written or typed of any set of documents does not indicate the total quantity of work necessary to complete those documents, *e.g.* the time taken to locate the correct stock card is frequently as long as the time taken to make an entry on the card. Moreover, the recording of any transaction will take longer where the procedure requires a clerk to initiate and enter part of the facts relating to that transaction at one stage and complete the recording at a later stage, than if the two operations are done at the same time. For example, to record the purchase of goods a clerk may record the purchase order number, date ordered, quantity ordered, supplier, the goods received note number, date received, quantity received, the unit price and the total invoice value. If the first four items are recorded at one stage, the next three at a later stage and later still the invoice value and unit price, then the recording of the purchase will take considerably longer than if all nine items are recorded at one operation.

For a clerk to record information, data must be transported to him. Each movement takes time whether a document is carried to the clerk or whether the information is obtained by telephone. In many businesses messengers are employed to transport the necessary documents from one clerk to another. It is usual to find, however, that where a messenger service exists, the clerks frequently transport urgent material themselves. Normally clerks will not tell an investigator that this is necessary; he will have to ascertain the position from personal observation or skilful interrogation. If a messenger service operates every half-hour, the average time documents must wait is fifteen minutes. Assuming that a document has to move between ten clerks in order that any transaction can be recorded, two and a half hours will be lost by waiting time. This may mean that goods for customers miss one day's transport and have to wait for the next. No business can afford to risk losing customers' goodwill by such bureaucratic impediments.

The filing and extraction of documents must be studied, both from the point of view of the quantity being filed and extracted and of the method of filing and extraction. It is very necessary to distinguish between temporary filing and permanent storage. This matter will be discussed in more detail in (g) below.

(g) *Number of copies of each document.* As indicated in (e) above, the number of copies of each document used must be ascertained. In considering whether the number of copies being used at present are necessary, the investigator must know the extent to which the copies are in simultaneous use. Where several departments must act simultaneously, plurality

of documents may be necessary. But the same piece of paper may be used by each department where they act successively, *e.g.* the copy of the customer's order used in the warehouse for the selection of goods may be used subsequently in the packing and despatch departments and as the basis of the invoicing procedure. Therefore, the timing of operations by each department must be known. A department may deliberately accumulate work in order to provide an economic quantity for machine processes. For example, when postings to sales ledgers are made, several hours work is usually accumulated to avoid frequent alterations to machine setting. This deliberate accumulation may mean that extra copies of the same document must be prepared so that one copy can await the machine operation. Careful consideration will have to be given as to whether this deliberate accumulation is to be allowed to continue. Normally the more copies of a document that exist, the more likely it is for them to remain static. Documents are necessary only to implement and record a transaction. Each transaction normally has a short active life. At the end of that short period of time, little or no permanent trace of the transaction may be necessary. The investigator must inquire into the degree of use of any permanent record in order to determine the number of copies which must remain at the end of the active life of the transaction. During the brief span of each transaction's life, the accent should be on activity, urgency and movement towards completion, not on permanent halts at wayside resting places. Temporary filing should be eliminated as far as possible.

(h) *Control of clerical work.* The investigator should inquire into the hourly output of clerical labour and the amount of arrears of work outstanding. If the supervisor can give a satisfactory reply as to the hourly output and the arrears, at least he will know what is going on. However, the simple question to a supervisor, 'how many invoices are prepared daily in your department', normally produces a blank stare instead of a factual reply. Answers must be obtained in respect of these enquiries, for the main sections of the clerical work which lend themselves to streamlining are those sections in which bulk work is undertaken. If the accountant is to render promptly information and results to management, the bulk work must be completed from day to day during the period and not started after the month's end. By completing as much as possible of the bulk work daily throughout the month, the work at the end of the month will be lighter. To post to the sales ledger accounts for half an hour a day is only part-time employment and should not require overtime; to post for ten hours at the end of the month will either take a day and a half or require the payment of overtime. The regular completion of work daily will not reduce the amount of work which has to be done in a month, but will ensure that it is done more easily.

(i) *Assessment of work.* The investigator must continually bear in mind the importance of the work which he is investigating and avoid wasting time on inconsequential details. Improving the system will be worthwhile where the work requires one hundred hours a day, but little economy is possible when the work only occupies at present one hour a month. The

cost of recording transactions must also be considered. In addition to the salaries of clerical staff, the business must bear a proportion of their pension contributions, sick benefit and national insurance; costs of stationery, plant and rent and rates of the space occupied. The cost of recording each type of transaction and each transaction within the group must be known. As a result of such study, many companies have decided to give away small quantities of goods rather than prepare invoices for them.

§ 87. Consideration of the problem

Having investigated the existing procedure, the investigator should now consider the problems involved. He will not, at this stage, consider the mass of details which his investigation has produced. Instead he must understand the work involved in fulfilling the basic business transactions of buying, selling and manufacturing. The inquiry will have disclosed certain essential elements which are necessary to purchase goods; to sell goods; or to manufacture goods. Some matters which will have been disclosed are dealt with in the next three paragraphs on purchase transactions, sales transactions and manufacturing operations. The points raised in those paragraphs may surprise some readers, but if the accountant concentrates on the best method of performing a clerical operation, he will never consider suppressing that clerical operation. For example, when studying accountancy, students are taught to prepare a day book and ledger to record purchase transactions; when investigating systems, the desirability of not keeping day books and ledgers should be considered.

§ 88. Purchase Transactions

The basic matters to consider when recording the purchase of goods are:

- (a) initiation;
- (b) implementation;
- (c) reception of goods;
- (d) certification of goods; and
- (e) payment for goods.

(a) *Initiation.* To find whether any goods have to be purchased, either there must be a physical inspection of stocks or an inspection made of a stock card to ascertain the balance in hand. Whether physical inspection is better than reading off the balance on a stock card will depend upon the size of the business and the area of the stores. Stock records have the advantage of exhibiting simply what ought to be in stock and a large number of items can be recorded in a very small space. Unfortunately, records suffer from the disadvantage of not necessarily being correct, as the result of delay in recording issues of materials. If it is necessary to purchase goods as and when they are needed, the accountant will have to provide for simple physical inspection or stock records. There may, however, be other possibilities, *e.g.* a buying policy supplementary to normal provisioning, or forward contracts.

In these circumstances, purchases may be initiated automatically at regular intervals, subject to an overall supervision of total purchases.

(b) *Implementation.* Where proprietary articles must be purchased, quotations are virtually a formality. In such circumstances if there are frequent and regular purchases of a particular type of raw material, it may be possible to substitute forward contracts. If there is a seller's market the purchaser may have difficulty in finding a supplier, in which case the buying department will have an important function to perform and in designing any procedures careful attention must be paid to their requirements. Where, however, there is a buyer's market, vendors usually make no secret of the availability of materials and buying will be relatively simple.

(c) *Reception of goods.* The matters to be considered are the storage space and labour available to place goods received in their appropriate spot. There must be some degree of anticipation both of the quantity likely to be received and the department requiring the goods. The physical task of receiving the goods is more or less coincidental with (d) below.

(d) *Certification of goods.* On receipt of goods the quantity and quality thereof must be certified. Physical counting and checking of test weights will usually be integrated with the actual storage of goods. Where, however, inspection involves technical knowledge the system must provide for part of the raw materials to be forwarded to the engineer or the laboratory for the quality control. The system used will provide for information to be given to the buyer of the quantity and quality of goods received.

(e) *Payment for goods.* As this has always been under the control of the accountant, the existing methods must be reviewed carefully. It must not be assumed that such methods are the best available. Where suppliers' accounts are settled at regular intervals a bought ledger and day book are superfluous. Purchases can be dealt with on a 'cash basis' provided that there is an adequate filing system for unpaid accounts. To pay for purchases a cheque, a cheque counterfoil and a cash book may be prepared. The accountant should consider whether the cheque counterfoil is necessary and whether the cheque and the cash book can be prepared simultaneously, *e.g.* by using carbon paper.

Before actually making the payment, each invoice is normally certified as to the receipt of goods, the unit price charged and the calculations. An investigation usually reveals that the majority of price extensions are correct. The accountant should consider, therefore, whether there is any necessity to check the calculations on every invoice. Test checking may be sufficient in respect of invoices from reputable suppliers; only a detailed check being made on invoices from those suppliers, which experience has shown, do forward incorrect invoices.

§ 89. Sales Transactions

When recording a sale the following must be borne in mind:

- (a) receipt of the order;
- (b) selection of the goods or the initiation of a manufacturing process;
- (c) despatch of the finished product;

- (d) issue of a sales invoice; and
- (e) debt collection.

The principal matters to be covered in respect of each stage are:

(a) *Receipt of order.* Frequently, by the preparation of adequate documents at the order stage, little additional work will be required at the later stages. The manner in which the order is obtained will determine the method by which the recording of the sale can be implemented. When orders are obtained by travellers calling on customers, the traveller will fill up the order form and this may be used as the basis for the sales invoice and for despatching the necessary goods. Where, however, the order comes direct from the customer by post, telegram or telephone, the type of document which will be received is outside the direct control of the business. It will be necessary, therefore, to prepare fresh order forms. Alternatively, customers may be supplied with copies of the order forms. The investigator should ascertain the type and number of orders which are obtained by travellers, forward contracts or agents and those which are obtained direct from the customer. Any procedure for sales transactions will be based on the information obtained. The illustration on page 118 shows the design of three documents so that they may be prepared simultaneously.

The type of sale which is made will also determine the repetition which exists. Where a limited range of goods is sold in a small range of packings, pre-printed orders and invoices are obviously possible. Where, however, a vast variety of products in many container sizes are sold, there will be small scope for pre-printing forms.

