

THE WAREHOUSING AND DISTRIBUTION COSTS IN A HOUSEHOLD
DISPOSABLE PRODUCT MANUFACTURING COMPANY

by

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Dedicated to my family and my parents.

PREFACE AND ACKNOWLEDGEMENTS

The physical distribution of goods and specifically the costs attached to this function of the business, has always been viewed as a marketing or manufacturing or even as a selling sub-function.

In recent years more enterprises are viewing the distribution and warehousing function as being just as important as the manufacturing, marketing, selling and administrative functions in the company. Although these various functions are separately identifiable, the interaction between these functions is essential in achieving any long-term or short-term profit objective.

Due to the increasing emphasis placed on the distribution function, it could only follow that more emphasis would be placed on the cost of this activity and the benefits achieved by incurring these costs.

Distribution and warehousing costs are incorporated in any budget, plan or forecast. This step is necessary in order to determine planned profit levels.

Analysing distribution costs is one way of providing a tool for the measurement of distribution efficiency.

I hereby declare that:

All conclusions drawn in this study are my own, and that no other person or institution can be held responsible for the propriety thereof.

A special word of thanks to Professor A.J.E. Sorgdrager for his valuable advice and guidance through the years. His personal interest only served as encouragement and tremendous inspiration.

I cannot describe the support I received from my family and the sacrifices they willingly made on my behalf. To them, a special word of thanks.

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Deo Gloria

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SYNOPSIS

Distribution cost information can assist management in planning, control and decision making.

The extent of assistance needed depends upon the approach of management towards responsibility in accounting and planning in order to achieve a corporate objective.

1. THE OBJECTIVE, SCOPE, METHOD OF STUDY AND EXPLANATION OF CONTENTS OF THIS STUDY

1.1 INTRODUCTION

Much emphasis has been placed on planning and control of manufacturing costs

Many of the cost accounting principles and techniques applied to manufacturing costs can also be applied to distribution costs, but some are more difficult to implement.

An attempt will be made to indicate how distribution cost information can be applied by management when addressing certain distribution accounting problems. Although the logistics of physical distribution is to a large extent the origin of distribution costs, only a few aspects are mentioned in this study.

1.2 THE OBJECTIVE OF THIS STUDY

The objective of this study is to:

- 1.2.1 identify the physical distribution functions in order to understand the importance of physical distribution in relation to sales and customer service;
- 1.2.2 indicate how planning and control of physical distribution costs can be achieved by using management tools such as budgeting and forecasting techniques;
- 1.2.3 emphasize the importance of inventory management as a sub-function of distribution management;
- 1.2.4 to highlight the difficulty of efficiency measurement in the physical distribution function;

- 1.2.5 to investigate the feasibility or not of allocating distribution costs to various business segments, considering the nature of distribution costs;
- 1.2.6 to indicate how control concepts such as management reporting and responsibility accounting can assist in controlling warehousing and distribution costs.

Van der Wath (1968 : 3 as quoted by Hechter, 1983 : 4) said that: "Doeltreffendheid, doelgerigtheid en doelmatigheid het die wagwoord van ondernemings geword".

To this, Hechter, (1983 : 4) added a fourth dimension - service, and said that: "Veral in die tekstielbedryf behoort dienslewering groot aandag te geniet."

This statement is also followed in this study, and the importance of effective distribution of goods in support of customer service is highlighted in a later chapter. Welgemoed, (1978 : 28) supported this statement in saying that physical distribution is the key link between a firm and its customers.

1.3 METHOD OF STUDY AND THE CLASSIFICATION OF CONTENTS

1.3.1 The methods of investigation followed in this study are:

- (a) a literature study of some of the various cost aspects of warehousing and physical distribution;
- (b) the practical application of certain costing techniques as experienced by the author.

1.3.2 The classification of the study is as follows:

- (a) Chapter 1 consists of stating the objective, scope and methods followed in the study and also an explanation of some of the costing and management concepts

in this study.

- (b) Section B consists of chapters 2 and 3 in which the budgeting and forecasting of distribution costs for planning and control are emphasised, and a discussion of important cost and management aspects of warehousing and physical distribution.
- (c) Section C consists of chapter 4 in which a short case study is done to indicate how distribution and warehousing costs can increase during a short term period and what management could expect over the long term.
- (d) Chapter 5 will be a summary of the study, and will also contain some conclusions.

1.4 METHOD OF QUOTATION

The method of quotation followed is specified in the manual: Hand-leiding : Bibliografiese styl, 1983, P.U. vir C.H.O.

Information is based on own research and experience when no reference is made to a specific source.

1.5 EXPLANATION OF CONCEPTS AND PRINCIPLES

To ensure the understanding and correct approach to warehousing and distribution costs, various concepts and principles should be distinguished.

Marketing is defined by Rädcl, (1971 : 522) as:

"Die uitvoering van aktiwiteite wat die vloei van goedere en dienste van die produsent na die verbruiker bewerkstellig."

Physical distribution is the storage and transportation of goods and is seen as a sub-function of marketing, although the activities performed could be separated from the marketing function.

There should be a distinction between the budgeting and forecasting concepts. Harper, (1976 : 42) defined these two concepts as follows:

- (a) A Budget is a cost plan relating to a period of time.
- (b) A Forecast is a prediction of what will happen as a result of a given set of circumstances.

From this it follows that a forecast is a judgement and a budget is an enterprise objective.

See also Batty, (1970 : 46-47) for a discussion on the distinction between a budget and a forecast.

The concepts functional budget and master budget should be seen as follows:

- (a) A functional budget relates to only a certain segment or responsibility centre of the business.
- (b) A master budget is a summary of all the functional budgets in the organisation.

The distribution cost budget is a functional budget.

Management by objectives is the process of management to achieve set targets.

Batty, (1970 :70) summarised primary objectives as ".... the carrying out of management functions in such a way that the company expands and earns a satisfactory profit, and the interests of shareholders are safeguarded."

Allen, (1973 : 64) stated an objective as a commitment to achieve a result.

Management by exception is seen as concentrating attention on matters that show an excessive deviation from a plan and not wasting effort on minor deviations.

Profit planning is the process of determining what sources are required and what constraints are placed on the organisation in order to achieve a target profit.

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SYNOPSIS

In this chapter the various distribution functions are classified and discussed to give an understanding of distribution as it could currently be implemented by companies.

Budgeting for distribution costs is then discussed, with reference to the advantages of budgets, problems in budgeting for distribution costs and the setting of distribution cost standards.

Forecasting, as used in distribution management is discussed as a sub-phase of the budgeting process and then as an extension of the budget.

For the purpose of budgeting and forecasting, special reference is made to cost behaviour patterns.

2. BUDGETING AND FORECASTING OF DISTRIBUTION COSTS AS ELEMENTS OF PLANNING AND CONTROL

2.1 INTRODUCTION

One of the most difficult tasks facing today's management is planning for the future in a world where drastic changes in business conditions occur almost daily. The best way to prepare for changing business conditions is to provide a framework that contains a specific plan, but is sufficiently flexible to allow adoption to unanticipated changes. Budgeting spells out management plans in quantitative terms and helps to evaluate such plans.

This plan cannot be determined without forecasting. *Forecasting in this case is a prediction of what will happen as a result of given circumstances. Harper (1976 : 42)*

Predicting the future, not to mention planning for this advent, has turned out to be very troublesome, and one will always find an abundance of forecasting failures.

2.2 THE DISTRIBUTION FUNCTION

Before investigating budgeting for and forecasting of distribution costs, it is necessary to take a look at the distribution functions in a company. It is important for management and personnel involved in any distribution activity to know what these functions are and to understand how these functions tie in with the overall objectives of the company.

The full distribution function is normally expressed as one of several marketing functions.

Rädel and Reynders (1971 : 663) say: "Waar distribusiebeleid slegs

een instrument van die algemene bemarkingsbeleid is"

The following statement is also made by Longman (1978 : 40):
Most marketing texts list the following as functions of marketing: (1) assembly (2) storage (3) selling (4) transportation (5) financing (6) risk bearing (7) assembly and dissemination of market information. In some cases pricing and grading are added as additional functions.

The distribution function can also be a sub-function of the operations division of a company and not a marketing sub-function. In this case good communication and co-operation between marketing, selling and operations divisions are essential. This matter, however, depends mainly upon the organisational structure of the company, the type and size of the market and a wide range of other factors.

The fact is that the objective of physical distribution is to ensure that the right quantity of the right product is available at the place where demand for it exists and at the time that demand exists. Pretorius (1981 : 1)

Cox (1965 : 16) says that distribution takes goods and services to people, or people to goods and services.

Bowersox (1974 : 45) states the following marketing functions:

Exchange functions -

Buying

Selling

Physical distribution functions -

Transportation

Storage

Facilitating functions -

Standardisation
Market finance
Risk bearing
Market information and research

The above can be summarised as follows: The distribution function is to provide consumers with the goods they need and the marketing function brings the goods or services which a business wishes to sell to the attention of the markets it wishes to sell to.

Transportation and storage have been mentioned by more than one author as the two main elements of physical distribution, and a closer look will be taken at these two functions.

2.2.1 The Storage or Warehousing function

The functions performed in a warehouse may be grouped into movement and storage categories.

Movement function

Receiving is the first movement function, and consists of unloading. Merchandise and materials normally arrive at the warehouse in truck-load quantities. Movement efficiency is improved by using conveyors or pallets.

Transfer or circulation is the second movement function. Goods are moved into the warehouse and placed at a designated spot. A second internal move is required when products are moved for order assembly.

Order assembly is the third movement function but also the primary function of the warehouse. *Order picking is the keystone of distribution warehousing. Mossman and Morton (1965 : 287).* At this point, movements are primarily aimed at regrouping products into assorted orders.

Shipping is the final movement function and consists of checking and unloading orders for outbound movement. A checking operation is required and generally consists of item counts for proper brand, size and so on.

Storage function

Temporary storage is the first storage function and regardless of inventory turnover, all goods received must be stored for some time. Temporary storage must provide a sufficient quantity of goods to satisfy demand and adequate safety reserves.

Longer term storage refers to storage in excess of inventory required for normal replenishment and reasons could be the following: Seasonal Production, Erratic demand requirements, Conditioning, Speculation and the realisation of special discount, or the effect of other promotional activities.

2.2.2 The Transportation function

Transportation as considered here starts at the point where goods are packed and ready for shipment or delivery, in order to get the goods into the hands of the customers.

In general, as seen by Heckert (1940 : 229), the transportation services consist of:

- Traffic Planning

- Preparation of shipping and delivery papers

- Shipment or delivery of goods sold to customers and transportation of goods returned by customers

- Handling traffic claims

2.2.3 The importance of effective distribution

As mentioned in the preceding sections, the main objective of physical

distribution is to ensure that customers are provided with the goods they want at the time and place these goods are required. Needless to say, the result of this will be satisfied customers and increased sales. Improvement in sales, no doubt, will lead to achieving the number one objective of any company and that is profit maximisation under almost any business conditions.

Partridge (1983 : 1) had the following to say about the customers of his company:

A Customer is the most important person in this firm ...

A Customer is not dependent on us, we depend upon him for a living

A Customer is not an interruption of our work, he is the purpose of it. He is doing us a favour by giving us the opportunity to serve him.

A Customer is a person who comes to us because he needs certain goods or services. It is our job to provide them in a way profitable to him and to ourselves.

A Customer is the most important person in this firm. Without him there would be no business.

These statements highlight the importance of the effective distribution of goods as part of a good customer service policy in achieving an overall company objective. It must be mentioned at this point that corporate objectives will differ between companies, and these differences depend upon a large number of factors such as goods or services offered, market environment, competition, company organisational structure, etc.

2.3 BUDGETING FOR DISTRIBUTION COSTS

Distribution costs are as important as production costs in determining what price the customer must pay. These expenses are a source of waste unless adequately controlled. It is only in recent years that businessmen started realising that distribution costs require as much control as production costs.

2.3.1 Advantages of budgeting for distribution costs

The utilisation of budgets and predetermined standard costs is as necessary for effective distribution cost control as for manufacturing cost control.

Neuner (1977 : 360) states the following reasons for the use of budgets being advantageous:

1. The preparation of budgets forces management personnel to engage in planning and in addition the objectives of the firm have to be defined and stated in financial terms.
2. The use of budgets lends itself to co-ordinating the activities of the various segments of the business. For example, the co-ordinating of the distribution, sales and production effort.
3. The implementation of budgets may provide an instrument for control and deviations from a prescribed course of action may be determined, and the causes for such deviations can be determined.
4. The techniques used in budgeting force management to examine carefully the uses of labour and capital with the result that a more efficient use of resources may result.
5. The use of budgets results in a management team that is cost

conscious before funds are committed. The emphasis in budgeting is not in cost reduction by itself but rather in maximisation of long-run profit.

6. When a budget plan has been set realistically and has the support of lower echelon management and workers, the budget can be a powerful tool for motivating employees to meet the budget objectives for costs and revenues.

It may not be possible to attain all these advantages simultaneously. For example, if excessive emphasis is placed on the control aspects of the budget, employees may well resent the budget and the motivation advantage may be lost. Care must be taken by management to balance all aspects of the budgeting process in order to obtain the maximum overall benefit from these six advantages.

Crowningshield and Gorman (1979 : 410) mentioned that a budget performs five broad functions: (a) planning, (b) co-ordination, (c) communication, (d) motivation and (e) control and then continue to discuss each one of these functions individually. These functions are applicable to all operational areas in the company, such as production, marketing, sales and distribution. It is important to note that these budget functions and objectives are not independant of each other. In fact, one cannot be achieved without the others.

The budget emphasises that all divisions of a company are working towards a common goal, and to be effective, budgeting must be a mutual effort with active participation at all levels.

In general, it is the purpose of distribution cost budgeting to determine planned levels of expenditure, type of expenditures and at what time these expenditures should be incurred in order to produce expected sales results.

Budgeting is a tool of control used by management, in the sense that actual results are compared to the budget, variances from budget are noted and the causes of these variances are determined. However, the most important aspect is to determine what corrective action should be taken to prevent these variances in future. There are some instances where no action can be taken on variances from budget but then it should be explained to management by the person responsible for that expense item. An example of such a variance could be a major increase in warehouse rental that was not catered for when the budget was prepared or a major increase in railage tariffs.

Neuner & Deakin (1977 : 363) state that the first limitation of a budget is the fact that at best a budget is only an estimate and that no one knows precisely what will happen in the future.

It is important to note at this stage that management should not lose sight of the concept of management by exception and their time and efforts should be directed towards matters which are not going according to plan. These divergencies from plan should be approached in order of importance and time should not be spent on unnecessary or trivial matters.

A budget cannot be a substitute for management. To the extent that the budget is based on sound forecasting, co-ordination of all departments, and followed up by continuous review, it can help bring profits and success. Good management and a good budget can do much together, but a good budget can do very little by itself.

2.3.2 The budgeting process

The first steps in budgeting are to convince management of the advantages of budgeting and adjust accounting systems to fit the needs of the budget program: Crowningshiield and Gorman (1979 : 413). The distribution budget forms part of the master budget of a company.

Figure 2.1 illustrates the relationship of the distribution cost budget to the other functional budgets in a company. It is important to note at this stage that without the sales budget not one of the other budgets can be completed. Certain fixed cost items can be determined but that is where the process will end.

An accurate sales forecast is thus imperative. It is often found that once a master budget is completed and accepted by management, such a budget is used as the basis for determining medium or long range plans such as a "five year plan". Figure 2.2 illustrates the relationship between forecasts, budgets and long term plans, as proposed by Batty, (1970 :61).

When preparing and developing the distribution expense budget, certain steps should be followed. Before discussing these steps, it must be mentioned that these steps can vary with different companies and this will largely depend upon factors as indicated in figure 2.3.

The steps to be followed are:

Sales volumes by product and by sales area should be determined and this will lead to deciding a manufacturing policy. The result of this is that it will be known where products will be produced especially in a company with decentralised production facilities. Inventory levels should also be considered at this stage. It is now possible to determine what distribution activity is required by the distribution centre. It is important to note that the budget should be based on actual expectations and that is what the sales forecast is all about.

The second step is to determine exactly what facilities will be required to accomplish the distribution task as set by the sales forecast. These facilities will include all the various aspects

of physical distribution of goods, logistical management, transportation, warehousing, and other requirements. At the same time it must be determined what the use of these facilities will cost the company and these costs should be classified according to functions and major activities (such as administration, warehousing or transportation), and in some instances by territories.

The third step will be to determine which expenses are direct and which are indirect. This is necessary for control purposes. Individuals are held responsible for those expenses over which they have direct control. This step also contains the separation of expenses into fixed, semi-variable and variable items.

The fourth step is to combine these costs in a meaningful format and after final approval this should be submitted to the budget controller or the person responsible for preparing the corporate budget.

The fifth and final step will be the implementation of the finalised distribution cost budget with the commencement of the period that the budget was set up for.

2.3.3 Problems in budgeting for distribution costs

Like manufacturing costs, distribution costs show non-variable, semi-variable and variable behaviour patterns in relation to volume, but a much smaller number of distribution costs are variable than variable manufacturing costs. *The bulk of distribution costs is made up of committed or programmed costs, both of which tend to be non variable on a short run basis. (Crowningshield and Gorman, 1979 : 502).* This characteristic of distribution costs contributes to the complexity of budgeting for distribution costs on the one hand, but also to the simplicity of budgeting for distribution costs on the other. It is

normally relatively easy to budget for fixed costs such as salaries and wages, rent, depreciation or insurance, provided that it is determined carefully and accurately what is to be insured, rented, depreciated or who is to be paid a certain salary. Added to the more complex side of budgeting for distribution costs is the fact that, because of the more fixed nature of distribution costs, it is very difficult to set a variable budget for distribution costs, not to mention the allocation of distribution costs to various product lines of a completely different physical nature and also different selling values per unit.

Another factor that contributes towards the difficulties in budgeting for distribution costs is the fact that distribution activities are more flexible than production activities and also very difficult to standardise and the implication of this is that distribution performance is more difficult to measure.

Distribution costs are largely joint and indirect costs, not readily assignable to specific products or product lines, and because these joint costs constitute a larger proportion of total costs than in the production area, they are even more troublesome than production costs, whether one is looking at budgeting or analysis of actual costs.

2.3.4 Distribution Cost Standards

Only by analysing distribution costs after these costs were incurred, is not a measurement of performance. Standards are required to judge distribution performance and signal its weaknesses. Cost analysis of distribution costs indicates what costs have been, but what costs should have been is just as important as achieved actuals, and the combination of standard and actual costs (which results in variances) will also give a good indication of what can be expected in future.

Frey (1935 as quoted by Heckert, 1940 : 209) said that:
"Only by comparison with an expected level of accomplishment can performance really be measured at a given time. Last year's results or the average of results over a period of years do not constitute reasonable goals or achievements for the activities of the coming year."

From this it follows that as for production costs, standards can be set up for distribution costs, although it may be quite difficult or even impossible to set standards for each and every distribution activity.

