SOME PRINCIPAL ORGANIZATIONAL PARAMETERS AFFECTING THE CAPITAL EXPENDITURE PROCESS

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I

INTRODUCTION

The purpose of this thesis is to develop some of the principal organizational parameters affecting the capital expenditure process of a business enterprise.

Great strides have been made in applying the "scientific" approach to many areas of managerial decision-making; however, capital expenditure decisions have been accorded scientific attention only in the past twenty-five years. In fact, the first major work devoted entirely to any phase of the capital expenditure process was Capital Budgeting by Joel Dean (Ref. 7) published in 1951. During this period, conditions for profit-making have been so favorable that expenditures based on intuition have fared well. However, factors such as (1) growth in the number and size of business enterprises during the past several years, (2) the change which is taking place in the structure of the economy, (3) rising price levels, and (4) the increasing importance of the government in its use of financial resources all tend to increase the importance of capital expenditure decisions.

Much of the work associated with capital expenditures has concentrated on evaluation techniques. It is suggested, however, by this writer and Morris (20), that what is most significant in developing and/or applying any "scientific" principles and practices to the capital expenditure process is not so much the particular formula, if it considers all relevant data, which is used to summarize the data on

capital expenditure proposals; but the organizational arrangements by which an enterprise reaches capital expenditure decisions.

In order to optimally design and utilize any system or process, it is necessary to know the parameters within which the process must function. This thesis will develop some of the more important organizational parameters affecting the capital expenditure process. The usefulness of these parameters will be determined by their application in the overall design of a capital expenditure process in a functioning enterprise.

The organizational parameters affecting the capital expenditure process are developed in the following manner:

1. At present there is no universally accepted definition of capital budgeting nor what expenditures constitute a capital expenditure; therefore, a simple examination will be made of the aim of the capital expenditure process.
2. The investment of funds for capital purposes is generally considered the primary management function about which other activities of the enterprise must align; consequently, a primary objective in relation to the capital expenditure process is formulated. This primary objective is formulated in a framework of uncertainty utilizing the basic characteristics of a closed-loop information-feedback system.
3. Enterprises utilize some aspect of their organizational structure and/or administrative processes to damp oscillations in their objective system. The organizational structure, administrative processes, and evaluation techniques employed by the

enterprise are the parameters that affect planning, execution, and verification in the capital expenditure process. Some of the major parameters and the manner in which they affect the capital expenditure process are discussed as follows:

A. Types of growth patterns and their effect on the organizational structure and the capital expenditure process.

B. Principal types of organizational structures and their effect on the capital expenditure process.

C. Administrative procedures affecting the capital expenditure process.

II

AIM OF THE CAPITAL EXPENDITURE PROCESS

Capital Budgeting Defined

Before attempting to deal with organizational parameters that affect the capital expenditure process, it is imperative that we understand the basic aim of capital budgeting. Therefore, four definitions of capital budgeting as stated by leading authors from the disciplines of management, resource allocation, financial commitment, and financial economics are presented:

> Dean (Ref. 7, p. 1) states that it is: "_____, the kind of thinking that is necessary to design and carry through a systematic program for investing stockholder's money. Planning and control of capital expenditures is the basic top-management function, since management is originally hired to take control of stockholder's funds and to maximize their earning power. In a broad sense, therefore, product-line policy, promotion, pricing, and labor relations can be viewed as subsidiary problems of administering management's trusteeship over capital."
>
> Barish (1, p. 217) states that: "The subject of capital planning, budgeting, and management is crucial to the operation of an enterprise. Broadly conceived, it represents the basic top-management function in the enterprise: the investment of funds in those activities where they will be most productive in promoting the profitability and long-range growth of the enterprise.
>
> "The management problem of determining the amount and manner of investment of funds for capital purposes is generally the primary management function about which all the other activities of the enterprise must be aligned. The capital budget mirrors the plan of future activities for the enterprise. Because it involves long-range commitments of funds, it is usually one of the first steps in establishing new directions and policies for the company."
>
> Horngren (13, p. 356) defines this function as: "Capital budgeting is long-term planning for making and financing proposed capital outlays. Most expenditures for plant, equipment, and other long-lived assets affect operations over a series of years. They are large, permanent commitments that influence long-run flexibility and earning power. Decisions in this area are among the most difficult,----."