(b) *Selection of goods.* The physical work of selecting goods to fulfil an order may be done from bins within a small area or may involve the collection of goods from several departments, depots or warehouses. The degree of concentration of the stock of finished goods will have a considerable bearing on the manner in which documents can be prepared. It may be necessary for orders containing many items to be sub-divided so that various departments may select the necessary goods, afterwards sending them to a central despatch bay. In other cases the goods may be sent direct to the customer from depots in different parts of the country. Before designing any forms, therefore, the total number of orders, the number of items on each order and the places at which the finished goods are stored must be known. Unless sampling techniques are applied, this will involve a considerable amount of work.

Synonymous with the selection of the goods, labelling may be required. In some industries, labelling can be effected at the manufacturing stage but in others only at the time of despatch. The time when the labels are required will determine whether labels must be prepared simultaneously with the manufacturing instruction or can await the preparation of despatch note and invoice.

(c) *Despatch of goods.* The selected goods may have to be packed in a manner appropriate to the method of despatch employed. If so, the physical work should be initiated by the original order. Despatch involves

ILLUSTRATION SHOWING FORM DESIGN TO ENABLE SIMULTANEOUS PREPARATION OF FORMS

INVOICE				WAREHOUSE ORDER		CONSIGNMENT NOTE		
X AMPLE CO. LTD.				Selected by .. Checked by. Packed by ..		X. AMPLE CO. LTD.		
GOODS ADDRESS*		GOODS ADDRESS *		GOODS ADDRESS *		GOODS ADDRESS *		
Despatch Route*		Despatch Route *		Despatch Route *		Despatch Route*		
INVOICE ADDRESS: (if different)		(This space will be blank)		(This space will be blank)		(This space will be blank)		
Order No. : *	File No. : *	Date of Order : *	File No. : *	Date of Order : *	File No. : *	Date of Order : *	Date of Order : *	
Description*	Quantity*	Unit Price	Description*	Quantity*	Description*	Quantity*	Quantity*	
TOP COPY † Date despatched Received in good condition: Signature				† Date despatched Received in good condition: Signature				† Date despatched Please forward the above goods to the address shown.

SECOND UNDER-COPY

FIRST UNDER-COPY

- Notes:
- (1) Those items marked with an asterisk (*) will be entered when the invoice is typed.
 - (2) Those items marked with a dagger (†) will be entered when the warehouse copy is completed.
 - (3) Further forms may be prepared, e.g. a copy invoice, but these have not been shown.

the choice and ordering of transport, the addressing of the goods, the loading of the goods, acceptance of the quantity despatched by the carrier and/or by the customer, and the necessary instructions to the carrier. The choice of transport will vary with the quantity for any given destination, the degree of urgency, the area in which the customers' reside and the policy of management. The office clerks must have definite instructions covering all of the above matters. The despatch note must show the method of carriage, details of the merchandise to be carried, the destination of the goods and the buyer's name. As this information must be repeated on the invoice, the two documents are frequently prepared at the same time. The despatch note must contain a space for the customer's or carrier's signature, on the basis of which claims will be made.

(d) *Invoice.* The preparation of the invoice is directly within the accountant's control. In many concerns the preparation of the invoice is regarded as a new transaction, although it is merely an extension of what has already taken place. This attitude must be avoided if office methods are to be efficient. On each invoice must be shown the customer's name and address, the date of despatch, quantity of each product despatched, unit price, the extension of the price, the trade discount, if any, and the settlement terms. The entry of the customer's name and address and date of despatch do not require comment. Whether the invoice can be printed so that only the quantity of, and not the description of, each product has to be inserted, or whether the quantity and description will have to be inserted on every invoice, will be determined by the type of business involved. Where possible the customer's agreement should be obtained to sell in standard pack sizes as this causes less work in the despatch and invoicing departments.

In considering the unit price, the accountant will need to know the method by which prices are fixed. If standard prices are used, the price may be pre-printed on the invoice or can be inserted at the time the order is received. But management may object to letting the workers in the warehouse know prices; or claim that standard prices may be altered before goods are despatched; or that pack sizes are altered by the warehouse which affects prices. If these objections are raised, they will need to be investigated. Where the prices inserted on the invoice depend on an individual decision, to make that decision at an earlier stage creates no more work, it merely alters the timing. By inserting the price on the invoice at the same time as the despatch note is prepared the delay involved in treating the pricing of invoices as a separate operation will be avoided. Where a complicated formula must be employed, it should be analysed to ascertain whether or not any simplification can be made. In some firms it is the practise to forward the copy invoice to several departments for them to certify the various prices before the final invoice is despatched to the customer. This delays the despatch of the invoice. As an invoice should be despatched on the same day as the goods, such practice should be eliminated. Once the quantity of the goods and the unit price have been determined, price extension is possible. Where sales are made in standard packs and at standard prices, the extension can be made and printed on the invoice.

However, it is frequently alleged that the possible combinations of quantities and prices are limitless. This may be true, but the actual combinations encountered in practice are usually few. An investigation of the invoices despatched in a period will disclose the normal combinations. The details of such combinations may be embossed on plates (*see* Chapter XI) or a simple ready reckoner may be prepared, from which employees can rapidly prepare invoices. Alternatively, invoices may be printed to include the normal combinations. Then special invoices will be prepared for all quantities and prices outside this range.

To determine the trade discount which is to be given requires the ascertainment of the rate and the calculation of the discount. The rate applicable will depend upon either the classification of the customer or the characteristics of the goods or a combination of the two. The method of ascertainment applied is important in determining whether the calculation must be made after the extension of prices or whether it can be incorporated in the unit price calculation. Where trade discount is given to wide groups of customers (*e.g.* one rate is given to wholesalers and another rate to retailers) the trade discount should be incorporated in the unit price. Then the invoice clerks determine the unit prices by the type of customer.

Normally the terms of settlement which depend upon the category of customer, the individual customer and the sales divisions serving that customer are known at the order stage. Such terms should be inserted, therefore, on the invoices at that time.

(*e*) *Debt collection.* The debt collection procedure normally involves a sales ledger, a statement to the customer, a receipt for the payment and a cash book. If the account is not paid within the settlement terms, a special overdue account procedure is necessary. A sales ledger, a statement for the customer and the overdue account procedure are not necessary where cash sales are made. Any amendments which increase cash sales and correspondingly decrease credit sales will cause, therefore, a fall in administrative costs.

Illustration (1)

A firm sold books which could be obtained by completing an order form¹ in previous editions or by letter. Purchasers were entitled to pay cash or buy on credit terms. An investigation revealed that the majority of purchasers paid cash. By introducing 'cash with order', a considerable saving in ledger postings, in writing letters and statements and in staff has been possible.

A sales ledger is not intrinsically valuable. Many businesses are successfully applying ledgerless methods. Normally ledgerless systems are efficient where there are few credit transactions for each customer in a month and where monthly settlement is normal. If the majority of the accounts fall within these two fields, it may be possible to isolate those accounts which do not. A sales ledger will be used for transactions involving the latter accounts, while the majority of items are recorded by ledgerless means.

Delay frequently arises in the submission of statements to customers. As a result inadequate cash collections are made, customers complain and

there is an interruption of the flow of other office work. Many firms are, therefore, ceasing to remit statements to customers except where multiple purchases are made during the month. Assuming it is necessary for statements to be prepared, they should be remitted to customers as early as possible after the end of each month. An interesting solution to this problem has arisen in one concern. Formerly customers' statements in respect of credit sales from a large number of retail branches were prepared mechanically at a central office. The presentation of the statement was excellent, but they were remitted to customers many days after the due date. As a result, cash paid locally after the closing date was ignored and customers' complaints were numerous. A policy of decentralization was decided upon whereby each branch prepared two sets of handwritten 'three-in-one' documents. One set consisted of a day book, ledger and statement and the other, receipt, cash book, ledger and statement. The customers now receive handwritten statements within 24 hours of the due date. As a result, complaints have been virtually eliminated. Admittedly, the presentation of the handwritten statements is inferior to the printed statement.

Similarly, the accountant should not be blinded by general commercial practice. Where a business only receives orders and collects accounts when the representative calls on customers, and these calls only occur at four-weekly, eight-weekly or twelve-weekly intervals, to send out statements every month is clearly useless. It is preferable to provide an up-to-date statement just before each journey by the traveller even though this may be in the middle of a calendar month.

Whether receipts need to be given for payments is a matter to be questioned. An example has already been given on page 108. In some European countries, it is the national custom not to employ receipts at all. Where receipts must be given, their possible combination at one entry with the cash book and possibly the ledger should be examined. The clerical work involved will depend on whether payment is made to the traveller at the customers' premises or to a branch or to the central office. Where money is collected by branches or travellers the duplicate cash receipts should be listed and the totals only entered in the cash book. Instead of duplicate cash receipts, a cash received sheet may be prepared simultaneously with the receipt. The totals of such sheets will be entered in the cash book. Readers' imagination will no doubt suggest other methods.

The policy of the business, total number of customer accounts and the number of overdue accounts contained therein will determine the method to be employed in connection with overdue accounts. Ledgerless methods are particularly useful in determining the overdue proportions of sales accounts; the unpaid invoices will remain in the customer's file. Where ledgers are used and there is a large number of balances, the work of locating overdue accounts is laborious and, as a result, frequently neglected or badly done. Management requires to know the overdue portion of the account, the remainder of the credit already granted, the unexecuted orders on hand and any future orders. The investigator should consider carefully

the amount of work involved in covering these four requirements and try, as far as possible, to simplify the procedure.

The accountant must bear in mind the characteristics of customers, the information which may be needed by representatives and any statistical information required by top management when deciding upon any procedure for sales transactions. The sales staff will attempt to understand and meet customers' individual requirements, *e.g.* plural invoices, four-weekly statements instead of calendar months, acknowledgment of every order, invoice with goods, etc. Any failure by the accountant to meet these requirements will have an effect on customer goodwill, which has been carefully built up.