Heckert, (1940 : 209) said that: "If no one is competent to judge what distribution effort is necessary to secure certain results and what it will cost to do it, then management must indeed be in a helpless position."

Standards are criteria of satisfactory performance under existing conditions and circumstances and not an unattainable ideal or mark to shoot at. Setting standards are not only a requirement for performance measurement itself, but also result in cost control, although these two concepts are very closely related and overlap to a large extent. In fact, cost control is the performance measurement against a predetermined standard of individual activity.

As mentioned, the fact that a large number of distribution cost items are fixed, assist towards making standard setting for distribution costs more simple.

Referring to the distribution expenses indicated in appendix 2.1, a closer look will now be taken at setting standards for these expenses.

Salaries: The first step in determining standards for salaries, is an analysis of functions to be performed and positions to be held by monthly paid employees. A schedule should then be pre-

pared indicating the following:

Name of employee

Position held

Current salary

Salary at beginning of the period for which standards are
set

Planned increase and at what time

This schedule must be completed for each month of the period that the standards are set for. Due to the confidentiality of this matter, this will be completed by the various department heads (Administration, Transportation and Warehousing). Total salaries for each month can then easily be determined. Provision should also be made for current vacant positions.

Employee benefit expenses:

The company's contribution or obligation towards these expenses are known and are normally confirmed by the corporate personnel division

From the schedule of salaries as described above, it is then easy to calculate what these expenses will amount to.

Employee services:

Canteen expenses can be determined from contracts with the outside suppliers that provide this service. It can happen that this service is provided internally, and a much more detailed plan will then be necessary. Staff welfare is normally left to the discretion of management and an amount is simply estimated for this purpose (normally based on historical figures plus an increase)

Travel and entertainment:

This expense item is to provide for the occasional small function and travelling expenses incurred by permitted personnel in performing certain duties.

Normally this is not a significant amount and is treated as a fixed expense.

The amount is determined by analysing historical figures and also an analysis of the activity that took place.

Rental:

Rental for offices and equipment can also be determined from contracts with the suppliers of the service.

Negotiations with the suppliers will indicate what increase in charges can amount to if this cannot be determined from the contract.

If these payments are made annually the amount can be divided by twelve to arrive at a monthly figure.

Purchased services:

Contracts are normally entered into with suppliers of fire protection equipment, waste removal companies or security companies. These expenses can also be easily determined from these contracts and are treated as a fixed monthly expense, although charges for waste removal can vary according to the number of truck loads etc. For maintenance and repairs to administrative vehicles, it is necessary to estimate the average distance to be travelled monthly in order to determine the frequency of services to these vehicles. An average cost for the servicing of these vehicles can then be applied to the number of services required during the year.

Operating supplies:

Firstly, it is necessary to estimate the quantity of these supplies to be used monthly. By applying estimated prices, costs can be determined. The analysis of distances travelled by administrative vehicles in the previous section can assist in determining the fuel consumption of these vehicles.

Insurance :

Vehicle insurance can be determined by applying the rate per vehicle to the number of vehicles, and divided by twelve to arrive at a monthly insurance cost.

Professional and Financial Services:

This cost is also very much an estimated monthly cost which is determined by management's expectation of how often this service will be used.

Sundry services:

Normally the total for these expenses doesn't fluctuate too much from month to month and the standards are then based on historical figures and expressed as a fixed monthly amount.

Depreciation:

A fixed monthly amount is determined from the asset register and accounting records.

The depreciation of new assets should also be included in the standard.

It is then possible that the depreciation standard can vary between two months.

A carefully assembled and approved capital expenditure plan will

assist in determining the additional depreciation.

Labour cost standards:

Setting standards for labour costs in distribution is a lot more complicated than in manufacturing.

Labour cost standards consist of two parts:

- (a) Labour rate standards.
- (b) Labour time or quantity standards.

The labour rate standards are fairly easy to determine. As with salaries, an analysis should be done of current actual rates paid to each individual, expected increases and timing of increases. Rates can also be determined through Union contracts, or negotiations. It is more difficult to determine labour quantity standards. In manufacturing, total standard hours are determined by multiplying a standard per activity unit (units produced or machine hours operated) by the number of activity units. This standard per activity unit is determined by industrial engineers using time and motion studies, average past performance at estimates based upon experience and knowledge of the manufacturing operation and the product. The problem with distribution is that it is more difficult to arrive at some activity measure to be used as a basis for setting quantity standards.

A suggestion is that management and supervisors determine how many hourly paid employees will be required to perform the necessary tasks in physically handling the forecasted sales volumes for the coming period. This will include activities such as receiving, storing, truck loading and deliveries. The next step is to classify the required labour (skilled, semi-skilled or unskilled) for the various positions, and determine the number of hours each labourer will have to work. The

necessary labour rates can then be applied to these hours to determine total labour cost. In the period that standards were set for, the actual labour cost can then be compared to these set standards and the labour quantity and rate variances can be determined. It is important to note at this stage that the standard to which the actuals are compared, are not as a result of the specific activity or volume achieved during the month (as is the case with a manufacturing department), but as a result of a predetermined activity.

Other problems with determining distribution labour cost standards are:

Labour cost is to a large extent a fixed cost. Activity has no real influence on labour cost. For example if a company delivers 10 000 cases of product on the one day and 12 000 or 8 000 on the following day, the normal labour cost will be the same for the two days (assuming the same number of employees worked the same number of normal hours on these two days, so management cannot adjust the number of employees on a daily basis to suit the required workload). One aspect of the labour cost that could vary between the two days, will be the amount paid for overtime premium.

The second aspect is that, unlike in a manufacturing department, labour does not consist of the same repetitive actions from day to day, and trucks and their crews do not follow the same route every day or deliver the same number of cases of the same product mix to the same customer as the day before.

Product mix is another problematic factor. Products can vary in size, weight and sales value per case within a product line, but a standard unit factor can compensate for that when it comes to cost allocations, or simply just to determine a common reporting

unit. The real problem, however, exists when one wants to compare various product lines with each other. There can be a vast difference between two products from different product lines when the following ratios are considered:

1. Case/weight ratio,
2. Case-cube ratio, or
3. Sales value per case.

A typical example can be found in the paper product industry when comparing the case size, weight per case and selling value per case of facial tissue to that of industrial towel products.

These are just three of many factors that contribute towards the difficulty in determining an activity base for labour cost standards. Another suggestion can be to determine activity for labour cost standards as follows:

Firstly, a clear separation should be made between all the various "operating departments" as indicated in the following example:

Warehouse departments:

Receiving area.

Product handling or circulation

Order assembly

Shipping

Transportation department:

Delivery

The next step will be to determine the exact labour complement in each of these areas, and then the labour cost standard as indicated in appendix 2.2. The hours per month and the rand value per month can now be used as standards for determining variances. It should be noted that it will be best to calculate

variances for each occupation separately, in order to eliminate a mix factor between the total quantity or efficiency variance and the total labour rate variance. For the same reason variances for normal labour and overtime premium should also be calculated separately.

Outbound Freight Standards:

Setting these standards could be complicated by the same factors discussed in the previous section (case/weight ratios, product mix etc.). The easy way out is to treat outbound freight costs as a fixed cost to the amount that was spent in any particular month. This is not correct, as outbound freight costs do vary with volume shipped. One way of setting standards is to treat all units on a weight basis, and after allocation of these costs to various product lines, calculate a cost per standard unit.

From the above discussion, the conclusion is that there are only two of the major distribution cost items that are really variable in relation to volume. These are:

Fuel consumption and other vehicle costs

Outbound freight for goods shipped by means of outside transport.

2.4 FORECASTING OF DISTRIBUTION COSTS

2.4.1 Forecasting as a sub-phase of budgeting

Harper (1976 : 42) mentioned that "... a forecast is a prediction of what will happen as a result of a given set of circumstances. From this it follows that a forecast is a judgment that can be made by anybody (provided they are competent to make judgments)..."

According to Dobson (1969 : 21), forecasting in distribution

management is concerned with determining:

The long-term demand, in terms of characteristics, qualities and values for the goods and or services supplied by the undertaking itself, and the long-term capacity of the industry and of the undertaking to meet the forecast demand.

The short-term demand for the goods and or services provided by the industry and by the undertaking itself, and the short-term needs of the industry and of the undertaking which will enable it to supply the forecast demand.

The long and short term trends in methods of distribution, particularly methods which enable efficiency to be increased and distribution costs to be reduced.

Although Dobson mentioned cost reduction, the importance of forecasting distribution costs based on future marketing and selling expectations cannot be overlooked. Even more important, is to forecast how future distribution costs will fit in with corporate profit objectives.

Batty (1970 : 88) said the following about the forecast period:

"Forecasts can be divided into long-term and short-term forecasts. Long-term forecasts can cover a period from present to, say, five or ten years ahead. How far ahead the forecast can go depends on the nature of the industry and certainly beyond ten years the future becomes so uncertain that the projection becomes rather dubious. In manufacturing companies the long-term forecast deals with expenditure investments and with the products which can be manufactured with the use of those investments once they have materialised as fixed assets. Within a particular industry there will be key factors which will give

an indication of likely events and trends. These have to be recognised, and each business has to keep itself informed of

- (a) the likely prospects for the industry as a whole and
- (b) the possible share of the market which can be gained by the business concerned."

Sales volumes are the foundations of a budget. Without sales volumes the budget cannot be completed, but a sales forecast is not merely an essential input to the budget. This is supported by the following statements:

"A good forecast is the key to effective inventory control. If management knows with some degree of certainty the expected demand upon the inventory, customers can be satisfied and costs can be minimised. It is important that a forecast covers the time lapse required for decision making and the necessary time to allow the decision to become effective." (Mossman and Morton, 1965 : 329).

"The fundamental input to planning and co-ordinating logistical operations is a forecast of customer demand." (Bowersox, 1974 : 103)

Many forecasting techniques have been developed in recent years. Each technique has its special use and the correct technique has to be selected for a particular use. The selection of a method depends upon many factors:-

- The context of the forecast
- The relevance and availability of historical data
- The degree of accuracy required
- The time period to be forecast
- The cost/benefit of the forecast to the company

Time available for making the analysis

(Chambers et al., 1971 : 57)

Appendix 2.4 indicates the various forecasting techniques that can be used, the accuracy of these techniques over short-term, medium-term and long-term periods, the degree of identification of turning points and typical applications. (Chambers et al., 1971 :57) These techniques are included as prescribed by Chambers et al., (1971 : 57) as no discussion will take place of the individual techniques. Although many of these techniques can be applied with reasonable accurate results, it will always be impossible to arrive at a final correct answer. Jones and Twiss (1978 : 14) said that:

"The role of forecasting is not to provide definitive predictions of what will happen in the future. This is clearly impossible. It can, however, assist in clarifying the future consequences of current developments in the absence of unforeseen events."

Accuracy is something that should always be aimed at, but the most accurate forecast can be the one where the answer is to be found between two boundaries. Figure 2.4 is a simple illustration of a sales forecast after actual experience of four years. The idea is that two forecasts are prepared after year four. One is an optimistic forecast and the other is a pessimistic forecast. Future sales figures can be found anywhere between these two forecasts in the area called the "solution field". It should be remembered that a forecast is only a guess at the future and should therefore never be considered as a rigid guideline. It is important to look at all forecasts as highly flexible indications of the future. Referring to fig. 2.4 an analysis should now be completed to determine the position of a possible solution within the solution field. This concept is also confirmed by Batty (1970 : 4) in the following statement:

"There are those who would prefer to see an upper and lower limit to be set when forecasting sales or profit."

2.4.2 Forecasting as an extension of the budget

Forecasting in a broad sense is the estimation of the future behaviour of certain variables. These variables can include items such as demand for a product, behaviour of costs in relation to sales or in many instances can serve as a tool for performance measurement. (Constantia, 1966 : 74)

The latter will be addressed more closely in this section.

Generally a budget is set for a period of one or two years. In preparing this budget, certain predictions are made, such as sales volumes for the budget period, manpower resources and utilisation of manufacturing capacity. On the other hand, predictions are also made for distribution activity to take place, such as warehouse utilisation, distribution methods, and distribution costs. Normally a few months will lapse before the budget comes into effect. For example the budget for a specific year can be prepared and finalized in say September of the preceding year. Certain assumptions or plans could have been built into the budget, but these are not realised in the period that the budget was set for. The following can serve as an example for items included in a budget but were not implemented or achieved as planned:

Acquisition of additional delivery vehicles is delayed for a few months.

Rental of an additional warehouse not possible as planned, as the construction has not been completed.

Use of outside transport as own fleet is incapable of delivery as planned.

These are three hypothetical cases of changes to a budget plan. To use the original budget as the only yardstick for performance measurement is not advisable. It is then necessary to determine an additional yardstick to be used as basis for performance measurement. In this sense the forecast is an extension to the budget.

The forecast as an extension of the budget is not at all removing the fact that management is absolutely committed to the budget. The introduction of the forecast is only providing another standard for measuring performance.

Results are compared to both the budget and the forecast ("updated budget"), variances are determined, analysed, and corrective action should be taken. All planning, decision making and financial analysis activities are focussed on profit maximisation. For that reason, the illustration that follows is done on an earnings statement basis. Appendix 2.5 indicates the budgeted earnings statement for a specific product line, and the forecasted earnings statement after the actual results for the first 6 months are known.

It is obvious that the forecasted year end profit will be more accurate than the budgeted profit. There is a twofold reason for that:

- (a) The forecast for the year already includes part of the actual results for the year.
- (b) As the year proceeds, certain cost factors are known such as prices, labour rate, etc. and a more accurate prediction of costs can be made.

The forecasting process is very much the same as for the budget. In short, sales volumes are predicted by product line and sales area and this information is then used as a basis for the prediction and planning of distribution activity and costs. All distribution cost items are investigated and the total distribution costs for each month of the forecast are predicted. See appendix 2.1 for distribu-

tion cost items. The objective is to determine what changes from the budget can be expected and what the effects of these changes will have on distribution costs (or all cost items for that matter) and on profit over a period of time.

Constantia (1966 :74) said that: "The goal of forecasting is to predict not only whether a change in demand will take place, but also the direction and magnitude of that change."

In preparing a forecast, there are various factors that should be considered in order to achieve the desired result. Appendix 2.3 indicates some of these factors. Depending upon the objective and purpose of the specific forecast, some of these factors might be overlapping and some of them need not be considered, but the idea is to indicate the field that should be covered when preparing a forecast.

One of the problems with forecasts is, according to Snadden (1980 : 26) that -

"The past and present is all that is known and any forecaster is biased by this knowledge", and also "The problem appears to be able to find a person who may be both at the forefront of much discovery, and who is not prejudiced by his knowledge alone."

Although Snadden is referring here to a person with forecasting and "discovery" abilities, the possibility that: a combination of (a) communication between divisional managers in planning and decision making and (b) carefully analyzed input data, will result in a forecast that is just as good, cannot be overlooked.

When forecasting is used as an extension of the budget, it must be remembered that managers will be held responsible for results achieved against the forecast. It is therefore necessary to en-

courage active participation in the forecasting process. Management that feels committed to the forecast will ensure a good quality of input for attainable results.

2.4.3 Cost Behaviour Patterns

A knowledge of cost behaviour patterns is essential in accurate cost and profit forecasting, decision making and performance evaluation.

Cost behaviour means the change in the level of cost experienced that corresponds to (or results from) a change in the level of activity or input associated with the cost. Houck, (1979 : 22)

According to Sorgdrager and Tromp (1977 : 18) costs can be classified as follows:

- (a) Fixed costs
- (b) Variable costs
- (c) Semi-variable costs

Fixed costs do not change with fluctuations in activity or capacity. (See Matz and Usry, 1976 : 543)

Sorgdrager and Tromp (1977 : 18) mentioned that fixed costs can increase or decrease if there is a substantial change (increase or decrease) in the level of activity.

An example is an increase in volume to such an extent that additional delivery vehicles must be acquired or an additional warehouse must be rented.

Matz and Usry (1976 : 544) confirmed this by the following statement: "In the long run, all expenses are variable. Some fixed expenses, however, can be changed in the short run because of changes in volume of activity or for other reasons (e.g. the

number and salaries of management groups) and are sometimes called *programmed fixed expenses*."

Other fixed expenses (e.g. depreciation or a long-term lease agreement) may commit management for a much longer period of time; they have, therefore, been labelled *committed fixed expenses*. Crowning-shield and Gorman (1979 : 13) see fixed costs as "... costs incurred in providing the capacity to do business - the costs of being in business."

Matz and Usry (1976 : 543) held the view that "... fixed expenses acquire the fixed characteristic through the dictates of management policy, and as management decisions create fixed costs, other decisions can alter the circumstances and change a fixed item both to its classification and amount."

Batty (1982 : 47-48) also said that "Fixed overhead costs are incurred as a sort of policy. Managers who can change policy can therefore change these costs."

The result of this is that, over a period of time, the fixed cost graph will follow a step pattern and not the conventional horizontal line.

Fixed costs are sometimes referred to as *period costs*. The reason for this is that these costs will be incurred for the *period*, whether there is a large or small volume of production.

Matz and Usry (1976 : 556) mentioned the following as the "value" of determining cost behaviour: "... is necessary in order to plan, analyse, control, measure or evaluate:

1. Departmental expenses allowed at various levels of activity
2. Operating efficiency of a department
3. Contribution margin and direct costing

4. Utilisation of facilities
5. Break-even point and cost-volume-profit situation
6. Marketing profitability of territories, products and customers
7. Company profit structure
8. Differential and comparative cost decisions
9. Proposed capital expenditures
10. Effect of alternative courses management might wish to follow."

There are various methods that can be used for separating mixed costs into fixed and variable components. It is sometimes assumed in practice that cost separation can only be applied to manufacturing costs. However, this is not the case. These methods of cost separation can just as easily be applied to the marketing, selling and distribution areas. One requirement is that any amount of mixed or semi-variable cost must be linked to some sort of activity. It is quite logic that without activity, there will be no variable cost. Appendix 2.8 is a brief summary of methods that can be used for cost separation.

See also : Sorgdrager and Tromp (1977 : 511-517)

Tucker (1981 : 22-24)

Matz and Usry (1976 : 546 - 555)

Hechter (1983 : 93 - 96)

Crowningshield and Gorman (1979 : 359 - 365)

Variable costs are expected to increase or decrease in proportion to activity.

Sorgdrager and Tromp (1977) as quoted by Hechter (1983 : 47) mentioned that variable costs can be classified as follows:

- a. Costs that change in direct proportion to activity
- b. Costs that change disproportionately to activity.

Disproportionate costs can then be divided into:

- i. Progressive changes
- ii. Degressive changes

Crowningshield and Gorman (1979 : 13) said that: "Variable costs are incurred in utilising the available capacity and represent the costs of doing business as opposed to the costs of being in business."

Semi-variable costs display both fixed and variable characteristics. It is simply a mixed cost containing a fixed and a variable component and an example is transportation costs. Transportation costs consist of depreciation (fixed) and fuel consumed (variable). As a result of the fixed element costs will never drop to a zero level even if activities have been stopped completely. The problem in practice is that semi-variable costs must be split and the fixed and variable elements separated for accurate forecasting, budgets, decision making and performance evaluation.

