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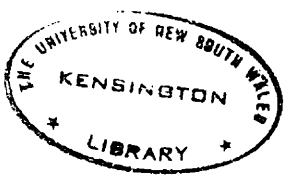

PLANNING PRINCIPLES AND PROCEDURES FOR A TYPICAL AUSTRALIAN BUSINESS ORGANISATION

DAVID FREDERICK JOHN ELLISON

THESIS FOR DEGREE OF MASTER OF BUSINESS ADMINISTRATION

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CONTENTS

SUMMARY

Planning, in its many forms, is an important, though often neglected, function of management. Plans form the infrastructure about which the growth of a business proceeds and develops.

The two fundamental questions of business administration;
Where is our business going?
How is it going to get where we want it to go?
provide the basis for the division of plans into two basic classes - long range and short range.

Long range plans answer the first question - they are concerned with broad policy decisions about issues which are of fundamental significance to the long term survival and progress of the business.

Short range plans answer the second question - they are concerned with the translation of the long range plans into detailed operational programs.

Of the numerous planning procedures, perhaps the best known and most used is budgeting. Budgeting spreads throughout the spectrum from long range to short range, ranging from long term capital plans of great significance, to short term operational budgets of relatively minor significance.

Many of the planning procedures, particularly those associated with modern short range planning techniques using electronic computation facilities, have great power and potential and a certain aura of glamour associated with them.

However, the planning process must always be considered in perspective, as one element in a multi-variable management process, and it should always contribute towards two of the major objectives of any business - long term survival and profitability.

CHAPTER 1.

PLANNING THEORY

The Concise Oxford Dictionary defines a plan as a scheme of arrangement, or a setting out of intended proceedings. The planning process is concerned with the predetermination of a course of action and incorporates three basic characteristics:

1. It involves the future
2. It involves action
3. It involves an element of personal or organisational identification or causation.

For example, a decision would not conform to this definition as it need not necessarily relate either to the future or need it involve action -- decisions, and the need to make them, will, however, inevitably be present in a plan and be part of the planning process. Nor is a forecast a plan as it need not necessarily involve action or personal or organisational involvement or causation, although forecasting is in many cases an essential element in the planning process. The essentials of planning in the business organisation are the selection of objectives and the determination of a rational approach to the attainment of the preselected objectives.

Plans come under many names and descriptions, typical examples being goals, policies, strategies, programmes, budgets,

FIGURE 1.1 (8)

RELATIONSHIP OF EACH DIMENSION TO VARIOUS PARTS OF THE PLANNING PROCESS

	DIMENSIONS OF A PLAN												
Planning Process	*Complexity* (G)	*Significance* (G)	*Comprehensiveness* (M)	*Timeliness* (L_L)	*Specificity* (L)	*Completeness* (L)	*Flexibility* (G)	*Frequency* (M)	*Confidential/ nature* (M)	*Formality* (G)	*Authorization* (M)	*Ease of Implementation* (G)	*Ease of Control*° (G)°
A. Establish means for the early determination of need for formulating a new plan or revising an existing plan.	X	X	X	X	X	X			X	X	X	X	X
B. Take special care to prepare the proposal in terms easily understood by the approving agent. This may include the use of non-technical terms and examples to clarify the proposal.	X	X	X	X	X	X	X		X			X	
C. Include on the planning staff representatives who possess the necessary technical knowledge and experience not possessed by the planner.	X	X	X	X	X	X	X	X	X	X	X	X	X
D. Include on the planning staff representatives from major organization units which will be affected by the plan.	X	X	X	X	X	X	X	X		X	X	X	X
E. Make formal contact with cooperating units to insure understanding of the nature of the project and the role to be played by the cooperating units.	X	X	X	X		X	X		X	X	X	X	X
F. Use sophisticated tools for data collection and processing as well as for decision-making.	X	X		X				X		X			
G. Subject significant components of the plan to careful tests to determine the soundness of the plan and to discover possible difficulties in attempting to gain approval of the plan.	X	X	X	X	X	X	X		X	X		X	X
H. Prepare the final plan in such a way that it is not only technically accurate but also persuasive in nature and easy to understand by approving and implementing units.	X	X	X	X	X	X	X		X	X		X	X

° G = Greater; M = More; L_L = Longer; L = Less.

FIGURE 1-1

standards, procedures and rules. Newman[1] considers that there are three broad groups of plans;

1. Goals
2. Single use plans
3. Standing plans

Goals. When plans are expressed in terms of the results that it is hoped to achieve they are called goals. A goal is the condition that is hoped to be brought about as a result of the plan. Goals and objectives are considered to be synonomous terms.

Single Use Plans. Single use plans are plans designed to be used once, for a specific project or task. Included in this category are:

1. Major programmes
2. Projects
3. Special programmes
4. Detailed plans

Newman[2] describes a hierarchy of single use plans which binds the four sub-sections into a consistent whole. At the upper end of the hierarchy is the major programme. This consists of a number of steps each of which splits into either one or a number of projects or special programmes. Each of these projects or special programmes then splits into a series of detailed plans down to the level at which the action of each individual is determined.

Standing Plans. The three major groups of standing plans are:

1. Policies
2. Procedures

3. Methods

The distinguishing characteristic of a standing plan is that the same decision is used to guide action on numerous separate and unrelated occasions.

Policies. A policy is a general plan of action that guides the decision making of an organisation towards the achievement of the goals of the organisation. Policies tend to be broad in scope, more in the nature of general guide lines. They are a type of plan inasmuch as they set out certain types of behaviour to be followed under certain conditions.

Procedures and methods. Procedures and methods are courses of action which have been pre-determined. Usually they are less general than policies and may become quite detailed in many instances.

The terms, procedures, methods, standards, rules and programmes are frequently used interchangeably, however it is useful to define each term individually.

A procedure is a course of action which has been predetermined. It usually consists of a number of separate steps often taken by different individuals.

A method is a course of action which has been predetermined and which relates to a single operation or workplace. A method could relate to one of the separate steps of a procedure.

A standard is a criterion established for the specific purpose of measuring the results of a plan as compared with the expected or hoped for results of the plan.

Rules are the simplest form of a plan. A rule requires that a specific and definite action be taken in a particular situation. They are related to procedures inasmuch as they guide action, but they specify no time sequence. Rules may or may not be part of a procedure or method. Rules may be distinguished from policies in that they allow no discretion in their application.

A programme is a complex of policies, procedures, rules and other elements necessary to carry out a given course of action. They may be far-reaching in their scope with respect to the organisation or may concern minor items.

OTHER METHODS OF CLASSIFYING PLANS.

Scott[3] considers that there are three major ways of distinguishing plans.

1. By subject area
2. By scope
3. By time

Subject Area. This variable describes plans in terms of observable specifications. A typical example is the grouping of plans in terms of functional specialisations, for example; marketing plans, financial plans, engineering plans, production plans and others. Another approach is to refer more directly to the subject matter of the plan, for example, personnel plans product plans and publicity plans.

Scope. Division of plans by scope is more complex than division of subject

area. Scope distinguishes plans according to the different range of influence and amount of detail which they contain. One form of classification by scope is the division of plans into strategic plans, tactical plans and operational plans[4].

Time. The time dimension gives rise to what are perhaps the two most commonly discussed divisions of planning, short-range planning and long-range planning. Although these two terms are in common use, the definition of what is short range and what is long range is seldom clearly stated. Rather there is a gradual merging of one with the other, or in some instances an overlapping of the two. Schaffir says:

> "Planning is 'long range' not so much because it attempts to span five or ten years, but rather because it raises fundamental questions, the answers to which have long-range impact. To me, the essence of 'long range' planning is the agonising reappraisal of the crucial problems and opportunities facing the business."[5]

Another class called intermediate plans has been suggested. These lie between the broad strategic goals of long range planning and the current operational programmes of short-range planning.

Thompson speaks of the dichotomy existing between short-range and long-range planning, and concludes that:

> "every decision, every action whether called short range or long range is immediately both."[6]

Essentially the difference between the two would appear to be not so much a question of the time involved in the plan as of the scope of the plan. Long-range plans are comprehensive, over-all and strategic, whilst short-range plans are derivative, functional and operational.

THE PLANNING THEORY OF LE BRETON AND HENNING.

Le Breton and Henning[7] have formulated a theory of planning which departs from the usual empirical approach to the subject and attempts to make a more basic examination of the planning concept. Their work covers, either directly or indirectly, all the aspects of the theory of planning generally expounded by less complete examinations of the subject; because of this it is intended, in the following pages, to discuss their theory in some detail.

The central theme of their argument is that the task of the executive is one concerned with the preparation, implementation and control of a fairly large variety of independent and interrelated plans. One of the most important functions performed by each executive is that of planning. A plan is an instrument to be used to assist in the performance of an assigned task. For a plan to be of maximum value, it must not only be logical in design but it must also contain reference to means to be used for implementing the various components.

Each formal plan should contain statements covering eleven different areas. These are known as the parts of a plan.

There are logical steps and guides that can be followed in the preparation of all plans. These are referred to as the planning procedure.

In addition each plan is postulated as being characterised by thirteen dimensions, each of which is present to a greater or lesser degree in each plan and which greatly influences the planning process. Finally the overall planning theory is divided into seven sub-theories which, combined with the parts of a plan, the recommended planning procedure and the dimensions of a plan give an integrated general theory of planning.

PARTS OF A PLAN.

Every formal plan should be logical in design, should include reference to means to be used for implementing the various components and should contain statements covering the following areas known as the parts of a plan:

1. Title of plan
2. Name of person who authorised the preparation of the plan
3. Name of persons who approved the finished plan
4. Name of persons who prepared the plan
5. Purpose or objective of the plan
6. Outline of problem
7. Recommendations - course of action to be taken
8. Expected results
9. Resource requirements
10. Supporting evidence - justifications for recommendations
11. Date plan was submitted and approved, and is to be implemented, and completion dates for each component of the plan

Title of the Plan. The title serves to identify the project and is essential to its proper control. Care should be taken when selecting titles, as a title open to misrepresentation or misinterpretation may cause problems during later stages of implementation of the plan.

Name of Persons who Authorised the Preparation of the Plan.

Name of Persons who Approved the Finished Plan.

Name of Persons who Prepared the Plan. The person responsible for implementing a plan will want to know by whose authority he has been directed to perform the task and who prepared and approved the plan. In addition to giving some perspective as to the relative importance of the plan, a knowledge of these facts will help in obtaining necessary co-operation from other units and in indicating where assistance may be sought if needed.

Purpose or Objective of the Plan. This would be an elaboration of the title in which an explanation would be given of the various areas covered by the plan. It should suggest to readers what they can expect to find in the body of the plan.

Outline of the Problem. This would be a follow-on from the statement of the purpose or objective of the plan and would present in greater detail the specifics of the problem.

Recommendations - Course of Action to be Taken. The recommendations are the statement, in specific terms,of what ought to be done to meet the problems outlined. It should be as complete in detail as possible so that

implementation can take place with a minimum of delay. This is the part of the plan which will almost certainly receive the greatest attention from reviewers.

Expected Results. This section should be also as specific as possible since it will serve as a standard by which success of the plan can be measured. The difficulties that it is anticipated might be met in the implementation of the plan should be set out in this section.

Resource Requirements. Except in the case where the recommendations of the plan are negative the implementation of the plan will involve the use of organisation resources. Details of these, set out as specifically as possible, should be included. These requirements should be set out in terms of units peculiar to the resources such as number of men, square feet of building area, cubic yards of concrete, as well as in dollar units.

Supporting Evidence - Justifications for Recommendations. It may be considered that the recommendations or some other part of the plan raise questions which, if not answered, could create doubts about the efficacy of the plan overall. If this is the case these questions should be discussed separately, preferably in an appendix to the plan. During the preparation of the plan attempts should be made to anticipate these questions.

Submission, Approval, Implementation and Completion Dates. The date of submission when compared with the date of approval gives an indication of the time it takes to get action on various plans. These dates also indicate the up-to-dateness of the material forming part of the plan. The date of

implementation indicates the time at which action on the plan should commence, and the completion date establishes the time at which all action proposed by the plan should be completed. Both implementation and completion dates may in fact consist of a series or schedule of dates for various phases of the plan. These dates form part of the framework for control of the plan.

PLANNING PROCEDURE

Planning is neither an automatic process nor does it just happen. Once there is an awareness that a plan is required it is useful to have a procedure to follow to develop the plan. The following sequence of steps is suggested as one possible procedure to follow in developing a plan.

1. Becoming aware of a possible need for formulating a plan.
2. For mulating a precise statement of the objective of the plan to be prepared.
3. Preparing a broad outline of the proposal.
4. Obtaining approval of the proposal.
5. Organising planning staff and assigning responsibility.
6. Determining the specific outline of the plan.
7. Establishing contact with all co-operating units.
8. Obtaining necessary data.
9. Evaluating data
10. Formulating tentative conclusions and preparing tentative plans.
11. Testing components of tentative plans.

12. Preparing the final plan.

13. Testing the plan.

14. Obtaining approval of the plan.

Becoming Aware of Possible Need for Formulating a Plan. Realising the need for a plan is perhaps the most significant phase of the entire planning procedure. It gives the initial impetus in the chain leading towards solution of the problem that has caused the need. The recognition of the need could come through a number of processes.

1. The recognition of a failing in some aspect of the present situation

2. A new idea arising from a source either within or without the business

3. A plan initiated on a more routine basis, such as the completion of an existing plan suggesting the need for a new plan

4. A variation between actual performance and expectation suggesting a need for a plan to examine and correct the situation

5. Suggestions from an organisational unit charged with the responsibility of making existing plans obsolete in the drive towards improvement

Formunating Precise Statement of Objectives of Plan to be Prepared. It is necessary to formulate clearly and precisely the proposed objectives of the plan so that the person responsible for approving the plan can review it objectively. Essentially this problem is one of communication and the attempt should be made during the planning process to develop an environment that will facilitate effective communication between all elements.

Preparing Broad Outline of Proposal. When a statement of the objectives

of the plan has been prepared the next step is to enlarge upon the proposal and to provide some supporting data. It is important at this stage to provide all pertinent information so that all approving authority can make an informed decision. It is often desirable to standardise and formalise the preparation of proposals to facilitate ease of comparison.

Obtaining Approval of Proposal. This step marks the end of the preparatory or getting ready phase. At this stage it will be decided whether or not the plan progresses any further. Up to this point the main concern has been to get authorization to initiate a study which, when completed, will be a plan.

Organising a Planning Staff and Assigning Responsibility. If the planning proposal is given approval the official planning group can be organised. Whilst the extent of the planning group will vary markedly depending on the size of the organisation, the important point is that adequate preparation be made to ensure that all needed data is obtained and that reasonable representation is had from those units which will be seriously affected by the plan.

Determining Specific Outline of the Plan. This step is an enlargement upon the details of the project submitted in the original proposal. It is intended to guide the planning group in its day-to-day work. This stage is considered to be extremely important because it gives meaning to the division of labour within the planning group, provides direction to each member, indicates any problem of excessive overlap, and allows for the setting of more precise

time standards for the completion of various components of the plan.

Establishing contact with all Co-operating Units. When a plan is to be prepared from data collected from a number of different sources, it is often desirable and some times necessary, to make official contact with responsible persons in each participating unit. Initially these persons should be informed of the authorisation of the project so that their co-operation can be readily sought when required in the later stages of the planning process. In some instances the units to be contacted may consist of persons both inside and outside the organisation. Those from outside the organisation would be consultants and the like, who co-operate on a fee basis and who would probably be subject to contract.

Obtaining Necessary Data. The collection of necessary data is a basic and vital part of the planning process, albeit it is often labourious and difficult. This is more so the case when organisation records are inadequate or when long-range projections and forecasts are involved.

Evaluating Data. Having obtained the necessary data it is then necessary to evaluate it for relevance to the achievement of the objectives, usefulness, validity, reliability and ease of interpretation. Not infrequently the problem is one of having too much of the wrong type of data. Once it has been decided that the data is valid and reliable and its meaning determined, it can be evaluated.

Formulating Tentative Conclusions and Preparing Tentative Plans. At this stage the various components of the plan which are interrelated must be

drawn together to form a tentative or preliminary plan. This is usually done in an informal style and its introduction may be done verbally. The important point is that the tentative plan is unofficial and has been prepared to guide the planners in testing out their recommendations.

Testing Components of Tentative Plans. Tests are often performed on the components of a tentative plan before a final plan is prepared, the object being to discover any possible flaws that may exist. The tests may not discover actual errors in the plan but only inadequacies, however useful information may be obtained from those units participating in the test. Where the plans are complex and full scale tests are not feasible, the use of models to simulate the real world should be considered. These models are used for testing plans as well as for decision making purposes.

Preparing the Final Plan. If the tests of the tentative plan indicate serious shortcomings, it may be necessary to repeat many of the steps listed previously, even to the point of submitting a new proposal. This latter situation should not arise, however, if other stages of the planning process have been carried out carefully. After the planners are satisfied with the test results each component is then integrated into a unified final plan. The plan should appear in the form previously set out in "Parts of a Plan", and should be so prepared that it will answer all significant questions that the planners could anticipate receiving from all interested parties.

Testing the Plan. The tests being considered here are those of completeness and saleability. At this final stage before the plan is submitted for approval

it is desirable to know whether it will be approved in its present form or whether it will be rejected in whole or in part. The purpose of the tests should be twofold:

1. To provide as much factual information about the plan as is needed to allow for an intelligent decision to be made regarding its value to the enterprise,

2. To ensure ease of interpretation and application of the plan by those units responsible for its implementation.

Obtaining Approval of the Plan. When the plan has been finally compiled and tested it is ready for submission for approval. Approval or otherwise of the plan may be subject to factors not related to the relative merits of the plan and which may be quite outside of the control of the planners; for example the plan may not have sufficiently high priority over other plans or the anticipated repercussions beyond the scope of the plan may be considered too serious. A point that must always be borne in mind is that the plan should be presented in such a manner as to receive approval because of its merits, not because of the subtlety of its presentation.

THE DIMENSIONS OF A PLAN.

The second part of the structural framework of the planning function as proposed by Le Breton and Henning, are the dimensions or characteristics of a plan. Every plan can be shown to be a function of thirteen dimensions, each of which is present to a greater or lesser degree in every plan. These dimensions are:

1. Complexity
2. Significance
3. Comprehensiveness
4. Time
5. Specificity
6. Completeness
7. Flexibility
8. Frequency
9. Confidential nature
10. Formality
11. Authorisation
12. Ease of implementation
13. Ease of control

Complexity. Perhaps the most easily recognisable dimension of a plan is its degree of complexity or simplicity. This degree of complexity or simplicity of a plan is conditioned by many factors, the more important being:

1. The number of parts within the plan and the interdependence of these parts
2. The number of variables to be considered in arriving at a decision about each component.
3. Precise guides available to help management in choosing alternatives
4. The technical nature of the subject matter being considered

5. The ease with which master plans and components can be sub-divided into more manageable units.

Number of Parts within the Plan. The measure of complexity here is not the number of parts or sub-parts which appear in the final plan, but the number of components which are logically distinct and identifiable within themselves but which need to be co-ordinated into a final total plan. In the formulation of the final plan from the parts it will likely be the case that the total complexity of the task will be greater than the sum of its parts. This will arise from the interaction of the various parts of the plan upon each other and the complications that are thus introduced.

Number of Alternatives to consider for each Component. Within each component of a plan there may be a number of alternative courses of action available to reach a given objective. If it is necessary to evaluate all these alternatives the planning process may become extremely complicated. Rather than do this it may be necessary to restrict the more exhaustive enquiries to one or two of the more likely looking alternatives.

Precise Guides to help Management choose Alternatives. Assuming that the technical nature of the material to be used in the plan and the number of alternatives to be considered are constant, then the plan will be more or less complex as the available guides to the desirability or otherwise of alternatives are less or more precise.

Technical Nature of the Subject. A plan may be complex because of the nature of the subject matter as such, or because of the planner and other

factors within the organisation.