Baumol (2, p. 434) states that: "Capital budgeting refers to the investment decision making procedures of business firms and other enterprises. The subject encompasses such topics as the selection of projects (which new factories, if any, should the company build), the timing of the investment, the determination of the amount to be invested within any given period, and the arrangement of the financial means necessary for the completion of the projects. The calculations which are appropriate for these decisions for the most part derive directly from the theory of capital."

Scope of the Capital Expenditure Decision

As can be seen from the above definitions quoted from leading authors in the fields concerned with capital budgeting, there is some diversity in what each of them sees as the primary function of capital budgeting. For example, Dean (7, p. 1) says the function is "to take control of stockholders' funds and to maximize their earning power," while Barish (1, p. 217) says it is "the investment of funds in those activities where they will be most productive in promoting the profitability and long-range growth of the enterprise." Yet it is implied, if not stated explicitly by each definition, that the capital expenditure process is the primary function of top management to which all other decisions are secondary.

After these authors and others who write about capital budgeting establish the capital expenditure process as being the primary function of top management, each of them then proceeds to present various techniques and general (although in many instances they are quite rigid) methods (rules) for evaluating a proposed capital expenditure. They then continue by relating and/or comparing these techniques with each other, develop procedures to follow, and to defend these techniques as

being the way to make the capital expenditure decision for the various classifications of capital expenditure projects. In addition, some of these authors admit and others imply that the "intangible factors" (qualitative factors) should be considered, i.e., those factors that are not readily convertible to money terms such as safety conditions, employee morale, corporate image, etc., before the final decision is made. It is not stated what these "intangible factors" are or how to consider them other than to state that they must be considered before a final decision is made. These factors are anything but "intangible"; they are indeed "tangible" (e.g., everyone knows that attracting and holding capable employees is extremely important, that the image portrayed by the enterprise to a large degree determines its success, etc.). Thus, these factors are non-measurable; and the results, while exceedingly measurable, may not show up until the distant future. Consider the following illustration:

> An engineering study was made, and it was found that a certain operation could be automated. The immediate results are clear: a savings in unit cost, better quality product, and customer orders can be filled more promptly. Therefore, we have tangible factors upon which an economic justification for an additional capital expenditure can be made; and the justification is satisfactory to meet the firms existing economic criteria for this type project. Without further consideration this operation is automated.

As a result of automating this operation, a group of capable and loyal employees are terminated. It is obvious that the following

"intangible" factors were not considered: (1) the firm's reputation within the locale, i.e., the attitude of the community toward the firm and its effect on prospective employees; and (2) effect on remaining employees doing similar but different operations. These effects on employee loyalty and morale, and effect on future employment practices are not measurable; however, in the long-run the results of this action would become obvious and measurable in terms of quality, cost, and/or other important criteria. Therefore, capital budgeting simply does not present a method for considering these "non-measurable" factors. What capital budgeting does is reduce profitability to a mathematical statement so that decision-making executives can compare alternatives and decide which is best.

It is generally agreed that these techniques are valuable tools as aids to decision making; but if capital expenditure decisions are in fact the primary function of top management, these authors and in many cases decision-making executives, are not addressing themselves to one of the major problems associated with capital expenditure decisions. That is, what are the organizational parameters affecting these decisions and what control and/or influence do these have on the final decision?

Thus, for more effective capital-expenditure decisions, answers must be found to the following types of questions: Is top management's primary function to maximize the earning power of the stockholder's investment as Dean indicates, or is this function one that can be performed adequately using a "satisfying" criterion? Does the organization's internal and external environment affect this decision? If so, how?

Does the particular organization structure affect this decision? If so, how? At what level in the organization should capital expenditure decisions be made? Therefore, it is clear that the central issue becomes: what are the criteria for deciding the desirability of a proposed capital expenditure?

As used in this work, the term "capital budgeting" refers to the process of estimating any future needs for funds and/or the allocation of existing funds to be used for capital expenditures. The term "capital expenditure decision" refers to any organizational decision affecting "capital budgeting." The remainder of this work will examine some of what this writer believes to be the more important organizational parameters that serve as criteria in the capital expenditure decision-making process.