Appendix 2.6 is an example of why it is necessary to separate fixed and variable elements of semi-variable costs.

Figure 2.5 is an illustration of the basic cost behaviour patterns that were discussed in this section.

Factors influencing cost behaviour are briefly discussed in appendix 2.7.

The discussed cost behaviour patterns are also applicable to distribution costs when analysed in relation to volume. The only difference between manufacturing and distribution cost behaviour patterns is that a larger number of distribution costs are fixed. The bulk of distri-

bution costs are made up of committed costs and programmed cost. As with manufacturing costs, distribution costs are also classified as direct and indirect costs, but it is a lot more difficult to trace direct distribution costs to various products or product lines. If an analysis is directed towards the various distribution functions, it is easier to trace direct costs.

Crowningshield and Gorman (1979 : 503) referred to the problem of direct and indirect costs in saying: "In the interest of accuracy, as many costs as possible should be classified as direct and then traced to segments. As the number of indirect costs mounts, the need for allocation increases, the problem of analysis becomes more acute, and the results of the analysis begin to lose their validity. The reliability of any study is dependant on the allocations that are made of indirect costs. No analysis can be any better than the assumptions behind the allocations."

2.5 SUMMARY

The main function of the physical distribution of goods in the long run is to improve the service to customers, and in doing so is assisting the marketing and sales divisions in achieving their objectives, one of which is to achieve the best possible sales results.

All divisional objectives would support the corporate objectives. Budgeting for distribution operations enforce planning and control, but is also a tool that improves communication and co-ordination. Realistic budgets also serve as a motivation instrument. In essence, the budget is the plan of the company expressed in financial terms. This plan is also related to the corporate objective of the company. The important factor is that good management and a good budget can do much together, but a good budget can do very little by itself.

It is difficult to set a variable budget for distribution costs due to the semi-fixed nature of these costs.

Sales volumes are the foundations of a budget and to forecast these volumes accurately is of the utmost importance. Accuracy in forecasting is not always a requirement, but the degree of accuracy is determined by the purpose of the forecast. Another important application area of forecasts is inventory control, as planning and decisions regarding items such as inventory levels and storage space demand a lot of management attention. Accuracy cannot always be achieved and the conclusion is that depending on the purpose of the forecast, optimistic and pessimistic boundaries can indicate a solution field.

Another purpose of forecasting is to serve as an extension of the budget. Since the time the budget was set, changes in operations could have taken place that affected distribution operations. To use an outdated budget as a yardstick for performance measurement, will give a false impression of efficiency, and the forecast is a tool to update the budget. Although a budget could be "updated", management's commitment to the budget cannot be removed, but management also becomes committed to the forecast.

Cost behaviour patterns should be considered when a forecast is prepared, as not all costs reveal the same behaviour with changes in activity such as volumes or hours operated.

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PORATE OBJECTIVES

FIG. 2.3 FACTORS INFLUENCING THE DISTRIBUTION COST STRUC-
TURE

FIG. 2.4 SALES FORECAST

FIG. 2.5 COST BEHAVIOUR PATTERNS

FIGURE 2.1

THE INTER-RELATIONSHIP OF FUNCTIONAL BUDGETS

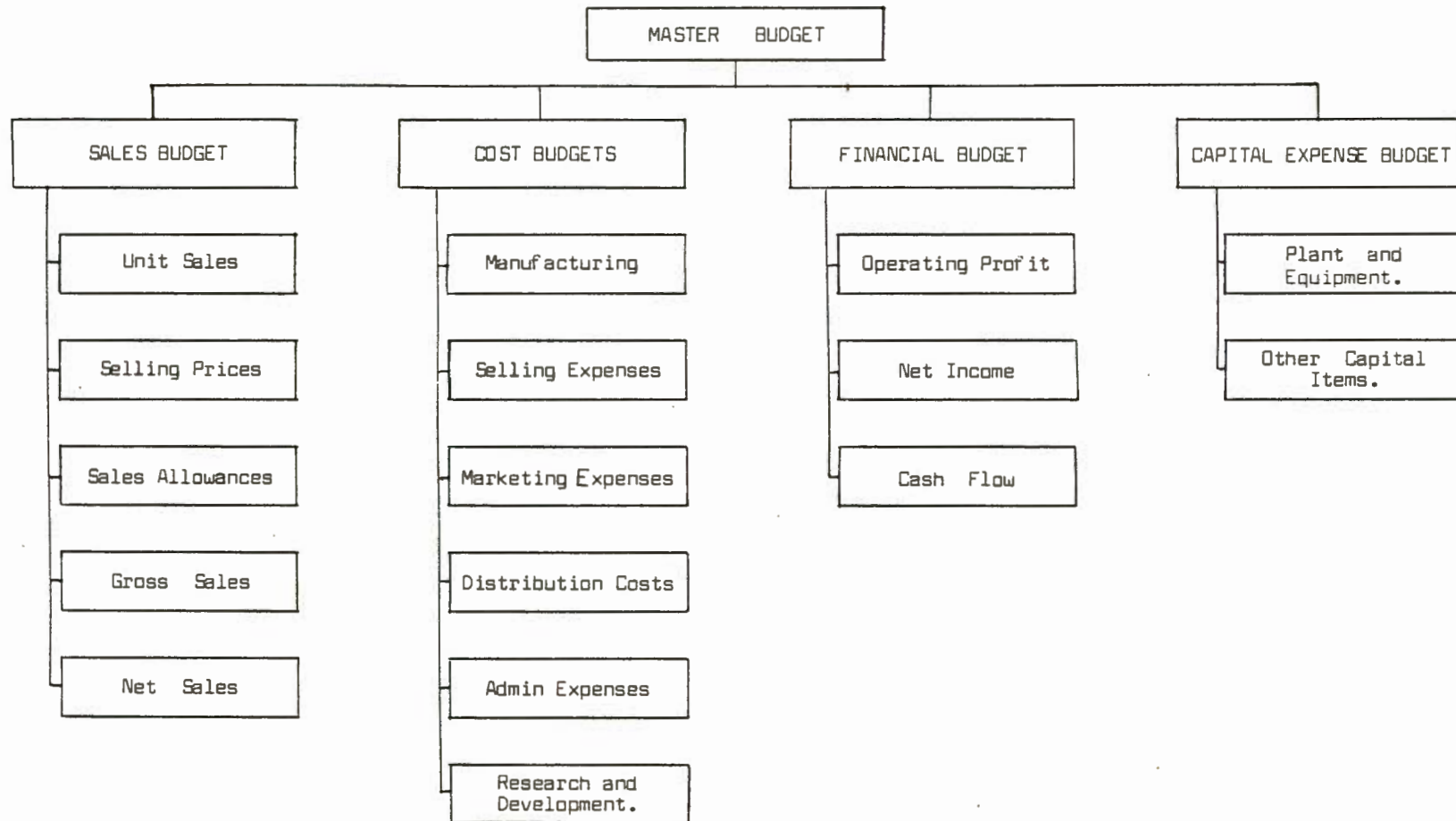


FIGURE 2.2

ACCOUNTING RELATIONSHIP BETWEEN LONG AND SHORT-TERM FORECASTS AND BUDGETS FLOWING FROM CORPORATE OBJECTIVES

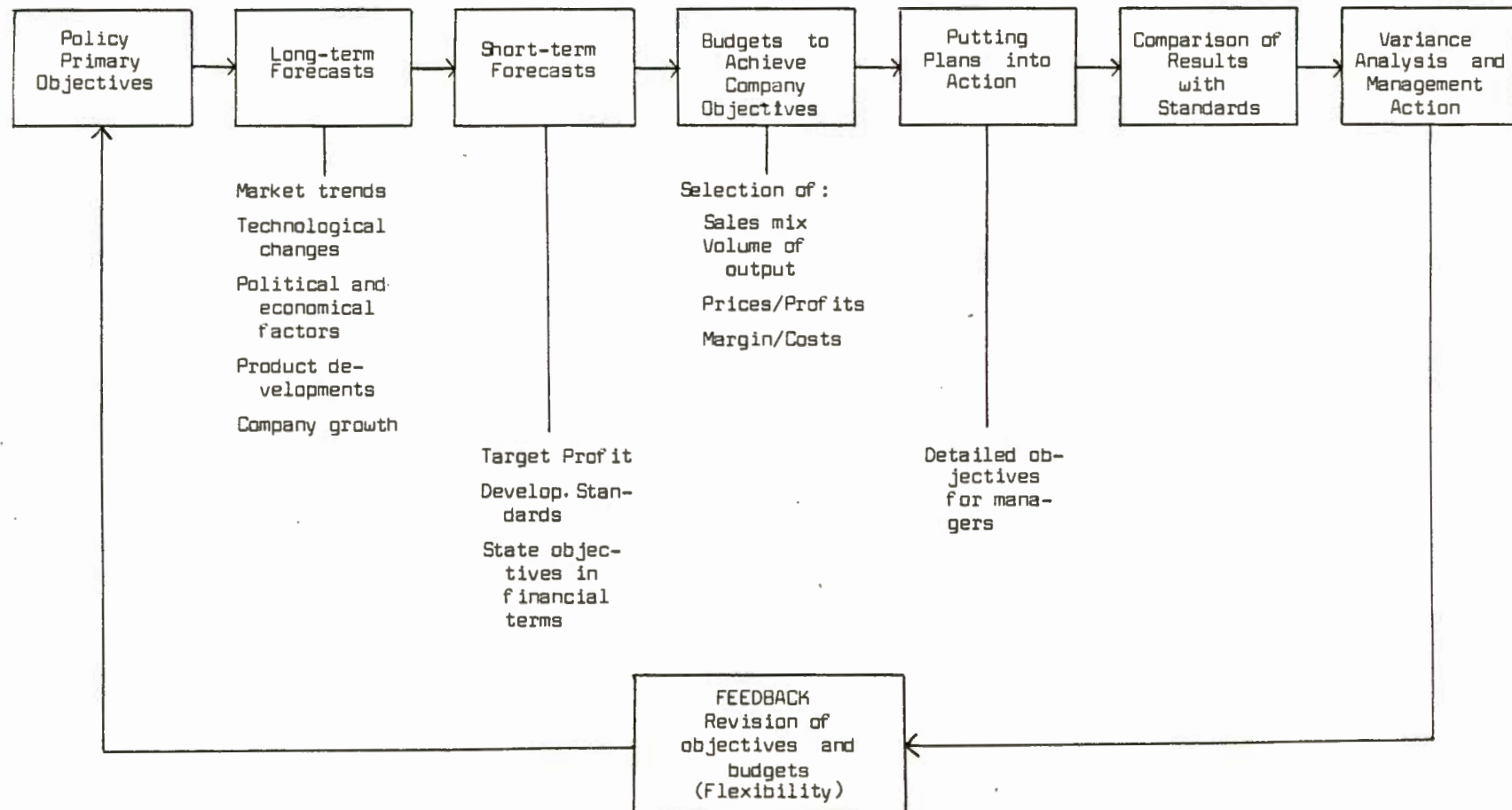


FIGURE 2.3

FACTORS INFLUENCING DISTRIBUTION COST STRUCTURE

Size of the company or organisation

Variety of products manufactured and sold

Organisational structure

Customer services policy

Distribution policy

Logistical management

Accounting and Management information systems

Manufacturing locations

Sales areas

FIGURE 2.4

SALES FORECAST

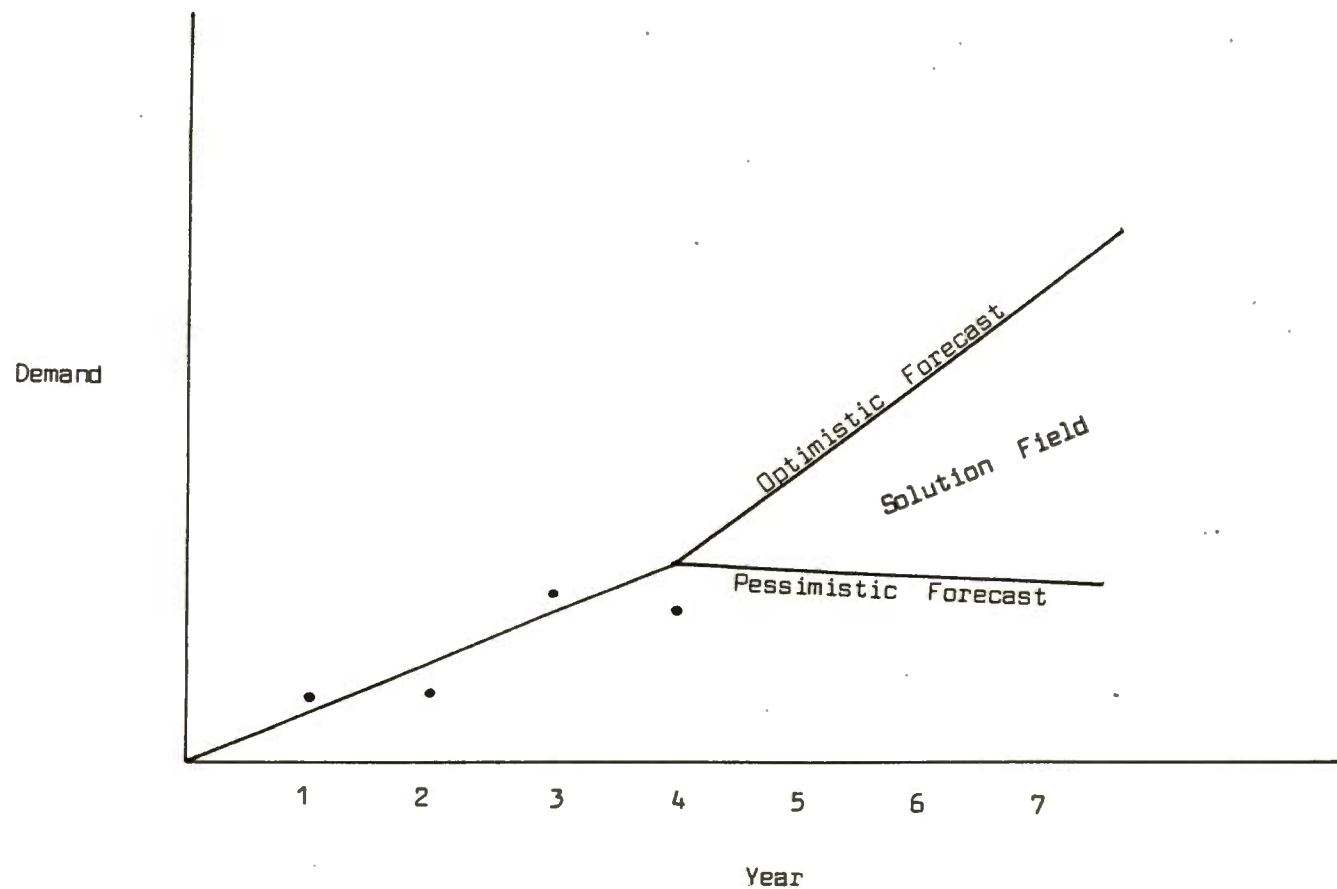


FIGURE 2.5

BASIC COST BEHAVIOUR PATTERNS

FIXED COST:

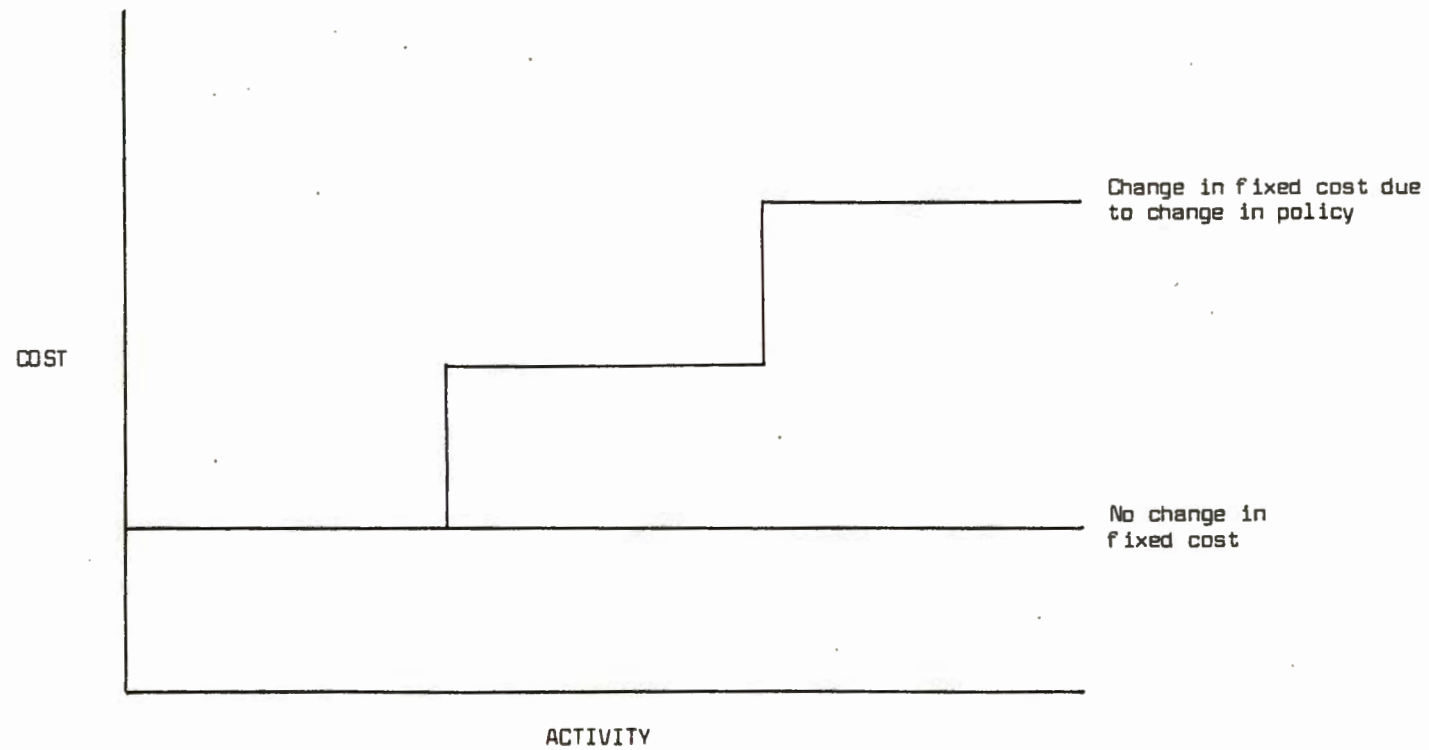


FIGURE 2.5 (Continued)

VARIABLE COST :