The technical nature of the subject matter to be used in formulating the plan has a significant impact upon the complexity of a plan. The greatest impact is felt when the knowledge required for the adequate preparation of a plan is limited to a few persons either within or outside of the company. If this knowledge is readily available to the planner then to him the plan will be less complex irrespective of the complexity of the technical matter. If this help is not available then an increase in the complexity of the planning process would arise, taken from the viewpoint of the planner.

Divisibility of Plan. Some plans are intrinsically easily separated into logical, self-contained components. In some cases these components may be so self-contained that little or no co-ordination is required between components. In this case each component could be considered as a separate plan in its own right. The complexity of a plan tends to be reduced as it is divided into sub-units; however the fact that a major plan can be divided into logical units does not necessarily mean that this will be done. It may remain an integrated unit because the planner is not able to visualise it as made up of logical components or because it may not be desirable to separate out components.

Significance. Planning and plans permeate every level of the business organisation, and although every plan should contribute to the success of the enterprise there are usually a few plans which are thought of as being

key guides to future success. One useful method of assigning significance to a plan is to measure it by one of the following tests:

1. The total cost of preparation and implementation of the plan

2. The anticipated income or cost reduction expected to result directly or indirectly from the plan

3. The strategic relation of the plan or sub-plan to the overall plan

Cost of preparation and implementation. A plan which calls for a planning process that is costly in terms of the use of organisation resources will generally hold a greater significance for the organisation.

Anticipated Income or Cost Reduction. Plans are usually prepared because they are expected to result in increased revenue or reduced costs to the organisation. These may be obvious, either directly in tangible money gains or savings, or may be in a more intangible form such as gains in staff morale. It is considered desirable that the planner should always attempt to calculate the anticipated results of any proposed plan in dollar terms.

Strategic nature of the Plan. Plans may be of vital importance in their own right quite apart from their contribution to a larger plan. On the other hand a plan may be neither costly within itself nor be expected to result in increased revenue yet it may be of great significance because of its strategic role within the overall business programme. Within a plan there is usually a hierarchy of components based upon their contribution to the total plan. This is true whether the plan itself is of great or little

significance to the organisation.

Comprehensiveness. A plan becomes more comprehensive as it crosses organisational lines, both within a department and between departments. The comprehensiveness may also vary as the extent of the influence of the plan vertically, or within a department, or by the influence horizontally, or between two or more departments. In the vertical influence a plan tends to become more comprehensive as it moves up the organisation ladder within a department. In the horizontal influence a plan tends to become more comprehensive the more departments it includes. The most comprehensive plan is one which embraces the whole enterprise. The degree of comprehensiveness of a plan is a function of the level within an organisation where the plan is formulated, co-ordinated and controlled.

Time. Time as an element in the planning process can be considered in four aspects:

1. The preparation time required for developing a plan
2. The lead time required for beginning work on major portions
3. The time required for full inplementation of a plan
4. The distance ahead to be considered as a basis for general planning

Preparation Time. For a simple plan the preparation time may be almost negligible or at best a few minutes. As the components of a plan increase in complexity and comprehensiveness, the preparation time tends to become prolonged. Usual reasons for the prolongation of the preparation time are:

1. The amount and availability of information that has to be collected

2. The ease of interpretation of the information

3. The number of separate departments involved in the preparation

4. The use of a committee to prepare the plan rather than a single decision maker

5. The explicitness and completeness of all statements of objectives and policies

6. The importance of the plan in terms of cost or contribution to profits

7. The need for a quick decision, and

8. The experience of all personnel of the enterprise in the planning process.

Lead Time. Lead time can be considered as the total time required for all other necessary components to be performed before action can be taken on the major components under consideration. Another way to look at lead time is as the getting ready time before the implementation of the major component of the objective of the plan. Perhaps the best example of lead time is in the case of building construction where a considerable time may elapse and numerous derivative plans may be implemented between the start of planning of the project and the actual commencement of construction. This elapsed time would be the lead time.

Implementation Time. Implementation time is the period between the start of the implementation of a plan and its completion. Thus scheduled time for the completion of a plan or a phase of a plan is a function of the

resources, human and material, within and outside of the company, economic significance of the plan and the availability of funds by the company sufficient for the completion of the project. It is not infrequent that there is a time delay between the end of lead time and the beginning of implementation time. The formal plan is allowed to lie dormant for weeks or months before any action is taken, preliminary or otherwise. This delay should not be confused with lead time.

Looking Ahead -- Long range. This final time element is concerned with the number of weeks, months or years ahead management might wish to consider before formulating general or specific plans. Much of what has been written on planning seeks to make a distinction between short and long-range planning. Long-range planning is usually thought of as extending five years or longer. It is important, however, not to become confused with the implementation time. Long-range planning is concerned with the problem of attempting to predict and provide for the kind of environment the enterprise will be facing -- political, economic, social and ideological -- at some distant point in the future. Frequently it is claimed that plans for the future should be made for no longer than the period for which reasonably accurate data can be acquired. Others claim that it is satisfactory to go further in a general way, but only to use such extended data as an extension of more concrete facts and expectations. For example a five-year plan may be used as a guide with only the first year or two

serving as the basis for a specific plan. To summarise, it is considered that the number of years a company wishes to look ahead for planning purposes is a function of the degree of reliability that can be placed on the data accumulated, the need for rather precise information regarding the future, and the cost of obtaining this information.

Specificity. Components of a plan may be presented in a most general way or in specific unequivocal terms. Some of the more important elements of a plan which are presented in various degrees of specificity are the time for the beginning and end of various parts of the plan, the quality and quantity of various components to be purchases and/or produced, and the assignment of direct responsibility for the implementation, co-ordination and control of the plan and all of its component parts. A number of organisational factors affect the degree of specificity of a plan, the major ones being; the adequacy of existing company policies and procedures, the time lag between the formal adoption of a plan and the anticipated date of implementation, the importance of the plan to the company, the level within the organisation it is prepared and approved, and the nature of the components of the plan.

Completeness. A complete plan is one which includes all necessary components for proper judgement to be passed on its adoption or rejection and for its expeditious implementation. The two major modes in which a plan may be incomplete are by the complete omission of significant components of the plan or by incompleteness in some component. Either

of these omissions may be a matter of deliberate decision during the framing of the plan. Regardless of the reasons for an incomplete plan, it should be recognised that the lack of complete information cannot help but lessen the effectiveness of the plan.

Flexibility. Many elements within a plan may be fluid in nature and subject to change and other elements may appear to be highly flexible. The flexibility of a plan is conditioned by many factors and may take many forms, the more important being;

1. The objective itself may be flexible
2. The plan as a unit may be flexible
3. Certain components of the plan may be flexible

Flexibility of Objective. The degree of flexibility desired within a plan is influenced by the built-in flexibility of the substance of the plan. If the object of the plan can be accommodated to a variety of changing conditions then there is less need to be concerned about flexibility than if the object is static and unchanging.

The Plan as a Unit. In many instances the components of plans are so intimately related that a change in any significant component will require changes in other component. When this condition exists it may be found useful to have two or more complete plans ready to be introduced in the event that a change is necessary.

The Components of a Plan. Where the components of a plan are not intimately related to such a degree that changes in one component will

reflect upon the whole plan, flexibility may be introduced by having alternative plans for components. In this case the total available flexibility is considerably greater than the previous case where the components are closely interrelated.

Frequency. The concept of frequency or the number of times a given type of plan is prepared, is considered to be one of the most important dimensions of a plan. Some plans are prepared on a continuous basis whilst others may occur only once or a few times in the life of an enterprise. Most plans fall somewhere between these two extremes.

Confidential Nature. The term confidential is defined as applying to situations in which the contents of a plan or the entire plan are not to be known to anyone except authorised personnel. It is considered that there are three major situations to be guarded against;

1. A possible competitive loss resulting from competitors getting advanced information regarding company tactics or strategy.

2. Unnecessary complications arising from disclosure where the plans are of a personal nature or where loss of flexibility may result.

3. Situations where disclosure may result in serious embarrassment, loss of goodwill or possible reduction in morale of affected persons.

Formality. The concept of formality covers every major phase or part of the total planning and performance process. It may be divided into five parts;

1. The authorisation of the study

2. Preparation of the plan

3. Approval of the plan

4. Implementation of the plan

5. Control of the plan

Authorisation of the Study. The authorisation of the study may be an elementary process by word of mouth or a few handwritten notes, or where a plan is considerably more significant and comprehansive may be done by a formal document.

Preparation of the Plan. A simple, restricted plan may be formulated through personal contact of an informal nature. As a plan becomes more complex and extends across two or more departments, the entire process becomes more formal. In addition, the techniques used in the preparation of the plan become more sophisticated as does the final presentation of the plan.

Approval of the Plan. The approval of a simple, restricted plan is often done by word of mouth or by means of a signature on a statement of the plan. At the other extreme, the plan may be debated at some length by a formal committee composed of members of all groups affected by the plan. Plans of great significance may require approval by the Board of Directors or by the shareholders.

Implementation of the Plan. In the simplest case it would be expected that each assignment would be given personally, and perhaps verbally by the executive in charge. The more elaborate plans will frequently include

departmental assignments within the body of the plan with the formal plan being distributed to responsible organisational units.

Control of the Plan. With a simple plan, control tends to consist of personal checks upon performance carried out by the executive in charge. The progress of a more complex and comprehensive plan would be checked by means of reports setting out measurements of performance against standard.

Authorisation. Within a large organisation where there may be a multiplicity of plans, care must be taken to ensure that only officially approved plans are prepared and implemented. This becomes a particularly important and difficult problem when a relatively large organisation is concerned and where many plans require cross-departmental co-operation. The degree of formal authorisation required for the preparation or implementation of a plan is a function of the significance of the plan, the confidential nature of the plan, the quantitative and qualitative nature of the co-operation required, the explicit authority of the planner, and the level within the organisation in which the plan is to be prepared and implemented.

Ease of Implementation. The successful implementation of a given plan is a function of four factors;

1. Complexity of the subject matter
2. Technical nature of the plan
3. The planning process
4. The content of the plan

Complexity of the Subject Matter. Plans for large projects can be extremely complex. Whilst the plan cannot eliminate all problems arising from this complexity it can help to guarantee the efficient and effective accomplishment of the objectives of the plan despite the complexity.

Technical Nature of the Plan. To aid the implementation of a plan it should be set forth in simple terms and should contain sufficient directness to enable each participant to perform his role with minimum verbal direction from others.

The Planning Process. To obtain the best possible implementation of a plan it is desirable to have a satisfactory level of motivation amongst all personnel involved. To obtain this, the planning process should be so organised that the employees feel personally responsible for its outcome, have a clear understanding of the purpose or objective of the assignment and have had some part in the development of the assignment.

Contents of the Plan. The basic provisions of a plan may be such as to preclude any emotional reaction by participants, or they may be so emotionally charged that implementation may become complicated. Where emotional reaction to a plan may become violent it may be desirable to assign the implementation stage to organisation units other than those usually responsible for such assignments. In the ultimate this may involve the bringing in of outside consultants to carry out the implementation.

Ease of Control. Control in this instance is defined as the actual measure of performance against standards after implementation has been commenced.

The use of effective controls is one of the best means of ensuring that plans are performed as scheduled or at least adjusted to meet unanticipated conditions. The basic requirements for an effective control scheme would include a set of standards for each major component within the plan, a system for recording actual performance, a method for measuring variance from standard, a procedure for diagnosing reasons for significant variance, and provision for modifying the original plan, when necessary. The ease of control of a plan is considered to be a multi-variable function of the preciseness and accuracy with which premises can be established, the accuracy of the plan, the preciseness and accuracy with which standards of performance can be established, the nature of the planning process and the measuring tools available.

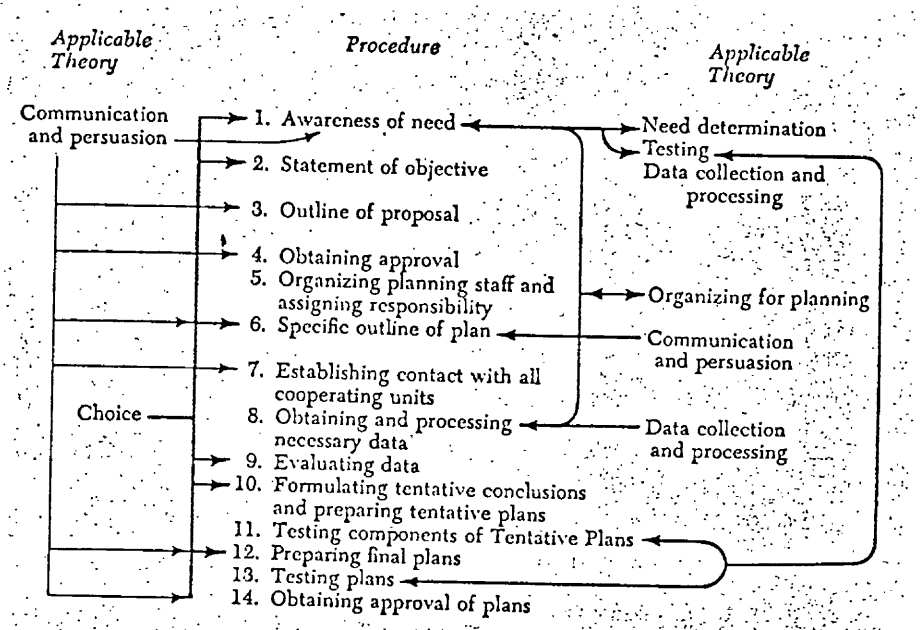
RELATIONSHIP BETWEEN THE PLANNING PROCEDURE AND THE DIMENSIONS OF A PLAN.

To integrate the theory of Le Breton and Henning, it is necessary to show the relationship between the various dimensions and the parts of the planning process. This interrelationship is illustrated in figure 1.1(8). As an example of the interpretation of the table, the greater the complexity of a plan the greater the likelihood that the planner would obtain benefit from steps A, B, C, D, E, F, G and H of the planning process, and the more the frequency of the plan the greater the likelihood that the planner would obtain benefit from steps C, D, and F of the planning process.

In order to explain further the various steps in the planning process

FIGURE 1.2 (9)

RELATIONSHIP BETWEEN PLANNING PROCEDURES AND PLANNING THEORIES



Le Breton and Henning developed seven component theories of the general theory of planning:

1. Theory of Need Determination
2. Theory of Choice
3. Theory of Data Collection and Processing
4. Theory of Testing
5. Theory of Organisation for Planning
6. The Role of Communication Theory in Planning
7. The Role of Persuasion Theory in Planning

The general relationship between these theories and the steps of the planning process is shown in figure 1.2(9). The theory of need determination has its greatest impact on the first step in the planning procedure, awareness of need. The theory of choice is of particular relevance to awareness of need, statement of objective, specific outline of plan, evaluating data, formulating tentative conclusions and preparing tentative plans, and preparing final plans. The theory of data collection and processing has its main impact on awareness of need and obtaining and processing necessary data. The theory of testing is of greatest importance in awareness of need, testing components of tentative plans and testing plans. The theory of organisation for planning relates specifically to organising planning staff and assigning responsibility. The theory of communication and the theory of persuasion have their greatest impact

upon awareness of need, preparing broad outline of proposal, obtaining approval, formulating a specific outline of plan, establishing contact with all co-operating units, preparing final plans, and obtaining approval of plans.

IN CONCLUSION - THE THEORY OF LE BRETON AND HENNING.

The planning theory of Le Breton and Henning is perhaps the best theoretical approach to the subject presently available. In their conclusion the authors set out areas for future research in planning theory. A particularly interesting suggestion is the development of a measuring scale to quantify intensities or degrees of each dimension of a plan. If such a scale were available it would be possible to get an overall rating for a plan based on the measure of its dimensions and thus a measure of the overall significance of the plan to the organisation.

THE PLACE OF PLANNING IN MANAGEMENT.

Billy E. Goetz states that management's search for economic efficiency may be analysed into three groups of activities:

1. Planning enterprise activities
2. Controlling enterprise operations
3. Conducting social contacts

In a footnote he adds:

"Various writers have divided the functions of management differently. Among others are the following:

Taylor: planning, performance

Newman: policies, organisation, facilities, technique

Church: design, equipment, operation, control, co-ordination

Sheldon: selling, procuring, facilitating

Walker: planning, direction, control, representing

Gulick: planning, organising, staffing, directing, co-ordinating, operating, reporting, budgeting."[10]

To these must be added:

Urwick: forecast, plan, organise, command, co-ordinate, control

Koontz and O'Donnell: planning, organisation, staffing, direction control

Terry: planning, organising, staffing, actuating, co-ordinating, reporting, budgeting.

Fayol: planning, organising, commanding, co-ordinating, controlling

LeBreton and Henning: establishing objectives and goals, determining policies and procedures, preparing necessary plans, implementation of plans.

Amongst these slightly differing views there can be seen a general consensus that planning, organising and controlling are three of the essential core functions of management. Le Breton and Henning consider that planning is an even more basic function which forms part of all the other functions inasmuch as all these functions are themselves planned.

To consider that the functions set out above were, in fact, the central and overriding functions of management would be to place too great a dominance upon the classical or traditional theories of management. Far more sophisticated theories have been developed which, whilst not denying that these functions have a place in the total theory, relegate them to a less important position than that proposed by the traditional school. March and Simon[11] who have advanced decision theory to a highly sophisticated level, incorporate planning in their theory with the statement:

> "'Planning', broadly defined, is of course indistinguishable from other kinds of decision making".[12]

Simon[13] says of planning:

> "There are two administrative techniques that are of key importance in the process of composite decision . . . . . The first of these is planning."[14]

CONCLUSION.

In this chapter the definition of planning has been examined, a major theory of planning reviewed, and an effort made to establish the place of the planning concept in the management process.

Planning is simple to define in broad and general terms, however a more detailed examination reveals some differences of opinion concerning the more detailed sub-divisions and classes of planning. This situation is not unusual in most fields of human communication. Perhaps the only useful conclusion that can be drawn is that, when planning is discussed, all parties concerned should ensure that they have a similar understanding of the terms being used.

The planning theory of Le Breton and Henning was reviewed in some detail. Without delving too deeply into the psychological and behavioural aspects of the planning process, their theory would be perhaps the most basic, theoretical approach presently available. It departs from the usual empirical approach to the planning process and, because of this gives a firm basis for a further development of planning principles and procedures.

The place of the planning process in management theory is largely a matter of degree, rather than a question of whether or not it, in fact, has a place.

No management theorists deny its significance, whilst some would say that it is the most significant factor in the management process.

In practice, in industry, the importance of planning in all its forms is slowly being recognised. Scott[15] has set out the situation in American industry particularly well, and a further insight may be gained from Steiner's[16] work. The situation in Australian industry has not been documented, however the indications are that the present state of progress is considerably behind that of American industry.

CHAPTER 2.

SHORT RANGE PLANNING.

The significant difference between short-range and long-range planning lies, not so much in the time dimension, as in the scope of the respective plans. Long-range planning raises fundamental questions, the answers to which have long-range impact. Short-range planning tends to be derivative, functional and operational, although it may also extend for lengthy time periods. Many of the short-range planning techniques would perhaps be better described as scheduling procedures. Scheduling can be defined as the establishment of a calendar timetable for allocating or committing resources to project activities within the limits available. Such allocation takes place only after the master plan has been drafted, refined and approved. The main objective in scheduling is to complete the project in the best time and at the least cost.

The foundations of the majority of the short-range planning techniques currently used can be traced to the scientific management era of the early 1900's. The work of Frederick Winslow Taylor inspired his contemporaries and others in later years to devise systems designed to introduce order and control into the industrial situation. The systems that have been evolved can be divided into four major classifications;

1. Prior cost systems
2. Prior scheduling systems, typical examples of which are Gantt charts, the Milestone method and the Line of Balance technique

3. Network planning systems

4. Modern analytical methods, such as linear programming, that have developed out of Operations Research.

PRIOR COST SYSTEMS.