III

OBJECTIVE OF A BUSINESS ORGANIZATION IN RELATION TO CAPITAL EXPENDITURE DECISIONS

Goals and Objectives*

Why does an individual join an organization? Why does he stay within that organization? What can we say is the goal of an industrial organization?

It should be clear that there is both a gain and a loss by belonging and/or associating with an organization. The component parts of an organization, its members, associate for different and sometimes contradictory reasons. An individual enters an organization to get "something" out of it; however, there is an attendant loss of some sort - time, satisfaction, etc. If the individual is to stay within the organization, the gain (as perceived by him) must exceed the loss.

People have different goals. The goals of an individual are a function of his needs and satisfactions. Therefore, the goals of members of an organization vary: for some it may be to provide themselves a "proper" standard of living, for others it may be to assure their term of employment, still for others it may be "to get ahead" and for others it may be to make money for the organization. It would seem then that goals are individualistic in nature.

The set of individual needs and satisfactions of the members of a particular organization conceptualizes the pattern of inherent variation

*The ideas in this section are primarily developed from Reference 25, pages 80-87.

in that organization; i.e., the needs and satisfactions of the members set the limits that the organizational process is capable of achieving.

There are many goals on many levels; thus the organization has no one goal. Organizational goals are conceptual in that they are the weighted means of individual needs and satisfactions. Therefore, this thesis will differentiate between goals and objectives on the following basis: "Goals are individualistic, a property of the individual; and objectives are organizational in nature" (25, p. 81). Presumably the primary objective of a business organization is maximum profitability to all members of that organization from the individual stockholder, to management, to the individual workers. This presumption does not deny the existence nor belittle the importance of other objectives such as corporate image, product reputation, improved labor relations, employee safety, etc. An examination of this presumption will be undertaken in a subsequent section.

Goals as an organizational parameter: The assumption is made that an individual expresses his goal(s) operationally in terms of needs and satisfactions. That is, if an individual's needs and satisfactions could be measured, this would be as perfect a measure of his goal(s) as could ever be obtained. A realistic means of measuring needs and satisfactions is not available; establishment of such measures is not the intent of this thesis, it is the job of the life scientists. However, this thesis proposes to show that this lack of measurement is a parameter placed upon the capital expenditure process and to suggest some means of reducing its effect.

The first step in reducing the effect of this lack of an effective measurement of needs and satisfactions is a continuing awareness on the part of all members of the organization that this parameter exists and that it has a serious impact on the capital expenditure process. If this awareness is used in a conscientious, qualitative sense, much can be gained without specific operational measures of needs and satisfactions. In the final analysis, it may prove that there will never be any completely operational measures for these quantities; however, this in no way negates the necessity for their recognition nor does it justify ignoring them in any decision-making process.

It has been stated that goals are the property of the individual and they are a function of his wants and desires; yet the needs and satisfactions of an individual are not completely determined by the individual himself. They are in a large part determined by what society makes desirable or wantable. Thus, today we consider a house substandard if it lacks running water, bathroom, or central heat. This was not so a hundred years ago. This society deems these desirable, so we have this need or satisfaction as a goal. This simple illustration points out that goals change as conditions of the internal and external environment of the organization change; therefore, a change in goals can be accomplished through changing the culture. Since a particular organization can and does have a unique "culture" of its own within the larger culture of society, its culture can and is changed. This change is generally accomplished by what is commonly called indoctrination and/or training. Thus, the implementation of reducing the effect of

this parameter of the capital expenditure process can be accomplished by conscious choice.

Objectives as an organizational parameter: It was stated earlier that individuals are the component parts of an organization and that these individuals have goals. Also, objectives have been defined as organizational in nature. Therefore, objectives are the goals that individuals set by conscious choice within the framework of the organization. Examples of organizational objectives are: to make a twenty per cent return on investment, to reduce waste by five per cent next month, to meet a certain sales quota in the next time period, to maintain good relations with the union, to hire and retain employees with certain qualifications, etc.