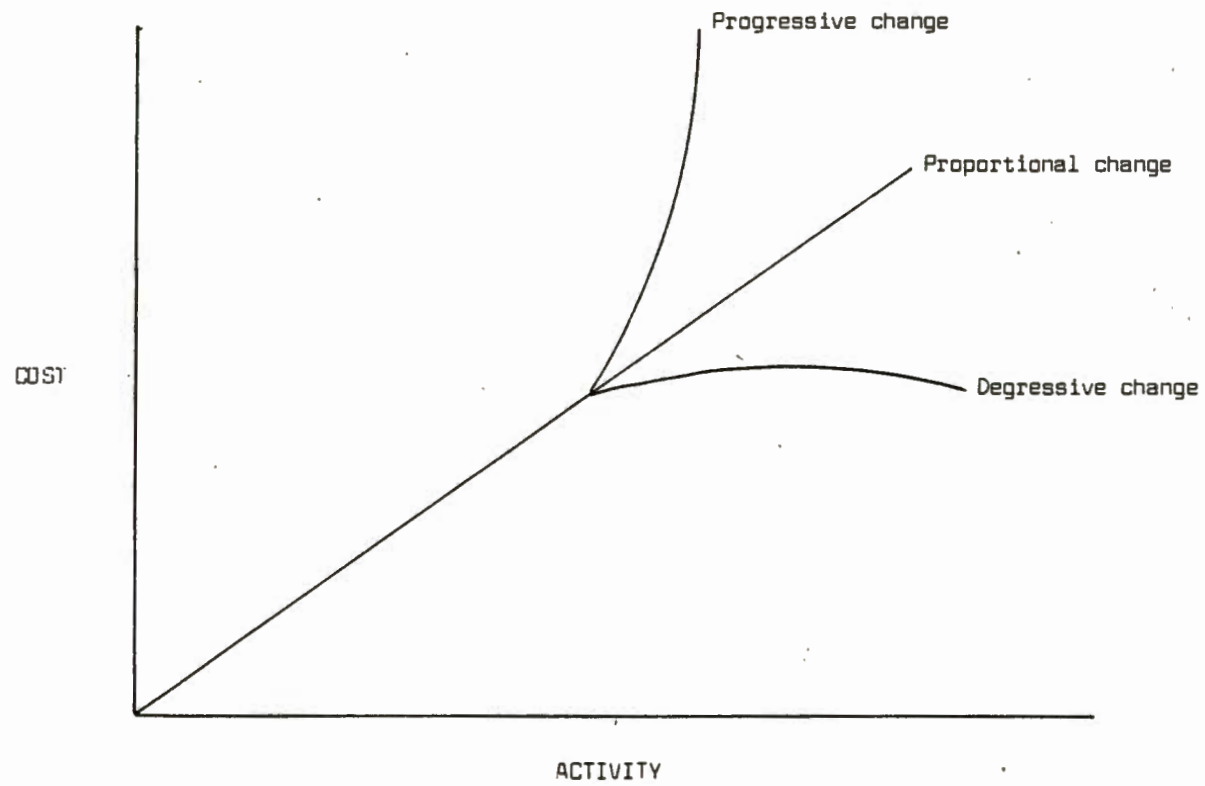
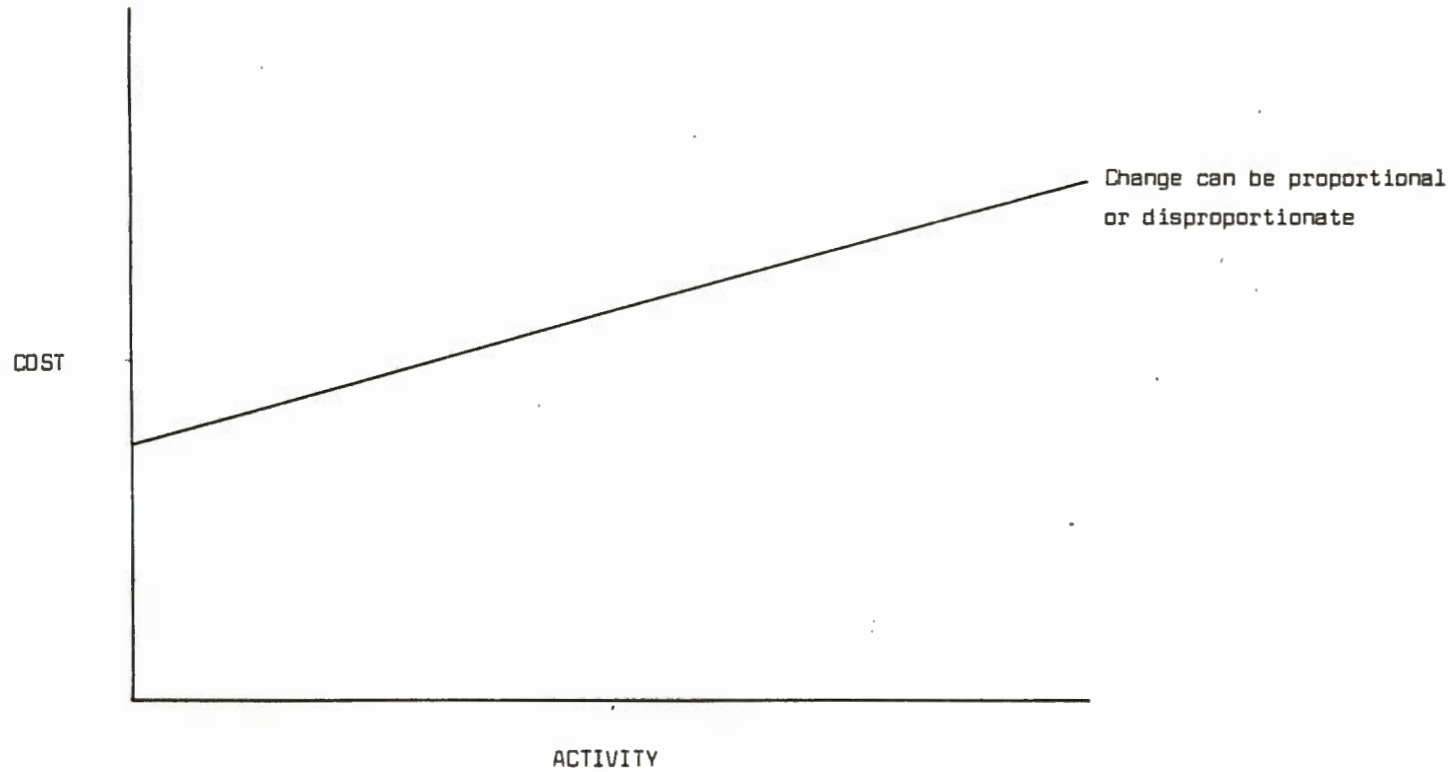


FIGURE 2.5 (Continued)

SEMI-VARIABLE COST:



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APPENDIX 2.1

DISTRIBUTION EXPENSES (ADMINISTRATION)

SALARIES AND WAGES

Administrative salaries and wages
Salaries in lieu of vacation
Outside administrative labour
Bonuses
Overtime premium

EMPLOYEE BENEFIT EXPENSES

Unemployment taxes
Workers' compensation insurance
Funded pension plans
Employee benefits - medical aid
Miscellaneous employee benefits

EMPLOYEE SERVICES

Canteen
Staff welfare

TRAVEL AND ENTERTAINMENT

Local travel
Entertainment

RENTAL

Offices
Office equipment rental

PURCHASED SERVICES

- Purchased fire protection
- Maintenance and repairs to administrative vehicles
- Office equipment maintenance
- Miscellaneous purchased maintenance
- Waste removal
- Purchased security

OPERATING SUPPLIES

- Stationary and printing
- Cleaning materials
- First aid and safety
- Fuel usage - administration vehicles

INSURANCE

- Administrative Vehicles Insurance

PROFESSIONAL AND FINANCIAL SERVICES

- Staff recruiting
- Computer Bureau Services
- Other professional services

SUNDRY SERVICES

- Telephones
- Telex
- Postage
- Subscriptions

DEPRECIATION

- Depreciation on administrative vehicles
- Depreciation on furniture, fixtures and equipment

DISTRIBUTION EXPENSES (TRANSPORTATION)

SALARIES AND WAGES

- Transportation salaries and wages
- Salaries in lieu of vacation
- Outside hired labour
- Bonuses
- Overtime premium

EMPLOYEE BENEFIT EXPENSES

- Unemployment taxes
- Workers' compensation insurance
- Funded pension plans
- Employee benefits - medical aid
- Missellaneous employee benefits

OPERATING SUPPLIES

- Diesel, fuel and gasoline usage
- Lubricants
- Cleaning materials
- Protective clothing
- First aid and safety equipment

OUTBOUND FREIGHT

- Railage to customers
- Railage to branches
- Railage to agents
- Road trans-shipments to customers
- Road trans-shipments to branches
- Road trans-shipments to agents
- Shuttle service costs

Road transport hire costs
Demurrage charges

DEPRECIATION

Depreciation on trucks and trailers
Depreciation on fixtures and equipment

PURCHASED SERVICES

Vehicle maintenance : Repairs
Vehicle service
Tyres
Miscellaneous maintenance
Purchased fire protection

INSURANCE AND LICENCES

Vehicle Insurance
Other Insurance
Vehicle Licences

DISTRIBUTION EXPENSES (WAREHOUSING)

SALARIES AND WAGES

- Administrative/Supervisory salaries
- Operating Labour
- Salaries in lieu of vacation
- Outside labour
- Overtime premium
- Bonuses

EMPLOYEE BENEFIT EXPENSES

- Unemployment taxes
- Workers' Compensation insurance
- Funded pension plans
- Employee benefits - medical aid
- Miscellaneous employee benefits

OPERATING SUPPLIES

- Diesel, fuel and gasoline usage
- Lubricants
- Cleaning materials
- Protective clothing
- Packing supplies for repacking
- Stationary and printing

DEPRECIATION

- Depreciation on: Light trucks
 - Tractors and trailers
 - Forklifts and clamp trucks
 - Furniture, fixtures and equipment

PURCHASED SERVICES

Vehicle maintenance: Repairs
Service
Tyres

Miscellaneous maintenance

Purchased fire protection

Purchased electricity

Office and building maintenance

RENT

Warehouse rental

Office equipment rental

APPENDIX 2.2

OPERATING LABOUR STANDARDS

Department : Transportation (Deliveries)

Occupation or Description	Rate	Manhours per Unit (WEEK)	Rand/Unit	Manhours per month	Rand per month
<u>Normal Labour</u>		<u>4 WEEKS PER MONTH</u>			
Truck Drivers 9	3-60	50 Hours per week per man (450)	1 620	1 800	6 480
Truck Assistants 18	3-00	50 Hours per week per man (900)	2 700	3 600	10 800
Bowser Attendant . 1	3-00	46 Hours oer week (46)	138	184	552
Clerk 1	3-00	46 Hours per week (46)	138	184	552
Supervisor 1	4-20	50 Hours per week (50)	210	200	840
	30			5 968	19 224
<u>Overtime Premium @ Time plus 50%</u>					
Truck Drivers 9	3-60	4 Hours per week per man + 2 (18)	65	72	259
Truck Assistants . 18	3-00	4 Hours per week per man + 2 (36)	108	144	432
Supervisor 1	4-20	4 Hours per week per man + 2 (2)	8	8	34
				224	725
		TOTAL PER MONTH		6 192	19 949

APPENDIX 2.3

FACTORS TO BE CONSIDERED IN FORECASTING

- * The economic climate of the country
- * The economic forecast for the industry
- * Competitors' strategies, production capabilities, financial position and distribution network
- * The company's own strategies and objectives, production capabilities, financial position and distribution network
- * The market size and estimated market growth or decline
- * Sales trends
- * Seasonal effects on sales
- * Introduction of new products and their effect on other product categories
- * Price activity and policy
- * Past volumes achieved
- * Size and professionalism of sales force
- * Sales areas and customers
- * Advertising and promotion activities and plans
- * Trade relations
- * Planned or required inventory levels
- * Unusual factors that influenced historical records

- * Past history of growth and profit
- * Product life cycles
- * Relationship of sales to economic indicators such as gross national product, personal income, employment, prices and industrial production
- * Product profitability
- * Results of market research studies

(The last three factors were noted by Horngren 1977 : 137)

FACTORS TO BE CONSIDERED IN LONG-TERM FORECASTING FOR WARE-
HOUSING COSTS

- * Land availability (present and future)
- * Fluctuations and security in the type of products stored
- * Cost of warehouse construction
- * Cost of relocating warehouse
- * Possibility of opening depots to supplement warehouse
- * Expansion possibilities of existing facilities
- * Political factors - Externaly and within the company
- * Expansion potential of the comapny
- * Future fuel considerations
- * Rail, road and air infrastructures (present and future)
- * Cash availability and interest rates
- * Building costs
- * Labour availability
- * Services and utilities
- * Municipal policies

APPENDIX 2.4

BASIC FORECASTING TECHNIQUES

A. Qualitative methods

Technique	1. Delphi method	2. Market research	3. Panel consensus	4. Visionary forecast	5. Historical analogy
Description	A panel of experts is interrogated by a sequence of questionnaires in which the responses to one questionnaire are used to produce the next questionnaire. Any set of information available to some experts and not others is thus passed on to the others, enabling all the experts to have access to all the information for forecasting. This technique eliminates the bandwagon effect of majority opinion.	The systematic, formal, and conscious procedure for evolving and testing hypotheses about real markets.	This technique is based on the assumption that several experts can arrive at a better forecast than one person. There is no secrecy, and communication is encouraged. The forecasts are sometimes influenced by social factors, and may not reflect a true consensus.	A prophecy that uses personal insights, judgment, and, when possible, facts about different scenarios of the future. It is characterized by subjective guesswork and imagination; in general, the methods used are non-scientific.	This is a comparative analysis of the introduction and growth of similar new products, that bases the forecast on similarity patterns.
Accuracy Short term (0-3 mnths) Med. term (3 mnths - 2 yrs) Long term (2 yrs & up)	Fair to very good Fair to very good Fair to very good	Excellent Good Fair to good	Poor to fair Poor to fair Poor	Poor Poor Poor	Poor Good to fair Good to fair
Identification of turning points	Fair to good	Fair to very good	Poor to fair	Poor	Poor to fair
Typical applications	Forecasts of long-range and new-product sales, forecasts of margins.	Forecasts of long-range and new-product sales, forecasts of margins.	Forecasts of long-range and new-product sales, forecasts of margins.	Forecasts of long-range and new-product sales, forecasts of margins.	Forecasts of long-range and new-product sales, forecasts of margins.
Data required	A coordinator issues the sequence of questionnaires, editing and consolidating the responses.	As a minimum, two sets of reports over time. One needs a considerable collection of market data from questionnaires, surveys, and time series analyses of market variables.	Information from a panel of experts is presented openly in group meetings to arrive at a consensus forecast. Again, a minimum is two sets of reports over time.	A set of possible scenarios about the future prepared by a few experts in light of past events.	Several years' history of one or more products.

APPENDIX 2.4 (Continued)

8. Time series analysis & projection

Technique	1. Moving average	2. Exponential smoothing	3. Box-Jenkins	4. X-11	5. Trend projections
Description	Each point of a moving average of a time series is the arithmetic or weighted average of a number of consecutive points of the series, where the number of data points is chosen so that the effects of seasonals or irregularity or both are eliminated.	This technique is similar to the moving average, except that more recent data points are given more weight. Descriptively, the new forecast is equal to the old one plus some proportion of the past forecasting error. Adaptive forecasting is somewhat the same except that seasonals are also computed. There are many variations of exponential smoothing: some are more versatile than others, some are computationally more complex, some require more computer time.	Exponential smoothing is a special case of the Box-Jenkins technique. The time series is fitted with a mathematical model that is optimal in the sense that it assigns smaller errors to history than any other model. The type of model must be identified and the parameters then estimated. This is apparently the most accurate statistical routine presently available but also one of the most costly and time-consuming ones.	Developed by Julius Shiskin of the Census Bureau, this technique decomposes a time series into seasonals, trend cycles, and irregular elements. Primarily used for detailed time series analysis (including estimating seasonals); but we have extended its uses to forecasting and tracking and warning by incorporating other analytical methods. Used with special knowledge, it is perhaps the most effective technique for medium-range forecasting - three months to one year - allowing one to predict turning points and to time special events.	This technique fits a trend line to a mathematical equation and then projects it into the future by means of this equation. There are several variations: the slope-characteristic method, polynomials, logarithms, and so on.
Accuracy: Short term (0 - 3 mths) Med. term (3mths-2 yrs) Long term (2 yrs & up)	Poor to good Poor Very poor	Fair to very good Poor to good Very poor	Very good to excellent Poor to good Very poor	Very good to excellent Good Very poor	Very good Good Good
Identification of turning points	Poor	Poor	Fair	Very good	Poor
Typical applications	Inventory control for low-volume items.	Production and inventory control, forecasts of margins and other financial data.	Production and inventory control for large-volume items, forecasts of cash balances.	Tracking and warning, forecasts of company, division, or department sales.	New-product forecasts (particularly intermediate- and long-term).
Data required	A minimum of two years of sales history, if seasonals are present. Otherwise, less data. (Of course, the more history the better.) The moving average must be specified.	The same as for a moving average.	The same as for a moving average. However, in this case more history is very advantageous in model identification.	A minimum of three years' history to start. Thereafter, the complete history.	Varies with the technique used. However, a good rule of thumb is to use a minimum of five years' annual data to start. Thereafter, the complete history.

APPENDIX 2.4 (Continued)

C. Causal methods

Technique	1. Regression model	2. Econometric model	3. Intention-to-buy & anticipations surveys	4. Input-output model
Description	This functionally relates sales to other economic, competitive, or internal variables and estimates an equation using the least-squares technique. Relationships are primarily analyzed statistically, although any relationship should be selected for testing on a rational ground.	An econometric model is a system of interdependent regression equations that describes some sector of economic sales or profit activity. The parameters of the regression equations are usually estimated simultaneously. As a rule, these models are relatively expensive to develop and can easily cost between \$5,000 and \$10,000, depending on detail. However, due to the system of equations inherent in such models, they will better express the causalities involved than an ordinary regression equation and hence will predict turning points more accurately.	These surveys of the general public (a) determine intentions to buy certain products or (b) derive an index that measures general feeling about the present and the future and estimates how this feeling will affect buying habits. These approaches to forecasting are more useful for tracking and warning than forecasting. The basic problem in using them is that a turning point may be signaled incorrectly (and hence never occur).	A method of analysis concerned with the interindustry or interdepartmental flow of goods or services in the economy or a company and its markets. It shows what flows of inputs must occur to obtain certain outputs. Considerable effort must be expended to use these models properly, and additional detail, not normally available, must be obtained if they are to be applied to specific businesses. Corporations using input-output models have expended as much as \$100,000 and more annually to develop useful applications.
Accuracy: Short term (0 - 3 months) Medium term (3 months - 2 years) Long term (2 years and up)	Good to very good Good to very good Poor	Good to very good Very good to excellent Good	Poor to good Poor to good Very poor	Not applicable Good to very good Good to very good
Identification of turning points	Very good	Excellent	Good	Fair
Typical applications	Forecasts of sales by product classes, forecasts of margins.	Forecasts of sales by product classes, forecasts of margins.	Forecasts of sales by product class.	Forecasts of company sales and division sales for industrial sectors and subsectors.
Data required	Several years' quarterly history to obtain good, meaningful relationships. Mathematically necessary to have two more observations than there are independent variables.	The same as for regression.	Several years' data are usually required to relate such indexes to company sales.	Ten or fifteen years' history. Considerable amounts of information on product and service flows within a corporation (or economy) for each year for which an input-output analysis is desired.