The information required by sales representatives must be provided easily. Care should be taken, however, to provide them with information which they can use, which is not necessarily what they may think they want.

Illustration (2)

Travellers receive payment of accounts direct from customers, as payment may be made either to head office or to representatives. When the traveller called, customers frequently could not find their statements so the traveller asked to be supplied with a copy of every statement. This was done but then he discovered that from time to time between the closing date of the statement and his call, payment had already been made to head office. His approach to the customer for payment, therefore, was frequently disliked. To remedy this the traveller asked for and was supplied with a note of every payment made to head office. As a result, the work at head office was considerably increased and the traveller was turned into a ledger clerk. Obviously, what he needed was an up-to-date statement immediately before his call. The procedures at head office were amended so that such statement was supplied to the traveller. As a result, the amount of work involved was considerably reduced and the traveller was able to apply all his energies to selling.

Frequently, a considerable amount of paper work is involved in maintaining liaison with travellers. A method of overcoming this is shown in the following illustration:

Illustration (3)

A shuttle card is prepared for every customer. The card is sent to the traveller immediately before his call on the customer and he is required to write on the card not more than one line relating to the call. He either records the negative nature of the call or details of the order placed by the customer. Full details are given on the card of the customer's name, address to which goods are sent, the address to which the invoice is to be sent, the representative, the standard number of copies of invoices and advice notes required for every order, the terms of sale and the transport needed. When the traveller calls he has a history of the customer's transactions immediately before him and the amount of writing required is limited. Immediately after calling upon the customer, the card is returned to head office. Thus, writing by the traveller and the staff at head office is reduced.

Admittedly this system may not be possible in many businesses but the illustration shows that originality and ingenuity and the avoidance of convention can reduce the costs of selling goods and collection of debts.

The statistics required by top management should be prepared from the original documents while the transaction is active. Frequently, statistics are prepared after the end of the period of the transaction. The orders received by individual offices should be totalled as the orders are received by the

offices and not in one operation after the end of the period. The total will be despatched at periodical intervals to head office. Thus, the necessary statistics will be prepared simultaneously with the issue of the orders for the despatch of goods.

§ 90. Manufacturing Operations

As a result of the different types of manufacture, it is impossible, in a book of this kind, to detail all the documents which might be necessary. Instead, the principles to be observed will be indicated. The purpose of documents should always be to direct and aid production. It must also be remembered that the persons recording any information in a factory are not clerks and dislike paper work. They should, therefore, be asked to record as little as possible so as to avoid risks of error and interruptions of effective work. The basic requirements to be covered, when considering the recording of any manufacturing transaction, are the issue of materials to production and the work to be done thereon.

(a) *Materials.* Students reading costing books will recall that these indicate that requisitions, returns, stock record cards, etc., must be completed in order to record the issue of materials. Quite rightly, the authors consider it necessary to lay down the system in order that the basic principles of costing can be understood. As already indicated, anybody reviewing systems must not be bound by normal office practice. The workman must be informed as to the material which is to be manufactured or worked upon. Where manufacture is of a standard product regularly repeated, the instruction can be preprinted and only total quantity to be manufactured will need to be inserted. Even if there is no repeat manufacture, it is probable that when the finished product is designed, a specification of the raw materials to be used is prepared. This specification, or a copy thereof, may be used as an instruction to withdraw materials and record the cost of so doing.

Whether stock records are necessary will depend upon the type of business. Where a business manufactures standard products containing few ingredients and selling in a variety of sizes, a daily, weekly or monthly physical inspection of raw materials and containers in stock will take only a short time. To record every issue from stock of raw materials and containers may take considerably longer. In these circumstances, physical inspection and no stock records would be the best method of ascertaining the purchases necessary. Admittedly that system would not show consumption or the goods which should be in stock. If these objections are made, the accountant should consider whether, from the production and filling returns for the period, he cannot calculate in total the theoretical quantities of the raw materials which must have been issued. If he can, one entry for the issues for a period will replace the separate entries for each issue.

In § 88 the recording of purchase transactions was discussed. It may be possible to use the document originating the purchase or receipt of goods as a stock sheet. Apart from the advantages of not having to repeat writing

the date, name of supplier, quantities of goods purchased and, perhaps, values, this system would indicate clearly where the goods were located; would enable stock control of differences by lot; would facilitate stock rotation as goods could be issued in date order; would clearly indicate the consumption of that particular lot of materials; and would assist in the pricing of materials to production as each batch of material could be priced at its actual cost.

In some industries, the same raw materials or partly-finished products are assembled according to different formulae to produce distinct types of finished product (*see* § 30). To record the movement of all components, the manufacturing documents should come to rest in the accountancy system as near as possible to the time that the components themselves are stored in partly finished stocks.

(b) *Work done.* At this stage, the costs to be covered are those for direct labour, indirect labour and overhead charges. The type of manufacture, job or process will entirely govern the clerical methods needed. The accounting system must provide a simple and true reflection of the physical events in the factory.

The costing of direct labour involves consideration of the methods of remuneration, the control of work and the analysis required to assist in the control of cost. The remuneration of an employee may be based on the number of hours worked or his output or a combination of the two. The time of work may be as important as the number of hours worked, *e.g.* when night shifts and overtime are contemplated. Before deciding on any variations in the present clerical system, the entire pay-roll should be carefully considered for the remuneration bases of different classes of workmen or trades may differ.

The control of work may be effected by a simple comparison of the output achieved in a period by the number of employees in that period. Alternatively, the basis of control may be complicated. But the greater the detail to be written by the workman, the greater the chance of inaccuracy. If the basic information is inaccurate, there is little point in having elaborate systems of control.

Each operation involves an instruction as to the work to be done, the actual work and its inspection. The works management will decide on the basis of their Production budget the quantity of output required. A copy of the form containing their instructions, or the form itself, should be supplied to the accountant for costing purposes, after the work has been passed by an inspector. Inspection is necessary to ensure that the workers maintain quality. If the inspector can use the same form as the worker, there will be a considerable saving in the recording work necessary. Where, however, he cannot use the same form because of the manufacturing cycle, copies of the basic document should be prepared. Such copies should be prepared simultaneously with the original. Thus the works instruction is used to initiate manufacture, inspection and as the basis of the costing records. This is another example of one document being used successively in several departments.

The analysis of indirect labour, where the entire time or pay of individuals or groups thereof can be charged to a particular indirect function or expense, is simple. The pay-roll will be regrouped and sub-totalled. For items such as coal, sundry and maintenance stores, similar procedures to those laid down for purchase transactions may be used. With items such as rent and rates, which cover the entire factory, it may be necessary to start with the final invoice for the whole factory and analyse it between departments. But, as far as possible, the information and expense for each individual department should be debited direct to that department and later grouped for the factory. The problems arising with machine utilization have been dealt with in Chapter VIII.

§ 91. Introducing new procedures

There are a number of principles to be observed when introducing a new procedure. They are:

- (i) find out how other people have tackled and solved the particular problem with which you are concerned;
- (ii) introduce modern methods and machines, where possible;
- (iii) encourage suggestions from those engaged in the detailed work;
- (iv) be prepared to introduce in your own department, if relevant, the principles you recommend before urging others to adopt them;
- (v) do not attempt too much at any one time;
- (vi) do not fail to finish introducing one section of your procedure before commencing the next;
- (vii) do not try to find a job for an ingenious machine which has caught your fancy;
- (viii) do not modify where you can eliminate;
- (ix) do not lack courage to introduce novel and unusual methods of doing a particular job.

Having obtained a grasp of the present practice, the development of new ideas can begin. Minimum data necessary to implement a transaction should be written down. This statement will cover the physical events which occur in the factory and warehouse. Then from the reports of your investigation find the amount of repetition involved in recording any particular transaction. There may be repetition of the identical transaction (*e.g.* a weekly order); or repetition of a certain constant throughout the recording of a particular transaction (*e.g.* writing the name of the supplier when recording a purchase transaction); or using the same information for several purposes (*e.g.* analysing sales invoices to ascertain sales in an area, afterwards making a different analysis to compute salesmen's commissions).

Control will normally be exercised at more than one point in the course of a transaction. The basis of the system of control and the person controlling each stage must be known. From this knowledge, it will be possible to determine the type of document to be used and its course round the

factory. For example, where inspection has to occur in a separate department from the receiving bay, the reception document should be directed via the inspection department to avoid additional writing.

The originator of any scheme should write down his proposals and compare them with the existing procedures. Next he will consider the differences to determine which must remain and which can be eliminated.

When the new procedure has been designed, it should be presented to the management and employees. When presenting the system, enthusiasm should be restrained, otherwise difficulties may arise in its introduction. Normally, the emphasis of the proposals will be different at management and employee level and it may be necessary to prepare two separate reports. When reporting, the following must be shown:

- (i) the reasons for introducing a new procedure;
- (ii) details of the new procedure;
- (iii) the advantages to management and to employees if the procedure is adopted;
- (iv) that the suggestions cover all foreseeable circumstances;
- (v) that the methods outlined are the best available.

From the point of view of management, the capital cost of the scheme, revenue costs in personnel, stationery, etc., and a comparison with existing methods must be given. Employees will be concerned in ascertaining whether they are directly involved; what facilities are to be provided for training; the methods by which the difficulties arising in the transition period are to be overcome; the effect on personnel requirements; the drudgery involved; the flow of work; the possibility of overtime through peak loads; and the machine noise to be expected.