Prior cost systems are based upon the concept of direct labour standards and control of direct labour costs. In these systems, costs are segregated into the categories of directly variable, semi-variable and fixed with respect to volume of goods produced. Variable, and to some extent semi-variable, cost control depends for its effectiveness upon a set of standards as a framework of reference, these standards normally being established by industrial engineering practices. The fixed or overhead elements in such control systems are often handled on a budgeted basis, that is, annual levels of expenditure are determined, usually without any specific identification of the costs of individual tasks within the overhead structure. Allied with a known pricing structure and a sales forecast, the standard costs and performances form the basis of the organisation's plan of operation for the desired planning period.

This approach to cost and profit planning in its many variations has had considerable success, particularly when associated with budgeting and with industries involved in high volume production of standardised products, or at least products with an established bill of materials and associated standard costs. However the system is not satisfactory when

applied to large, non-standard, "one off" programmes which have become such an important feature of industrial life in recent years.

PRIOR SCHEDULING SYSTEMS - GANTT CHARTS.

The Gantt chart was developed during World War I by Henry L. Gantt, one of the pioneers of scientific management. Gantt charts emphasise that time is one of the major elements in planning, whereas prior cost systems are essentially concerned with cost and profit planning. Perhaps the major application of Gantt charts has been to production planning, however the technique is general in nature and can be used to plan the best use of a wide range of organisation's facilities and then to control the operations in accordance with these plans.

The concept of the Gantt chart is simple, and in practice they are quick and easy to use. On the vertical axis of the chart are listed the kinds of capacities to which the various requirements must be allocated or orders to which capacities are to be apportioned. The horizontal axis represents the available time for this work. Allocation is accomplished by assigning the times necessary for performance of the given tasks to the available capacities or requirements by trial and error, until a feasible fit is discovered. This, then, becomes the plan of action for the time span covered by the chart, and the chart can then be used for management control purposes.

The notation and symbolism used in constructing Gantt charts varies to some extent, however the following symbols are commonly used:

FIGURE 2.3 (18)

PROJECT VARIATION OF GANTT CHART

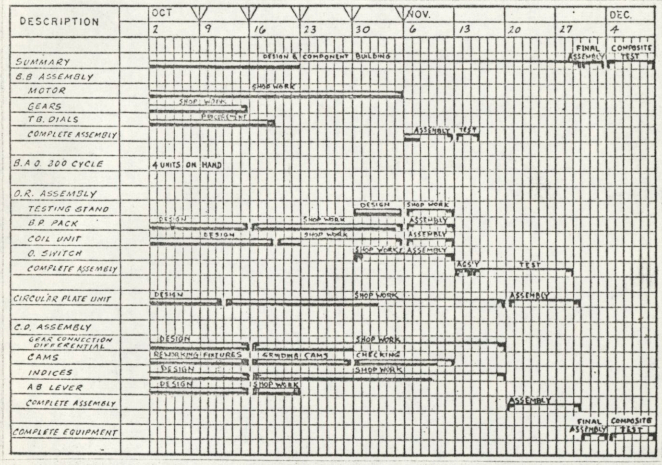


FIGURE 2·2
VARIATION OF GANTT CHART AS USED
FOR MAINTENANCE SCHEDULING

NO. 5 MACHINE SCHEDULED SHUT

MONDAY, 29TH MAY 1967

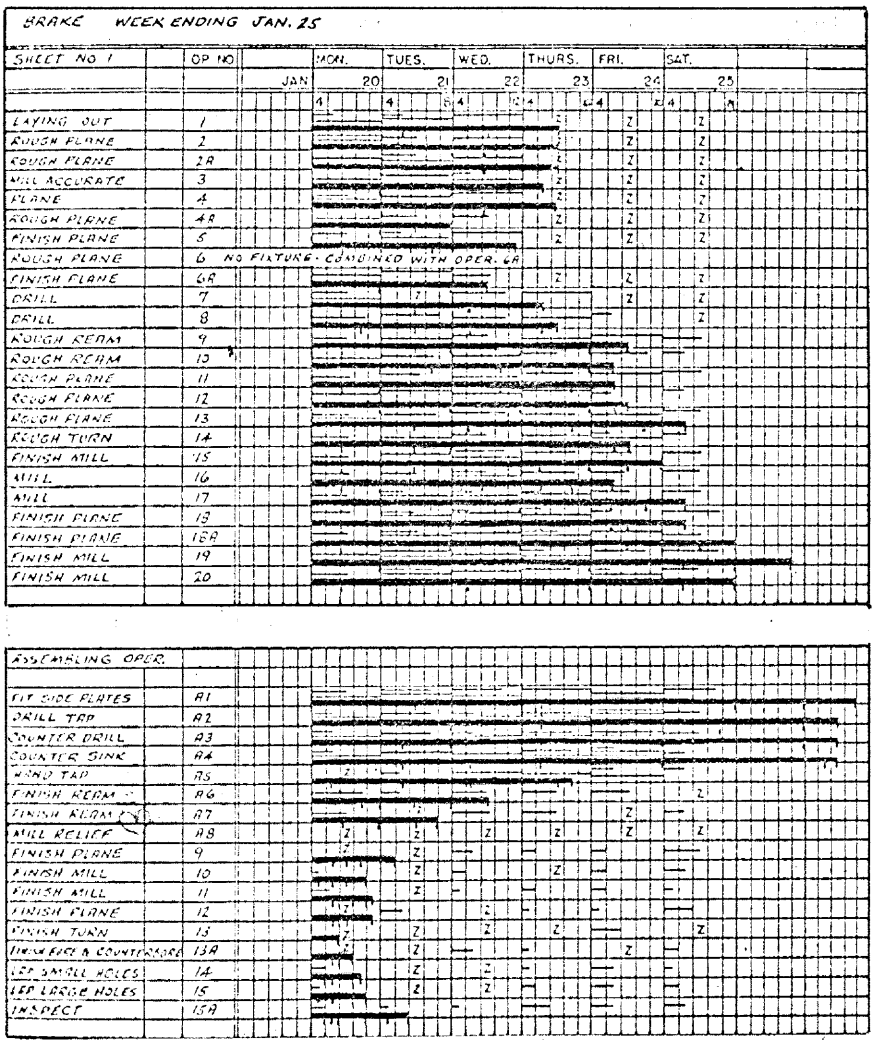
Shut 6.15
Magnus Wash 6.15 - 6.45
Cut off Felts 6.45
Wash up Vats by 7.45
Fit Top, bottom felts 7.45 - 12.30
Prepare and shrink 12.30 - 1.00

Lower Rolls	1.00 - 1.30
Fill up Vat system and Acid	1.30 - 2.00
Stock on	2.00
Wet End Required	12.30
Steam at pressure	2.00
826 required at	1.00 p.m.

		TRADESMEN	ASSISTS.	F.	C.	P.	W.	R.	E.M.	I.F	7.30 8.30 9.30 10.30 11.30 NOON 1.00 2.00
	SERVICES ROUTINE WORK:-										
	Check all hoses and connections					1					xxxxxxxxxxxxxxxxxxxxxxxxxx
	O/Haul slice boards				1						xxxxxxxxxxxxxxxxx
	" wooden doctors				1						xxxxxxxxxxxxxxxxxxxxxxxxxxxx
	ROUTINES, PREVENTIVE MTCE. & OTHER WORK:-										
	DRYERS & CALENDER WORK:-										
	Check and adjust Sheahan rope pulley			1							xxxxxxxxxxxxxxxxxxxx
	" bolts on " " rings			1							xxxxxxxxxxxxxxxxxxxxxxxxx
7579	Change Jag reeler slitter bar			1				1			xxxxxxxxxxxxx
7581	Check No.7 extraction fan)			7							xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
7554	Fit grease pipe 7 Ext. ")										
7587	No. 7 Header, trap & sight glass			12							xxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
7589	No.57 Header repack steam gland			12							xxxxxxxx
7588	Fit by-pass Ross Grewin fan			13							xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
7590	No. 25 Dryer Header			14							xxxxxxxxxxxxxxxxxxxxx
7591	No.8 " Steam trap sight-glass			14							xxxxxxxxxxxxxxxxxxxxxx
7592	Dryer Oil leaks			15							xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
	4th Section Sheahan ropes							1:2			xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
	WET END & PREPARATION										
	Inspect return suction roll tray			W. JOYNER							
	Check belts 2nd press top roll drive			L.H.							
	Pack necessary pumps, refiners			Shift Fitter							xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
7584	Replace 3rd Press Lead roll belt			3			2				xxxxxxxx xxxxxxx
7459	Free 1st - 2nd press B/S lift gear			3							xxxxxxxxxxxxxxxxxxxxxxx
7583	Change Hurletron roll	"B"		5				3:4			xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
7585	Instal stock line blanks			6							xxxxxxxxx
7582	Reposition end 3rd press check roll			6							xxxxxxxxxxxxx
7486	Instal No.7 Baffle			6							xxxxxxxxxxxxxxxxx
7346	O/Haul 3rd-4th-5th press doctor Oscill.			8							xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
7572	Booster M.G. set check oil rings			9							xxxxxxxxxxxxxxxxxxxxx
7557	Remove pipe over liners tank (safety)			9				5			xxxxxxxxxxxxxxxxxxxxxxx
7494	Re-set 5th press doctor			10				3:4			xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
7580	Refit keys 1st - 2nd press rolls			11				3:4			xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
7578	Repack pumps 826			2							xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
7586	Check Hyd. conveyor slats			4			1 + FIREMAN				6.30xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
7463	Check Drive on Screw lift			16							xxxxxxxxxxxxxxxxxxxxx
7558	Wash up tap Dorr water line			16			2				xxxxxxxxxxxxxxxxx
	SERVICES DEPTS.:-										
7388	Repair Centricleaner headers						3				xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
7378	Instal Hyd. conveyor catch-plate						4				xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
7413	Build up around pipes 826				2 + B/L						xxxxxxxxxxxxxxxxxxxxxxx
2874	" " wall 1 - 2 chests	(PRODUCTION TO CLEAN WALL)			B/L						xxxxxxxxxxxxxxxxxxxxx
2583	Disconnect F.W. Wash up tap					1					xxxxxxxxxxxxx
	ELECTRICAL DEPT.:-										
	Brush gear Prep. Motors								6		xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
	" " Jordan Motors								7		xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
	" " M.G. sets, master motors								8:9		xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
	Check break detector, Hurletron								10		xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
	Brush gear Jag reeler - lighting								11		xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
	No.14 Substation check cubicles								2:3:4		xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
	Standby Hydrapulper conveyor								1		xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
	Change Wet End control buttons								5		xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
	Isolations								1 - 7		xxxx
	INSTRUMENT FITTERS:-										
2936	No.1 Chest level controls									1	xxxxxxxxxxxxxxxxxxxxx
2892	Liquid cyclone - trial gauge									1	xxxxxxxxxxxxxxxxxxxxxxxx
2937	Align Hurletron									2	xxxxxxxxxxxxxxxxxxxxxxxxxxxx
2938	" controller - starch plant									3	xxxxxxxxxxxxxxxxxxxxxxxx
	TOTALS			17	3	1	4	5	11	3	

FIGURE 2.1 (17)

GANTT CHART



1. An angle (⌜) opening to the right, indicating the date or hour when work is to be begun

2. An angle (⌝) opening to the left, indicating the date on which work is to be completed

3. A figure (1^{10} 1) placed at the left side of a space indicating the amount of work scheduled for any period of time

4. A figure (1^{34} 1) placed at the right side of a space indicating the amount of work done up to any specified time.

5. Work done during any period of time is represented by light lines. Heavy lines show the cumulative amount of work done and its relation to the amount scheduled to be done up to any given date

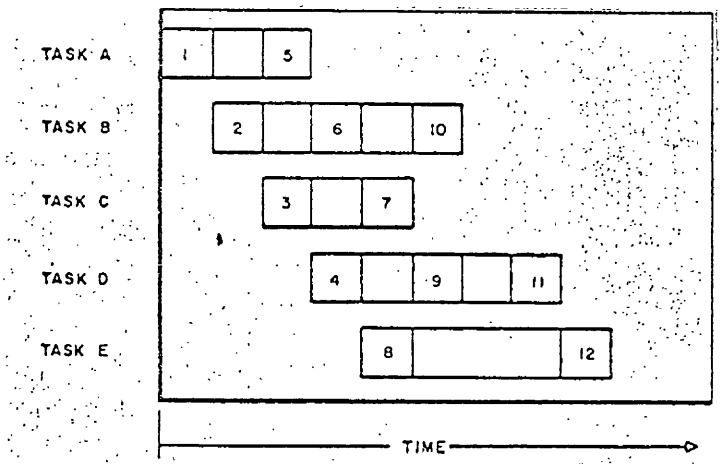
6. A cross (⋈), indicating a time period which is eliminated when the time previously allocated becomes unavailable

7. A vee (∨) indicating the current date.

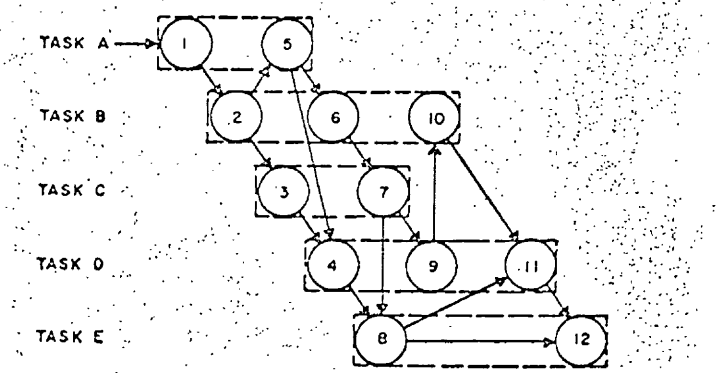
Whilst the Gantt chart appears in many variations the progress chart form has become the most commonly used type for planning purposes. Typical examples are shown in figure 2.1 which illustrates the planning of a week's work in a machine shop, whilst figure 2.2 shows the use of a variation of the technique to plan a five-hour maintenance shut-down on a large paper machine. Another variation, the project planning chart, illustrated in figure 2.3, can be used to plan "one-off" type projects and developments, however they tend to become unwieldy in use for projects of any complexity.

FIGURE 2.4 (19)

GANTT MILESTONE CHART



PERT NETWORK DERIVED



Charts, and in fact many graphical techniques, are often difficult to handle; the Gantt chart requires constant attention to keep the information up to date. Corrections and changes in schedules and plans are difficult to make, particularly as the plans increase in complexity. Another weakness of Gantt charts and similar planning devices is that they consider only one dimension -- time. Quite often there are other factors which must be considered, not the least of which is cost.

PRIOR SCHEDULING SYSTEMS - THE MILESTONE METHOD.

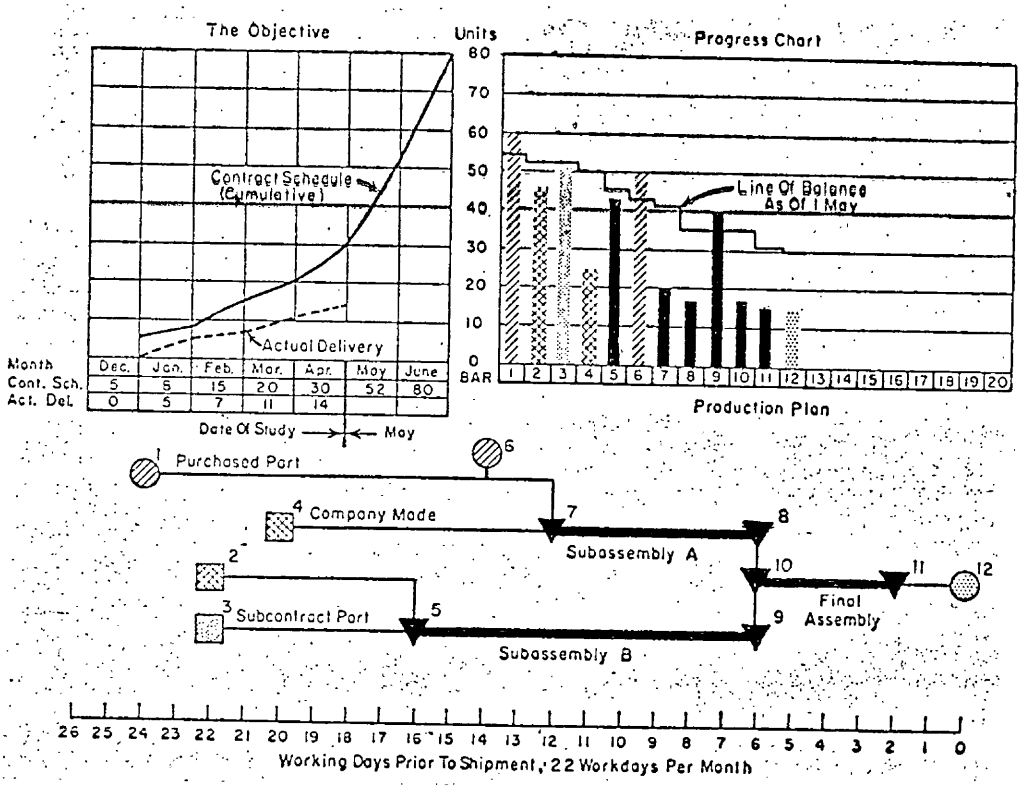
The milestone method is in essence a refinement of the Gantt chart, introduced as a step towards obtaining a more comprehensive programme planning and control system. A much simplified example is shown in figure 2.4. In order to obtain a more detailed view of programme status, individual "milestones" are established within each horizontal bar on the Gantt chart. These points must be carefully selected to ensure that they represent a carefully defined and relevant point in time. Whilst this method is an improvement on the Gantt chart, it does not explicitly indicate the constraints that exist in a plan nor does it take into account the cost factor. Because of these factors it has tended to find its main use as a master scheduling or summary reporting technique.

PRIOR SCHEDULING SYSTEMS - THE LINE OF BALANCE METHOD.

Figure 2.5 shows in simplified form the essential elements of a line-of-balance chart. At the base of the chart is the programme plan or "set-back" chart, which represents the key to the line of balance

FIGURE 2.5 (21)

LINE OF BALANCE CHART



technique. It is made up by analysing and displaying in a horizontal fashion all the assemblies that feed into the final end product, the subassemblies that feed into these assemblies, etc., back to the point of initial purchase of material. After this is done, standard or estimated times are developed for the lines connecting the start and completion points of individual assemblies and sub-assemblies, and the results are shown on a calendar-time scale as working days prior to shipment.

In the upper left-hand corner of the line-of-balance chart is the objective or cumulative contract schedule. In figure 2.5, this curve shows that a total of eighty units are to be delivered by the end of the month of June. Actual deliveries are behind schedule as of the end of April. If, at the end of April, it is desired to know how many item 1 parts must be purchased in order to make delivery of all units scheduled for the end of May, it is necessary to go through the following steps:

1. Determine the set-back time to item 1 (this is twenty-four working days or one calendar month)

2. Enter the objective chart as of the date of status reporting (in this case, the end of April)

3. Go one month to the right of this date, and draw a vertical line upward to the point where it intersects the cumulative-contract-schedule line. This shows that fifty four item 1 purchased parts must be on order at the end of April; otherwise the delivery quantity and schedule called for by the cumulative delivery curve will not be met.

This number, that is, fifty-four item 1 purchased parts on order at the end of April, is carried across to the progress display shown in the upper right-hand portion of the line-of-balance chart. By this means a line of balance is developed for all items shown on the set-back chart. The value of the line of balance is always expressed in equivalent end-product units. For example, if two of the same parts are required for use in subassembly A, 108 must be ordered by the end of April; but this is expressed on the line-of-balance progress chart as 54. At the end of April it will be noted that only fifty of item 4 must be ready for fabrication start. This is because item 4 has a different production lead time than item 1.