APPENDIX 2.4 (Continued)

C. Causal methods

Technique	5. Economic input-output model	6. Diffusion index	7. Leading indicator	8. Life-cycle analysis
Description	Econometric models and input-output models are sometimes combined for forecasting. The input-output model is used to provide long-term trends for the econometric model; it also stabilizes the econometric model.	The percentage of a group of economic indicators that are going up or down, this percentage then becoming the index.	A time series of an economic activity whose movement in a given direction precedes the movement of some other time series in the same direction is a leading indicator.	This is an analysis and forecasting of new-product growth rates based on S-curves. The phases of product acceptance by the various groups such as innovators, early adapters, early majority, late majority, and laggards are central to the analysis.
Accuracy: Short term (0-3 months) Med. term (3 mnths - 2 yrs) Long term (2 yrs & up)	Not applicable Good to very good Good to excellent	Poor to good Poor to good Very poor	Poor to good Poor to good Very poor	Poor Poor to good Poor to good
Identification of turning points	Good	Good	Good	Poor to good
Typical applications	Company sales for industrial sectors and subsectors.	Forecasts of sales by product class.	Forecasts of sales by product class.	Forecasts of new-product sales.
Data required	The same as for a moving average and X-11.	The same as an intention-to-buy survey.	The same as an intention-to-buy survey + 5 to 10 years' history.	As a minimum, the annual sales of the product being considered or of a similar product. It is often necessary to do market surveys.

APPENDIX 2.5

PROFIT FORECAST FOR THE LAST 6 MONTHS OF THE YEAR

INCOME STATEMENT	19XX BUDGET		19XX ACTUAL FORECAST	
	First 6 months	Last 6 months	First 6 months	Last 6 months
Sales	1 200 000	1 380 000	1 113 000	1 328 250
Cost of Sales	600 000	660 000	583 000	665 500
Distribution Expenses	54 000	62 100	83 000	99 600
Gross Profit	546 000	657 900	447 000	563 150
Media Advertising	12 000	12 000	12 000	12 000
Promotions	162 000	186 300	150 000	179 000
Selling expenses	15 000	18 000	16 000	19 000
Marketing expenses	16 000	19 000	15 000	18 000
General and administrative expenses	50 000	60 000	46 000	55 000
Operating Profit	291 000	362 600	208 000	280 150
<u>INFORMATION</u>				
Units Sold	60 000	60 000	53 000	55 000
Selling Price Rand/unit	20	23	21	24.15
Cost of Sales Rand/unit	10	11	11	12.10

APPENDIX 2.5 (Continued)

1. ANALYSIS OF RESULTS

1.1 The actual results for the first six months of the year are considerably lower than the budget due to the following reasons:

1.1.1 Volumes achieved are lower than the budgeted volumes.

1.1.2 Distribution expenses are higher than the budget in spite of the lower volumes.

1.1.3 Changes in other cost items also affected profit but these will not be discussed.

2. BASIS OF THE FORECAST

2.1 Management realised that budgeted volumes for the second six months will not be achieved but also hoped to improve on the first six months

2.2 The increase in distribution costs could be for a variety of reasons, such as:

(a) Different distribution operation than budgeted for.

(b) Renatal of additional warehouse.

(c) Use of outside transport etc.

2.3 Management acknowledged the changes to the budget and these changes have been built into the forecast.

2.4 Changes in other cost items have also been built into the forecast.

2.5 The result is that a new profit figure is determined which, in all probability, will be more accurate and closer to reality than the budgeted figure for the last six months of the year.

APPENDIX 2.6

EFFECT OF COST BEHAVIOUR ON UNIT COST

Because some costs do not increase with volume (or activity), unit cost will bear an inverse relationship with activity - decreasing as the volume increases and increasing as the volume goes down.

Operating costs for a delivery vehicle can be summarised as follows:

Fixed cost per annum:

Insurance	R	400.00
Licence fees	R	150.00
Depreciation	R	<u>4 000.00</u>
	R	<u>4 550.00</u>

Variable cost per kilometre:

Fuel and oil	R	0,090
Maintenance	R	0,007
Tyres etc.	R	<u>0.003</u>
	R	<u>0.100</u>

Cost per km for different distances travelled can now be calculated as follows:

Distance travelled (in Km)	20 000	30 000	40 000
Operating costs: Fixed per annum	R 4 550	R 4 550	R 4 550
Variable @ R0,10/km	<u>2 000</u>	<u>3 000</u>	<u>4 000</u>
Total cost	<u>R 6 550</u>	<u>R 7 550</u>	<u>R 8 550</u>
Cost per km.	R 0,328	R 0,252	R 0,214

This illustration indicates that no single figure can be determined for the cost per km that could be used in estimating the total cost to operate the vehicle.

A cost estimate for a given number of kilometres to be travelled in a year would require the use of an equation:

$$\text{Total cost} = \text{Fixed cost} + (\text{Variable cost/km} \times \text{kilometres})$$

There is a need for both a non-variable and a variable breakdown in decision making as well (such as the choice between own transport or outside transport). Fixed costs can then be ignored as the cost will not change with the decision.

APPENDIX 2.7

FACTORS INFLUENCING COST BEHAVIOUR

FACTOR	BRIEF DESCRIPTION
1. Fluctuation of cost with volume.	* From a total cost point of view this relates to direct costs such as material and labour. * It should be noted that these cost increases can have the characteristics to increase with volume in the following ways: - Direct proportional - Progressive - Degressive
2. Inherent nature of the cost itself.	* This is as a result of the existence of certain fixed costs. * If additional hourly paid employees have to be taken on, this can result in the employment of an additional supervisor. (His salary is then a fixed cost.
3. Provision of capacity.	* The cost of having capacity cannot be changed with variations in volume * Physical equipment cannot be disposed of during periods of

APPENDIX 2.7 (Continued)

FACTOR	BRIEF DESCRIPTION
4. Managerial policies and decisions.	low volume, and brought back during periods of high volume. * Managerial policies and decisions can influence costs in the form of decisions on capacity, organisational structure, wage payment plans and decision to make or buy. * Employment policy can keep labour costs from fluctuating with volume by keeping employees on the payroll when it is not justified by volume.
5. Cost control	* The degree of cost control (although not always possible) can influence cost behaviour. * If controls are slack, one can find that, for example, material costs can increase (due to excessive waste and spoilage).
6. Outside forces	* Outside forces such as labour unions may affect costs through contracts calling for minimum hours of pay, guaranteed employment or employee benefits during layoffs.

APPENDIX 2.7 (Continued)

FACTOR	BRIEF DESCRIPTION
7. Prices paid for input factors	* Costs can vary due to prices paid for materials, wages or expenses such as rent etc. * However, these are not likely to occur regularly over short periods. * Price changes can lead to management decisions that alter cost behaviour patterns - high labour rates may lead to automation.
8. Accounting methods	* Accounting itself has no influence on cost behaviour, but timing of charges to some accounts may distort the behaviour pattern. * Vehicle expense is a typical example. * Cost of items such as tyres, lubrication and maintenance accumulates with usage (distance travelled) and a period in which distance travelled is low, may be charged with a high expenditure for major repairs.

APPENDIX 2.7 (Continued)

FACTOR	BRIEF DESCRIPTION
9. Random factors.	* Factors not related to volume may create significant deviations from expected patterns of cost behaviour. * Abnormal costs are caused by fires, floods, energy shortage etc. * In cost studies allowances should be made for these abnormal cost items.
10. Learning curve situations.	* As the abnormal factors mentioned above, allowances should be made for learning curve situations, such as new technology, the adoption of a new distribution facility or system etc.
11. Other factors.	* These would include, to a certain extent, items that could have been mentioned under management policies and decisions. * Items included here would be: - Change in product design. - Technological changes.

APPENDIX 2.8

METHODS FOR SEPARATION OF FIXED AND VARIABLE COST

METHOD	BRIEF DESCRIPTION
1. Observation or inspection, also called "Accounting analysis".	* This is achieved by simply studying the chart of accounts and the behaviour of costs with fluctuations in activity. * A decision is then taken as to whether costs are fixed or variable.
2. The dominating factor method.	* Costs are classified as fixed or variable depending on the dominating factor. * In essence, this method and the observation method can be combined as one method.
3. Industrial engineering method.	* Based on studies of the physical aspects of operations (material and labour usage, efficiency of machines etc.) it is determined what cost behaviour patterns should be. * The basic idea is to compare what "cost should be" to "what costs were".

APPENDIX 2.8 (Continued)

METHOD	BRIEF DESCRIPTION
4. The High-low method	* Data recorded in the past are used but only to the extent that it provides a reliable guide to the future. * In order processing, for example, the workload will be studied and costs will be estimated without reference to the past. * This method can also be used with other methods and can serve as a check on the other. * This method relies on the difference in cost from one level to another. * High and low refer to the highest and lowest activity levels. * The variable cost rate is determined as follows: $b = \frac{\text{change in cost}}{\text{change in activity}} \therefore$ $b = \frac{\Delta Y}{\Delta X} \quad \text{where}$ b = variable cost per unit ΔY = difference in cost ΔX = difference in activity

APPENDIX 2.8 (Continued)

METHOD	BRIEF DESCRIPTION
5. Method of Least Squares	* Fixed costs are then determined in the following formula: $Y = a + bX \quad \text{where}$ Y = Total cost a = fixed cost b = variable cost per unit X = total quantity of units * Although this is a very simple method, the disadvantage is that only the two levels of cost and activity are considered, and data for all activity between the two observations are ignored. * This method contains the simultaneous solution of the following two equations: $\begin{aligned} \sum XY &= a\sum X + b\sum X^2 \\ \sum Y &= na + b\sum X \end{aligned} \quad \text{where}$ X = activity Y = total mixed cost a = fixed cost b = variable cost/unit n = number of observations

APPENDIX 2.8 (Continued)

METHOD	BRIEF DESCRIPTION
	* The main advantage of this method is that all activity levels are considered when separating fixed and variable costs * It also eliminates personal bias or inexperience as might be the case by observation or inspection * Mathematically the answer must be correct and individuals cannot differ in their separation of fixed and variable costs * It must be borne in mind that for any method applied, the results can only be as good as the input or base data used
6. The scattergraph method	* Each pair of observations are plotted on a graph * Costs are plotted on the Y axis against volumes on the X axis * A trend, or regression, line that best fits the data is then drawn, either by inspection or mathematically in such a way that differences between the trend line and observed costs are at a minimum sum * The intersection of the trend line with the cost axis denotes the fixed cost component * Variable cost per unit is then the total cost less the fixed cost element divided by the activity

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SYNOPSIS

This chapter will deal with the general aspects in physical distribution that are important but in practice are sometimes overlooked. The importance of inventory management is emphasised and an attempt

is made to indicate how physical distribution efficiency can be measured. General problems with distribution cost accounting and cost allocations are also highlighted.

3. IMPORTANT COST AND MANAGEMENT ASPECTS OF WAREHOUSING AND PHYSICAL DISTRIBUTION

3.1 INTRODUCTION

The importance of inventory management as a sub-function of distribution management is often neglected, as distribution costs are sometimes referred to as the cost of delivering goods sold.

Executives quite often want to know what benefit is derived from incurring distribution costs, or the degree of efficiency of distribution operations. Although difficult to measure, an attempt will be made to indicate how distribution efficiency can be measured.

Accounting for and control of distribution costs form the basis of distribution cost analysis for the planning of operations and decision making on the distribution functions or segments thereof.

3.2 INVENTORY MANAGEMENT

Inventory management is one of the most important aspects of distribution management. Too much inventory on hand will result in storing and handling difficulties as well as increased carrying costs, and too little inventory on hand will create a customer service problem.

ANON. 1977 (as quoted by Reese, 1977 : 32) said that:

"Inventories are the graveyard of American business because they have so frequently been the prime cause of business failure."

Forecasting, as discussed in the previous chapter, must also be applied to inventories.

"One of the most difficult aspects of inventory management is the inability to forecast both the amounts of inventory needed and the times at which they will be needed." (Constantin 1966 : 323)

"A good forecast is the key to effective inventory control." (Mossman and Morton, 1965 : 329)

3.2.1 Inventory functions.

"The objective set for physical distribution is to ensure that the right quantity of the right product is available both at the place where demand for it exists and at the time that demand exists." (Welgemoed, 1978 : 27)

The broad function of inventories can be seen as "the right quantity of the right product".

Dopuch et al. (1974 : 266) mentioned that there are three general motives for holding inventories:

- (a) The transactions motive, which relates to the need to hold inventories to meet sales requirements.
- (b) Precautionary motive for holding inventories based on the assumption that the costs of potential stockouts are greater than the cost of holding additional inventories.
- (c) The speculative motive, based on expected future input or output prices to change.

According to Bowersox (1974 : 181) there are four prime functions

of inventory:

- (a) Geographical specialisation of the individual operational units of the enterprise. The manufacturing location could be a considerable distance away from areas of prime consumption, due to location of promotion factors.
- (b) Decoupling to provide maximum efficiency of operations housed at a single geographical location, thus allowing each product to be manufactured and distributed in economically sized lots.
- (c) Balancing supply and demand such as seasonal production and year-round consumption or year-round production and seasonal consumption.
- (d) Safety stocks to provide for short range variations in either demand or the operational capability to replenish inventories. A great deal of inventory management is devoted to calculate safety stock levels.

All these functions combine to prescribe a level of inventory investment necessary to perform to management objectives.

Inventories can be reduced only to a level of performing these four inventory functions.

At this level, inventory investment to achieve geographical specialisation and decoupling, can only be modified by changes in the facility location and operations of the enterprise.

Adjustments to inventory required to balance supply and demand is the result of the difficult task of forecasting future demand.

The inventories committed to safety stocks represent the greatest potential for improved inventory performance

Morgan, 1963 (in a reprinted series of articles from Harvard Business Review 197-? : 17) mentioned twenty two reasons for holding inventory. (See attachment 3.1)

3.2.2 Inventory Costs

The objectives of inventory management from a cost point of view are to keep the investment in inventory as low as possible without disturbing distribution activities.

Management realizes that holding inventory is quite expensive and that inventory holding cost does not only consist of manufacturing costs. Over investment in inventories results in under utilisation of capital or resources but in recent times this appears to be one investment that is receiving the necessary attention.

In most instances, the total inventory cost consists of:

- Total ordering cost
- Total carrying cost
- Total acquisition cost.

Ordering cost is the clerical cost involved in preparing a purchase order or production order and special processing and receiving costs relating to the number of orders processed, and can be made up as follows:

The costs of reviewing and determining the amounts to acquire and of clerically processing the order.

The costs incurred in inspecting the order and placing it in storage.

The costs of processing the purchase payments.

To a certain extent these ordering costs can be overlapping with certain carrying costs (such as labour due to joint functions) and a

Careful distinction should be made between ordering and carrying costs. This will largely be determined by aspects such as the size of the company, organisational structure of the company, skill and experience of employees in this area, and internal control situations regarding the inventory procedures.

Carrying cost usually consists of a desired rate of return on the investment in inventory and costs of:

- warehousing (storage)
- insurance and taxes
- labour costs
- obsolescence and deterioration
- property taxes
- the cost of money tied up in inventory (interest).

Inventory obsolescence and spoilage can be as a result of:

- * Loss due to damage to the product and the product cannot be salvaged.
- * Spoilage due to deterioration of the product
- * The product cannot be sold due to technological innovation or style changes. This emphasises the importance of product life cycle studies. The question here is whether this cost shouldn't be considered as a marketing cost
- * The type of product and the time period it remains in inventory can affect these costs, although it will be a small portion of the overall costs, unless perishable products are considered.

It should be noted that these costs are incurred as the abovementioned damages are not covered by insurance.

Labour costs are incurred by functions such as inventory maintenance,

supervision and other clerical work. As discussed in the previous chapter, labour cost over the short term tends to be a fixed cost, because it does not fluctuate with inventory levels. On a long-term basis labour cost can be variable as adjustments have to be made for increased inventory holding in the long run.

Warehousing and storage cost could include the following:

- Rental of a warehouse
- Depreciation on own warehouse
- Electricity and air conditioning
- Building maintenance
- Other warehouse costs

The cost of money tied up in inventory or the interest on the investment in inventory usually makes up the largest portion of inventory costs. The interest rate selected is essentially an opportunity cost and may be based upon the cost of borrowing money or the rate that could be achieved when investments are made. The profit rate of the company could also be used.

"The opportunity cost concept is based upon the assumption that if a certain amount were not tied up in inventory, it could be invested in other activities which would return the assumed rate of interest or profit. " Mossman and Morton (1965 : 316)

This statement emphasizes the importance of inventory levels not being too high.

Insurance and taxes on inventory are easy to determine for the purpose of determining the cost of inventory holding. For planning purposes, it could also be expressed as a percentage of capital invested in inventory

"Acquisition costs consist of the cost of manufacturing or purchasing of inventory, and are sometimes ignored from various

inventory policies unless purchasing is taking place when case or quantity discounts are available." (Horngren, 1977 : 464)

However, the acquisition cost of manufactured finished goods should be included as it seldom happens that these goods are manufactured month after month, at the same cost. Even when a standard cost system is used, variances should be considered and taken into account in order to arrive at actual acquisition costs. Horngren (1977 : 464) mentioned that the ordering and carrying costs behave in opposite ways. "If huge inventories are carried, ordering costs will be low and carrying costs will be high."

3.2.3 Inventory Control

Maintaining adequate stocks of inventory and providing optimum customer service calls for close management attention and effective controls. Reducing inventory through control, can result in a more efficient and liquid working capital level.

The thrust for an effective inventory control programme starts with top management, who should determine the desired level of customer service capability and consider the cost and financing available to carry inventory. Then realistic objectives should be set and communicated through to managers directly responsible for inventory. These are the plant managers and distribution managers who provide the sales department with the right amount of finished products at the right time to meet sales targets.

There are various analytical techniques for determining the right amount of inventory to be kept on hand. One of them, the ABC method, is widely used.

The ABC concept is that in any series of items, a selected small fraction of the items will account for a large portion of the values.

Inventories are then classified into three categories A, B and C. See appendix 3.2 for an example of such a classification.

Class A consists of a few high valued items. From the example this can be seen quite clearly, when 10% of the inventory items represents 72% of the total value.

Class B consists of socalled "middle" value items, where the number of items as a percentage of the total and the value as a percentage of the total are roughly the same.

Class C category contains the low valued items. In the example this category consists of 70% of the items, but only 9% of the value is represented by these items.

Fig. 3.1 and fig. 3.2 are graphical illustrations of these different inventory categories.

Fig. 3.1 indicates the individual classifications while in fig. 3.2 the three categories represent a cumulative situation to end up with the last point of the curve, representing total number of items in inventory and the total value.

It could be necessary to use some judgement to determine the actual out-off points between the three categories.