The first report should give only an outline of the scheme. Its purpose must be clearly established, without prejudice arising over the actual means of achievement. Many people believe that the report should not be in written form but that discussions should take place between the persons involved. This may be an excellent method but suffers from the disadvantage that, unless the interview is recorded on a tape-recording machine, there is no record to refer to at a later date. Assuming, however, a report is to be prepared, emphasis should be given to the individual requirements of the recipient. The report must be constructive and not purely critical. Frequently it is necessary to criticize the existing methods in order to establish the need for a change but care should be taken to avoid encouraging defence of the present situation. Nobody likes a change and the accountant should realise that he is bound to meet a certain amount of opposition. His report should not increase the amount of opposition to be received.

It is rare for a scheme to have no disadvantages. When proposals are put forward, therefore, the shortcomings of the scheme should be frankly stated to show that they have been weighed and not forgotten and that they are not of such a nature as to destroy the scheme. So far as possible, the report should be in the form of pictorial presentation, as it is normally

easier for people to understand the flow sequence of a number of documents on a chart. Wherever possible, however, there should be a minimum of report and a maximum of demonstration. When demonstrating the scheme to anybody, constructive criticism should be encouraged. Any suggestions made should be considered and accepted, if practical. Where they cannot be accepted because they would disturb the smooth running of the scheme, the position must be clearly explained.

When proposals for new procedures have been accepted by all persons involved, the next problem is that of change-over from the old procedures to the new. Considerable care should be exercised in devising the change-over procedures. The personnel should be trained in their new tasks and a 'dummy run' made concurrent with the old methods. All the necessary stationery, office layout and equipment should be ready before the scheme commences. Until everything is ready, the scheme should not be introduced.

After the new system has been put into force, the accountant should prepare a follow-up programme to ensure that the new procedure is being operated, to measure the effect on costs, to measure the speed with which the documents are flowing between their various control points, and to see whether any extraneous functions have encroached upon the scheme, possibly as a result of defects therein.

CHAPTER XI

OFFICE EQUIPMENT

§ 92. Introduction

In this last chapter various types of office equipment and methods are discussed. The subject is not one which can be mastered easily by reading unsupported by practical experience. Readers should attend demonstrations of office machinery and methods and examine machines and systems of mechanized accounting in actual operation. The nature and purpose of the records produced, the sources of original information, and the checks automatically imposed by the machine are more important than its construction. In the succeeding paragraphs, therefore, we have concentrated on the limitations or special advantages arising from the use of various machines and office methods.

§ 93. Writing

Creating an original record or document involves writing. The eight common methods of 'writing' are:

(a) *Handwriting*. This is not considered an art at the present time, merely the means to an end. As a result, bad handwriting has encouraged industry to use copy typing. But good writing may eliminate the necessity for some copy typing. Writing must be considered where it is less expensive than the cost of having to copy-type documents from bad writing.

Handwritten documents can often be used for internal and external communications. For example, the addition by handwriting of the date and quantity required to a pre-prepared purchase order.

(b) *Typing*. Some persons are sufficiently skilled to type their original matter direct from thought, and at a sufficient speed to be economic, *e.g.* journalists and writers. Generally in industry, however, this dual proficiency is not found. Furthermore, if typing is slower than dictating and the relevant official is highly paid, direct typing is uneconomic.

(c) *Shorthand-typing*. Dictation is a rapid form of creating original documents. Unfortunately there is no machine commercially available which converts speech into a 'written' document. Therefore, an intermediary stage must be interposed, *e.g.* shorthand. Theoretically, the originator can write shorthand from which the final document can be typed. Unfortunately, originators rarely know shorthand and few persons can read another's shorthand. Furthermore, employees' time is used uneconomically. Typist's time is wasted when dictation is interrupted by

telephone calls or the 'dictator' is not available. Against these disadvantages, there are the following advantages:

- (i) where the dictation is poor and ungrammatical, the typist can often improve the style of the final document; and
- (ii) the typist can by reference to other documents save the dictator's time in repeating matter already typed.

(d) *Sound recording-typing.* Magnetic sound recording may be employed. With magnetic sound recorders a magnetic pattern is created on a recording surface from which it is possible to reproduce automatically at a later date the sounds which caused the pattern to take shape. The differences which exist between machines are in:

- (i) the recording surface, *e.g.* discs, tape, sensitized paper and wire records;
- (ii) the ease with which matter can be played back, erased and corrected;
- (iii) the size and weight, which involves quality of reproduction and length of record;
- (iv) the method of operation by mains, car battery or dry battery.

This method eliminates the shorthand element and substitutes a typist who by controlling the reproducing machine can type from the original recording. Thus typist's time is saved, as there are no breaks for interruptions of the dictator's time (the recording machine being stopped and started as required) or for his slowness of thought. Sound recording machines can be used for dictation when shorthand-typists are not available. The typist can transcribe from the record when the dictator is absent. However, the introduction of magnetic sound recorders may meet with opposition from dictators (particularly those who dictate badly) and from shorthand-typists, who do not wish to lose their shorthand skill.

Recorded data can, in most instances, be transmitted through the post. Some organizations do this as a normal method of communication between branches and divisions. The recipient plays back the recording and takes any necessary action. Afterwards the tape, disc or other recording medium can be cleared magnetically and re-used. Alternatively the tape, etc., will be cleared automatically during a subsequent dictation. Thus, if a permanent record is needed, a typist must transcribe from the record.

(e) *Punching cards – tabulation.* The perforation of holes on cards by means of a hand punch or key-board operated machine to represent data is another method of creation of original documents. The punched cards can be interpreted and reproduced by various types of machine to give both alphabetical and numerical characters. The cards may be used many times, but the size of the cards severely limits the information which may be punched thereon.

Furthermore, 'interpreting' machines are expensive, noisy and inflexible. Punched card machines require specialist personnel. This matter will be dealt with in greater detail in § 101.

(f) *'Mark sensing'.* Cards can be marked so that the marks can be converted into holes automatically by a 'sensing' machine. Thereafter the

cards have the same attributes as conventionally punched cards. Card marking consists of 'dashes' or 'crosses'. The method can be used where the majority of the data is pre-punched on the card by 'reproduction' methods and only a small amount of information is left to 'mark', *e.g.* stocktaking cards where the description, code number and cost for each product have been pre-punched leaving the quantity in stock to be marked.

Marking is probably not as quick as punching when either operation can be performed in a central office. The marking, however, requires no special training, and can be done anywhere, *e.g.* in the factory.

(g) *Plate Embossing.* Certain types of addressing machines use metal plates from which reproduction is effected. These plates are created by embossing machines which punch the letter form into the metal. This is not a rapid method of creation and is only worthwhile where substantial reproduction will be required.

(h) *Type Composition.* This requires skilled labour; the type takes a relatively long time to be set-up; and the machinery required is expensive. But where reproduction on a considerable scale and of high quality is required, type is the only practical method.

§ 94. Reproduction

Reproduction implies copying a document in whole or in part by manual or mechanical means. Office equipment manufacturers have realized that a considerable quantity of repetition work occurs in offices and offer a wide variety of machines and devices. These include:

(a) *Carbonless Stationery.* Sensitized stationery capable of transmitting and receiving a facsimile simultaneously with writing or typing is, at the present time, costly. But there is a saving in expenditure on carbons and the time needed for their insertion, as they are unnecessary. At the time of writing this book, the number of good copies possible at one typing is limited. Such stationery is clean to use and handle.

(b) *Carbon paper.* This is the most widely used form of reproduction. Basically, the principle is to transmit by pressure or impact a carbon trace on to another surface from a carbon deposited surface. This is done either by writing or typing on a document which is:

- (i) carbon backed, *i.e.* the carbon has been deposited on to the reverse side of the paper in whole or in part; or
- (ii) part of a set interleaved with 'one-time' or re-usable carbon paper.

'Carbon backed' paper may be used where circumstances are unfavourable for carbon insertion, *e.g.* on a despatch loading bay. Such paper may be used in conjunction with typewriters, addressing and printing machines. Because of the cost of 'carbon backed' paper, usually carbon is deposited on limited areas only in which the variable data are reproduced; the top and undercopies being mainly preprinted with the repetitive data. The recipient may dislike handling the document as it is inclined to be dirty. The number of possible copies is limited and depends on the means of creation (writing, typing or addressing machine). The cost of the paper will vary with the position, shape and area on which carbon is deposited.

One-time carbon paper is relatively expensive, especially where the documents upon which the area requiring reproduction is small. Large and deep invoice headings may look attractive, but will be costly in unused one-time carbon as well as paper. One-time carbon paper is frequently used with continuous stationery. Normally, the number of copies in each set will be limited by the cost and not by the limits of possible reproduction. Re-usable carbon paper is itself economical but must be interleaved each time or special devices used. Alterations, where many copies are involved, are tedious.

(c) *Photocopying*. This method of reproduction has become common in recent years. There are three main categories:

- (a) image reproduction only;
- (b) reflex; and
- (c) auto-positive.

Documents may be photographed for storage purposes. Microfilm is used and up to 18,000 'cheque-size' documents can be recorded on 100 feet of 16 m.m. film. When reference is to be made to any document, the appropriate roll of film is inserted into a 'reading machine' which contains a screen. The operator winds the roll through the machine until the required information is projected on to the screen. This method of photocopying is only economic if:

- (i) the quantity to be photographed is considerable;
- (ii) the storage space available is limited; and
- (iii) the negatives can be stored in an easily accessible manner.

This is an occasion when need must be especially considered before the 'gadget' is purchased. Management must decide whether documents need to be stored or whether all or a substantial bulk might be destroyed. Only after careful consideration should photo-copying be decided upon as the cost of the machines and film is considerable.