In the actual use of the line-of-balance technique a periodic count is made of completed parts and subassemblies, exclusive of rejects, and the quantity displayed in a vertical bar chart fashion, as shown in the upper right-hand portion of figure 2.5. Since the line-of-balance method does not generally cover all material going into an end product, only the parts in shortest supply for any one sub-assembly are displayed for control purposes. If the vertical bar in the upper right-hand corner of figure 2.5 is below the line of balance, a shortage of material exists; if above, there is too much material. As of the end of April, item 4 the company made part, is the major contributor to the overall schedule delinquency. At every updating period the line of balance will move upward, and new item completion quantities will be posted.

The line-of-balance method has value as a planning technique particularly in large-scale repetitive production operations where the product breakdown is well defined and processing times are stable. Its use for non-repetitive development type programmes or in the early stages of production planning has not been found satisfactory mainly because of the lack of flexibility of the system and the uncertainty of the time estimates involved. As with Gantt charts and the milestone method, line-of-balance is concerned primarily with the time dimension, a characteristic which reduces its usefulness as a planning and control technique.

NETWORK PLANNING SYSTEMS .

When attempting to establish a completion date for any large complex task in industry, whether it be in project development, marketing, capital budgeting, engineering, research or production, it is necessary to time-table and plan all of the activities which form part of the task. The previously discussed scheduling methods are of limited value due to their inflexibility and the inability to show the interrelationships between the various elements of the plan.

Considerable research into this planning problem culminated, in the late 1950's, in the development of two separate planning systems, the critical path method or CPM and the project evaluation and review technique or PERT. Both of these are part of the more general group of network planning techniques based upon the scientific and logical analysis

of all the elements of a task and the interrelationships of these elements.

The Elements of a Network. In network analysis a project is represented by an arrow diagram which is made up of two basic elements, events and activities.

An event is defined as a meaningful specified accomplishment (physical or intellectual) in the programme plan, recognisable as a particular instant in time. Events do not consume time or resources.

An activity is a time consuming element in the execution of a task. An event is separated from another event by an activity. An activity cannot be started until its preceeding event has been accomplished. A succeeding event to an activity cannot be accomplished until the activity is complete.

There are a number of important rules connected with the handling of events and activities on a network. These rules must be followed in order to maintain the correct logic of the network; in addition, they have an important impact on the quality and depth of planning required to construct a network.

Rule 1 Each activity must have a predecessor and successor event. Similarly, each event must have a preceding and succeeding activity, with the exception of starting and terminating events. However, an event may have more than one preceeding and succeeding activity.

Rule 2 No activity may start until its predecessor event is completed; in turn, no event may be considered complete until all activities leading into it have been completed. This rule requires that events and activities

be clearly defined and the real restraints of the programme identified and portrayed on the network.

Rule 3 Each activity must have a unique set of numbers assigned to it. In cases where two or more activities exist between any one pair of predecessor and successor events, the situation is best handled by introducing a dummy or zero time activity after the common preceeding event or before the common succeeding event.

Rule 4 An event must describe the complete relation between all entering and leaving activities. This rule is frequently broken where a number of activities finish and start at the one event. The construction of the network must be such as to show the true interdependencies between entering and leaving activities.

Rule 5 No given event can be followed by an activity path that leads back to that same event. This situation is known as looping.

Time Estimates. It is in the matter of time estimates that a significant difference exists between CPM and PERT. In CPM a single estimate is given, which expresses the expected time for the activity to be completed; with this approach, the problem of uncertainty in time estimates is disregarded. However in a great many activities a substantial element of time uncertainty does exist and to make allowance for this a three time estimating concept was introduced into the PERT system. In the three time approach estimates are made of the optimistic, most likely, and pessimistic activity times. These are defined as;

Optimistic - the shortest possible time in which the activity can be accomplished,

Most likely - the time estimate which would be made if only one were requested. It is also the time that would occur most often if the activity were repeated under exactly the same conditions many times; or it is the one that would be given most often if many qualified people were asked.

Pessimistic - the longest time that the activity should take. It should be a time that is exceeded on no more than one in a hundred occasions. The time should reflect the possibility of initial failure and fresh start, but should not be influenced by such factors as catastrophic events, strikes, fires, power failures and the like, unless these are risks inherent in the activity.

Once having obtained these three time estimates, two further steps are possible. The first is to combine them into a single time -- the expected time. It is not possible to state with any certainty what this expected time will be, unless the way in which the actual time taken for the activity varying over a large number of repetitions of the activity is known. However experience has indicated that activity times will follow the beta distribution. If so, this will give an expected time

$$te = \frac{a + 4m + b}{6}$$

where a is the optimistic time, m is the most likely time, and b is the pessimistic time. This formula gives a time somewhat greater than the

most likely time -- in fact, a time one third of the way from the most likely and the mid-range value of the optimistic and pessimistic times. The second step that can be taken is to obtain an indication of the probability of achieving the expected time. The greater the difference between "a" and "b" the less likely it is that any particular value of expected time will be achieved. Based upon the normal distribution as an approximation, the standard deviation is; $\frac{b - a}{6}$.

Using this information, and making the simplifying assumption that the probability distribution of times for accomplishing a job consisting of a number of activities may be approximated by the normal distribution, the probabilities of meeting specified times or being within a range of specified times can be determined. The probability of meeting a specified time can be calculated using normal probability distribution tables and the equation

$$Z = \frac{T_S - T_E}{S.D.}$$

where Z = probability factor

T_S = scheduled or specified time

T_E = Expected time

S.D. = standard deviation

The probability of an activity being completed within a specified time range can be determined by calculating the probability of completion within each of the times and then subtracting the two probabilities.

Analysing the Network. Having completed the initial planning associated with the network, that is preparation of the network diagram and attendant time estimates, further considerable benefit may be obtained by analysis of the network. From an analysis of the network it is possible to determine that sequence of events which takes the most time to complete. In small networks this can be done by visual means, but where the number of activities rise to over 150 then more sophisticated means are needed, either by calculation manually or by a computer. This one path, which is more critical than others, is called the critical path. The critical path of a network is the path between the origin and the end objective that requires the greatest amount of time. It is found by totalling individual times along every possible path in the network, and selecting the sequence of activities/events requiring the greatest amount of time. When any event on the critical path falls behind its expected date of accomplishment, it can also be expected that the final event will fall behind.

Earliest start time (EST). Earliest start time is the earliest time at which an activity in a project can start. Earliest start times are calculated by adding the earliest start time for a preceding activity to the duration time for the same preceding activity. When there are multiple preceding activities, select the activity with the largest numerical early start value, because the activity cannot possibly start until the preceding activity with the greatest accumulated time has been completed.

Latest finishing time (LFT). Latest finishing time is the latest time for the finish of an activity if minimum project duration is to be maintained. Latest finishing times are calculated by subtracting the duration time for a succeeding activity from the latest finishing time for the same succeeding activity. When there are multiple succeeding activities, select the activity with the smallest numerical late finish value, because the latest possible finish time will be when the accumulated time for the succeeding activities is at a minimum. Latest finishing times are calculated by starting at the end of the network diagram, then following back through the network to the beginning activity.

Float time. Float time is a term from critical path terminology and is defined as the time by which the start of an activity may be delayed without causing the project to take longer; however if an activity is delayed it may cause delays in the start of succeeding activities.

Slack time. Slack time is the PERT equivalent of the CPM float time and is the difference between the latest time for the event and the earliest time for the event. Events with zero slack are on the critical path. If a schedule date is imposed on a project that is earlier than the expected project duration, negative slack is possible.

Float analysis. Float analysis is the breaking down of float time into its components. Four types of float are recognised. Total float, free float, interfering float and independent float.

Total float time is the excess time that can be made available for the

completion of an activity if the preceding event is achieved at its earliest date and the succeeding event at its latest date. It is the amount of time that an activity can be delayed without affecting the critical path activities. Free float is the excess time that can be made available for an activity assuming its preceding and succeeding events are achieved at their earliest dates. Free float time is thus the amount of time that an activity can be delayed without affecting the earliest possible starting time of any other activity immediately following it.

Interfering float time is the difference between the total float of an activity and the free float time of the same activity.

Independent float is the margin available to an activity when its preceding event occurs as late as possible and its succeeding event as early as possible.

Presentation of Results. Upon completion of the network analysis in terms of the critical path and the slack or float characteristics, the requirement becomes one of the presentation of the essential information present in the complex data obtained, to those who need it, in a form that can be readily understood and acted upon. Broadly, the results of the network analysis can be presented in four main forms;

1. Events reports
2. Activities reports
3. Selective reports
4. Graphical representations

The events reports and activities reports are both usually in tabular form, whilst graphical representations employ pictorial techniques to place emphasis upon either event or activity relationships. In all four types, the aim is to select the required information and to arrange it in its most useful and most easily understood form. However, despite the best arranged of reports and pictorial representations, the most fruitful results can only be obtained from the analysis by having a full understanding of the exact significance of the calculated data -- dates, critical paths, slacks, floats etc.

Replanning. When the network has been constructed, analysed, and the results assembled in a convenient manner, the plan can, for the first time, be examined in its entirety. The task now becomes one of ensuring that the plan's objectives are met on time and that suitable general policies are fulfilled. The examination of the network should be directed towards the following major factors;

1. Project duration time -- is it too long or too short
2. Degree of uncertainty in project end date and other intermediate important events
3. Cognisance of external restraining dates
4. Suitability of plan as a basis of work schedule and control
5. Financial implications of the plan
6. Suitability of the methods employed

All of these factors are interlinked, and often conflicting in their interaction.

To ensure that the network fulfils its objectives it is replanned until the analysis shows that the required improvements have been made. These changes are made by;

1. Changing activity relationships or the method of carrying out the plan,that is,altering the network

2. Re-allocating resources, that is, altering activity times

3. Scheduling activities and events more closely

It is probable that a combination of these courses will have to be tried before the final plan is evolved. Because of the complexity of the average network, and because several alterations are usually made simultaneously, the outcome of the changes is not always predictable and it becomes necessary to re-analyse the planning network after each set of adjustments. It therefore becomes an ITERATIVE procedure, whereby successive experimental improvements converge upon the most satisfactory plan.

PLANNING THE USE OF RESOURCES BY NETWORK METHODS - MONEY.

During the original formulation of both the PERT and CPM methods it was recognised that the network technique would provide an ideal framework for the development of cost control on complex programmes. The basic objectives of network/cost analysis are twofold;

1. To achieve a significantly better, or more realistic, original programme cost estimate

2. Once the programme is authorised to proceed, to achieve a marked improvement in control against the original estimate

Whilst in theory the concepts of cost control based on the project network are not complex, the design and the implementation of a practical cost control system is somewhat more difficult. The fundamental problems facing the system designer are found in the structure of the normal project organisation and in the determination of the desired level of effectiveness of the system. The basic organisational problem is the conflict between the project approach of network cost control and the functional approach of cost accounting procedures found in most industry. The conflict is particularly evident in the design of the input and output phases of the network system. The input to a network system requires the development of an activity accounting procedure by which actual expenditure data are coded to provide association with activities or groups of activities in the project network. However the output from the system must be project oriented to provide project summary reports, organised by time period, areas of responsibility, and technical subdivisions of the project. Determination of the desired level of effectiveness of the system is a problem because of the mass of detail available from a network analysis particularly when electronic computation methods are used. It is necessary to ensure that the output level is such as to provide useful material which will provide a return on the investment necessary to establish the system.

The two major systems of network cost planning and control are PERT/COST and CPM Normal Cost/Crash Cost.

PERT/COST. The PERT/COST system is based upon the PERT/TIME network concept of project planning, with the addition of the accumulation of labour hours, charges for direct costs associated with the works and also indirect costs against the time period at which it has been decided that activities should take place. The main features of the PERT/COST system are as follows;

1. Breakdown of a project by considering the same project in different degrees of detail at different summary levels. The most significant feature of this work breakdown is to provide a framework for identifying all the major tasks of a programme.

2. Use of a "work package" concept at the lowest level of detail. The necessity for a multiple activity "work package" arises from the difficulties associated with handling the sheer mass of detail which would arise if all activities were costed separately.

3. The combination of work packages and multi-levels by an indicative account code structure to form an integrated reporting system

4. A man-hour analysis of labour requirements

5. The preparation of cost totals by individual work packages

6. The preparation of cost summaries at each project level

7. The integration of cost progress with physical progress

8. The provision of a system for re-estimating outstanding costs at different stages of a project

9. A comparative analysis showing cost progress

10. Predictive reports showing forecast project completion dates.

The PERT/COST system is a relatively new management planning tool which has obvious advantages but also some serious disadvantages, not the least of which is the cost of the system itself. Baumgartner says;

> "The cost of PERT/TIME and PERT/COST is hard to ferret out of PERT promoters, but the average estimate is about 1.5 to 2.5 percent of the total project cost for PERT/TIME and double that, or 3 - 5 percent when PERT/COST is added."(22)

Unless the system, in any specific case, can clearly show a positive return in excess of its cost, it would be difficult to recommend its use. For Australian conditions it is unlikely to supersede the more modern of the conventional costing systems in anything but the largest of projects.

The CPM Normal Cost/Crash Cost system (sometimes known as the Time Cost Optimisation or Augmentation system) uses the concept of criticality to apply extra resources to the project selectively, so that the maximum reduction of project time is achieved with the least additional cost. From the concept of a critical path it is apparent that to speed up a project, one or more activities on the critical path must be accelerated. If activities on the critical path are progressively accelerated the cost of the project increases and, at the same time, the shortened critical path may make other previously sub-critical activities critical. To accelerate the project further, the newly critical activities must themselves be considered for crashing. When all activities that

will expedite the project have been crashed, the project cannot be shortened further, and the cost for this time is a minimum.

For the purposes of the calculations it is assumed that the cost of each activity increases linearly with time from the normal values to the crash values. While there is argument about the validity of such an assumption, the real problem of using this time-cost technique is the difficulty of obtaining good data for input to the model. A real disadvantage arises from the time and extent of computation necessary to systematically change the project duration parameter and calculate the minimum cost for each change. Only in the simplest project is it possible to carry out this computation by hand so that in practice this is almost invariably done by a computer.

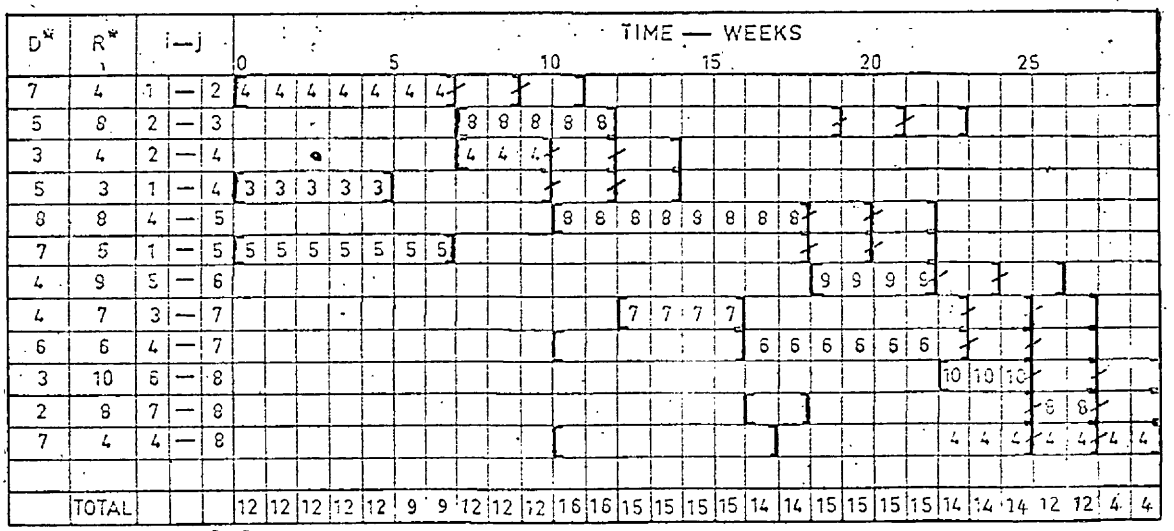
PLANNING THE USE OF RESOURCES BY NETWORK METHODS - MEN, MACHINES AND SPACE.

Planning by the network method as discussed up to this stage, has almost ignored the question of resources inasmuch as no specific attention has been paid to the number of men and machines required by the resulting schedule, or even the amount of space that will be required at any instant of time. As none of these resources can be made available in unlimited quantities, a realistic project plan and schedule must work within the limits imposed by the availability of resources.

There are two basic problems involved; one is concerned with levelling resource demands with a constraint on the total project duration

FIGURE 2.8 (26)

PROJECT SCHEDULE PRODUCED WHEN PEAK RESOURCE IS LIMITED TO 16



* D=Duration, R=Resources

FIGURE 2.9 (26)

PROJECT SCHEDULE TO KEEP RESOURCE PEAK TO 15

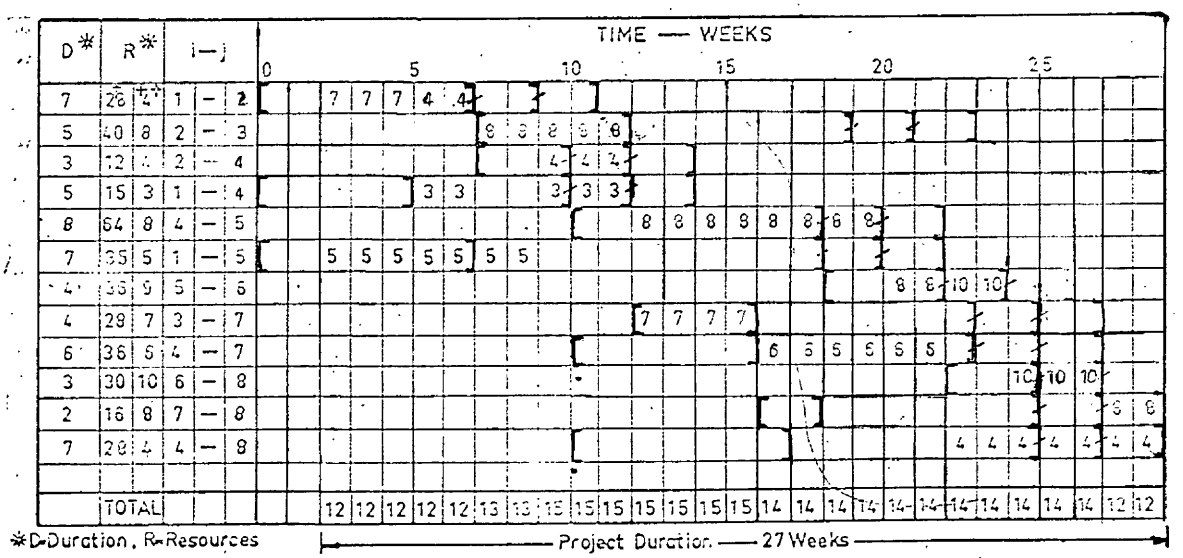


FIGURE 2.6 (24)