Dividing the inventory into three categories, enables management to devote the proper amount of time and effort to controlling that inventory with the highest value. The degree of control and effort associated with the ABC method is as follows:

A items: Tightest control possible with regular management review, accurate records, top level supervision, close follow up and close attention to bad times. Most accurate and complete records, and frequent audits for accuracy are also essential.

B items : The requirements here can be stated as normal controls, good records and regular attention.

C items : Simple controls and recordkeeping, but periodic review is required here. The danger to this category is that management could devote too much effort on the first two categories, and that control on the items in class C could receive too little attention.

This method of selective control of inventories is normally used for one or more of the following reasons:

- a. Minimize rand value investment
- b. Improving of customer service
- c. Prevention of stockouts
- d. Control of warehouse space
- e. Control of transportation.

(Constantin, 1966: 332)

For further discussions and illustrations of the ABC method of inventory classification and control, also see: Horngren (1977 : 474-476) and Neuner and Deakin (1977 : 481 - 482).

Another technique that can be applied to assist in control of inventories, is the setting of quantity standards. According to Sorgdrager and Tromp (1977 : 43), these standards are:

- (a) Standard order quantity (Economic Order Quantity)
- (b) Minimum stock level
- (c) Order level
- (d) Maximum stock level
- (e) Average stock level

For a detailed discussion of these standards, see Sorgdrager and Tromp (1977 : 43 - 54).

The aim of stock control is to ensure that demands are met at all times. Annan (1981 : 22) mentioned the following main requirements for physical inventory control procedures, some of which have already been mentioned:

- (a) The physical security of inventory should be ensured.
- (b) Available storage should be used as best as possible.
- (c) Inventory levels should be kept to a minimum to avoid unnecessary investment.
- (d) Inventories should be at a level to meet planning requirements.
- (e) A proportion of stock should be held to act as a buffer against cut of stock.
- (f) Obsolete stocks, pilferage and deterioration of stocks should be avoided.
- (g) Periodical stock checks should be made.
- (h) Controls should assist in providing management information
- (i) Holding costs should be kept to a minimum.

Another technique that can also be implemented to assist in inventory control, is the composite analysis technique. This technique enables management to make an assessment of the efficiency and effectiveness of inventory holdings. Comparisons can be made:

- (a) of various inventory holding areas within the organisation
- (b) with other organisations engaged in the same trade (if the necessary information is obtainable)
- (c) to results of previous years
- (d) to predetermined targets.

This technique consists of the following:

- (a) Operating efficiency analysis.
- (b) Activity efficiency analysis.
- (c) Inventory turnover rate.
- (d) Inventory turnover ratio.
- (e) Inventory level movement analysis.

The operating efficiency analysis is measuring the efficiency of costs incurred in the warehousing area. It is determined by expressing warehousing operating costs as a percentage of the value of inventory moved out of the warehouse. This percentage could then be compared with the percentages of previous years or with a target percentage.

When comparisons are made to previous years, the effect of inflation should be accounted for. For example, if the current year operating costs should be expressed as a percentage of the previous year's inventory movement, inflation should be accounted for. However, if the current year percentage is to be compared to that of the previous year, the effect of inflation should have been included in both operating costs and value of inventory moved out (inventory should be valued at actual cost). When a standard costing system is used, variances should also be included in value of stock moved out.

It should be noted that a drastic change in product mix can distort the ratios, especially when new products are introduced with a cost value or sales value which is a lot higher or lower than those of existing products. The objective is not to lay down specific formulas, but to highlight the concept of these techniques. Variations in percentages should be investigated. Reasons for fluctuations could be:

- (a) Fluctuations in holding costs.
- (b) Changes in inventory shipped
- (c) Fluctuations in manufacturing quantities.

The activity efficiency analysis consists of expressing the company's total trading expenditure as a percentage of the average inventory holding for a specific year. Again, comparisons can be made to either a target that was set to percentages of previous years, or comparisons of various inventory holding areas. Fluctuations in percentages should be investigated, and if needed, corrective action should be taken. Fluctuations could be as a result of:

- (a) Changes in trading activities.
- (b) Change in level of inventory holding.

The inventory turnover rate is determined by expressing the number of the inventory moved out (sold) in terms of the average inventory holding for the financial year. The result will indicate how many times a year inventories are turned over. This rate can be determined by product line, and then the number of units or the value can be used. It can be more useful to determine this rate by product line because there will certainly be a difference between the rates for various product lines. This technique will indicate which product lines have the highest turnover rate and this can assist in warehouse planning and outlay of products in the warehouse. As with the other techniques, fluctuations should be investigated when comparisons are made.

The inventory turnover ratio is indicating the number of days of inventory on hand, and is assumed to be calculated in dividing the average stock holding for the year by the value of sales in the year and then multiplied by 365. It can be modified by using only the number of operating days in the year and not 365 days. It is important to note that whatever number of days are used, this should be constant from period to period. This technique can also be used on a monthly basis and not only at year ends, depending on the information system used, and the availability of information. This ratio could also be more meaningful when it is calculated by product line

instead of total inventory

The inventory level movement analysis is a simple comparison of inventory on hand at the end of a specific period (month or year) to the inventory on hand of a previous period. The percentage increase in inventory is then calculated. This percentage is used to identify large movements in the value of inventory holdings.

Appendix 3.3 is a summary of the formulas of the above techniques as indicated by Annan (1981 : 24).¹

These formulas can be modified to a large extent by companies in order to suit their own specific requirements for inventory control, but it can be of assistance to management.

Appendix 3.4 is an example of the technique of comparative analysis of inventory holding of two inventory holding areas, and conclusions drawn from the available information are set out in appendix 3.5. Figures are for illustration purposes only, and could differ to a large extent in practice.

General weaknesses in inventory control (appendix 3.6) and suggestions for improvements (appendix 3.7) were identified by Annan (1981 : 24).

3.3 EFFICIENCY MEASUREMENT OF PHYSICAL DISTRIBUTION

Longman (1978 : 1 - 2) defined efficiency as:

"The attainment of a given objective with the least possible effort or cost"

and in distribution cost analysis,

"... measures are established of the degree to which the marketing activities contribute to the attainment of the ultimate business objective."

Bowersox (1974 : 58) said that physical distribution performance can be measured in terms of:

- (a) Total Cost
- (b) Customer Service.

3.3.1 Efficiency measurement in terms of cost

The overall measurement of distribution efficiency in terms of cost is the company's profit and loss statement. Appendix 3.8 illustrates a profit and loss statement up to operating profit level. Two situations are reflected for distribution expenses.

If the assumption is made that situation A reflects the budgeted figures for a specific period and situation B represents the actual results for the same period, the effect of distribution costs can clearly be seen. The increased distribution expenses resulted in a drop in operating profit margin from 17.6 percent of net sales to 15.2 percent of net sales. There could be quite a range of reasons for the distribution expenses exceeding the budget, some of which could be:

- (a) Distribution operation is different to what was budgeted for.
- (b) Complete lack of cost control in the distribution function.
- (c) Efficiency of distribution function was overstated in the budget.

The measurement used in this case is to express distribution expenses as a percentage of sales, in the example 4.9 percent and 7.3% respectively.

Longman (1978 : 2) said that: "Because business efficiency is definable primarily in terms of income and expenditure, the most obvious approach to the measurement of that efficiency lies in the collection and interpretation of cost and income data relating to operations."

Longman (1978 : 3) also said that: "Efficiency cannot properly be measured in terms other than those relating to the objective sought, and in business that objective is profit."

The method of expressing costs as a percentage of sales has the advantage that it allows comparisons from period to period (months, years etc.) although the value of sales and distribution expenses can be completely different between these periods.

A requirement for this method to be efficient is that an expense report of distribution expenses should be available. If the information in appendix 3.8 were changed and the two situations would reflect two specific months in a year, the comparison of distribution expenses as a percentage of sales could still be made. It should be noted that, as discussed in the previous chapter, a large portion of distribution expenses is fixed. With a material fluctuation in sales value, the percentage could also show a major change. For example, if sales dropped dramatically, the distribution cost as a percentage of sales will increase - a 20 percent decrease in sales will not imply a 20 percent decrease in distribution costs.

The distribution expense report should be assembled:

- (a) To indicate expenses by item.
- (b) To classify expenses into administration, warehousing and transportation.
- (c) By distribution centre.
- (d) To indicate the number of units shipped for the period

by product line.

In the case of a fluctuation of distribution expenses as indicated in the example, it will be easy to determine exactly in which distribution centre the costs have increased and also which category of costs such as transportation or warehousing are involved.

3.3.2 Efficiency measurement in terms of customer service.

According to Bowersox (1974 : 59), the specific measures of customer service performance consist of level and response of delivery provided level relates to expected inventory availability and response is concerned with the speed and consistency of delivery. The typical practice in physical distribution systems is to provide rapid response and a high degree of consistency with respect to timely performance over a number of consecutive re-orders. (Bowersox, 1974 : 60)

Bowersox (1974:60) then discusses the degree of efficiency required on the product life cycle concept, where he mentioned that the life cycle consists of four phases:

- (a) The introductory phase
- (b) The growth phase
- (c) The saturation or maturity phase
- (d) The obsolescence or declining phase.

See also Lucas *et al* (1979 : 339)

Andrews (1978 : 44) separated the third phase into:

- (a) The maturity phase, and
- (b) The saturation phase

The result was that he distinguished 5 stages in the product life cycle.

Bowersox (1974 : 60 - 62) discussed distribution performance during the product life cycle as follows: "During the introductory stage of a new product, a high level and response of physical distribution performance will be desired. During this stage, physical distribution can be expected to play a prominent role in the integrated marketing offering. Shipment sizes will tend to be small and the frequency of orders will be erratic.

During the growth stage, physical distribution performance can be expected to move from a high level of customer service to a level that can be realised at a more economical expenditure.

The desired physical distribution performance during the saturation stage can be expected to become highly selective.

During the declining stage the distribution system must continue to support the degree of product distribution the firm is attempting to maintain while it continues to avoid excessive risk in the event that the product is discontinued.

A variety of physical distribution strategies are required during the product life cycle, but the most important is that market demand should be met. For a discussion on distribution cost factors during the product life cycle, see Hechter (1983 : 23 - 24).

As effective customer service depends largely on effective transportation, vehicle scheduling becomes more and more important. The objective of vehicle scheduling is to decide on the best route pattern within the following restrictions:

- (a) Lowest marginal cost
- (b) Least distance
- (c) Offload times per type of goods and type of customer
- (d) Smallest fleet

- (e) Best capacity of the fleet
- (f) Product mix
- (g) Individual customer requirements.

Computerised vehicle scheduling will contribute towards finding the desired pattern within these limitations. However, this subject falls beyond the scope of this study but had to be emphasised for the contribution that can be made towards improved customer service.

Distribution efficiency in terms of customer service should be answered by the following question:

Did the company provide all the customers with the products they required, in the right quantity and quality they wanted, and at the time and place they wanted it?

3.4 DISTRIBUTION COST ACCOUNTING

3.4.1 The nature and classification of distribution costs

"The objective of physical distribution is to ensure that the right quantity of the right product is available at the place where demand for it exists and at the time that demand exists."
(Pretorius, 1981 : 1)

Following from this, distribution costs are the costs incurred in the process of ensuring that the right quantity of the right product is available at the place where demand exists and at the time the demand exists. The objectives of distribution cost accounting as seen by Longman and Schiff (1955 : 72), are summarised in appendix 3.9.

these objectives have been adjusted and altered on basis of own research to be more applicable to the discussion that will follow on distribution cost classification.

Longman and Schiff (1955 : 69) defined distribution costs as "... all costs incurred after the goods have been made available for sale. These would include all market and administrative expenses."

In chapter 2, the statement was made that the distribution function need not necessarily be part of the marketing function, depending on the organisational structure of the company.

The assumption was made so far, that the distribution function is completely separate from the marketing, selling, finance or manufacturing function, although emphasis must be placed on the degree of communication between these five functions. In further discussions, costs will be classified as purely distribution costs and will not include any marketing or selling costs.

Heckert (1940 : 7) also classified distribution costs into:

- (a) Direct selling expenses
- (b) Advertising and sales promotion expenses
- (c) Transportation costs
- (d) Warehousing and handling expense
- (e) Credit and collection expense
- (f) Financial expenses
- (g) General distribution expense

The classification of expenses largely depend upon the organisational structure of the company and the responsibility of individuals.

Appendix 3.10 indicates the classification of total costs in a company that could be used for preparation of management reporting documents such as product line earnings statements. For the sake of

completeness, revenues and profits are also indicated.

These earnings statements could be assembled as follows:

- (a) By individual product line
- (b) By certain product line groups
- (c) By division
- (d) For the company

The advantage of using this format is that expenses by individual centres are available in total and when comparisons are made, fluctuations that influenced profits can be detected immediately.

Only distribution expenses fall within the scope of this study, and the other expenses will not be discussed. Distribution expenses are classified in three major responsibility centres:

- (a) Administration expenses
- (b) Transportation costs
- (c) Warehousing costs.

See appendix 2.1 in chapter two for an analysis of cost items per distribution responsibility centre.

Longman (1978 : 14) said: "The first step in making accounting information useful to management, is to classify or group these costs."

Distribution costs are also classified into direct and indirect costs.

Direct costs can be associated with a specific segment of the business, such as product lines, sales territories or customers.

Indirect costs are incurred for more than one segment of the business and cannot be traced directly to a specific segment.

This is where cost allocations are important, which will be discussed later.

A further breakdown of cost classification is according to the fixed or variable nature of the cost item, which has been discussed.

3.4.2 Distribution Cost Allocation.

One example of the need for the allocation of distribution expenses can be seen from the assembly of product earning statements by product line when the absorption costing method is used. There are many distribution cost items that cannot be traced to a specific product line or customer, but the absorption costing method (also called the full cost approach) is based on the requirement that "... each segment of operations should bear it's fair share of the total cost, including both direct and indirect charges," (Crowningshield and Gorman 1979: 504).

The allocation of indirect costs is an inescapable problem in nearly every organisation and in nearly every facet of accounting. (Horn-gren, 1977 : 494). The problem is not to calculate the amounts that should be allocated, but to find an acceptable basis that can be used for allocation. Crowningshield and Gorman (1979 : 504) said that two questions should be answered before the problem of allocation can be solved:

- (a) which costs can be reasonably allocated?
- (b) what basis should be used in the allocations?

If costs cannot be allocated on some basis that will provide an equitable distribution to various segments, these costs should be left unallocated. The problem facing accountants and management is that the use of an arbitrary base of allocation will end with the results also being arbitrary. As long as this limitation is acknowledged, this can be an acceptable situation.

One factor that should be remembered is that if an arbitrary base is selected for cost allocation, such a base should be kept constant and should not be changed from time to time, unless a decision is taken to change the base due to complete incorrectness. Management should first approve such a change before it can be implemented.

The allocation of costs can support various profitability analysis such as:

- (a) Product lines
- (b) Individual or major customers
- (c) Sales areas.

Crowningshield and Gorman (1979 : 504), said that the selection of costs to be allocated and the choice of methods of allocation are matters that must be left to the good judgement of the accountant, who must base decisions on the facts collected in each individual case. No firm rules can be laid down, except that all allocations must pass the tests of reliability and feasibility.

The reliability test requires that there should be some relationship between the cost allocated and the base used for allocation, while the feasibility test requires that the clerical expenses of making the allocation should be within bounds and justified by the results.

Any base that is used for the allocation of indirect costs must be subjected to close scrutiny before it is adopted.

The analysis of distribution costs on the basis of products or product lines sold, is one of the most common appearances of distribution cost allocation. Although for accounting purposes only one income statement to determine company profits is periodically prepared, earning statements by product line are also compiled. These

earning statements are information documents and not accounting records. The income statement for the company is broken up into the various product lines. Total distribution expenses must then be allocated to these product lines.

What sometimes happens in practice is that standard values for distribution costs are determined by product line. These values are expressed in terms of a Rand per standard unit. At the end of the period the units sold are multiplied by the standard rates and a "Total standard distribution cost" figure is determined. The actual expenditure for the period is then allocated to the various product lines, using the standard value as a base. Appendix 3.11 is an example of such a cost allocation to various product lines.

The example is incomplete to the extent that the actual distribution costs for the period are not separated between fixed and variable elements. The comment that could be made is that the total distribution expenditure is 15.4 percent more than the budgeted amount. However, the cost per unit for the product lines in Division A is 16 percent or more higher than the budget. It would appear that the product lines in Division B have received a benefit at the cost of the product lines in Division A. This method of allocation of distribution costs is applied in practice, but one product line may have to carry costs that should have been allocated to another product line.

Crowningshield and Gorman (1979 : 505) said that all costs need to be allocated only if management insists upon complete allocation, but even then they should be discouraged from this attitude of mind. Sevin (1954) as quoted by Crowningshield and Gorman (1979 : 505 - 6) said:

"It is the considered opinion of the author that it is neither feasible nor useful to attempt a full allocation of all distri-

bution and administrative costs in most businesses, although there are many who make such an attempt."

The full cost approach to distribution cost analysis can be used, but companies and management should emphasise the fact that some costs are allocated on an arbitrary basis.

For discussions of bases that could be used for allocations of distribution costs to segments of the business, reference can be made to:

- (a) Crowningshield and Gorman (1979 : 506 - 509)
- (b) Neuner and Deakin (1977 : 505 - 509)

Accountants and managers that opposed the full cost approach to distribution cost analysis reason that although a business is made up of segments (product lines), these segments should be co-ordinated for the maximum benefit of the company. The business is not made up of separate entities, each striving to earn profits on its own. Only the company can make profit. The profitability of a particular segment should be judged by the contribution it has made, and that contribution can be fairly measured only by the revenue and the costs traceable to it. Common costs are not something to be allocated, they are profit barriers to be overcome by an effective combination of segment contributions. (Crowningshield and Gorman, 1979 : 511)

This argument led to the contribution approach of profitability analysis and is discussed by Crowningshield and Gorman, (1979 : 511 - 513). Summarised, the contribution of a segment is the revenue it has provided less the costs that are traceable to its operations. These costs represent costs that would be eliminated if the segment was discontinued. The profitability of a segment is measured by the contribution it makes to the recovery of nonescapable costs.

3.5 DISTRIBUTION COST CONTROL AND REPORTING TO MANAGEMENT

Control is defined by Anderson (1975 : 4 - 5) as ".... the process of monitoring business operations to ensure that they attain the desired state - accomplish the planned objectives. This is achieved by comparing the actual results achieved with the planned objectives and measuring the extent of deviations".

Harper (1969 : 143) mentioned that the essentials of control are:

- (a) A plan
- (b) Comparison of actual with plan
- (c) Action - to rectify divergencies.