Many documents of which copies are required are received from external sources. The size, shape, style and type of paper used are, therefore, beyond control. Some internal requirements demand the use of sturdy or opaque paper or card. In these circumstances, if the documents must be reproduced, a 'reflex' type of machine is necessary. The machine produces a negative (by photography) which becomes the 'master' from which copies can be printed. However, the revenue cost per copy is high and the machine operation is relatively slow. Despite these disadvantages, many firms are employing 'reflex' type machines as they may be operated by unskilled labour; original characteristics (signatures, alterations) of the document are preserved on the copies; the saving in time in copying long documents makes this method cheaper than handwriting or typing copies; complicated drawings are copied easily, probably at a lower cost than by employing a tracer; and capital outlay is small. Because of the foregoing, this method is usually employed when:

- (a) the number of copies required of any document is small;
- (b) the original characteristics are required, e.g. signatures;

- (c) the original document is complicated and the copy required must not include errors or require checking, *e.g.* draft accounts, drawings; or
- (d) copies are required quickly and can be made more rapidly by this means than by copy-typing, tracing, etc.

'Auto-positive' reproduction requires the use of a translucent 'master'. The degree of translucency governs the speed of operation. Light passes through the translucent portion on to paper sensitive to light. The type-written areas, printing, drawn lines, etc., being relatively opaque, inhibit the passage of light and thus become formed by 'exception' on the sensitized sheet. This sensitized paper is then 'fixed' so that it does not change further on exposure to normal daylight. Apart from the translucency requirement of the master copy, this method has many of the advantages of the reflex method but does not suffer from the disadvantages to the same extent. Although the speed of operation is still much slower than many other forms of reproduction, it is considerably faster than that of the reflex machine. Furthermore, the cost per copy is much lower, but the capital outlay on equipment is higher.

The use of auto-positive reproduction is limited by the degree of control over the matter to be copied. Thus, if there is a need to reproduce internal documents and those papers can be translucent, auto-positive reproduction is possible. The original document will be prepared on translucent paper. Whether this method of reproduction is preferable to those in which the original document is not prepared on translucent paper, will depend on the result of comparing the cost of preparing auto-positive copies of the original and using the machine to produce reproductions and the cost of copying of the original by other means, *e.g.* typing with carbons, spirit duplicating.

(d) *Spirit Duplication.* This involves the transfer of hectograph carbon or dye from a 'master' to stationery damped with spirit. The spirit acts as a transfer medium for the dye and quickly evaporates. Pressure is applied to master and stationery at the time of transfer, usually by rollers on the 'wringer' principle. The master is usually of paper with an 'art' surface on the back. It is created by writing, typing or drawing on the matt surface with hectograph carbon facing the art surface. The hectograph carbon can be sheet carbon, carbon roll, or carbon ribbon. The quality of the master will depend upon the hardness of the surface underneath the carbon, the pressure applied in writing and quality of carbon. As hectograph carbon is obtainable in a number of colours, the master can be in colour according to the carbons used for its preparation. The reproduction of all colours is simultaneous at the 'transfer' stage.

The disadvantages of spirit duplication are:

- (i) the dye stains the hands unless care is taken not to handle the carbon or the back of the master;
- (ii) the number of copies is limited (some manufacturers claim up to 400 copies); and
- (iii) special stationery is required for masters,

The advantages are:

- (i) there is flexibility of creation of the master;
- (ii) the method is cheaper than photocopying;
- (iii) no special skill is required;
- (iv) there is no severe limitation on the type of stationery usable for reproduction;
- (v) reproduction is rapid;
- (vi) the capital outlay is small; and
- (vii) alterations of the master are simple.

Photocopying and the use of ordinary carbons are economic when few copies are needed. Spirit duplication is preferable where between 10 and 200 copies are required. Where more than 200 copies are required, other methods of reproduction are to be preferred.

(e) *Ink Duplication.* This involves the cutting of a wax master (or stencil) by typing or by the use of a metal stylus or wheel pen whereby an incision is made in the wax surface. Alterations and corrections involve 'filling' and re-cutting. After the reproducing machine has been inked (usually from tubes of ink), the stencils are fitted to the machine. Absorbent stationery is fed through the machine and automatically brought into contact with the master. By the use of rollers the ink is pressed through the incisions in the stencil, thus reproducing the writing on the master on each sheet of paper. Special absorbent stationery is required otherwise the ink is difficult to dry. Unfortunately absorbent paper is unsuitable for writing on later in ink. After reproduction, the removal and cleansing of the stencil and the cleansing of the machine is a dirty operation.

It is possible to reproduce documents in various colours. A separate stencil for each colour element, a separate inking of the machine and a separate run for the reproduction of each colour are required. Great care must be taken when creating the masters to ensure good registrations of each colour area. A large number of copies can be obtained if desired from a single stencil. The quality of reproduction can be excellent.

(f) *Lithographic Reproduction.* Masters for this method can be produced by typing, using a special ribbon; by writing or drawing, using lithographic ink; or by photographic process. The master surface is metallic, being either very thin metal sheet or paper bearing a metallic deposit. After creation, the master must be chemically 'fixed'. The master is inked, then brought into contact with a 'blanket' roller, on which the image is reversed so that a positive result is printed. The 'blanket' and not the master comes into contact with the reproducing stationery.

Photographic stencils are produced by copying or writing the original document in light proof ink on thin paper. This paper is placed on top of the stencil (whose coating hardens when exposed to strong light) and light is projected through the paper on to the stencil. The coating hardens except where the outline of the original impedes the light. The stencil is washed to remove the unhardened coating, thus leaving a photographic outline of the original on the stencil.

The disadvantages of this form of reproduction are:

- (i) the cost of master sheets;
- (ii) the time required with some machines for 'fixing' and inter-changing masters;
- (iii) the difficulties of operating some machines and the use of chemicals;
- (iv) the dirty work involved when changing masters and cleaning machines; and
- (v) the capital outlay.

The advantages are:

- (i) the high quality of the reproduction;
- (ii) the possibilities of eliminating pre-printed stationery by using professionally prepared master forms;
- (iii) the high speed of printing; and
- (iv) the possibilities of half-tone and colour reproduction.

(g) *Perforated Tape*. Specially constructed typewriters can perforate card or tape with a coded pattern of holes to represent both the typewritten data and the typewriter operation (carriage return, backspace etc.) simultaneously with the creation of the original document. The same 'typewriter' or 'interpreting' machine can subsequently 'read' the punched tape or card and reproduce the data thereon in typewritten form. Alteration and correction is simple. Perforated tape may be used to actuate teleprinters or punched card machines (*see* §§ 97 and 101). The speed per line of type is high for automatic typing but cannot compare with the simple revolution of some of the duplicating machines described above. The capital outlay is heavy.

(h) *Addressing Machines*. These use either typed stencils or metal masters produced by embossing. The typed stencils are inserted in small card holders. Stencils are not attached to the machine. The stencils are automatically reproduced by a form of ink duplicating (*see* (e) above) and are used on envelopes, pay sheets, dividend sheets, etc. The card holder has certain 'areas' which may be punched out to enable the selector in the machine to operate. After setting, the selector 'feels' each card, rejects those not conforming to the selected code, and causes the printing mechanism to work where rejection does not occur. Although only one copy is obtainable at each print, the stencil may be retained in the printing position enabling further copies to be taken. One manufacturer claims that if 125 stencils and 125 envelopes are fed into the machine, the envelopes will be addressed in one minute. The procedure is similar with metal masters except that these have to be embossed by special equipment and only limited alterations are possible.

§ 95. Sorting

Accurate and speedy sorting is necessary where large numbers of documents in regular use are involved. Sorting may be alphabetical or numerical or by a combination of the two. Alphabetical sorting is preferable where external documents (purchase invoices, sales, orders etc.) are

involved: numerical sorting is possible with internal documents (sales invoices, material requisition notes, etc.) A careful arrangement of the sorting sequence adopted may reduce work. Customers' orders may be sorted in the sales department initially in alphabetical order to enable them to be numbered; then in geographical areas for posting to ledgers; then in numerical order within each geographical area; and finally again in alphabetical order for credit control purposes. The first and last sorts are identical and consideration should be given to rearranging the order of sorting.

Apart from table surfaces, pigeon holes, flap sorters and certain proprietary methods, which select cards by the insertion of a rod into holes, may be used to assist sorting. Pigeon holes and flap sorters are useful where documents are to be sorted into a limited number of groups. Proprietary methods are relatively more expensive than the other methods.

§ 96. Filing

Before considering methods of filing, management must decide whether filing is necessary. Filing of documents should be allowed only if they will be used again. If the accountant has reviewed the office organization on the lines suggested in Chapter X, there will be few copies available for filing. In deciding the method of filing the copies available, attention must be given to the following matters:

(a) *Length of storage.* Where storage is only necessary for a short time, the sorting and filing systems should not be elaborate. Certain main categories (customer orders, purchase invoices, job cards etc.) will be laid down together with the period for which documents in each category are to be retained. Only simple box files or 'flap' files may be required.

(b) *Classification* must be simple and consistently followed. A consideration of subsequent use will determine whether personal or subject filing is adopted. Frequently an extra copy is taken so that one copy can be filed under subject, the other under persons' names. Although this procedure is necessary where constant reference must be made under each heading, normally management should aim at filing under only one classification. Management must lay down a simple principle for classifying documents which will leave no doubt as to the correct place for any document to be filed.

Illustration

Where cotton olive drab shirts are the subject matter of correspondence, any person hunting for previous correspondence could look under C for cotton; or O for olive; or D for drab; or S for shirts. If the armed services method of classification, namely 'shirts, cotton, olive drab' is used, there is only one place to which reference need be made. Obviously the method of the armed services is not the only one which may be used. It is given here for the purposes of illustration.

(c) *Location of filing* will depend on the storage space available and the department likely to make the most use of the documents in the future. Filing equipment offers both ideal and inefficient filing positions. It is less fatiguing to file in the two middle drawers of a four-drawer filing cabinet

than in the top and bottom drawers. The most frequently used documents should be placed, therefore, in the two middle drawers.