RESOURCE REQUIREMENTS FOR PROJECT SCHEDULE WITH ALL ACTIVITIES STARTING AT THEIR EARLIEST STARTING TIME

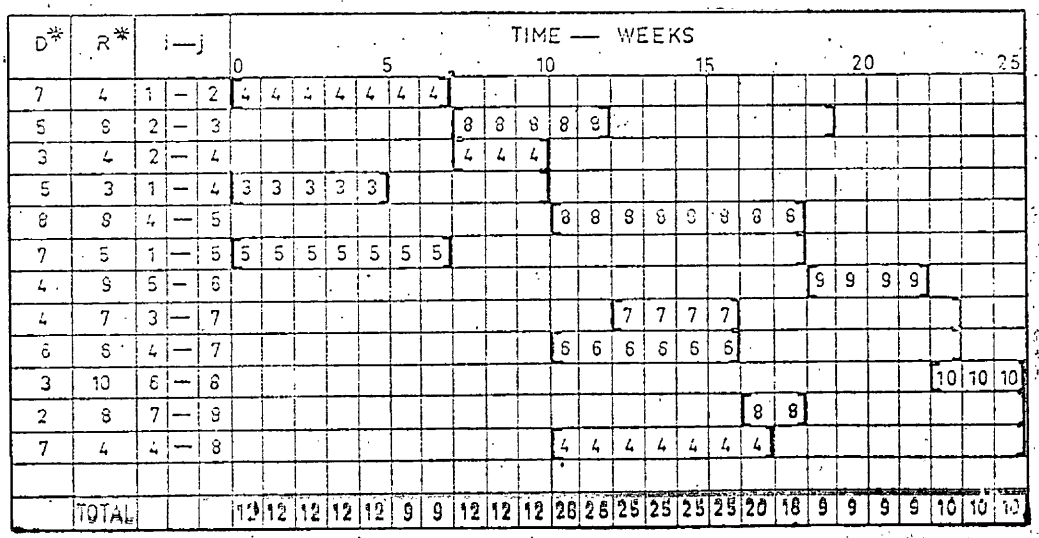
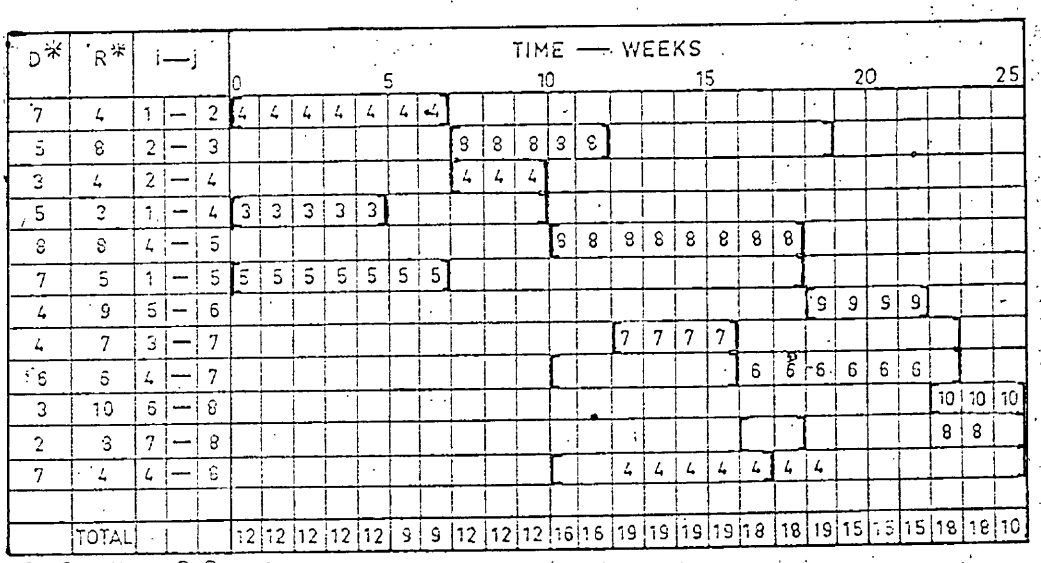


FIGURE 2.7 (25)

RESCHEDULING OF PROJECT WITHIN THE MINIMUM TIME OF 25 WEEKS



D= Duration , R=Resources

time, the second is the minimisation of the project duration time with a constraint on the availability of certain key resources. The degree of formality of resource planning can vary all the way from a visual check, using the project network, to the preparation of a detailed bar chart or even to the use of sophisticated computer techniques. The most elementary resource allocation check consists of noting, from a visual inspection of the network, the level of demand for the resources in question. Assuming that activities are scheduled to start at their earliest times, resource overlaps can be noted in the time period when the resource is scheduled and excessive demands noted. In cases of excessive demand, alternative activity schedules can be tested, making full use of activity free slack in order to keep disruption of the network to a minimum.

In cases where a simple visual inspection is not appropriate due to the size and complexity of the network and the frequent occurrence of the resource being examined, it may become necessary to use graphical techniques or, in the case of a very large network, to use electronic computation. Figures 2.6, 2.7, 2.8 and 2.9, adapted from a paper by Butcher[23] illustrate a simple example of resource allocation. Figure 2.6 shows the resource requirements with all activities starting at their earliest starting times, in figure 2.7 the project has been rescheduled to keep the maximum resource requirement to 19, figure 2.8 shows the situation when the peak resource is limited to 16, and in figure 2.9 the resource peak is kept to 15.

An example of a comprehensive system of multi-project scheduling is the Resource Allocation and Multi-Project Scheduling technique designated RAMPS. RAMPS is a method of generating work schedules for several projects simultaneously and allocating resources amongst different projects in a manner which most nearly satisfied particular scheduling objectives. Where a number of schedules would meet the desired objectives, the least cost solution is selected. The system is particularly suitable in cases where there are many projects competing for the same set of resources, such as in the construction industry, in maintenance departments, or in job production shops.

In the RAMPS system the conflict between the alternatives of delaying the project or speeding up work is resolved by applying cost penalties to project delays and specifying additional costs for extra resources used. Relative priorities between projects being scheduled simultaneously are specified by applying a financial delay penalty for each day the project completion extends beyond a target completion date, and by varying the size of this penalty according to the relative priorities of the various projects. In a similar manner financial values can be assigned as "interrupt" penalties to individual network activities. As usually the alternative to dividing an activity for scheduling purposes is to use premium resources, the comparison of the "interrupt" penalty with the extra costs incurred by using premium resources gives a more realistic basis for decision making. Even on small networks the task

FIGURE 2.10 (27).

THE PLACE OF PERT/CPM AND RESOURCE ALLOCATION IN THE PROJECT PLANNING AND CONTROL LOOP

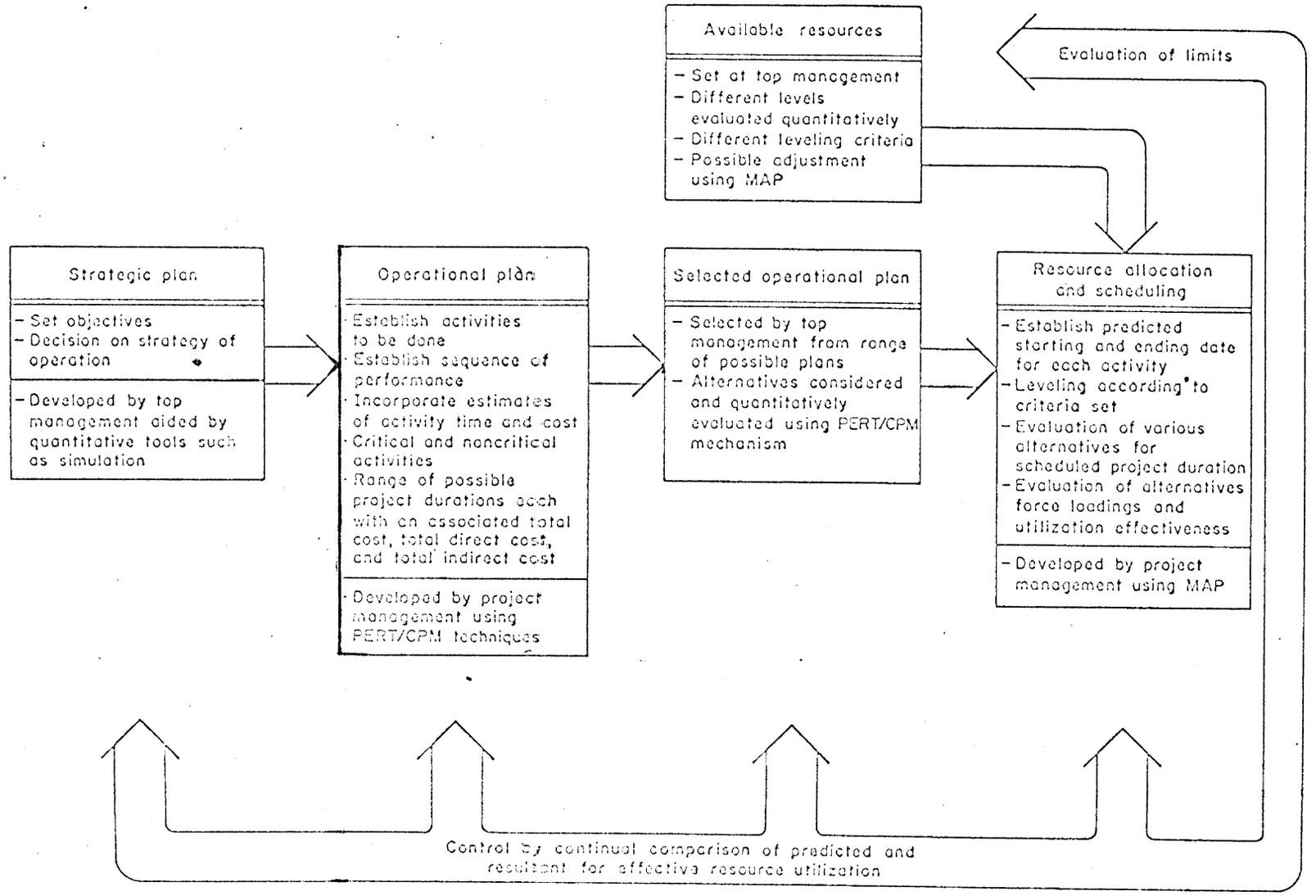


FIGURE 2.10

of determining the best schedule using the RAMPS system becomes extremely complex when more than two networks are involved, each having several hundred activities, the problem becomes incapable of logical solution without the use of a computer.

Figure 2.10 shows clearly the place of resource allocation and scheduling in the planning loop of a project management and control situation. Discussing the role of PERT/CPM and the resource allocation system MAP[28] in the project management function, Martino says:

> "Good utilisation of resources can be insured only by applying the overall control cycle of which MAP is only a part..... PERT/CPM and MAP are powerful tools in providing management with not only quantitative measures but, even more significantly, dynamic control".[29]

FUTURE DEVELOPMENTS IN NETWORK PLANNING AND CONTROL METHODS.

The pace of development of the use of network planning and control techniques is such that it is difficult to distinguish between what is present and what is future. The scope for development lies in two directions, firstly the further development of areas already being used to a limited extent, such as resource allocation techniques, and secondly the development of new techniques and new areas for their use.

A major problem with network methods is the sheer mass of information they can deliver -- in a large project it can become overwhelming, with the danger of the analysis losing all value for control purposes. A technique to overcome this is suggested by Baumgartner[30] -

it is called the Status Index.. Basically the Status Index is a means of relating actual progress and costs versus the project plan. The index is derived from the formula;

$$\text{Status Index Number} = \frac{\text{Progress}}{\text{Scheduled Progress}} \times \frac{\text{Budget}}{\text{Actual Expenditure}}$$

An index of greater than one indicates better than expected progress whilst an index of less than one indicates less than expected progress. It is claimed that the Status Index provides managers with:

"1. Time-cost performance to date in relation to the plan

2. Time-cost projections for completion of the project objectives

3. A ranking of problem areas by criticality

4. An indication of potential trouble spots

5. Anticipated schedule slippage and overruns or underruns

6. A means of determining where management can withdraw resources to assist more critical phases.

The Status Index does not:

1. Provide a current project plan, schedule or budget; it is dependent on these as inputs.

2. Force good, detailed planning, as PERT/TIME does. It is a useful tool in evaluating the effectiveness of planning, however".[31]

This technique does appear to have considerable promise as a readily obtained, simple and effective means of project control when used in conjunction with network methods.

Battersby[32] considers that there is room for improvement in some areas and mentions;

1. Better methods of allocating resources
2. Better ways of estimating job durations
3. A sounder statistical basis for dealing with
   (a) distributed job durations
   (b) sub-critical paths
4. Computer routines for compiling network

There is considerable scope for the extension of network planning and control methods outside the engineering field. There appears to be some reluctance in professions outside engineering to accept network analysis as a planning and control aid. Yet there is no good reason for this -- the method is general in nature and can be applied to almost any set of activities and events. Potential fields of application in business and industry are;

1. Securities issues
2. Long-range planning
3. Marketing and advertising programmes
4. Merger or acquisition programmes
5. Staffing of plants
6. Planning and control of the use of capital
7. Inventory planning and control

PLANNING AND OPERATIONS RESEARCH.

"Operation Research may be defined as a scientific method of providing management with a quantitative basis for decisions regarding the operations under its control".(33)

It is a relatively new field distinguished by a scientific method, an overall approach, and heavy use of mathematical and statistical models as a framework for analysis. It relies on an inter-disciplinary approach, drawing heavily on the skills of scientists, engineers, statisticians, mathematicians and accountants, to examine all aspects of a problem and to draw from a wide range of scientific concepts, methods, techniques and tools, those which are most applicable to the problem at hand. Horngren says;

"OR is primarily a tool for planning rather than controlling; that is, it is a rigorous means for discovering feasible alternatives, evaluating them, and choosing the best alternative. Operations researchers stress the fact that careful planning is the key to business success".(34)

There are five distinct steps in the operations research approach to a problem area;

1. Formulation of the problem by observation and analysis. This involves searching for and explicitly stating the nature of the problem.

2. Construction of the hypothesis, theory or model which expresses the important patterns or relationship of all important factors in the situation.

3. Solution of the model by one or several of the large number of

techniques available to the researcher.

4. Interpretation of the solution and determining the significance of the solution obtained as a prediction of what will occur in the real situation .

5. Implementation of the solution.

Operations research has been considered basically as a short-range planning tool. On this matter, Arnoff says;

> "Most of the applications of operations research reported on to date have occurred in areas which might be classified as short-range planning both strategic and tactical. There are relatively few published operations research studies primarily concerned with long-range planning. This lack, however, is readily explained. In the first place, operations research is a new science, and management has not as yet had sufficient opportunity to develop confidence in the merit of utilising an operations research approach. Consequently, operations research teams are often initially obliged to consider problem areas where the results of their efforts can be evaluated in a rather short time. This has resulted in a concentration on the solution of short-range problems, such as in the area of production and inventory control, where data are readily available, where many of the problems are of easily manageable size and of high potential pay-off, and where this pay-off is readily measurable. . . .
>
> In the second place, even when management confidence is

present and when the Operations Research team is permitted to consider long-range planning problems, short-range planning is still a necessary prelude. Only after a company has established its day-to-day and short-term operations on a sound basis can it fruitfully enter into long-range planning. Stated in another manner, in any long-range planning problem, one must, of necessity, consider the short-range problems as the first phase". (35)

This was written in 1957 and refers to the situation then with regard to American industry. Australian industry is to-day in the first throes of the acceptance of operations research as a management tool. Applications tend to be very much as described by Arnoff -- short range in nature and generally for the reasons outlined by Arnoff. However, the technique is general in nature and can be applied equally as well, with due allowance for the accuracy of the data, to either long-range planning or short-range planning. Indications are that in the future the greatest returns from the technique may be obtained in the field of long-range planning.

The major operations research techniques are:

1. Mathematical programming
2. Queueing or waiting line theory
3. Simulation
4. Decision theory
5. Game theory

Mathematical programming is indicated when a group of limited resources must be shared among a number of competing demands and where all decisions are interrelated because they all have to be made subject to a common set of constraints. The two best known and most often used branches of mathematical programming are linear programming and dynamic programming. Linear programming is perhaps best known for its application in the transportation and allocation problems. Queueing theory is relevant in situations characterised by queues, a typical example being a servicing facility where units arriving for service may be required to wait when the service facilities are occupied, and where on other occasions the service facilities may stand idle when no units are presenting for service. Simulation may be described as the manipulation of the model derived in the course of an O.R. analysis. It is a particularly useful technique where it is not possible to solve the model either analytically or by using an algorithm. Using simulation technique the model may be manipulated in a rational manner until the values of the various parameters are found which result in an optimal solution. Simulation is important when;

1. It is not possible or is too costly to experiment on the operation itself.
2. It is not possible to construct an adequate model.
3. Analytical or algorithmic techniques do not exist to solve the model.

Decision theory makes use of statistical and Bayesian probability theory to deal with problems of decision making under conditions of uncertainty

or risk. In problems of this type, the nature of the uncertainty is known in the form of probability distributions. The approach taken is to compute the expected value of the return from each course of action and to select the course of action which optimises this expected return.

Game theory is an extension of decision theory where, instead of a choice of action being conditional on the possibilities of several outcomes, it is determined by the possible alternative actions of an opponent playing the same game. This technique has interesting possibilities, but to date has found little use in practice.

Hermann and Magee have evaluated the contribution of OR as follows;

> "Characteristically, operations research tends to force an expansion in viewpoint and a more critical, questioning attitude. It also stimulates objective thinking, partly because it emphasises broad purposes and partly because the mathematical nature of the model and technique limits the influence of personal bias. The results of operations research studies are quantitative. They provide an opportunity for sound estimates in terms of requirements, objectives, and goals, and a basis for more precise planning and decision making. The contributions of operations research to business analysis and planning have been important and substantial."

CONCLUSION.

This chapter has examined the major short-range planning methods ranging from relatively simple prior cost systems and bar charts of various types to the more complex network planning methods and the techniques of operations research. All of these methods have their uses in particular situations. It is not always the case that the most sophisticated system is the best -- as always in the business situation the return from the use of any technique must be weighed against the cost of its introduction and use.

The network planning method was examined in considerable detail as this system has distinct and definite advantages for planning of projects at all levels from the largest to the smallest. Perhaps the most important feature of this method is the objectivity and logical thought that it brings to the analysis of a project. Another important feature is the extent to which it is capable of being extended and modified to suit particular circumstances. Its use for cost control purposes was discussed and also methods of resource allocation. A need exists for means of simplifying the output of the method so that its implications can be readily understood by persons not necessarily skilled in its use. This need could be fulfilled by the Status Index derived by Baumgartner.[37]

The significance of operations research as a planning tool was

discussed briefly. However, the length of the discussion bears an inverse relation to the importance of the method. In the United States it has proved to be one of the most significant tools available to the planner, and with the increased availability of electronic computers, a similar phenomenon can be expected in Australian business.

CHAPTER 3.

BUDGET PLANNING.

"A budget is a quantitative plan of action and an aid to co-ordination and control. Budgets basically are forecasted financial statements, formal expressions of managerial plans. They are targets that encompass all phases of operations -- sales, production, distribution, and financing".[38]

Budgets may be either short range or long range, both in terms of the scope of the budget and their place in the planning hierarchy and in terms of the actual time span covered. They may span a period of one year, and not infrequently less, and in the case of capital budgeting for plant and product charges, up to ten or more years. The units of the budget may be expressed in financial terms or in terms of man hours, units of product, machine hours, or any other numerically measurable term. They may deal with operations, with capital expenditure or with the flow of cash.

Budgets are also co-ordination and control devices. A budget used as a planning tool only is to a large extent ineffective as one of the great benefits of budgeting springs from the rapid investigation of deviations from budget and the subsequent corrective action. Koontz and O'Donnell[39] classify budgets into five basic types;

1. Revenue and expense budgets
2. Time, space, material and product budgets

FIGURE 3.1 (40)

A SIMPLIFIED CLASSIFICATION OF BUDGETS

MASTER BUDGET	
Operating Budget, Consisting of	Financial Budget, Consisting of
Budgeted income statement	Cash budget
Sales budget	Receipts
Production budget	Disbursements
Materials	Budgeted balance sheet
Direct labor	Budgeted statement of sources and applications of funds
Factory overhead	
Inventory levels	
Cost of goods sold budget	
Selling expense budget	
Administrative expense budget	

SPECIAL BUDGET REPORTS
Comparisons of planning budgets with actual performance
Reports for specific managerial needs, for example, breakeven projections
Long-term budgets, often called capital budgets or facilities budgets
Flexible overhead budget

3. Capital expenditure budgets

4. Cash budgets

5. Balance sheet budgets

Another classification of budgets as proposed by Horngren[40] is shown in figure 3.1.

Revenue and expense budgets are by far the most common in business. Based upon the sales budget they set out plans for revenues and operating expenses. Operating expense budgets can be as numerous as the number of individual expenses in the business, however there is normally a dollar cut-off point below which it is not considered appropriate to budget.