Corrective action to be taken should always be the second last phase of control. Without corrective action, there is still no control as deviations from the plan will only re-occur in the following period. A system of follow-up as the final step in control is necessary to ensure that corrective action has effectively been taken. This follow-up system could take the form of a monthly review meeting. The following points should be discussed in such a review meeting:

- (a) Results of the current period should be presented.
- (b) Any deviations from a plan should be pointed out.
- (c) The most probable cause or causes for the deviation should be stated. It is obvious that a detailed study of the causes for deviations should be carried out in order to determine these causes. It could happen that some reason for a deviation is assumed, but when rectified the problem could occur again in the following period as the real problem was not corrected.
- (d) Once the causes for deviations have been determined, proposals for corrective action should also be presented.

- (e) Feedback should be given on problems from the previous period and the extent to which these problems were solved. If a problem re-occurred in the current period, this should be highlighted and would require urgent attention.

Responsibility accounting is placing the emphasis on certain cost or responsibility centres. These centres normally include the following functions or divisions:

- (a) Distribution
- (b) Financing
- (c) Selling
- (d) Marketing
- (e) Operations
- (f) Manufacturing

The distribution division can now be sub-divided into:

- (a) Various distribution centres
- (b) Each distribution centre can then be sub-divided into responsibility functions such as Administration, Transportation and Warehousing.

Reference can be made to appendix 2.1 for illustration of the composition of a distribution responsibility report, for a distribution centre.

The manager responsible for each distribution centre will have to report on the costs in his area.

"The attention is directed towards individuals and the basic question is who spent the money rather than what the money was spent for." (Crowningshield and Gorman, 1979 : 447)

It is obvious that the ultimate responsibility for costs in a specific centre lies with the manager in charge of that centre, although duties can be delegated to deputies.

Matz and Usry (1976 :43) said that to control costs, the following fundamentals should be observed:

- (a) Fixing responsibility for control
- (b) Limiting the individuals's control effort to his controllable costs
- (c) Reporting the performance of the individual

Once responsibility reports for distribution costs have been determined, the results should be reported to senior management. It should be noted that the objectives of distribution responsibility reports are to enable senior management to:

- (a) Study the trend of distribution costs
- (b) Measure efficiency of the distribution operation and management responsible or accountable for specific costs
- (c) Plan future distribution strategies
- (d) Use available information in general decision making.

Appendix 13.12 is a summary of the essentials of good reporting as seen by Crowningshield and Gorman (1979 : 452 - 3) and Heckert (1940 : 334 - 335). These reports can be issued in three formats:

- (a) Tabular reports
- (b) Graphic reports
- (c) Narrative reports

It should be noted that the contents of distribution cost responsibility reports can include various elements such as:

- (a) Budgeted cost for the month and year to date
- (b) Forecasted cost for the month and year to date
- (c) Actual cost for the month and year to date
- (d) Variances from budget and forecast
- (e) Product lines and units shipped for the period

These are but a few of the wide variety of elements that could be included in the responsibility report. There are many others and the contents and format of the report will be determined by the intended use of such a report.

Allen (1973 : 217) said that: "A report is a verbat or written statement of progress and results. The recording of information and the preparation and use of reports is a basic responsibility of every manager."

3.6 SUMMARY

Inventory management is an important sub-function of distribution management. Considering the various functions to be performed by inventories it is difficult to watch against over investment and under investment in inventory at the same time.

Over investment in inventory will result in lost interest and increased carrying costs, while too low inventory levels can result in stockout situations with the loss of customers accepting a substitute product.

Two main techniques used in inventory control are:

- (a) The ABC method of cost classification
- (b) Comparative analysis technique

Distribution efficiency can be measured in terms of:

- (a) Distribution cost expressed as a percentage of sales
- (b) Degree of customer service rendered

Various categories of distribution costs are incurred and not all these costs can be traced directly towards certain product lines. These costs can be treated in basically two ways:

- (a) All costs are allocated to certain segments of the business. Indirect costs or costs that were incurred for the benefit of more than one segment (product line, division etc.) should be allocated to these segments on the most realistic bases. These bases can be arbitrary, but management and accountants should acknowledge this fact in profitability - and decision making studies.
- (b) Indirect costs remain unallocated and are shown separately in the income statement. Only direct costs are charged against a segment and a contribution is calculated. The contribution of all the segments together should then be used for recovering expenses that were not allocated.

Responsibility accounting in distribution is placing the emphasis on the individual responsibility or cost centre. The manager in charge should then answer to senior management on the degree of cost control in his department. Emphasis should be placed on the objectives of responsibility reports as a tool of control in assisting management in determination of trends, efficiency measurement and general decision making.

LIST OF ILLUSTRATIONS

Figure 3.1 The ABC method of inventory classification
(Individual)

Figure 3.2 The ABC method of inventory classification
(Cumulative)

FIGURE 3.1

THE ABC METHOD OF INVENTORY CLASSIFICATION

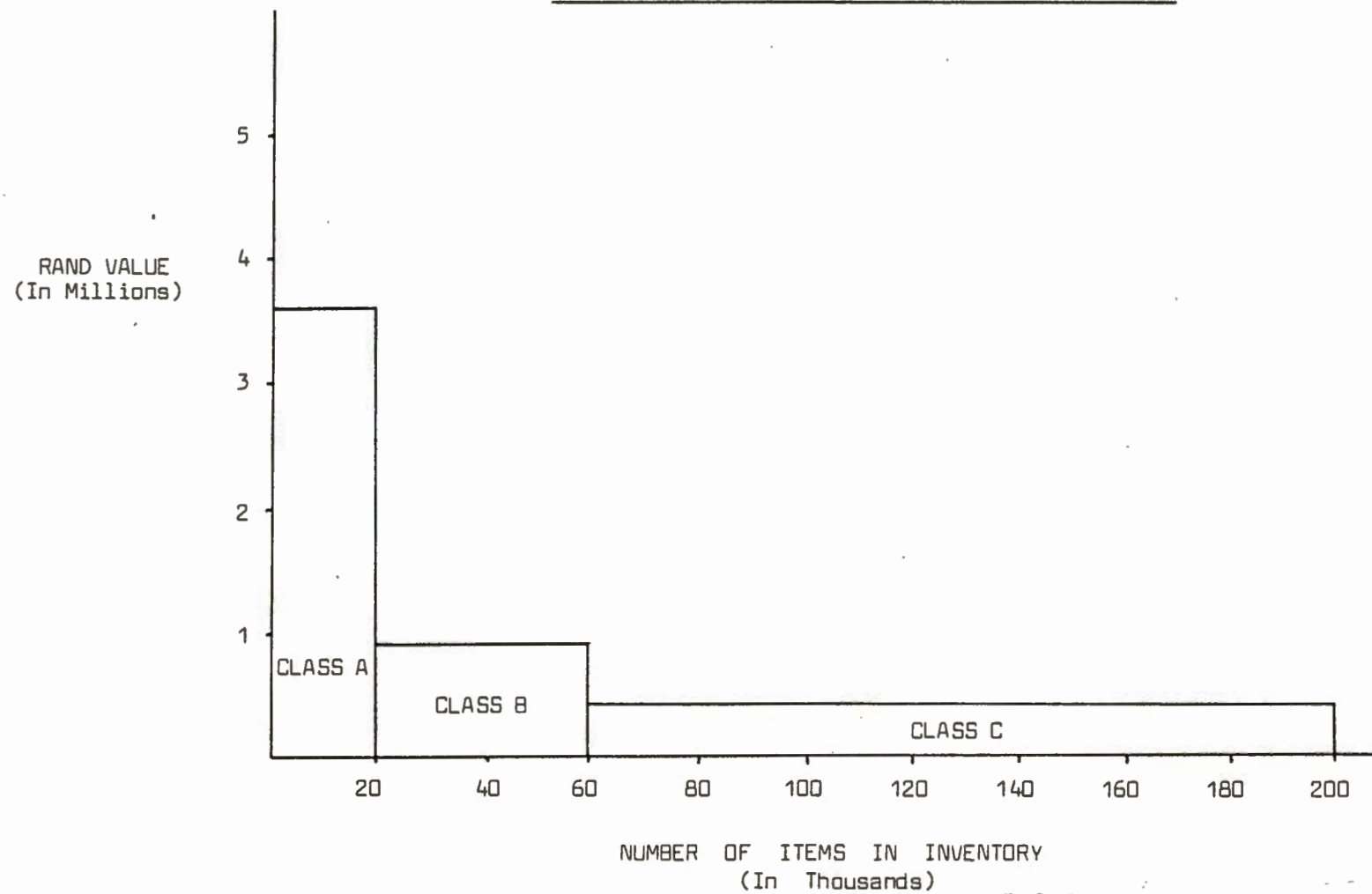
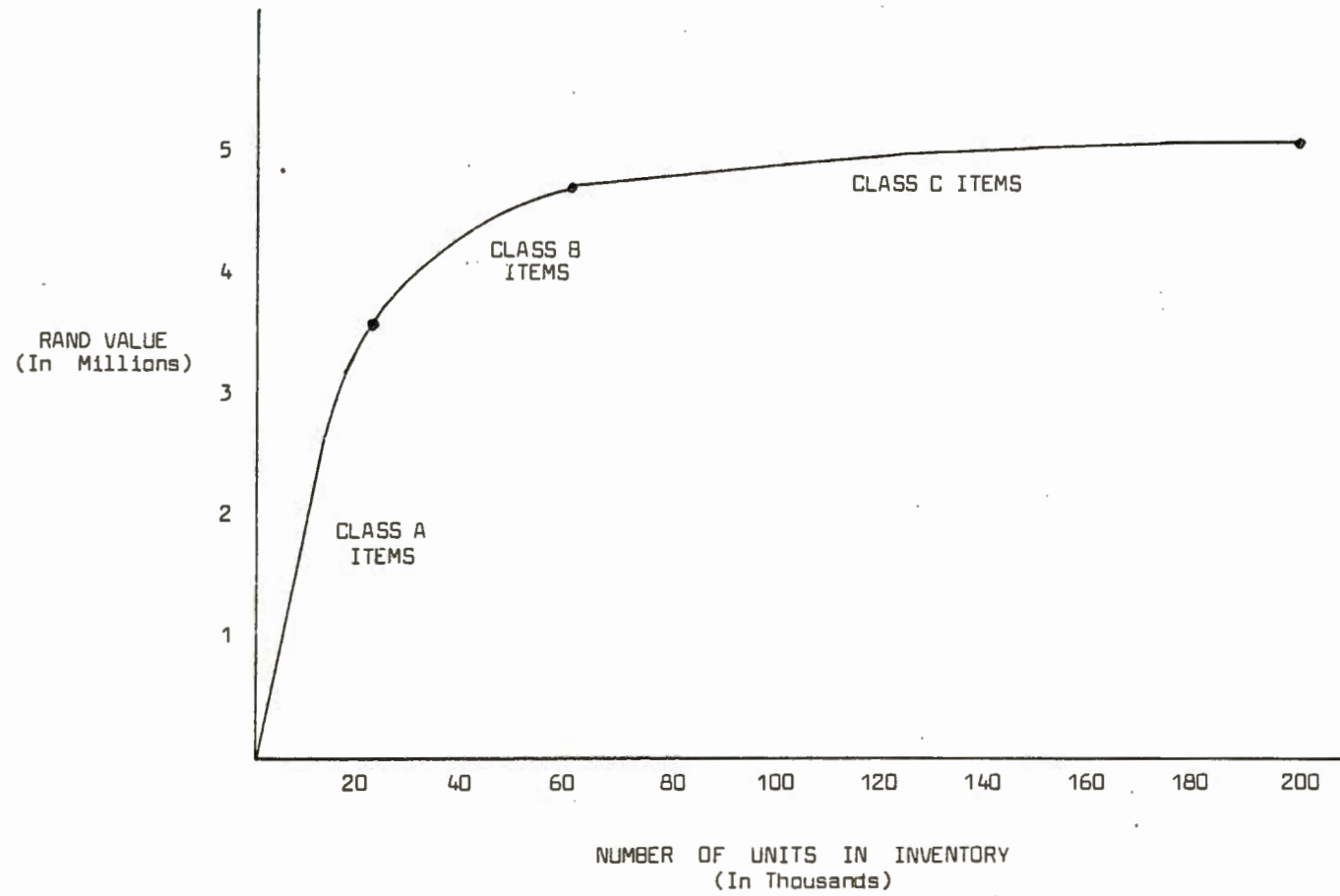


FIGURE 3.2

THE ABC METHOD OF INVENTORY CLASSIFICATION



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	3.3	Comparative analysis techniques of inventory control
	3.4	Comparative analysis of inventory holdings (example)
	3.5	Conclusions from comparative analysis of inventory holding
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	3.12	Essential characteristics of good reports

APPENDIX 3.1

REASONS FOR HOLDING INVENTORIES

1. To provide customer service in the face of sales fluctuations and other problems.
2. To give customers assurance of availability.
3. To hedge against expected surges in sales because of promotions or price reductions.
4. To avoid shipment to fill a definite order.
5. To await shipment to fill an expected order.
6. To handle production variations.
7. To make material in economic run sizes.
8. To allow for batch production.
9. To permit flexibility in plant scheduling.
10. To hold off increasing capacity.
11. To permit more flexible raw material scheduling.
12. To provide raw material storage.
13. To take advantage of raw material price.
14. To take advantage of distribution costs or factors.
15. To hold material that is a by-product.
16. To store overruns or misruns.

17. To await disposition (as in the case of a cancelled order).
18. To keep storage equipment operational or from shutting.
19. To allow for errors in measuring and recording.
20. To protect against strikes and work stoppages.
21. To protect against nature elements.
22. To speculate against price and cost changes.

APPENDIX 3.2

ABC METHOD OF INVENTORY CLASSIFICATION

C L A S S	I T E M S		R A N D V A L U E	
	Number of Items	Percent of Total	Total Value	Percent of Total
A	20 000	10%	R 3 600 000	72%
B	40 000	20%	R 950 000	19%
C	140 000	70%	R 450 000	9%
	200 000	100%	R 5 000 000	100%

APPENDIX 3.3

COMPARATIVE ANALYSIS TECHNIQUES FOR INVENTORY CONTROL

TECHNIQUE	METHOD OF CALCULATION
1. Operating Efficiency	1. $\frac{\text{Warehouse Operating Costs}}{\text{Inventory moved out (Sales)}}$
2. Activity Efficiency	2. $\frac{\text{Total Trading Expenditure}}{\text{Average inventory holding}}$
3. Inventory Turnover rate	3.1 $\frac{\text{Units Sold (Shipped)}}{\text{Average number of units in inventory}}$ 3.2 $\frac{\text{Sales Value}}{\text{Average value of inventory holding}}$
4. Inventory turnover ratio	4. $\frac{\text{Inventory holding at end of period}}{\text{Sales}} \times \text{Number of days}$
5. Inventory level movement	5. $\frac{\text{Current Period inventory value :-}}{\text{Less Previous period inventory value}} \frac{\text{Previous period inventory value}}{\text{Previous period inventory value}}$

APPENDIX 3.4

COMPARATIVE ANALYSIS OF INVENTORY HOLDINGS

CURRENCY UNIT: R1 000

PERIOD

Inventory value at end of period

Average Inventory holding

Units sold at cost

Warehouse operating costs

Total trading costs

Operating days

Operating efficiency %

Activity efficiency %

Turnover rate (Times)

Turnover ratio (Days)

Inventory movement analysis % .

D I V I S I O N A				D I V I S I O N B			
1	2	3	4	1	2	3	4
263	366	469	642	89	88	94	119
	315	418	556		89	91	107
	693	850	1168		409	391	471
	59	76	110		22	21	25
	21	29	42		3	3	4
	200	200	200		200	200	200
	8.5	9.0	9.4		5.5	5.3	5.3
	6.7	7.0	7.5		3.4	3.3	3.7
	2.2	2.0	2.1		4.6	4.3	4.4
	106	110	110		43	48	51
	39.1	28.1	36.9		(1.1)	6.8	26.6

THE OBJECTIVE IS TO COMPARE RESULTS FOR PERIODS 2, 3 AND 4

APPENDIX 3.5

CONCLUSIONS FROM COMPARATIVE ANALYSIS OF INVENTORY HOLDINGS

MEASUREMENT	DIVISION A RESULTS	DIVISION B RESULTS
1. Operating Efficiency	1.1 This % has increased in all three years	1.1 Percentage relatively constant but lower than the percentages in Division A
	1.2 Warehouse operating costs are increasing faster than movement of inventory out of the warehouse	
	1.3 Reasons could be lack of control on inventory holding costs	
	1.4 Percentage is higher than the percentage for Division B in every year	
	1.5 The reason could be a difference in type of operation between the two divisions	

APPENDIX 3.5 (Continued)

MEASUREMENT	DIVISION A RESULTS	DIVISION B RESULTS
2. Activity Efficiency	2.1 The percentage has increased in all three years 2.2 Trading expenses have increased faster than the value of average inventory holding 2.3 Percentage is higher than the percentage in Division B, and should be investigated	2.1 Percentage relatively constant but lower than the percentages in Division A
3. Turnover rate	3.1 The rate decreased in year 3 but the change is not material, and fairly constant on average 3.2 Turnover rate is only about half of the rate in Division B 3.3 Turnover rate indicates an uneconomic holding of inventory	3.1 The rate is fairly constant

APPENDIX 3.5 (Continued)

MEASUREMENT	DIVISION A RESULTS	DIVISION B RESULTS
4. Turnover ratio	3.4 Action should be taken to reduce inventories in this division	
	4.1 Although the ratio is just about constant, stockholding is about twice that of Division B when measured in number of days	4.1 Turnover ratio is only about half of that in Division A
	4.2 Inventory holding is too high and action should be taken to reduce inventories	4.2 The alarming factor in this division is that the turnover ratio is increasing continuously
5. Inventory level movement analysis	5.1 This analysis confirms the problem of too high inventories in this division	5.1 This division maintained about the same level of inventories for the first three years

APPENDIX 3.5 (Continued)

MEASUREMENT	DIVISION A RESULTS	DIVISION B RESULTS
6. Summary	5.2 There is a consistant annual increase of inventories	5.2 An increase could be expected in year 4 as sales have increased but inventories were constant in the first three years
	5.3 Attention could be given to production scheduling	
	6.1 Urgent attention should be given to inventory levels in this division	6.1 Although this would appear to be a model inventory holding set-up, attention could still be given to individual products as there may be some uncovered problems

APPENDIX 3.6
GENERAL WEAKNESSES IN INVENTORY CONTROL

1. The annual checking of certain inventory items is insufficient.
2. The level of inventory held contains an element which is either slow moving or redundant
3. Insufficient management information relating to inventory holding
4. An excessive number of inventory holding points could exist
5. Lack of formal training for stores personnel
6. In the case of purchased goods, not enough use is made of periodical contracts

APPENDIX 3.7

PROCEDURES TO IMPROVE INVENTORY CONTROL

1. Inventory control procedures should be reviewed to see if improvements can be made, and in so doing consideration should be given to rationalisation of inventory holding points
2. Management information provided at present should be reviewed to ensure that it is adequate in meeting management's demands
3. Management information should include
 - 3.1 Details of slow moving and obsolete inventory
 - 3.2 Changes in prices of purchased goods
 - 3.3 Inventory turnover rates
 - 3.4 Number of days inventory held
4. Perpetual stock counts
 - 4.1 Procedures to introduce perpetual stock-taking should be developed if they do not already exist
 - 4.2 This will ensure regular monitoring of physical inventory holdings
5. Inventory levels
 - 5.1 The introduction of maximum and minimum inventory levels on inventory records where turnover is sufficient to warrant it
 - 5.2 This procedure should prevent overstocking and avoid the running out of inventory items
6. The introduction of a staff training programme will give the employees the opportunity to learn alternative techniques and procedures for inventory control