(d) *Extraction of documents and files.* When files or some of the contents thereof are extracted, some other person may require the same files or documents before replacement. One method is to insert a card or sheet in place of the extracted material, indicating the destination of the papers and the date of extraction. This card or sheet acts as a substitute indicator and is usually the requisition for the file. Some companies do not permit the removal of individual papers from the files. If documents are wanted for information or scrutiny the entire file must be obtained. In addition all files may have to be returned for filing every night. This procedure does not cause as much extra filing work as might be supposed, for files are not requisitioned until they are wanted and tend to be dealt with promptly. The need for substitution indicators is reduced. Moreover, files cannot be locked away in a drawer while the holder of the key is away on holiday.

(e) *Destruction of documents.* Before deciding upon the method of filing, the period during which papers are to be filed must be known, otherwise unnecessary work can arise. If customer correspondence is kept for a maximum period of two years, *i.e.* last year and the current year, one year's filing must be destroyed annually. Where correspondence covering both years is inserted in the same folder, destruction will require every file to be examined. But if the correspondence for each year is placed in a separate folder and all folders for any one year are filed in the same drawers, removal can be en bloc instead of file by file.

(f) *Equipment.* Having considered the above, management must decide which papers need to be locked away or require fireproof storage and the amount which can be spent on capital equipment (cabinets and cupboards) and on consumable equipment (*e.g.* file folders). The capital equipment available may be divided into three groups:

- (a) safes;
- (b) filing cabinets with drawers for horizontal filing with or without locks; and
- (c) vertical filing racks, either with suspension devices or with simple 'pigeon holes'.

Safes are expensive and only justified when security is necessary.

Horizontal filing in drawer cabinets suffers from the disadvantage of requiring a lot of space, as allowance must be made for a gangway with the drawer open. Many refinements exist to assist in the location of files, varying from header tabs and dividing cards to proprietary systems of suspension. The cost of each cabinet and the files can be substantial. As a result, cabinets are usually used for 'active' files only. Vertical filing racks are economical in space, as only storage area and gangway are required. The filing racks may be locked. Reading the file designation may be difficult as files are rarely thick enough for it to be displayed horizontally on the gusset. Special strips placed vertically or at an angle are usually employed. Location of a particular file may be slow with pigeon hole filing, because several files may have to be extracted to find the file needed.

§ 97. Communications

A business needs to communicate large quantities of information internally as well as communicating with its customers, suppliers, etc. Information must be transmitted swiftly but the cost of so doing must not be excessive. The cost of long distance telephone calls will be disclosed on receipt of the Post Office account. But with local calls, the length of the conversation does not alter the charge and so the cost in staff time may be overlooked. In addition to the wages of staff, the chief factors involved are the rapidity with which and the distance the communication is to be sent. The eight common methods are:

(a) *Postal services* are capable of conveying written or recorded data to any destination. The facilities and rapidity of delivery are sufficiently well known to need no elaboration.

(b) *Special and internal messenger services* can carry written or oral recorded data but, unless the distances involved are short, are very expensive. Within such limited distances, these methods are swifter than postal services and are under internal instead of external control.

(c) *Telephone communication* is oral only but can be simply recorded. The cost of uncontrolled long distance calls can be considerable. Where regular trunk calls are unavoidable, contract connections may be effected. These are fixed calls, in time and duration. Not only is the call charge per minute less but personnel can anticipate the call and be available. Time expended by personnel is the major factor with telephone calls, particularly those within the premises. The cost of telephonic communication can be reduced by the use of private lines where there is a large volume of traffic.

(d) *Teleprinter*. Information is transmitted in 'typed' form over specially reserved lines known as TELEX or by private teleprinter circuits. The two parties are connected as for a telephone call, either by private line or through an exchange. Communication is effected by typing out the information on a special machine, which by electrical impulses causes a similar machine at the receiving end to reproduce the information being typed on the sending teleprinter.

• The 'telephone' line cost for teleprinter transmission can be low (it is much lower per minute than speech). As the communication becomes typescript the unnecessary elements which creep into spoken calls tend to be eliminated. Furthermore, the presence of the addressee at the time of receipt of the information is not required. The two principal disadvantages of teleprinter transmission are that some degree of operator skill is required and that as installations are usually central, it is customary to write original messages which have to be copied on to the teleprinter. Normally in the United Kingdom the apparatus is rented at a low rental and not purchased outright.

(e) *Telegrams* are a universally known form of transmission. The main disadvantages are:

- (i) the cost is relatively high;
- (ii) delivery, other than by telephone dictation at the receiving end is comparatively slow;

- (iii) oral sending and receiving is slow, and costs staff time; and
- (iv) errors occur, because of bad dictation, poor writing or sending mistakes.

The advantages include:

- (i) rapid communication with persons not connected by telephone; and
- (ii) for short messages over long distances, telegrams can be cheaper than telephone calls.

(f) *Facsimile transmission* is still in course of development, although it is commercially available. The matter to be sent is wrapped around a revolving cylinder in a 'desk transceiver' and a spot of light is made to scan the message. The reflected light from this scanning spot is focused upon a photo-electric cell. Writing causes the cell to set up electrical impulses which are conveyed by telephone line to a distant receiver where they activate a stylus which records the matter on special receiving paper. When the entire document being sent has been scanned, the receiving paper will exhibit a facsimile of it.

The advantages of this method are:

- (i) no operating skill is required;
- (ii) no human transcription is needed;
- (iii) signatures, drawings, handwritten or typewritten documents can be transmitted; and
- (iv) the capital cost or rental is relatively small.

The restrictions or disadvantages are:

- (i) the distance of sending is limited;
- (ii) private lines are required;
- (iii) the document size is limited;
- (iv) the maintenance cost is relatively high; and
- (v) receiving paper is a specially processed product.

(g) *Pneumatic tubes* are in wide commercial use for the physical conveyance of papers and other objects. A cylinder, or carriage, is propelled through metal tubes by compressed air. Destination routing can be effected through an exchange. For large volumes of traffic over short distances, this method can be a useful means of communication. It is used frequently in department stores for customer payment; the customer being dealt with departmentally, but cash handled by a centralized cashier's office. The practical applications go considerably beyond this, however, *e.g.* there are large tubes capable of conveying complete files between adjoining buildings.

Unfortunately tube installations are inflexible. A change of office layout may be prevented or may require substantial engineering work to alter the tube system. Some concerns avoid this restriction by not attempting a complete delivery system by tube, but operating transmission to a central point on each floor. Pneumatic tube installations permit a continuous flow of documents between the various stations, thus avoiding delays inherent in messenger services.

(h) *Conveyor systems* are usually considered for warehouses and factories but can be used in offices. To be economical there must be a considerable volume of traffic either between two points, or a number of points on the same circuit. Generally, these systems are inflexible. Architectural as well as engineering work may be required to make changes. A conveyor system is used in at least one foreign air terminal. The open reception hall has a series of registration desks, and finally a cashier's office. Tickets and other documents are placed on this conveyor by the register clerks without leaving their desks, and delivered to the cashier. The run is a straight line and handles a considerable volume of traffic. As the conveyor can be used simultaneously by several clerks at separate desks, it is more suitable than the pneumatic tube which would have to be used consecutively.

§ 98. Introduction to Mechanized Accounting

Mechanization is not the road to Utopia in office efficiency. When considering the introduction of mechanized accounting the organization of the accounting work is reviewed. This may result in mechanization being unnecessary. Nevertheless, there are few businesses in which some mechanical aids are not worthwhile. In the succeeding paragraphs various types of machines will be discussed.

§ 99. Adding and Calculating Machines

An *adding* machine has a number of keys which when depressed cause the machine to add, the result appearing in the windows of the machine. Such machines are relatively inexpensive.

An *adding-listing* machine combines adding and printing mechanisms. Amounts are set up in the machine by depressing keys. On depressing a further key, the machine prints the amount on a roll or sheet of paper and simultaneously adds the amount to any previous total. Subtraction, sub-totalling and totalling devices are normally incorporated in the machine. Staff require little training before using adding or adding/listing machines.

Other machines are available with two or more adding mechanisms enabling two series of figures to be multiplied and results accumulated in another register. Alternatively, calculating machines may be of the barrel type. Addition and subtraction are achieved by setting up amounts, and by rotating a crank handle once the amounts set up are automatically added to or subtracted from the previous total in the product register. Multiplication is achieved by moving successively the product register carriage into the unit, tens, hundreds and thousands position and rotating the crank handle, *e.g.* if 1,840 is to be multiplied by 126, the amount of 1,840 will be set up in the setting register, the product register will be moved to the 'unit' position and the crank handle rotated 6 times, then to the 'tens' position, when the handle will be rotated twice, and finally to the 'hundreds' position, when the handle will be rotated once. The result will be seen in the windows of the product register. Division requires a similar procedure. Special training is required if full advantage of complex keyboard calculators and barrel type computers is to be obtained.

§ 100. Book-keeping (Accounting) Machines

For Ledger work these machines usually need only two registers, but more complicated types offering several registers are available. The registers can be used to add or subtract amounts both for horizontal and vertical totals while the printing mechanism will simultaneously print the detailed amounts and totals. Many machines incorporate a typewriter keyboard. The machines are used for a variety of purposes, such as day book and wages analysis, payroll, and ledger posting. The capital investment is substantial. The use of book-keeping machines may cause increased repetition (*e.g.* it is necessary to 'pick-up' the opening balance when posting to ledgers) while, in other fields, the use of reproducing devices is inhibited (*e.g.* national insurance and fixed deductions in payroll preparation must be typed for each employee; they cannot be pre-printed on the pay-roll sheet). On the other hand, book-keeping machines can assist in the elimination of duplication by documentary alignment with either the use of carbon paper or the automatic mechanical repeat mechanism, *e.g.* postings can be made to the sales ledger account and customer's statement simultaneously with the creation of sales summaries.