Time, space, material and product budgets are usually presented in their final form in monetary units, although at certain stages of the planning process they are much more significant if dealt with in physical units. Among the more common units are direct labour hours, machine hours, units of material, square feet allocated, and units produced. Budgets incorporating these units are most frequently observed in the field of production budgeting. The production budget or production volume budget is ordinarily the next step after the preparation of the sales budget; it is the first of a series of budgets which deal with the manufacturing operation, and which intermesh with operating expense budgets.

Capital expenditure budgets outline future planned expenditure

on such items as land, leaseholds, buildings, machinery, inventories, transportation equipment and numerous other items of a capital nature. It may also include certain intangibles such as patents, franchises, trade marks, licences, trade names and goodwill. Capital expenditures are made for the maintenance and replacement of present capital resources and for the addition of new resources. The basic purpose of budgeting such resources is to give considered judgment to their desirability, the time when they should be made, and the availability of funds by which they can be safely financed. They are a particularly common form of budget, and businesses that disregard budgets for operations control seldom neglect budgeting capital expenditures.

Cash budgets focus attention on the short range aspects of business management as distinct from capital budgets which focus attention on long range aspects and which are closely related to long-range planning. The cash budget is a forecast of cash receipts and expenditures against which the actual cash behaviour is measured. The importance of the cash budget can be appreciated when it is realised that no plan of operations is complete unless sufficient cash can be made available when required to meet the obligations of the plan. Cash budgeting also shows the availability of excess cash, thereby making possible planning for profit making investment of this cash.

Balance sheet budgets spotlight the financial plans of a business. Not infrequently the emphasis in business is placed upon the

planning of sales, production, profits, new products, growth and capital, while insufficient attention is given to the financial effects which will result from attempting or attaining these objectives. These effects are disclosed in a general way in the balance sheet budget, and rather more specifically, in detailed budgets of working capital, accounts receivable, accounts payable, inventories and such others as may be considered relevant. These budgets can also be used as a check on the accuracy of all other budgets.

Budget summaries are a formal expression in quantitative terms of overall managerial policies and objectives for a specified period; they are frequently broken down into detail with respect to time, products and organisational responsibilities. Budget summaries, of which one form is the balance sheet budget, are frequently referred to as the planning budget, the plan of operations, the master budget, the period budget, or the static budget.

FLEXIBILITY OR VARIABILITY OF THE BUDGET.

An analysis of budgets from the viewpoint of the dimension of flexibility separates out three basic categories;

1. Appropriation budgets
2. Fixed or forecast budgets
3. Flexible or variable budgets

The mechanism of the appropriate budget is the establishment of a limit to be spent on a given activity, in a given time period, followed

by the formal approval of the expenditure of this specified amount. Appropriation budgets are common in government applications, but have restricted usage in business. They are sometimes used in connection with advertising expenses, or research and development expenses.

Fixed or forecast budgets involve a plan which is unchanging. As the sales or production volume varies with actual conditions, the standard of measurement is not changed. Inflexibility is not a feature of business and future planning must be based upon conditions that can be expected to vary. For this reason the principle of variability or flexibility is the key to an effective budgetary planning and control system.

A variable or flexible budget is one which permits revision of estimates, of operating costs and profits, with changes in the sales or production volume. It refines the static or fixed type of budget by adjusting for variations in the output rate. The classification of costs in accordance with the concept of cost variabilities requires the use of three distinct cost categories;

1. Fixed costs
2. Variable costs
3. Semivariable (or semi fixed) costs.

Whilst definitions of these terms differ in detail, the following definitions given by Horngren cover most variations;

"Variable costs; those which tend to vary in total directly in proportion to sales or production volume or other measures of activity; for example

direct materials or piece rates for direct labour.

Fixed costs; those which are not expected to change in total within the current budget year irrespective of fluctuations in activity, for example, property taxes, depreciation and supervisory salaries.

Semi-variable costs; those which vary in total with the rate of activity but not in direct proportion; for example, repairs and engineering. These costs often are mixtures of variable and fixed components." (41)

From these definitions it can be noted that the flexible budget is flexible only with respect to the variable costs; the fixed cost items do not change markedly with activity.

An important factor in the establishment of a flexible budget is the selection of the activity base or factor of variability. This activity base must be the factor that most accurately expresses or measures the overall activity under consideration. It must have several basic characteristics;

1. It must measure fluctuations in the activity which cause costs to vary.
2. It should be affected as little as possible by factors other than volume.
3. It should be easily understood
4. It should be easily obtainable
5. Management should have control over the activity.

Advocates of flexible budgeting tend to consider fixed budgets as useful only for the general, tentative co-ordination and evaluation of the overall financial plan; the analysis of cost behaviour is regarded as the

basic means available of introducing reality into the budgeting process. In the planning stage it is contended that such analysis highlights the financial characteristics of alternative operating proposals. In the control stage it is considered to be essential for co-ordination and for the attainment of optimum profit under actual changing conditions not anticipated by the fixed budget.

Alternative and Supplementary Budgets. The flexible budget is, for practical purposes, infinitely variable, although the accurate range of this variability may be limited. In some situations, such flexibility may not be necessary -- in this case another less involved method of obtaining flexibility is to establish alternative fixed budgets for alternative eventualities. These may be few or large in number; however budgets for three levels of activity, high, medium and low, should cover most situations. As the level of business activity changes with respect to the selected planning period, the appropriate budget can be utilised.

Another method of obtaining flexibility is by use of the supplementary budget. A master fixed budget is prepared for the basic planning period, say six months or one year. Each month a supplementary budget is issued, constructed to take account of expected business conditions for the next monthly period. This monthly supplementary budget gives each department authority for scheduling output and spending funds above the basic budget (or restricting funds if necessary) if and to the extent that is called for by short term plans. It also gives management

the advantages of close control, at the same time giving department managers a minimum level of operations for long-range planning purposes.

THE BUDGET INDEX[42].

In industries that are not highly automated or that do not use assembly line techniques, the speed of operations tends to be set by the performance of people. To control this type of operation a system designated Performance and Cost Evaluation, PACE, was developed by the Norair Division of the Northrop Corporation in the United States. PACE is a statistical analytical method based largely upon work sampling and effort rating. However it is not aimed at measuring the performance of individuals but rather the effectiveness of groups. The method is divided into two major components;

1. PACE measurement
2. PACE programme

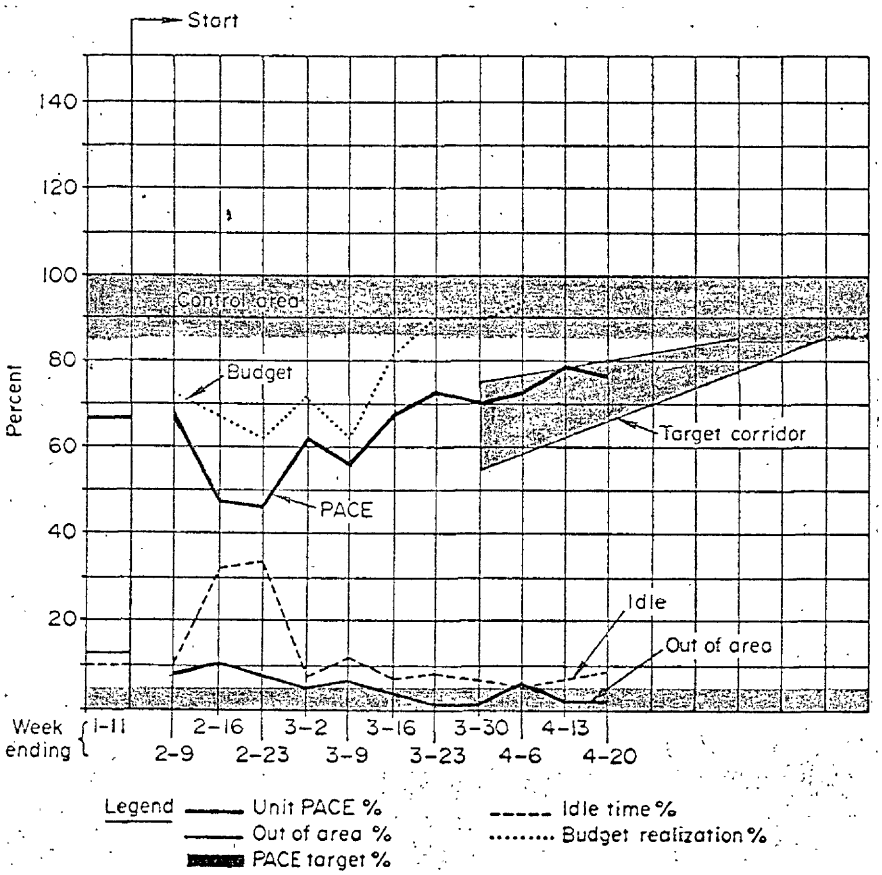
Of a number of factors forming part of the second component, one in particular is relevant to the subject of budget planning and control -- that is the budget index.

The usual budgeting control technique is to prepare detailed budgets and then to compare these budgets with actual expenditure in the budgetary period. In the PACE programme, the budget must be prepared in terms of hours by job and function, as related to the group being controlled. The budget index, then, may be computed as follows;

$$\text{Budget index} = \frac{\text{budgeted hours}}{\text{actual hours}} \times 100$$

FIGURE 3.2 (43)

THE P.A.C.E. BUDGET CONTROL CHART



The significance of the relationship between budgeted and actual performance is stated to be dependent on two factors;

1. The accuracy with which the budget is prepared

2. How well the group being considered actually performs in relation to its best potential performance.

If, before the installation of the PACE programme, the budget figures were geared to a presumably inferior performance, the budget index would start at around 100. As the PACE index trends towards the control area, the budget index should also rise, but would be in excess of 100. When PACE is well into the control area, the budget index should hover around a 100 horizontal trend. A graphical representation of the budget realisation index is shown in figure 3.2.

PROGRAMME BUDGETING.

Programme budgeting is a planning and programming process that was initiated within the United States Department of Defense in early 1961, and developed under research contracts by the RAND Corporation. The technique has, so far as can be determined, been applied only to the U.S. Department of Defense, so that it is here explained in terms of defense procedures and equipment. However, on the subject of wider use, Novick says;

> "The government in general, including Congress, and industry have shown wide interest in the new process. Variants of it may be expected to be adopted by other government agencies." (44)

Planning and programming are considered to be aspects of the same process, differing only in emphasis. Planning is defined as the selection of courses of action through a systematic consideration of alternatives, whilst programming is defined as the more specific determination of the manpower, material and facilities necessary to accomplish a programme.

The significant feature of the process is the change of approach to decision making and control. Planning is considered in long-range terms of resource outputs, for example, missions, forces and weapons systems rather than in the more conventional terms of resources inputs such as personnel, construction and procurement. The process incorporates a five-year force structure and financial programme, expressed in terms of forces, manpower and dollar requirements. A long-range programme of this type used to control current operations, requires a continuous type of budget review; to achieve this requirement a programme change control system was developed. In the change control system, approval limits are established to concentrate attention on the major current or prospective issues in accordance with the well established "management by exception" technique. These limits are stated in terms of total obligational authority requirements, for the current or budget fiscal year and on a total basis. A progress reporting procedure for a number of the most important material items is used. Milestone schedules are also established to reflect the events and activities upon which the financial plan is based. Actual

accomplishment is reviewed monthly against the milestones, and remedial action is taken or revisions are made to the five-year plan as necessary.

An appreciation of the concept of the method may be obtained from the statement of Deputy Secretary Gilpatric;

> "In the past, the Defense Department has often developed its force structure by starting with a budget and sending it off in search of a programme. Our new system of programme packaging has reversed this procedure, by first determining our over-all strategy, then fitting the hardware and the manpower to those objectives". (45)

The planning-programming-budgeting structure consists of five major elements:

1. A programme structure in terms of missions, forces and weapons systems, that is, in terms of the overall major objectives.
2. Analytical comparisons of alternatives -- planning decisions are made after comparing projected costs and effectiveness of feasible programme alternatives.
3. A continually up dated five-year force structure and financial programme.
4. Year round decision making on new programmes and changes.
5. Progress reporting to test the validity and administration of the plan.

The introduction of such a system has not been without problems, the two major of which relate to the quality of the forward planning and the accuracy of the cost estimating. It is evident that the

effectiveness of forward budgeting is directly related to the effectiveness of the forward planning that precedes it. However, it was found that many of the departments and agencies concerned with the system had little experience with long-range planning, and less with the connected problem of relating such planning to budgeting. Special measures and sustained effort were necessary to develop the necessary planning skills. Cost estimating is fraught with difficulties in a situation where many of the projects involved are developmental and original in character and where so many uncertainties face the estimator. Despite this, it is necessary to maintain the validity of the method, that approved programmes be carried out within the approved cost figures. The steps taken to overcome this problem included training programmes to increase the supply of trained military cost analysts, improvements in contractor cost reporting -- particularly with respect to the introduction of PERT/COST methods -- and a more systematic assessment of actual cost experience with newer weapon systems against the earlier claims.

To perceive the programme budgeting method in true perspective it is necessary to relate that it is based upon an overall financial budget of approximately $50,000 million, and that initially the entire United States defense programme was sub-divided into over 800 programme elements. For its effective operation it relies on the use of massive electronic computation facilities and the availability of large numbers of highly trained personnel.

ADVANTAGES AND LIMITATIONS OF BUDGETING.

Welsch enumerates the following advantages of budgeting;

"1. It forces early consideration of basic policies

2. It requires adequate and proper organisation -- that is, there is a definite assignment of responsibility for each function of the business

3. It compels all members of management from the top down to participate in the establishment of goals

4. It compels all members of departmental management to make plans in harmony with plans of other departments

5. It forces management to put down in cold figures what is necessary for satisfactory results

6. It requires adequate and appropriate historical accounting data

7. It compels management to plan for the most economical use of labour, material, facilities, and capital

8. It instils in all levels of management the habit of timely, careful, and adequate consideration of all factors before reaching important decisions

9. It reduces cost by increasing the span of control, hence less supervisors are needed

10. It frees executives from many day-to-day internal problems through the media of predetermined policies and clear-cut authority relationships thereby providing more executive time for planning and creative thinking.

11. It tends to remove the cloud of uncertainty that exists in many firms, among lower levels of management, relative to basic policies and objectives.

12. It pinpoints efficiency or its lack

13. It promotes understanding, among members of management, of their co-workers' problems

14. It forces management to give timely and adequate attention to the effect of the expected trend of general business conditions

15. It forces a periodic self analysis of the company

16. It aids in obtaining bank credit

17. It checks progress or lack of progress toward the objectives."[46]

Budgeting has considerable advantages and impressive potential -- it also has dangers and limitations. However these stem, not so much from characteristics of the budgeting process as from the way in which the process is applied. Koontz and O'Donnell[47] consider there are four main dangers;

1. The danger of over-budgeting -- some budgetary control programmes are so detailed and complete that they become cumbersome, meaningless and unduly expensive -- budgets should only be used when they materially assist in major planning and control

2. The danger of allowing budgetary goals to supersede enterprise goals -- budget limits should only be maintained provided that such action

contributes to enterprise objectives.

3. The danger of hiding or obscuring inefficiency -- budgets show a tendency to develop by precedent -- expenditures made in the past become standards for future expenditure -- Budgeting must be accompanied by constant re-examination of the standards and conversion factors which translate planning into numerical terms.

4. The danger of inflexibility -- in the ever-changing dynamic world of business the manager must be ready to change his plans at short notice -- the budget must be structured so that such change is readily possible, especially in cases where budgets are made for long periods in advance.

Welsch[48] lists four limitations that should be kept in mind. One of these, that of flexibility, was mentioned above; the others, in summary, are;

1. The budget plan is based on estimates and it is upon the accuracy of the basic estimates that the strength or weakness of a budget programme depends. Because the budget programme is based entirely on estimates, judgement is necessary in interpreting and using results.

2. Execution of a budget plan will not occur automatically -- budget techniques must be continually adapted, not only for each particular business, but for changing conditions within the business.

3. The budget will not take the place of management and administration. It is simply a management tool, to be used in such a way that all attainable benefits are derived.

Horngren discusses the human and motivational problems associated with the implementation of budgets, and states;

"The human aspects of budgeting and standard costs are much more troublesome in practice than the technical phases."[49]

Typical human problems arise when factory people lack education and an understanding of budgets, when they lack interest in the budget and when they misunderstand or mistrust the budget. These factors point out the need for education of management, particularly at the lower management levels, so that they understand the budget and its objectives and can make a positive contribution to its effectiveness as a management tool.

CONCLUSION.

Budgeting is one of the most useful and widely used business planning and control techniques, both for short-range and long-range planning. The term planning and control is used because a budgetary system without control is not an effective system. This chapter discussed the various types of budgets using the five basic type classifications of Koontz and O'Donnell as a framework.

The flexibility of budgets was considered and it was concluded that fixed budgets have only limited application in business. Two simple ways of introducing flexibility without the cost of the infinitely variable budget were mentioned -- in many instances, particularly in the case of the small business, it may not be necessary to have a fully flexible budget. In cases such as this, these methods would be quite adequate.

The PACE Budget Index was briefly covered. This is a control device, related to a budget, that is used to give a simple, easily observable, measure of performance to budget. In many respects it is not unlike the Status Index used with the PERT network planning system as discussed by Baumgartner[50]. Techniques such as this have definite value in the ever-present problem of communicating in simple understandable terms, the output of modern management tools.

The United States Department of Defense Programme Budgeting technique was also discussed. This system is basically the results of an objective analysis of a planning and control problem after the realisation that the existing system was inadequate. The researchers commenced from the objectives of the enterprise, and the constraints in which it operated, and derived a system that would best assist in the achievement of the objective. Whilst the resources available to the United States Department of Defense would certainly not be available in Australia, this type of approach to a planning problem is recommended. Programme budgeting has many features that are general in nature and could be applied, with due alteration for particular circumstances, to almost any business.

Finally, the advantages of budgeting and some associated problems were discussed. The advantages are quite considerable, so much so, that any business not using budget planning would be well advised to examine its reasons for not doing so, very closely. The disadvantages were seen to be related to the application of the technique rather than intrinsic

in the technique itself. As with any management tool the context in which it is applied must be examined carefully and a continuous attitude of questioning maintained to ensure that an adequate return is being obtained for the resources involved.

CHAPTER 4.

LONG RANGE PLANNING.

WHAT IS MEANT BY LONG RANGE PLANNING?

It would be tempting to endeavour to define long-range planning in simple straightforward terms, and then to develop an analysis based on this definition. However the present state of the art (it could not be called a science) of long-range planning is such that simple definitions do not catch the essential substance of the concept and activity. Drucker defined it in general terms as follows;

> "It is the continuous process of making present entrepreneurial (risk taking) decisions systematically and with the best possible knowledge of their futurity, organising systematically the efforts needed to carry out these decisions, and measuring the results of these decisions against the expectations through organised, systematic feedback."(51)

It will be noticed that this definition incorporates the control function in the planning process. This is a subject of much debate and many writers prefer to consider control as a separate function in the management process quite distinct from planning.

Scott(52) considers that long-range planning is concerned with two separate issues -- the answers to the questions;

1. Where is the company going?
2. How exactly does it get where it wants to go?

FIGURE 4.1

Dimensional Characteristics of a Strategic Long Range Plan

Dimension	State of the Dimension which Would Characterise a Strategic Long Range Plan
1. Complexity	Generally low in complexity, with few parts and minimum technical content.
2. Significance	Very high in this dimension -- strategic long-range plans are most significant of all business plans
3. Comprehensiveness	Very high -- strategic long-range plans affect all aspects of the business
4. Time	Time dimension may vary considerably
5. Specificity	Low in specificity -- tend to be general in nature
6. Completeness	Varies considerably -- generally, the greater the time dimension the less the completeness
7. Flexibility	High
8. Frequency	Tends to be low as these plans tend to be infrequently changed
9. Confidential Nature	Varies over a wide range. Some strategic long-range plans are communicated widely, others are highly confidential
10. Formality	High
11. Authorisation	High
12. Ease of Implementation	Varies over a wide range depending on the level of the other dimensions
13. Ease of Control	Varies over a wide range. Could perhaps be related to the actual functioning of the particular organisation itself.