APPENDIX 3.8

PROFIT AND LOSS STATEMENT

	SITUATION A		SITUATION B	
	Value	% of Sales	Value	% of Sales
	R		R	
Gross Sales	15 000 000	101.9	15 000 000	101.9
Discounts	285 000	1.9	285 000	1.9
Net Sales	14 715 000	100.0	14 715 000	100.0
Cost of Products Sold	8 240 000	56.0	8 240 000	56.0
Distribution expenses	721 035	4.9	1 074 195	7.3
Gross Profit	5 753 965	39.1	5 400 805	36.7
Advertising Expenses	176 580	1.2	176 580	1.2
Promotion Expenses	2 001 240	13.6	2 001 240	13.6
Selling Expenses	161 865	1.1	161 865	1.1
General and Admin Expenses	824 040	5.6	824 040	5.6
Operating Profit	2 590 240	17.6	2 237 080	15.2

APPENDIX 3.9

THE OBJECTIVES OF DISTRIBUTION COST ACCOUNTING

1. It forces a review of the company's basic distribution plan and its working organisation
2. It provides management with a new, detailed understanding of its distribution structure
3. It shows how much expense and what kinds of expenses are incurred for distribution activity
4. It permits the assignment of responsibility for costs to specific individuals and provides a measurement of their performance and cost control from time to time
5. It permits an evaluation of alternative distribution methods and helps in the appraisal of using outside transport or warehousing as opposed to use of own facilities
6. It highlights inefficiencies in operating procedures such as order processing, receiving, deliveries and to a certain extent inventory carrying costs
7. It enables cost and profit calculation as a result of achieved sales
8. An analysis of costs and profits by products and customers suggests ways of improving results
9. It provides an indication of the effect on costs and profits of any change in product mix or in the ratio of customers of different types
10. It shows the cost of handling orders of different sizes and provides a better basis for planning quantity discounts
11. It facilitates over-all company budgeting procedures
12. It assists management in cost control and cost forecasting
13. It assists in general decision making

APPENDIX 3.10

COST AND REVENUE CLASSIFICATION FOR EARNINGS STATEMENT PURPOSES

Gross Sales

Discounts

Net Sales

Cost of Sales

Distribution expenses

Gross Profit

Media Advertising

Promotion Expenses

Case Discounts

Override Payments

Retail Advertising

Other Promotional Expenditure

Selling Expenses

Marketing General and Administrative expenses

Other General and Administration expenses

Operating Profit

APPENDIX 3.11

DISTRIBUTION COST ALLOCATION TO PRODUCT LINES

1. DETERMINING THE STANDARD RATE

Budgeted distribution cost

R 1 300 000

	Distribution Cost Allocated by Product Line	Budgeted Standard Units	Standard Rate
Division A: Product Line 1	R 400 000	10 000	R40/SU
Product Line 2	R 180 000	5 000	R36/SU
Product Line 3	R 60 000	1 000	R60/SU
Division B: Product Line 8	R 600 000	60 000	R10/SU
Product Line 9	60 000	3 000	R20/SU
	R 1 300 000		

2.1 ACTUAL DISTRIBUTION COSTS FOR THE PERIOD

	Administration	Transportation	Warehousing	Total
Distribution Centre A	75 000	360 000	152 000	587 000
B	60 000	315 000	120 000	495 000
C	40 000	153 000	80 000	273 000
D	25 000	72 000	48 000	145 000
TOTAL	R 200 000	R 900 000	R 400 000	R 1 500 000

2.2 SALES FOR THE PERIOD

Standard Units

Division A :	Product Line 1 -----	95 000
	Product Line 2 -----	5 100
	Product Line 3 -----	1 200
Division B:	Product Line 8 -----	60 000
	Product Line 9 -----	2 950

APPENDIX 3.11 (Continued)

2.3 STANDARD DISTRIBUTION COST FOR THE PERIOD AS BASIS FOR ALLOCATING ACTUAL COSTS

	Units	Rate	Value	Percentage
Division A: Product Line 1	9 500	40	380 000	29.4
Product Line 2	5 100	36	1 836 600	14.2
Product Line 3	1 200	60	72 000	5.6
Division B: Product Line 8	60 000	10	600 000	46.3
Product Line 9	2 950	20	59 000	4.5
			R 1 294 600	100

3. DISTRIBUTION COSTS ALLOCATED

	Percentage	Amount	Rand/Unit
Division A: Product Line 1	29.4	441 000	46.42
Product Line 2	14.2	213 000	41.76
Product Line 3	5.6	84 000	70.00
Division B: Product Line 8	46.3	694 500	11.58
Product Line 9	4.5	67 500	22.89
	100	R 1 500 000	

4. COMPARISON TO THE BUDGET

	Budget	Actual	Percentage Difference
4.1 Total Distribution Expenses	R 1 300 000	R 1 500 000	15.4%
4.2 Distribution cost per standard unit			
Division A: Product Line 1	40	46.42	16 %
Product Line 2	36	41.76	16 %
Product Line 3	60	70.00	16.7%
Division B: Product Line 8	10	11.58	15.8%
Product Line 9	20	22.89	14.5%

APPENDIX 3.12

ESSENTIAL CHARACTERISTICS OF GOOD REPORTS

1. Reports should be kept as simple as possible, containing only the essential information. Exceptions that need attention should be highlighted
2. The format of reports should be tailored to the person who will use them, not to a function or job
3. Information contained in reports should be accurate, but only to the degree required for their purpose
4. To be of value, reports should be timely, sometimes at the expense of accuracy
5. Reports should not only communicate, but also motivate in being positive and constructive in approach. However, a report should be viewed as a case of accountant pointing out the shortcomings of others
6. The number of reports should be kept at a minimum and every report should serve a definite purpose. The reporting system should also be under constant review
7. Reports should not only contain recitals of actual costs and operations but also relationships, trends and signals as to what should be done or matters that need attention

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SYNOPSIS

In this chapter a brief look will be taken at the effect of customer service on sales results, and how a distribution problem can be solved, through adoption of a new distribution operation.

4. CASE STUDY

4.1 INTRODUCTION

The objective of this chapter is to indicate the extent of changes to physical distribution operations made by a company, in order to improve the delivery service to its customers. In order to keep information confidential, no reference is made to the company or the sources of information used by the company. Results produced by the company were also altered.

4.2 HISTORICAL OPERATIONS

The historical operations in the company are set out in order to provide an understanding of the problems experienced by the company in running an effective physical distribution operation

The company was operating from five separate locations in a specific area. These locations consisted of:

(a) Manufacturing location A.

This factory produced in the region of 60% of the total sales of the company.

The distribution operation was also executed from this factory.

In addition to that, storage facilities existed for both raw materials and finished goods.

(b) Manufacturing location B.

This factory produced about 25% of the total sales of this company.

The distribution operation was also carried out from this manufacturing location, and storage facilities also existed at this location.

(c) Warehouse C.

This warehouse was rented by the company and was used for storage of raw materials and finished goods.

The location of this warehouse was adjacent to manufacturing location B.

(d) Warehouse D.

This warehouse was situated about 25 km away from manufacturing location B, and was used for the storing of raw materials and finished goods.

(e) Warehouse E.

This warehouse was situated about 15 km away from manufacturing location A, and was also used for the storing of raw materials and finished goods.

The result of running an operation as described above, was as follows:

- * Excess costs were incurred by the added movement of materials required from the various warehouses to the manufacturing/distribution locations.

(This added movement of goods and materials, was as a result of insufficient operating space at the two manufacturing locations.)
- * The complexity of the operation resulted in customers receiving split deliveries.
- * Customer service has deteriorated to the point of affecting company sales and long-term development prospects.

Management found this situation completely unacceptable as the company's objectives of :-

- (a) real profit growth in the short and long term and
- (b) the retaining and increase of market share would not be met.

Future expansion of manufacturing operations is also restricted due to the combination of manufacturing and distribution operations.

4.3 FEASIBILITY STUDY AND ALTERED OPERATIONS

Based on the unsatisfactory situation as described above, a study was carried out to determine:

- (a) Solutions to the existing problem
- (b) Feasibility of proposed alternatives

The findings of the study was that the company should rationalise its distribution operation in order to improve customer satisfaction and service level. In addition to that, the operation centres will be reduced from five to three locations as the company can eliminate the three warehouses utilised for storage of finished goods and raw materials. Furthermore, space will be released at the two manufacturing locations for expansion of manufacturing facilities.

The financial evaluation of this study indicated that at the specific time, the company's capital structure would be unable to absorb the investment in the erection of such a distribution facility, although the company had acquired a piece of land that would be suitable for this purpose.

The decision was then taken to rent a newly erected warehouse at a location that would be quite suitable for rationalising the distribution operation. This would result in space becoming available at the manufacturing locations for future expansions, and the company could gain experience in operating a centralised facility, which can assist in the design of a purpose built facility at a later stage.

This method of operation would also be cost efficient due to:

- * A reduction in staff
- * Cost savings from combining the distribution fleets and eliminating split deliveries to customers
- * The elimination of the three warehouses that were rented for storage.

Manufactured finished goods are to be transported from the manufacturing locations to the distribution centre. Inventory holding at this centre will be properly controlled to avoid over investment in inventories or any stockout situation. Outside contractors could be used for this transportation. A small buffer storage would be required at each manufacturing location. A centralised order department will process all orders received.

4.4 THE EFFECT ON COST

When operating the old distribution operation, distribution costs as a percentage of net sales was in the region of 5%. In the first month of implementing the proposed method of operation, distribution costs were as high as 7.8% of net sales, although it should be borne in mind that additional expenses had to be incurred to start the operation at the distribution centre.

In the second and third month of operation, these costs were 7.0% and 6.5% respectively. It is clear that the learning curve concept also applied to this whole function although measured in costs and not in the conventional output per time period.

Regarding sales performance, it should be mentioned that in the third month of operation the company achieved an all time record and in the fourth month of operation, sales results were not far behind those of the third month.

4.5 SUMMARY

In adopting a new distribution operation, the company appears to have achieved its objective of improved customer service (reflected in increased sales).

Increased distribution costs can be expected to decrease as the end of the learning curve is approached.

However, additional warehouse space is not always the solution to distribution problems.

5. SUMMARY AND CONCLUSIONS

The physical distribution department of a company performs two basic functions:

- (a) Storage of goods
- (b) Transportation and delivery of goods

The objective of the physical distribution function is to improve customer service.

To control physical distribution and warehousing costs, some framework for control has to be set up. This control measure must be used as a yardstick for comparison:- The Budget. After predicting future demand, the budget is set up, which is a plan expressed in quantitative terms. However, the budget should be flexible to allow for unanticipated changes, but instead of changing the budget, a forecast is implemented. In this way, the forecast is an extension of the budget. Apart from planning and control, the budget also performs co-ordinating, communicating and motivating functions. The absolute commitment of management to a budget and forecast is essential.

To predict and control costs, a knowledge of cost behaviour patterns as well as a knowledge of factors influencing distribution costs is essential.

The storage sub-function of distribution consists mainly of inventory control and management. Accurate forecasting of inventory levels assist in achieving a satisfactory customer service record. Also coupled to this is that too high inventory levels will result in increases in carrying costs and loss of interest, while too low inventory levels affect customer service.

Inventory control can be achieved by applying various techniques such as the ABC method of inventory classification or the comparative analysis techniques.

As the objective of physical distribution is customer service, management would want to know to what extent this objective has been achieved. The efficiency measurement of physical distribution can basically be done in two ways:

- (a) Measurement in terms of cost
- (b) Measurement in terms of customer service

The first measurement does not relate to the distribution objective, but rather to the corporate objective, which is profit maximisation. Using this method, distribution is expressed as a percentage of sales. The conclusion was that very few distribution cost items are direct variable. The result will be that the higher the sales value, the lower the distribution cost percentage will be.

The second method is comparing the number of units delivered for a period, to the number of units that should have been delivered and expressing this as a percentage. If the assumptions are followed constantly to enable comparisons to previous periods, this method is the best indicator of distribution efficiency. One factor that could influence the measuring of distribution efficiency, is the product life cycle concept.

Classification of distribution costs is essential for control and cost analysis.

Due to the nature of distribution costs (mostly semi-variable and fixed) and the fact that these costs are mainly joint costs, it is difficult to find a realistic and acceptable basis for the allocation of distribution costs to various segments of the business (product lines or customers). This resulted in the adoption of the contribution approach and only costs that can be traced to a segment are allocated. Other costs remain unallocated.

Control of distribution costs can be achieved by applying the concept

of the responsibility accounting system. This accounting and reporting system is an accounting system designed to control costs by directly relating the reporting of these costs to the individuals in the company's organisation who are responsible for their control. It emphasises the controlling of operations and costs and not the accounting and bookkeeping aspects.

The main conclusion to be drawn from this study is that a good distribution system without the same quality of management will never meet its objective.

6. UITTREKSEL

Die fisiese distribusiefunksie in 'n onderneming behels die opberging van goedere en daarna die vervoer van sodanige goedere na verskeie afsetpunte. Die primêre doelstelling is egter om diens aan kliënte te verbeter, met 'n gevolglike verbetering in verhoudings tussen die onderneming en sy kliënte.

Om beheer uit te oefen oor distribusiekoste, is 'n raamwerk of riglyne vir kontrole nodig. Die implementering of gebruik van 'n begroting verskaf die nodige kontrolemaatstaf. Verskeie vooruitskattingstegnieke word gebruik om die nodige steun aan 'n begroting te verskaf. 'n Begroting (ook vir distribusiekoste) benodig 'n sekere mate van buigsaamheid om voorsiening te maak vir gebeurlikhede waarvoor nie begroot is nie. Vooruitskattings kan gebruik word om hierdie buigsaamheid te verskaf, deurdat 'n begroting nie formeel verander word nie, maar deur slegs 'n vooruitskatting te doen van verwagte resultate as gevolg van veranderde omstandighede. Sodoende word 'n vooruitskatting dan 'n verlengstuk van 'n begroting.

Afgesien van beplanning en kontrole is die funksies van begrotings en vooruitskattings ook nog koördinerend, kommunikasie en motivering. Al word 'n vooruitskatting op 'n latere stadium gedoen, is bestuur nog steeds gebonde aan 'n begroting. Die rede hiervoor is voor die hand liggend. Indien bestuur voel dat 'n begroting te enigertyd aangepas kan word, sal die begroting sy waarde as kontrolemaatstaf en beplanningshulpmiddel heeltemaal verloor.

Om distribusiekoste te kan beheer en om 'n vooruitskatting van dié koste te doen, is 'n deeglike kennis van kostegedragspatrone onder verskillende omstandighede, absoluut noodsaaklik.

Die opbergingsfunksie van fisiese distribusie bestaan uit voorraadkontrole en voorraadbestuur. Die akkurate vooruitskatting van voorraadvlakke dra baie by tot die bereiking van bevredigende diens aan kliënte

deurdat voldoende voorraad gehou word om aan die vraag te voorsien, maar terselfdertyd word nie te veel voorraad gehou nie. Indien voorraadvlakke te hoog is, kan die drakoste daarvan verhoog, en 'n verdere faktor is die verlies aan rente as gevolg van oor-investering.

Voorraadkontrole kan, deur gebruik van sekere tegnieke, heelwat verbeter word. Van hierdie tegnieke is die ABC klassifikasie van voorraad en die vergelykende analise tegniek die belangrikste. Eersgenoemde bestaan uit die klassifikasie van voorraad volgens eenheidswaardes terwyl die tweede metode bestaan uit die berekening van verskillende verhoudings wat met 'n teiken of met vorige periodes se verhoudings vergelyk word.

Aangesien die hoofoogmerk van fisiese distribusie die verbetering van diens aan kliënte is, is dit logies dat senior bestuur sal aandrang op 'n verslag rakende die effektiwiteit van fisiese distribusie. Die effektiwiteit van fisiese distribusie kan hoofsaaklik volgens twee metodes gemeet word. Eerstens kan distribusie uitgedruk word as 'n persentasie van verkope. Hierdie persentasie kan dan vergelyk word met dié van vorige periodes of met 'n voorafbepaalde persentasie. Hierdie vergelyking kan egter misleidend wees aangesien 'n groot deel van distribusiekoste vas of semi-veranderlik is. Indien verkope daal, sal die persentasie dus toeneem. Dié metode word algemeen gebruik, maar hou nie veel verband met die "kliëntediens" oogmerk nie. Dit hou veel eerder verband met die oogmerk van die onderneming as 'n geheel, naamlik maksimalisasie van wins.

Die tweede metode is om 'n "effektiwiteitspersentasie" te bepaal. Dié metode is relatief eenvoudig deurdat werklike aflewerings vir 'n periode uitgedruk word as 'n persentasie van bestellings ontvang wat in dieselfde periode afgelewer moes word. Die metode bepaal in werklikheid hoe effektief diens aan kliënte was. Die fase waarin 'n produk gedurende sy lewenssiklus verkeer, kan egter 'n invloed hê op die effektiwiteit van aflewering.

Die klassifikasie van distribusiekoste is uiters noodsaaklik vir koste kontrole aangesien veranderings of gedurige fluktuasies in kostevlakke maklik opgespoor kan word. Die nodige kontrolemaatreëls kan dan toegepas word.

As gevolg van die vaste en semi-veranderlike aard van distribusiekoste, en ook die feit dat distribusiekoste oor die algemeen 'n gesamentlike kostepatroon vorm, is dit moeilik om distribusiekoste na verskillende besigheidsegmente toe te deel. Dié probleem lê daarin dat 'n basis vir toedeling baie moeilik bepaal kan word. Die resultaat was dat die bydrae-benadering al hoe meer aanhang begin kry het. Dié benadering bestaan daaruit dat slegs direkte koste na 'n besigheidsegment toegedeel word, terwyl die res van die koste ontoegedeel bly. Só word 'n bydrae gelewê deur elke segment tot die delging van ontoegedeelde koste.

Verantwoordelikhedsrekeningkunde dra veel by tot die kontrole van distribusiekoste. Verantwoordelikheid vir 'n koste item word gedra deur die persoon wat aan die hoof van 'n spesifieke departement staan. Die voordeel van hierdie stelsel bestaan daaruit dat klem gelê word op die distribusie-aktiwiteite en die koste daaraan verbonde, eerder as die suiwer finansiële rekeningkundige aspekte van die distribusiefunksie. Die kontrole van distribusiekoste in dié geval lê daarin dat van 'n individu verwag word om verslag te doen oor die koste in sy verantwoordelikhedsarea.

Samevattend kan gesê word dat 'n goeie distribusiestelsel sonder goeie bestuur om dit te beheer nie maklik die distribusiedoelstellings sal bereik nie.

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