When using book-keeping machines, particular attention must be paid to:

- (a) The sources of information from which postings are made. Posting is normally based on the 'slip system' whereby the prime documents (*e.g.* suppliers' invoices for posting to bought ledger and carbon copies of sales invoices for posting to sales ledger) are used as direct posting media. Day books and journals are not used for posting; they are commonly eliminated, sales summaries being automatically reproduced. Special attention must be paid to the numbering and filing of such documents.

The following system is recommended:

- (i) All prime documents should be numbered consecutively in the order of first entry in the accounting records;
 - (ii) The prime documents, before first entry, should be collected into batches of suitable classification and manageable size;
 - (iii) Batches should be numbered and filed in number order;
 - (iv) Batch totals in quantities and money and any analyses which have gone into the accounts from the documents comprising the batch should be recorded in control accounts.
- (b) The checks imposed by the system. In ledger posting these are usually as follows:
 - (i) The posting media is pre-listed by using an adding/listing machine and the total thereof compared with the total of the amounts posted. The system of internal check is strengthened if the documents are pre-listed in the department from which they come before being passed to the machine operator.
 - (ii) Various forms of balance pick up proof, depending usually on the old balance being picked up twice (once before the posting is made and once after).

- (iii) Offsetting, stuffing or pulling of ledger cards: Offsetting is effected by altering the position of a card in its tray so that it stands out from its fellows. Stuffing is the system of inserting the posting media in front of the cards to which they relate. Pulling involves the withdrawal in advance of all cards which are to receive postings and, if they are not already in the order in which the postings are to be made, arranging them in that order. A further protection may be obtained by including the account number in each line of entries so that a posting to an incorrect account shows up as a 'wrong number'.
 - (iv) The maintenance of Control Accounts to which the totals of each batch of entries are posted, the balances of the Control Accounts being compared at frequent intervals with the current balances on all accounts comprised in one control.
 - (v) The system of 'double run' by which all postings are made twice, once to the actual ledger account and once to a copy of it which can be used as a 'statement' for issue to the customer. This is the most comprehensive check of all as it should reveal errors of any of the kinds already considered (the posting of a wrong amount, an error in picking up the old balance or a posting to the wrong account) unless the same error is made in both operations.
- (c) The disadvantages inherent in the use of the machines are:
- (i) The absence or inadequacy of cross-references between prime documents, primary records (day books or their equivalents) and secondary records (ledgers or their equivalents). Thus, the control sheet which contains the copies of a batch of invoice postings to ledger accounts rarely shows the names of the accounts to which postings have been made and thus falls short of a normal record in day book form. The inclusion of an account number should remedy this fault. Similarly, difficulty may be experienced in linking up totals posted to nominal ledger accounts with the detailed items from which they were obtained.
 - (ii) The absence of adequate correlation of debits and credits in a personal ledger account. If debit entries are not identified with the relative credit entries, and *vice versa*, the current balance on an account may become incapable of analysis into the items of which it is composed, resulting in difficulty in preparing a statement which explains the amount outstanding. The normal remedies for this weakness involve the reimposition of manual processes, in order to mark off items on one side of the account against those to which they relate on the other side, and to analyse the balances into the specific items which make them up. Where the sales ledger is concerned these tasks may well be made part of the system of credit control.

- (iii) Misuse of the expressions *Dr.* and *Cr.* Provided it is understood this feature of some systems is not a disadvantage of any consequence. It springs from the fact that the mechanism distinguishes between positive and negative items and not between debits and credits as such. For example, debit balances on sales ledger accounts and credit balances on bought ledger accounts are normal (*i.e.* positive) balances, while credit balances on sales ledger accounts and debit balances on bought ledger accounts are abnormal (*i.e.* negative) balances. Normal balances are usually printed in black without any distinguishing mark (other than a sign which indicates that one of the adding registers has produced a total or a sub-total) but abnormal balances, which are often printed in red, may be followed either by a *Dr.* or *Cr.* which is not necessarily a correct indication of the nature of the balances.

§ 101. Punched Card Equipment

The three fundamentals of punched card equipment are:

- (a) conversion of data into holes punched in a card by a key-punch;
- (b) mechanical sorting of cards into the desired sequences by a sorter;
- (c) tabulation of sorted cards by a tabulator.

Various types of punching machines exist, either hand or electrically operated. Each machine has a keyboard. After inserting a supply of cards, the operator reads off the data from the original documents and depresses the appropriate keys. The depression of the keys effects the punching of the holes. With an automatic key punch, skilled operators can achieve 10,000 key depressions in an hour. The cards are produced in standard sizes and are divided into a series of columns, each having numerical positions 0 to 9. The columns are divided into groups, called fields, each field representing a particular element of the data to be recorded. Before punching can be done, the descriptive material on the original document must be coded, *e.g.* numbers must be assigned to each branch, traveller, territory, expense classification and type and grade of raw material and finished goods. Codings in current use should be recorded in registers available to all members of the staff who are required to originate or interpret cards. Once a particular code is punched into a card, the card will be sorted and later interpreted by the tabulator under that code. Great care must be taken to see the original coding is correct. After the cards have been punched, they are repunched so that the holes now being punched are slightly offset from those originally punched thus producing elongated holes. Thus, after verifying, any round hole remaining represents a difference between the original punching and the verifying. The difference can be investigated to establish the correct punching. A speedy way of examining cards after verifying is by way of an automatic verifier which inserts a distinguishing marker card into the pack where differences exist. The cards are now available for use but one further precaution may be taken. The cards may be added on the tabulator (with the printing mechanism not working) and the total

agreed with the adding/listing machine list total of the basic information.

The verified cards will be inserted in the sorter, which senses the holes in a pre-arranged field and sorts the cards in the desired order. Sorting can be done at speeds of up to 600 cards a minute.

Sorted cards are fed into the tabulator. This machine can list single cards, add together groups of cards, deal with subtraction as well as addition within a group of cards, and print the results. The sorting machine can sense only one column at any particular time, but the tabulator senses all required columns simultaneously. The method of control varies with the make of equipment used, but means exist whereby the varying fields on different cards control the different printing sectors and adding registers. The manner and flexibility of varying the adding and printing control is one of the main differences between the different makes of plant.

The tabulator will print all the information on each card, or omit unwanted information, depending upon the setting instructions of the operator. Where groups of cards are collated, the change of the control number (*i.e.* the feed into the sensing mechanism of the first card of the next group) causes the tabulator to total all the amounts in the previous group of cards and print the total. After which, the cards of the next group will be sensed and the information recorded thereon collated and so on.

The above is a simplified description of a punched-card system. Many refinements exist. These include:

(a) *A Summary Card Punch* is a tabulator attachment which will punch all or part of the information printed by the tabulator, at the sub-total or grand total point, into a new card. The new card represents the total of a number of detail cards. The summary card punch provides the punched summary card automatically instead of an operator having to read the sub-total or grand total off the printed sheet and punch a new card.

The use of summary cards can reduce the number of card 'runs', thus saving machine time, *e.g.* when using cumulative data.

(b) *A Reproducing Punch* which will automatically punch duplicate sets of cards from existing sets. Thus, where a proportion of the punched information must be repeated many times, the repetitive details can be punched into cards by the reproducing punch. Then the cards are available for the other information to be punched into them manually.

(c) *The Interpreter* will print the information represented by the punched holes on to the card itself. This enables the card to be read without the need to 'read' the punched holes.

(d) *The Interpolator* will compare, and if needed, merge two sets of cards. Suppose one set of cards represents raw material prices and another set raw material consumption and it is desired to match the latter with the former for computing the cost of consumption. Both sets of cards must be sorted, by using the sorter, into raw material code order. Then they are loaded into two separate hoppers. The interpolator will reject those raw material price cards which represent raw materials where no consumption

has occurred and merge the remainder of the cards. The interpolator can perform a simple comparison, maintaining separate packs of cards, but accepting or rejecting from each according to a desired characteristic.

(e) *Multiplying Punch.* This machine will sense the holes in any two fields, multiply the one by the other and punch the result into another field of the same card. This used to be a mechanical operation but can now be done by electronic multipliers (which must not be confused with computers). As well as multiplication a limited amount of cross adding of two fields is possible. This machine will operate in both sterling and decimals.

§ 102. Application of Punched Cards

Punched card accounting machinery is expensive, whether viewed from the point of view of capital outlay or rental. It is usually possible to use every item of equipment made, and quite naturally the manufacturers tend to encourage this to be done. But possible use and economic use are very different matters and it is the accountant's duty to discover the distinction.

The circumstances which merit the use of punched card equipment are those which require the use of original data in several different ways. By using carbon paper and integrated design stationery entries can be made simultaneously on a statement, in a ledger account and in the summary sheet. If, in addition, sales analysis by representative, industry, and product group is required, further writing and sorting would be needed. There is a limit to the use of carbons and manual sorting of slips. Thus, where a large number of transactions needs to be analysed in several different ways, the original punching of that information into cards will enable machines to perform accurate and rapid analyses. However, bulk runs are desirable. As the flow of work may be interrupted until a sufficient quantity of work is available, the accountant must decide whether office efficiency will be impaired.

The mechanisms of punched card equipment are necessarily complicated. As a result there are definite limitations to the position of printing sectors; to the number of alpha/numerical sectors; to the arrangement of adding registers; and to the number of digits in each register which can be provided.