The type of planning associated with the first question is termed strategic, and that with the second, implementational. Strategic long-range planning is defined thus;

> "Strategic long-range planning is a systematic approach by a given company to making decisions about issues which are of fundamental and crucial importance to its continuing long-term health and vitality". (53)

It will be noticed that the control aspect is not mentioned in this definition. Scott's definition of strategic long-range planning, with due alteration to detail, is the one generally accepted to be what is understood by long-range planning. Whilst in the general case such plans will be long in actual time span, they need not necessarily be so; long-range planning in a seasonal industry may be a matter of one season.

The description of a strategic long-range plan in terms of the "dimensions" of Le Breton and Henning[54] is shown in figure 4.1. This table shows clearly the variation that could exist between individual long-range plans, yet they could all conform to the general definition. For the purpose of this discussion the term long-range planning is used synonymously with Scott's definition of strategic long-range planning.

THE STRUCTURE OF LONG RANGE PLANS.

The structure of long-range planning is best analysed in terms of the five basic activities that make up the long-range planning process:

1. Establishment of objectives
2. Setting up assumptions of what is believed to be true of the internal

and external environment of the business

3. Seeking the facts regarding possible courses of action

4. Evaluation of the expected results of possible courses of action

5. Decision on a course of action

To this framework Drucker would add;

"(6) decision structure; (7) impact stage, the reaction in all areas to action taken on a decision; and (8) actual results".[55]

The latter three points arise out of his inclusion of control in the definition of long-range planning, however it is not intended to include them in this discussion.

Establishment of Objectives. The establishment of objectives, goals or targets is the first, and possibly the most important, step in long-range planning. Improper selection or faulty specification of objectives will destroy the entire basis of the plan. The term objectives is in itself an undefined and elusive term and is used in many different ways. However the Concise Oxford Dictionary definition, "point aimed at", gives a useful basis to formulate a definition of a planning objective as a statement of the purpose towards the achievement of which the business plan is aimed.

The achievement of a profit (but not necessarily profit maximisation) and business survival, are of paramount importance in business enterprise, and these two objectives always lie in the background of any business plan.

The development of objectives can be shown to occur in four

stages[56]. The first stage is the preliminary stage. This consists of highly generalised and incompletely developed notions of purpose, and ideas concerning growth, profitability, survival and stability. Following on from this rather vague stage, is a second stage in which tentative objectives are developed -- these reflect attempts to develop more specific statements of purpose than those making up the initial preliminary objectives. The third stage in the evaluation of objectives is revision where the tentative objectives are revised or adjusted, and finally there is the fourth stage, the development of final objectives. The division of objectives during the planning process is not a matter of clear-cut delineations but rather a gradual transition from one stage to the next. The end result is a set of objectives that are more precise and more perceptive statements of purpose than were possible at the start of the planning process.

Setting Up Assumptions. It is necessary that planning be performed within an established and accepted framework of consistent planning assumptions. The major subject areas of assumptions predominant in the long-range planning process may be divided into two groups; external to the business and internal or within the business. The external assumptions relate to the general business environment which includes political, economic, social and technological condition; the product market, which includes conditions influencing demand for the firm's product; and the factors of production market which relates to land, location, labour, materials, parts and capital. The internal assumptions relate to the sales forecast, capital

investment in plant and equipment, policies, major plans already decided and numerous other factors that influence or prescribe the type of planning to be performed. Whilst the majority of the assumptions will relate to tangible factors, there is also a large class of intangible factors that should not be neglected. These cannot be expressed in quantitative terms, but they are significant background elements in the planning framework.

The development of assumptions can, in certain circumstances, be an extremely difficult part of the long-range planning process. To aid in this development Scott[57] establishes five categories or classifications of the major types of assumptions.

1. Imposed assumptions. These are assumptions that the planner is required to take as given and fixed. They may be imposed by top management, and usually require no further investigation -- this is not to say, however, that they should not be questioned.

2. High probability assumptions. In the business situation there are a great many factors which either remain constant or can be treated as constant within certain limits. Assumptions relating to these factors can be made with a high degree of confidence. Assumptions of this kind are normally accepted without detailed analysis unless there is reason to suspect their validity or unless the particular subject is of such prime importance that it needs to be investigated more thoroughly.

3. Irreducible uncertainty assumptions. These are subjects which have a high degree of uncertainty. Attempts to analyse these subjects reach a level

of certainty beyond which further analysis is costly and largely fruitless -- that is, a level of irreducible uncertainty has been reached and the remaining uncertainties must be accepted as unavoidable.

4. Previous information assumptions. A business that is a going concern can be expected to have a considerable accumulation of knowledge and data in its information system. If this information is readily accessible it can prove useful in the establishment and verification of assumptions. It may be necessary to judge the validity of the data before it is used.

5. Planning analysis assumptions. The final category consists of those subjects which require special investigation by the planners in order to develop assumptions. A considerable amount of skill is required to select the appropriate subjects for more detailed analysis as distinct from the high probability assumptions. It is essential to ensure that potentially important or key assumptions are not accepted on superficial evidence.

Long-range planning would be greatly simplified if clear, accurate assumptions on future conditions could be readily established. Within the framework of business and with the present state of knowledge, this is not possible. To overcome this, it is desirable to establish a systematic approach to the analysis of planning assumptions and to know the degree of certainty or uncertainty attached to them.

Decision Making. The last three basic activities in the structure of long-range plans, that is, seeking the facts, evaluation of selected alternatives and decision on a course of action, are here analysed as part of the one

process, decision making. Koontz and O'Donnell refer to a key planning principle which they call the principle of alternatives, this states;

"In every course of action, alternatives exist, and effective planning involves a search for the alternative representing the best path to a desired goal". (58)

It is rare, in the business situation, for alternatives to be lacking, generally a superfluity of alternatives is the case. These alternatives may be matters of technical method or a question of exclusion. They may be implicit alternatives known and accepted as part of the business framework, or they may be explicit alternatives which are determined only after considerable analysis. One of the most helpful techniques in selecting among alternatives is that described as the principle of the limiting or strategic factor or, as it is called by Scott, "climactic choice" (59). This principle states, that in choosing between alternatives, attention must be concentrated on those which appear to be of critical or decisive importance in determining the major attributes of the eventual strategy.

The principle was first expounded in detail by Barnard in 1938. He states;

"The analysis required for decision is in effect a search for the strategic factors'. ..... As generally as I can state it, this theory is as follows: If we take any system, or set of conditions, or conglomeration of circumstances existing at a given time, we recognise that it consists of elements, or parts, or factors, which together make up the whole

system, set of conditions, or circumstances, Now, if we approach this system or set of circumstances, with a view to the accomplishment of a purpose (and only when we so approach it), the elements or parts become distinguished into two classes: those which, if absent, or changed would accomplish the desired purpose, provided the others remain unchanged; and those others. The first kind are often called limiting factors....."(60)

Scott talks of climatic choices as being of four major types;

1. Early choice concerning a strategic factor where a choice made early in the planning process limits the scope of the planner -- choices of this type have a great effect upon the eventual strategy.

2. Part-way choice concerning a strategic factor, which is a choice made during the course of an analysis, usually after consideration of some preliminary findings. A part-way choice may have a very significant effect upon the structure of eventual strategy.

3. Choice of strategy alternatives. This is the selection of major alternatives for consideration as possible long-range strategy. The selection of the limited range of alternatives to be considered is generally made from a large number of possibilities.

4. Final choice of strategy from among alternatives, which is the final step in the decision process.

The limiting factor theory has considerable merit; perhaps its greatest drawback is the degree of subjectivity involved. Methods of overcoming

this will be discussed later.

Koontz and O'Donnell[61] propose that in selecting from among alternatives, three aids to decision are open to the manager -- experience, experimentation and research. There is little denying the place of experience in business, but there are also dangers in relying on past experience as a guide for future action. If experience is carefully analysed rather than blindly followed, it can be extremely useful as a guide for business decisions. Experimentation is an obvious technique to try, in order to determine which of various alternatives is best. However it is an expensive method and experimental results do not always give an accurate indicator of what might happen in practice. It is a technique that should only be used after a careful analysis of its possible value. Research is a most effective technique for selecting alternatives where major decisions are involved. Research focuses attention on the problem and brings out the limiting factors in the various alternatives and their major components. Research applies the scientific method to planning.

LONG RANGE PLANNING AND THE IMPACT OF OPERATIONS RESEARCH AND COMPUTERS.

Operations research is the application of the scientific method to business problems. The demands of competition and the ever-increasing drive for increased productivity have reduced in value many of the qualitative decision making techniques. They cannot fulfil the requirements of to-day's business, let alone those expected in the future. New methods had to be

devised which would reduce the uncertainty to the irreducible level and then provide opportunity for a reasonable chance of controlling the irreducible uncertain content. These methods have been long adopted in the field of short-range planning, however their use in long-range planning has been restricted. Steiner says;

> "..... experience differs considerably with strategic planning as compared with programming. In the first area the problem is far too unstructured for sophisticated quantitative methods and, as a consequence, they are not much used. In the programming area the newer techniques are being used."(62)

Scott agrees with this summing up, when he states;

> "One consequence of this qualitative nature of climatic choices is that quantitative techniques for solving problems (such as operations research) are normally not applicable. The issues cannot usually be stated numerically or in a clearly defined scalar manner. They are, rather, unprogrammed problems which can be resolved only by a type of problem solving often called heuristic".(63)

Arnoff, a well known advocate of operations research, recognises that the penetration of the technique is not widespread in the field of long-range planning. However he does record a number of cases in which it has been used to great effect.(64)

A technique of great value that can be used with little effort, to aid in the decision making aspect of planning, is expected value (or

expected utility) theory. This consists of evaluating the probabilities of certain events and the values and costs associated with them. The values and costs can then be weighted by the probabilities to give an expected value for the particular choice. By this method an optimal policy may be developed for future action. There is no guarantee, however, that this optimal policy would be compatible with the overall company objectives, due largely to the difficulty of allowing for intangibles.

One major difficulty with the application of the scientific method is the sheer magnitude of the mathematical and computational aspects that can arise when complex variables and interrelationships are included in the analysis. Computers have great advantages in this regard as they can eliminate the tedious hand processing that could arise in very complex planning programmes. Without computers such processing could be so costly and time-consuming that a distinct possibility would exist of its not being carried out. Computers can also be used in examining the consequences of different alternatives in the strategic planning process. In the ultimate, computers may be used to simulate the business (and perhaps the economy). The effects of alternative long-range plans on the future of the business could then be determined by inserting the appropriate variables into the computer programme. There is little doubt that the computer will find increasing use in the long-range planning process. However, as always with any management technique, it must be ensured that the returns from the system outweigh the costs.

FLEXIBILITY IN LONG RANGE PLANNING.

A high degree of flexibility is a desirable characteristic in long-range plans for three reasons;

1. The future itself is always uncertain

2. A large part of the environment of the future is not controllable by any individual company

3. The one certain thing about the future is that it will differ in a great many ways from the present.

Scott[65] suggests that two different aspects of flexibility are of importance in long-range planning;

1. Built-in flexibility, which is the incorporation of alternatives into the plan to allow for possible future changes

2. Deliberate-postponement flexibility, which is the deliberate postponement of some choices or decisions whilst taking action on others. The objective here is to delay some decisions until future information becomes available.

Koontz and O'Donnell discuss the principle of flexibility. This principle, which states;

"Flexibility should be a major consideration in the selection of plans, although its costs and dangers must be weighed against its advantages".

This latter statement summarises particularly well the place of flexibility in the long-range planning process.

LONG RANGE PLANNING AND FORECASTING.

Accurate forecasting plays a key role in the long-range

planning process. As well as giving a basis for the formulation of planning assumptions it can, by focusing attention on the future, assist in bringing a unity of purpose to planning. Often too much is expected from forecasts with a failure to recognise the unavoidable margins of error involved and a tendency to regard forecast figures as something stable and unchangeable. The underlying assumptions of a forecast should always be examined to determine whether they are supported by facts, reasonable estimates, or accurate reflection of policies and plans.

Whilst forecasting is a technique in its own right, distinct from the long-range planning process, it plays such an important part in the formulation of long-range business plans that it is of interest to note its essential elements as described by Koontz and O'Donnell.[67]

1. Developing the groundwork or building a structure on which future estimates can be based.

2. Estimating future business.

3. Comparing actual with estimated results and determining reasons for any major discrepancies.

4. Refining the forecast process, that is, attempting to obtain constant improvement as experience with the process is gained.

Improvements in business forecasting techniques are a field in which major gains stand to be made which will increase the efficacy of long-range business plans.

ORGANISING FOR LONG RANGE PLANNING.

The acceptance of long-range planning as a separate and distinct management function has created a need for an understanding of the organisational arrangements necessary to secure full benefit from the process. The size of a particular business is the major criterion of the scope of the long-range planning effort. In small and medium sized businesses it would be usual for long-range planning to be carried out by the chief executives as part of their day-to-day activities. Arrangements in large business would tend to be more sophisticated, with four major alternatives available:

1. Planning by top management personnel, particularly the Board of Directors, Managing Directors and top departmental managers.
2. Planning by committees -- either executive and/or subordinate.
3. Planning by consultants.
4. Use of staff planning unit.

Planning by the Individual. The dilemma of the individual in the small to medium business, is to find time to devote to long-range planning activities. In the business where the need is realised it is also necessary for the top management to contend with day-to-day activities and the situation is such that these, in the majority of cases, receive preference. Several factors can be advanced to account for the exclusion of planning activities. The first and most obvious is sheer physical overload -- the majority of businesses tend to be centralised with a large proportion of

decision making carried out by the would-be planner. This lack of delegation of authority, or in the small business, lack of staff to whom to delegate authority, ensures that little or no time is available for planning activity. The second factor is a function of the different requirement of temperament for a planner vis-a-vis that for a manager. Planning is high in thought content, whilst managing is high in action content, albeit each necessarily includes elements of the other. Considerable discussion has raged in management literature as to whether or not planning should be separated from doing and to what extent. The third factor is centered around the human preference for routine as compared with the unprogrammed task. Long-range planning is essentially an unprogrammed, intellect stretching, excogitative activity -- the temptation is to neglect it. There is no simple answer to this problem. It is necessary for the individual to recognise the importance of giving more attention to the long-range planning activity and to make the necessary organisational adjustments to enable him to do so.

Planning by Top Management. For all practical purposes, a Board of Directors usually has full authority over all elements of the planning process and is free to delegate a larger or smaller part of this authority as it deems appropriate. However, there is no clear indication of the extent to which boards play an active role in the formulation and development of long-range plans. Le Breton and Henning consider that the effectiveness of a board as a planning unit is enhanced when;

"the board is properly balanced between inside and outside directors
members are selected on the basis of ability rather than title or position
adequate compensation is provided board members
stockholders are kept fully informed of board decisions and plans".(68)

The long-range planning role of a departmental manager in a large business varies from that of the top executive in the small or medium sized business to the extent that he is called upon to co-operate with his peers and superiors in the formulation of their plans and also company-wide plans. This is in addition to planning for his own department. To his advantage, however, is the great scope for decentralisation and delegation in the large business. His major problem is to find the appropriate combination of planning and performance (doing) to ensure that the amount of planning activity does not detract from his supervisory capacity to direct and control.

Planning by Committees. Committees, both formal and informal, play an important role in the business planning, for example, the board of directors is itself a committee. Le Breton and Henning say;

"Committees are effective means of establishing company goals and and policies. They are almost prerequisite to long-range planning. They can perform effectively in the latter phases of forecasting (analysis of data, evaluation of conclusions). Their role in budgeting has been proved to be of critical value and importance."(69)

FIGURE 4.3 (72)

USE OF AN ADVISOR BOARD

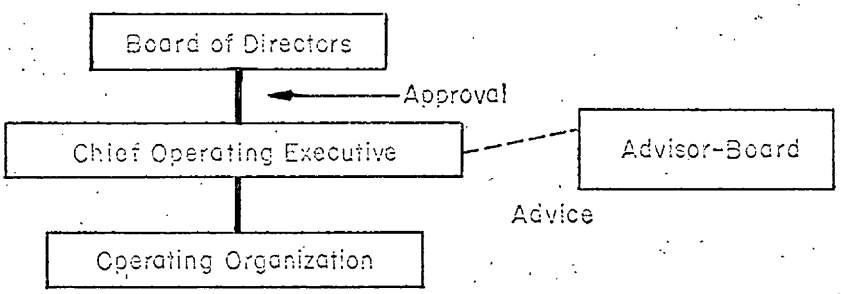
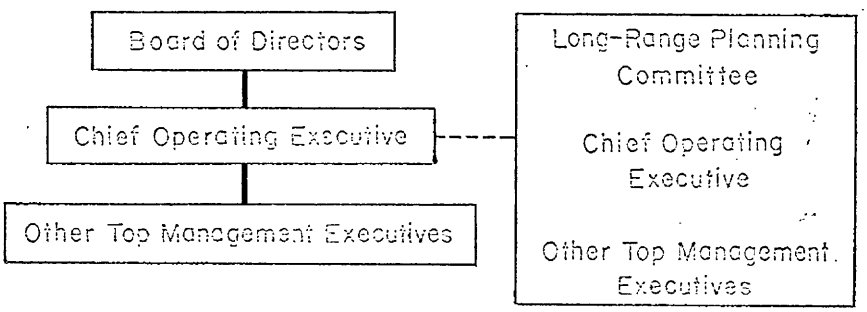


FIGURE 4.2 (71)

THE LONG RANGE PLANNING COMMITTEE



Scott[70] sees the formation of top management committees as one method of adjusting top management workload and proposes the type of arrangement shown in figure 4.2. This committee could be used in addition to a full-time staff planning unit.

It is NOT possible to classify committees as either good or bad as planning instruments. In some phases of the planning process they are particularly effective, whilst in others they are relatively ineffective. As a general rule they are good for collecting and evaluating data and preparing plans, but poorly suited for implementing plans.

Planning by Consultants. The use of management consultants is a feature of contemporary business life and there is every indication that this trend will accelerate in the future. Consultants are peculiarly well suited to assist in long-range planning activities -- they have an independence which enables a more detatched view of the business as an entity and have a fund of varied knowledge which can bring a fresh approach to the conduct of a business. To the small business they represent a cost which can be discontinued at short notice, as compared with a long term investment in a staff planner or planning unit.

Most consultants serve only in an advisory capacity and seldom have authority to approve a plan. A variation on the use of consultants is the Advisor-Board, as outlined by Scott. The organisational arrangement is shown in figure 4.3. The Advisor-Board covers subjects

ranging from operating problems to long-range planning. Its use is qualified by the statement;

"For a small company which is led by a strong president, the Advisor-Board is likely to prove very useful. It needs modifications, no doubt, if it is to be used in large companies with many capable executives". (73)

Staff Planning Unit. Large businesses tend to make use of the staff planning unit. The unit is usually small, consisting of well qualified and experienced personnel. Its advantages are the opportunity to specialise and to concentrate attention on specific matters without the day-to-day pressures that plague the line executives. Its disadvantages lie in its cost and the continual necessity to ensure that its activities are being directed to useful ends and that its capabilities, and the results it obtains, are being profitably utilised by top management.

CONCLUSION.

This chapter has encompassed a brief survey of the subject of long-range planning. Initially it was necessary to define the term, in order to develop a logical analysis. Some confusion arises from the time factor involved, however it was pointed out that the distinguishing factor was rather the content and scope of the plans.

A structure of long-range plans was set-up and each item in the structure discussed individually. This was followed by a discussion of the impact of the contemporary scientific method approach on the long-range planning process. The impact was seen to be not as great as in some other fields of business, due to the high subjective, qualitative content inherent in long-range plans. However developments in the techniques of operations research lead to the hope that it may be possible to increase the objective, quantitative content with, it is hoped, commensurate resulting increases in long term profitability.