Invoicing by the punched card system normally involves the punching of a card for each line of entries on the invoice. If a multiplying punch is used, the quantity and price of each article will be punched by hand; the machine will multiply the one by the other and automatically punch the resulting amount into the appropriate field of the card. The item cards are sorted into account number, merged with name and address cards by using the interpolator and tabulated on invoice forms, the total of all the items constituting one invoice being found and recorded automatically. The recording of recurring or standard transactions or parts thereof may be facilitated by a system of pre-punching. If comparatively few commodities are dealt in, at standard quantities and prices that are not subject to frequent variation, batches of cards recording commodity, description or number, quantity, price and amount can be punched in advance on an

ordinary or automatic key punch or reproducing punch. When invoicing a customer, the operator will extract the pre-punched card, which will result in a considerable saving of time.

Ledger posting may be by the *open item* method or the *balance card* method. Both methods involve the punching of cards for every transaction which enters into a ledger account. For the sales ledger, four sets of cards must be prepared, one set for goods (*Dr.*) (prepared from the copies of invoices rendered to customers); one set for allowances (*Cr.*) (prepared from the copies of credit notes issued); one set each for cash (*Cr.*) and discounts (*Cr.*) (prepared from the copies of receipts issued).

Suitable trays and cabinets must be provided to house the cards which constitute the current 'ledger' and for filing away cards removed therefrom. The principal difference between the two methods is in the make up of the current 'ledger'.

(a) *Open item method.* All the cards relating to each account are filed together in trays until a remittance is received which relates to specific items in the account. The cards for these specific items are then withdrawn or 'pulled' from the 'unpaid' tray and tabulated with the cash (and discount if applicable) card to prove, by revealing 'nil' balances, that the correct cards have been pulled and that the correct amount has been received or paid. Then the cards that have been pulled are filed away in a 'paid' tray.

Where a payment 'on account' is received so that it does not clear specific items, the cash card itself is filed in customer and date order in the 'unpaid' tray.

At the end of the month, the cards in the 'unpaid' tray are merged with the name and address cards by the use of an interpolator. When all the 'unpaid' cards have been merged with the name and address cards, they are tabulated to produce a separate statement in duplicate for each customer. The tabulator automatically calculates and prints the balances and accumulates them to provide at the end of the run a grand total for agreement with the ledger control accounts.

After the statements have been tabulated, and the name and address cards have been sorted out of the pack, the other cards are returned to the 'unpaid' tray and constitute, in effect, the opening balances ready to recommence the cycle of operations next month. The carbon copies of the statements are filed in a sales ledger binder but these copies only show outstanding items on each customer's account and do not give any record of cash payments and completed transactions. To provide this information the cards from the 'paid' tray are posted by the tabulator on to individual customers' history sheets, which are, in effect, the sales ledger record of all past and settled transactions. After this posting has been completed all the 'paid' cards are filed away and are available for providing any statistics which may subsequently be required.

(b) *Balance card method.* All the cards relating to each sales ledger account for the current month, including those recording cash settlements and a balance card recording the opening balance, are filed in the current ledger tray in account number order. At the end of the month they are

merged with name and address cards and tabulated to produce a statement in duplicate, the total of the balances also being accumulated in the tabulator and agreed with the control account. The top copies of the statements are despatched to the customers while the carbon copies are filed to provide the permanent sales ledger.

New balance cards are prepared preferably by the use of a summary card punch, and filed in the current trays as a starting point in the next month's routine. The name and address card are filed for re-use and item cards for the past month are filed away for reference if necessary.

If there is a large number of accounts with comparatively few entries in each and the customers normally settle monthly the open item method is the better choice. Cash items are specifically ear-marked against the items which they settle, so that the resulting balance is clearly explained.

The balance card method is simpler where many invoices have to be posted to one account in the course of a month and payments on account are frequently made.

§ 103. Electronic Computers

The popular press has called computers 'electronic brains', but unfortunately this could not be further from the truth. Computers can execute a whole series of calculations, tests and comparisons and select any one of a number of alternatives when instructed to do so. But the instructions must be worked out by office personnel before the machine can operate. Such personnel are called 'programmers', and require careful training. When programming a computer, office organization and methods experts will investigate the office routine and decide precisely what the machine is required to do. This investigation, which will be on the lines indicated in Chapter X, may result in such reorganization of office procedures that electronic computers are unnecessary. This has been the case in many businesses where the management were considering the introduction of computers. On the basis of their investigation, flow charts will be prepared. From these charts, the programme will be devised. Before the programme is finalized, it will be fed into the computer and any errors rectified. The final programme will be stored ready for use when required. A *flow chart* depicts a sequence of events in diagrammatic form.

The main components of an electronic computer are:

- (a) an Input unit, to receive instructions and the data for processing;
- (b) a Storage unit, to retain the instructions, and such data as may need to be stored;
- (c) an Arithmetical unit, to do the calculations; and
- (d) a Control unit, to control the sequence and timing of operations within the computer; and
- (e) an Output unit, to provide the results.

All these units deal with electrical patterns or impulses. Therefore, data must be converted into binary notation.

Our conventional method of numbering, counting in tens, is called denary notation and may be written down as follows:

$$10^1 = 10; 10^2 = 100; 10^3 = 1,000.$$

Under the denary system the progression of the figure 2 would be:

$$2 = 2^1; 4 = 2^2; 8 = 2^3; 16 = 2^4; 32 = 2^5.$$

Alternatively this progression might be written down as:

2 to the Power of:	0	1	2	3	4
equals the binary digits:	0	10	100	1,000	10,000

Thus, the binary notation enables denary numbers to be expressed in terms of 1 or 0 only. The following table adds odd numbers to the scale and shows the conversion of 0 to 9 into binary notation:

Denary:	0	1	2	3	4	5	6	7	8	9
Binary:	0000	0001	0010	0011	0100	0101	0110	0111	1000	1001

Thus, by expressing all numbers as 1 or 0 or a combination of 1 or 0, the computer can be made to send or not send an electric impulse through the valves in its series of circuits. By using valves, operations may be conducted at very high speeds. Thus, a combination of two valves operating as follows:

- (i) Both off.
- (ii) First impulse (*i.e.* 1 in denary scale), one on, second off.
- (iii) Second impulse (*i.e.* 2 in denary scale), first one off, emitting pulse to second one – on, can be expressed in binary numerals as:
 - (i) 00;
 - (ii) 01;
 - (iii) 10.

Addition, subtraction, multiplication (repeated adding) and division (repeated subtraction) are possible.

Input units, in which certain basic instructions (*e.g.* stop, go, read) are incorporated, convert the instructions fed to them from external sources into electronic impulses. Many different types of Input units exist motivated, for example, by punched cards, punched tape, magnetic tape or photo-electric reading. Machines using punched cards operate at a slower rate than those using magnetic tape. But as up to 7,200 cards an hour can be dealt with by the machine, this is not normally a major disadvantage. The Input unit senses the input data, *e.g.* punched holes in the cards or tape, changes the denary notation into binary and sets up a chain of electronic pulses.

The electronic impulses are stored in the storage unit. This can store instructions and data. The computer will deal with the data in accordance with the instructions. As each instruction is completed the computer automatically moves on to the next. There are numerous methods of storage, and constant development and research is being made in this field. The two chief conflicting problems are size of storage and rapidity of access. At the

time of writing, the principal methods of internal and external storage are:

Internal Storage: Magnetic drum; Electronic tube; Mercury delay line.

External Storage: Magnetic tape; Punched tape; Punched cards.

The computer selects the various alternatives which the programme provides in the following manner. The programmer ensures that the possible courses of action are reduced to a series of 'yes' or 'no', 'on' or 'off', or in binary notation 1 and 0. The data being processed arrive at an arrangement of valves which compare an element of the data with a pre-determined test. If the answer is 'yes' one switch or circuit is automatically operated; if the answer is 'no' another circuit is operated.

Illustration

The programme instructs the computer to compare the wages earned with the tax free amount. If the former exceeds the latter, the data will pass through the tax computation routine. If the tax free amount exceeds the wages earned, the data will by-pass the tax computation routine.

The storage of information in the computer enables variable data to be fed into the machine and to be processed in conjunction with standard information which may be stored permanently, or for the duration of the calculation. Thus, a series of quantities of raw material consumption could be put in as variable data for evaluation with the aid of a series of raw material cost prices already stored in the computer. The instruction programme would provide for the extraction from store of the price of the required raw material at a particular point in the routine, the raw material binary code of the input being matched with that of the store.

Some calculations may proceed part way and then need to await the results of other calculations before they can proceed further. The programme will provide for the machine to store temporarily the result and at a later stage reintroduce it into the arithmetic unit. The arithmetic unit consists of electronic circuits which provide for addition, subtraction, multiplication and division. A co-ordinating or control unit is incorporated to control the computer and ensure that the programme is complied with.

Having carried out all the functions required of it, the computer must, by means of the output unit, print the result. At the time of writing the speed of operation of arithmetic units has not been matched by the means for dealing with the results. Some manufacturers of computers have provided for temporary storage at the output stage from which data is drawn at a rate at which it can be printed. The majority of output units prepare punched cards or punched tape which are inserted into printing machines. The speed of the latter varies but one machine prints 900 lines a minute.

Electronic computers are extremely expensive and require costly ancillary plant. But in addition to the equipment, the development of a programme can take many months, or even years. Some authorities have estimated that two years will elapse from the time of agreement that electronic computers should be considered to the installation and operation of the machines although this may be optimistic! Computers are unsuitable for any work other than that on a very large scale and are relatively in-

flexible. They are being used for wages computation, stores accounting and costing. Normally, however, the cost is not lower than by using other methods. The advantage claimed is that information may be available within hours, instead of days or weeks. Alternatively, it may not be possible to obtain the information in time for use by any other methods because of the number of calculations involved.

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