Finally, methods of organising for long-range planning were discussed. The more formal methods such as top management committees and staff planning units will only be relevant to large companies. For the small and medium sized company the load will devolve upon the Board of Directors and a few top management executives. If the returns from long-range planning are admitted,then time must be found, by re-allocating other duties if necessary, to consider and plan the future activities of the company. The use of consultants was also commented upon and also

the use of an Advisor-Board. This latter technique may be of value to small businesses, as a means of reducing the cost of long-range planning.

Good long-range planning is expensive in more ways than one. The plans are inevitably complex, and many risks must be assessed. A comprehensive plan will require many hours of discussion, even after the time-consuming collection of data has taken place. However, despite the difficulties involved in the long-range planning process, and always provided that the costs of the process are kept to reasonable limits, industry stands to make gains in stability and profitability by inaugurating comprehensive and reliable long-range planning programmes.

CHAPTER 5.

PLANNING IN PERSPECTIVE.

With the new-found interest in business planning in all its manifestations, there exists the possibility of the limitations and problems associated with the process being glossed over and disregarded. Were this to happen, there would exist the possibility of resultant financial losses due to over-planning, followed by a reaction against the planning process, which could be to the detriment of the business as a whole. Writing of the limitations of long-range planning, Ewing says;

> "it is a very good idea to keep these limitations in mind. By thinking positively and realistically about planning, we can keep it from becoming another fad."(74)

This lesson applied with equal pertinence to all forms of planning, not only to the long-range category. It is now proposed to discuss briefly some of the major limitations and problems which apply to all forms of planning.

COST IN EFFORT AND MONEY.

It is essential that the costs of planning be continually measured against the expected benefits to be derived from the utilisation of the plans. This applies particularly to the use of some of the highly sophisticated contemporary techniques which, in many instances, involve the use of electronic computers to enable processing and evaluation of the masses of data which they need and produce.

The effort and resources that could be expended on forecasting, evaluation of alternatives, development of derivative plans, or other aspects of planning, are almost unlimited. Perhaps the only serious constraints are the cost to the business and the time available to the manager before action must be taken. Koontz and O'Donnell record a case of over-planning;

> "A project, undertaken by a large aircraft manufacturer, in which a minor modification of an airplane took some 3,000 man-hours of engineering and production planning for a job requiring 50 direct man-hours, when, had the job been done on a relatively unplanned basis, the planning time could have been reduced to some 30 man-hours, with only a doubling of the direct man-hours involved."(75)

Whilst, hopefully, such an example is not typical, it would be possible to do something similar by using a network analysis such as PERT/COST with three time estimates, on a relatively small project with a low profit margin; or by introducing a comprehensive flexible budgeting system where a simple fixed budget system would suffice; or by a small business in a rapidly changing industry employing consultants to establish comprehensive five and ten-year plans.

There have been established general guide lines, relevant to planning expense, that are useful. Firstly, large firms can engage in more planning and more thorough planning than small firms, secondly, the more detailed planning becomes the more expensive it will be, thirdly, the longer into the future plans are projected the more costly they will be

and finally, as plans become less significant, the amount of effort and expense that should be expended is reduced. Koontz and O'Donnell sum up the argument of this section in these words;

"From the standpoint of expense, the underlying principle that should be applicable to planning is simple: no firm should spend more on planning than the value of the benefits that might be expected."[76]

It would perhaps be better to use a criterion based on benefits at some level above the planning expense as some of the returns from planning are problematical whilst the expenses are certain.

LIMITATIONS OF FORECASTING.

The limitations of forecasting are particularly relevant to long-range planning and have been discussed elsewhere under that heading. Newman[77] describes two methods of overcoming the limits imposed by unreliable forecasting. The first is to make studied attempts to improve the forecasting technique, the second is to detour around the areas of greatest uncertainty which is akin to postponing a decision until it is absolutely necessary. The second technique is important and receives considerable attention in decision theory. New and improved scientific techniques and greater world-wide economic stability are reducing the element of uncertainty to a certain degree, however the situation remains essentially as Newman described it in 1950;

"..... the inability to forecast accurately remains one of the factors that limit the period and the detail in which planning is practical."[78]

LIMITATIONS OF FLEXIBILITY.

Flexibility, to a greater or lesser degree, is an essential element of any type of plan. However not all the flexibility must be in the plan itself. The establishment of plans tends to make administration inflexible, and the more detailed and widespread the plans the greater the desire not to change. To a certain extent the reluctance to change is part of the nature of man. To change requires effort and application, and upsets the status quo. Pre-conceived ideas have to be changed and instructions and commitments changed. As a general rule the more highly programmed the plan the more objection there is likely to be to any form of change. Limitations due to inflexibility may be classified into endogenous inflexibilities and exogenous inflexibilities.

Endogenous Inflexibilities. These spring up from within the firm itself and include the psychological inflexibility mentioned above and inflexibility in policies and procedures and in capital investment. Policies and procedures tend to become rigid and ingrained in the business -- to change them can be extremely difficult. If changes are required for a particular plan then one facet of the plan may need to be the technique to be used to make this change. There is a high degree of inflexibility inherent in many classes of invested capital. Investments in plant and machinery, inventory, production lines, personnel training and a host of others, cannot be changed quickly. Whilst the general principle in planning is to disregard sunk costs, since little can be done about them, nevertheless their existence does

influence planning and places severe constraints on the possibility of change.

Exogenous Inflexibilities. These come from outside the business, and as well as the entire social environment, include government policies, labour organisation and technological change. The influence of government is having a profound effect on to-day's business. Tax and trade policies place constraints on business activities, whilst government expenditure regulates the state of the economy and business activity. This influence can be expected to increase, as instanced by the planned Anti-Monopolies legislation, and inflexibility from this source will always be a prime feature of Australian business life.

The existence of a high level of trade unionism, particularly those organised on a national basis, restricts the freedom of the business manager. The activities of the Conciliation and Arbitration Commission fix wage levels and working conditions within closely defined limits, at the national level, whilst trade union activity does so at the plant or factory level. The growth of collective bargaining in Australian industrial life can be expected to further reduce what flexibility is presently available in the labour sphere.

Technological change is a factor which has been discussed at great length by many authorities. It creates planning problems in two regards, firstly it changes so rapidly that accurate forecasting is rendered difficult, but at the same time, at any given time, the state of technical

FIGURE 5.1 (80)

TYPES OF ADMINISTRATIVE PLANS

SCOPE	GOALS	COURSES OF ACTION	
		Single-Use Plans	*Standing Plans*
Broad Plans ↕ Detailed Plans	Objectives (Missions)	General Programs	Policies
	Budgets and Deadlines	Projects	Organization Structure
	Performance Standards for Expense, Quality, Quantity, etc.	Personnel Assignments	Standard Procedures
		Detailed Schedules, Specifications, Methods, etc.	Standard Methods

progress is a relatively inflexible factor. Plans may be delayed awaiting the development of new material which will certainly be developed in the near future, but in the interim are creating delays in plans for the present.

INTEGRATION OF SHORT RANGE AND LONG RANGE PLANNING.

As with all aspects of business it is essential with business planning that a measure of balance and perspective be maintained. The tendency on the part of managers is to focus attention on the short range or very short range, day-to-day, aspects of planning, and to relegate long-range planning to the position of a marginal or fringe function. This situation is unsatisfactory -- it is necessary that the planning function also be planned and that short-range plans co-ordinate and integrate with the long-range plans and overall objectives of the business. Scott describes the situation as follows;

> "Business plans are carried out at all levels of management, and most companies establish layers of plans which (in descending order) become progressively narrower and more detailed in their scope. They form, in other words, a hierarchy of plans whose various layers usually receive special designations, primarily to aid the administration of planning activities. These designations help clarify the scope of different plans, and they also help achieve consistency and harmony between the different plans."(79)

Newman establishes a range of administrative plans as shown in figure 5.1, and says;

> "Good planning depends in part upon choosing the best forms or types of plans for the specific operation. ..... In addition to the selection of the proper types of plans, the executive should seek INTEGRATION of his plans."(81)

To obtain this integration requires a process of continual appraisal and review by the manager, to ensure that a balance is being maintained in the company's planning efforts.

THE FOCUS OF PLANNING.

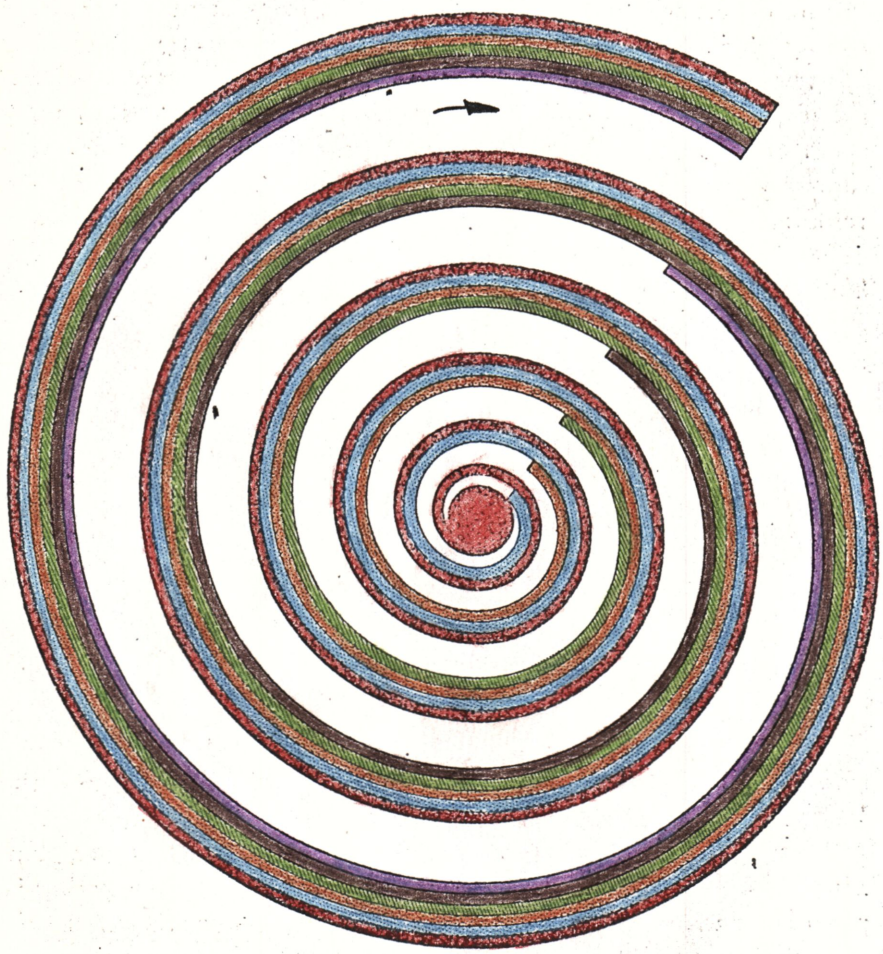
Planning for the business as an entity requires a highly co-ordinated effort by all areas of specialisation. Planning will be carried out independently in every area of the business, and these separate efforts must be reconciled and co-ordinated. Given this co-ordination, individual businesses will tend to have, to a greater or lesser degree, a particular orientation. For example a business may be marketing oriented, production oriented, finance oriented, technically oriented, and so on for the various other functional areas. Ferrell discusses this factor in some detail, and argues that the orientation should, in fact, be towards the customer. Customer orientation is defined as;

> "...the awareness of and fulfilment of the concept that a business enterprise's profitable growth depends upon its future ability to serve selected customer needs rather than to sell particular products or services."(82)

Following upon the establishment of this particular orientation, business

FIGURE 5.2 (84)

SEQUENTIAL FLOW CHART OF BUSINESS PLANNING



planning is described in these terms;

"The aim of business planning is to anticipate, and programme, in all functions of the business, the future service of those customer needs with the most profitable growth possibilities for the business." (83)

Marketing planning is seen as the one strand which is present throughout the business cycle. Business planning starts with marketing planning, initially the identification of opportunities for profitable growth, and finishes with marketing planning to dispose of the finished product or service. The relationship of the various functional planning areas is shown graphically in figure 5.2. The business planning cycle commences at the centre of the spiral.

BUSINESS ESPIONAGE.

Business espionage has received little publicity in Australia and there is no reason to believe that it is present in this country except to a very minor degree. However, it is considered to be a problem of some magnitude in American business life. The subject is particularly relevant to business planning, as the objective of the espionage is, in the majority of cases, to reduce the uncertainty level associated with forecasting and planning for the future. Smith says;

"The current upsurge of industrial espionage,....., is mainly attributable to a toughening of competition, with a resultant increase in the pressure on ethics. But two less obvious developments are also responsible, and these, like the heightened competition, are essentially

postwar in origin. The first is the terrific premium American industry now puts on all kinds of information....."[85]

There is evidence to suggest that the increased use of the more sophisticated methods of operations research, and in particular decision theory, is placing a premium on information due to the realisation of the benefits of the additional information. Bayesian decision theory is based upon the revision of probabilities by the use of additional information and the manager familiar with the technique would well appreciate the degree to which uncertainty can be reduced by this method.

CONCLUSION.

Business planning, in any of its numerous forms, is not a simple, straightforward process. Many of the methods are quite complex and there are limitations and problems, both human and mechanical, associated with the application of the planning process. Of the factors mentioned, perhaps the most important from the practical business viewpoint is the associated expense in time and resources. Planning should show returns for the resources it consumes and should make a positive contribution to profit -- albeit the actual figures for the costs and returns, particularly the latter, associated with the process may be exceedingly difficult to determine. To ensure the profitable use of resources it is essential that the planning effort be integrated and that a sense of balance be maintained in its application -- the development of short-range planning to the exclusion of long-range planning, or vice versa, would not be in the best interests of a business as a whole.

Following on from the need for integration and balance within the planning process itself, is the need to realise the place of planning in the overall management process. Essentially it can be considered as an important part in the management process as a whole -- one part in a complex matrix of interconnected and intermeshing parts. An over-indulgence in the planning effort could very well be as detrimental to the business as an under-indulgence. The objective should be to ensure a level of integrated planning effort which will make the maximum contribution to the achievement of the overall business objectives.

NOTES ON THE TEXT.

1. W. H. Newman, Administrative Action. p.18

2. Ibid, p.38

3. B. W. Scott, Long-Range Planning In American Industry. p.29

4. Strategic planning is the attempt to answer the question; "Where is the business going?"
Tactical planning is the attempt to answer the question; "How does the business get where it wants to go?" It is frequently called implementational planning.

5. Quoted in G.A. Steiner, editor, Managerial Long-Range Planning, p.8.

6. S. Thompson, How Companies Plan. p.32

7. P.P. Le Breton and D.A. Henning. Planning Theory.

8. Ibid, pp.54 - 55.

9. Ibid, p.320.

10. B. E. Goetz, Management Planning and Control. pp. 1 - 2.

11. J. G. March and H. A. Simon, Organisations.

12. Ibid, p.200.

13. H. A. Simon, Administrative Behaviour.

14. Ibid, p. 228.

15. B. W. Scott, op.cit.

16. G. A. Steiner, op.cit.

17. H. B. Maynard, editor, Industrial Engineering Handbook, Figure 2-8, p. 6 - 49.

18. Ibid, Figure 2-10, p. 6 - 51.

19. R. W. Miller, Schedule, Cost, and Profit Control With PERT. Figure 5, p.24.

20. An excellent description which clearly shows the potential of this method may be found in L. W. Hein. The Quantitative Approach to Managerial Decisions. pp. 329 - 354.

21. R. W. Miller, op.cit. Figure 2, p.19

22. J. S. Baumgartner, Project Management. p.47.

23. W. S. Butcher, Including Resources In the Critical Path Schedule. p. 307.

24. Ibid, p.308

25. Ibid, p.309

26. Ibid, p.310

27. R. L. Martino, Allocating and Scheduling Resources. p.142.

28. MAP - originally "Manpower Allocation Procedure" but re-named "Multiple-Resource Allocation Procedure". It is similar in concept to RAMPS although different in detail. It was developed by R. L. Martino (see 27. above).

29. R. L. Martino, op.cit. p.143.

30. J. S. Baumgartner, op.cit. p.43

31. Ibid, p.49

32. A. Battersby, Network Analysis. p.145

33. D. G. Graham, Quantitative Methods, Seminar 1, p.2

34. C. T. Horngren, Cost Accounting, p.767

35. D. W. Ewing, editor, Long Range Planning for Management, Quoted in Article 20, by E. Leonard Arnoff, p.197.

36. E. C. Bursk and J. F. Chapman, eds., New Decision Making Tools For Managers. Quoted in Article 1, by C. C. Herrman and J. F. Magee, p.25.

37. J. S. Baumgartner, op.cit.

38. C. T. Horngren, op.cit. p. 165.

39. H. Koontz and C. O'Donnell, Principles of Management, p.548.

40. C. T. Horngren, op.cit. p.168.

41. Ibid, p.195.

42. An excellent survey of PACE and the budget index is contained in L. W. Hein, op.cit. pp. 261 - 288.

43. Ibid, Figure 15-7, p.274.

44. G. A. Steiner, editor. op.cit. Quoted in Chapter 11. Program Budgeting: Long-Range Planning in the Department of Defense. -- David Novick, p.198.

45. Ibid, p.202

46. G. A. Welsch, Budgeting: Profit Planning and Control, p.21.

47. H. Koontz and C. O'Donnell, op.cit. p.550

48. G. A. Welsch, op.cit. p.22

49. C. T. Horngren, op.cit. p.245

50. See Chapter 2 - Short Range Planning.

51. Quoted in R. W. Ferrell, Customer-Oriented Planning, p.29

52. B. W. Scott, op.cit.

53. Ibid, p.63

54. P. P. Le Breton and D. A. Henning, op.cit. Their theory is discussed in some detail in Chapter 1 of this thesis.

55. Quoted in R. W. Ferrell, op.cit. p.29

56. This analysis is derived from B. W. Scott, op.cit. Scott's work is an excellent text book on the subject of Long Range Planning.

57. Ibid, p.108

58. H. Koontz and C. O'Donnell, op.cit. p.135.

59. B. W. Scott, op.cit. p.136.

60. C. I. Barnard, The Functions of the Executive. p.202. Barnard ascribes the concept to Professor John R. Commons.

61. H. Koontz and C. O'Donnell, op.cit. p.142

62. G. A. Steiner, editor, op.cit. p.321.

63. B. W. Scott, op.cit. p.140

64. Quoted in D. W. Ewing, ed. op.cit. Article 20, Operations Research and Long-Range Company Planning, by E. Leonard Arnoff. A particularly interesting example is given of the use of Operations Research in the long-range planned expansion of an electricity generating utility.

65. B. W. Scott, op.cit. p. 141.

66. H. Koontz and C.O'Donnell, op.cit. p.202

67. Ibid, p.111, these elements are discussed in greater detail.

68. P. P. LeBreton and D. A. Henning, op.cit. p.166. This book has an excellent section on organising for planning.

69. Ibid, p. 229.

70. B. W. Scott, op.cit. p.161 et seqq.

71. Ibid, p. 162, Exhibit 1.

72. Ibid, p. 167, Exhibit 3.

73. Ibid, p. 168.

74. D. W. Ewing, Editor, op.cit. p. 375.

75. H. Koontz and C. O'Donnell, op.cit. p. 197

76. Ibid, p. 42.

77. W. H. Newman, op.cit. p.59

78. Ibid, p.60

79. B. W. Scott, op.cit. p.23

80. W. H. Newman, op.cit. p. 54. Fig.8

81. Ibid, p.53.

82. R. W. Ferrell, op.cit. p.28

83. Ibid, p.32

84. Ibid, p.51, Chart V.

85. D. W. Ewing, ed. op.cit. p.361. Article 33. Business Espionage by Richard Austin Smith.

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