Then, as such, the objective system is a complex system of interconnections. It is an n-dimensional array where the different objectives within the organization may be necessary correlatives or they may in some respects be antithetical. For example, the objective of the production function of an industrial organization may be to produce more product at a lowest unit cost; and yet the results incurred in moving toward this objective may be in opposition to that of the personnel function which is striving for increased personnel benefits. Within this framework, organizational objectives are a complex set of parameters that place a restriction upon any function within the organization, especially the capital expenditure process. But, is the capital expenditure decision made within the framework of this complex interconnecting system of objectives or is it made within the more narrow or specific

limits of an overriding primary objective (e.g., maximum profitability)? This primary objective, if it exists, is the endpoint towards which all group activity in an organized enterprise is aimed.

The presumption was stated earlier that the primary objective of a business organization is maximum profitability to all members of that organization. Thus, it is necessary, at this point, to examine this presumption. Selznick (23, p. 281) states that:

> "Organization may be viewed from two standpoints which are analytically distinct but which are empirically united in a context of reciprocal consequences. On the one hand, any concrete organizational system is an economy; at the same time, it is an adaptive social structure. Considered as an economy, organization is a system of relationships which define the availability of scarce resources and which may be manipulated in terms of efficiency and effectiveness."

Since these two standpoints - organization as an economy and organization as an adaptive social structure - are empirically united, it becomes necessary to choose one of them as a base for examining the above presumption. Therefore, the choice of organization as an economy will be chosen as an arbitrary starting point for this examination; hopefully, these two standpoints will converge. Many opinions, arguments, and discussions have been grounded upon the economic standpoint; the following statement by Cyert and March (6, p. 8) summarizes many of these positions:

> "The assumptions of rationality in the theory of the firm can be reduced to two propositions: (1) firms seek to maximize profits; (2) firms operate with perfect knowledge,----. Thus, we can assume that firms maximize the discounted value of future profits, and that firms have perfect knowledge only up to a probability distribution of all future states of the world."

Summary: A distinction has been made between goals and objectives. Goals are individualistic; that is, they are a measure of an individual's needs and satisfactions. Goals affect the capital expenditure process, but they can be changed by changing the "culture" of the organization within the broader framework of the culture of the society. Objectives are organizational in nature; that is, they are the weighted means of individual needs and satisfactions, and they are established by conscious choice within the framework of the organization. As such, the objective system is a complex system of interconnections which places parameters on any organizational function. However, it is proposed that organizations reduce the complex system of objectives to an overriding primary objective which serves as a base for decision-making purposes. This proposal will be examined in terms of: first, organizations operate with imperfect knowledge and as such formulate objectives in a framework of uncertainty; and second, questions the assumption that an organization's primary objective, if it exists, is maximum profitability to all its members.

Organizations Operate with Imperfect Knowledge

In the majority of the basic economic models the assumption is made that any decision will be made within the framework of complete certainty (perfect knowledge). This assumption is clearly illustrated in the quote summarizing the economic standpoint at the end of the last section. Thus, a decision would be made under the simplification that only one possible future could occur. This is not to pretend that the decision-maker knows the future with certainty, but it is an act of conceptual simplification.

It allows the decision-maker to answer the question: if this set of circumstances were to occur, what would be the reasonable course of action? Answering this question allows the decision-maker to act as though he had virtually complete information concerning what would happen if he chose any given course of action.

It is an obvious fact that organizations cannot operate with complete information (perfect knowledge) of the world even as it exists today. Further, it is an impossibility to predict the state of the world at any future time; but it is necessary to predict (forecast) certain segments of it as it will exist in the future, e.g., sales for an industrial enterprise. Principles and techniques of forecasting are outside the realm of this work; however, the fundamental prediction - knowledge relationship will be examined in order to show its effect on formulating organizational objectives.

Prediction - Knowledge Relationship: To predict is "to tell or declare beforehand; foretell; prophesy,"[1] but more than this, to predict is to prognosticate, "to foretell from signs or symptoms."[2] Thus, prediction implies knowledge. More specifically, prediction implies knowledge of present and past behavior relative to the matter under consideration. Further prediction implies that knowledge of the relationship between experiences of the present and past and the events of the future exists.

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1. Webster's New Collegiate Dictionary (Springfield, Mass.: G&C, Merriam Co., 1957) p. 665.

2. Ibid. p. 675.

Prediction and knowledge, then, are so mutually necessary as to make it almost impossible to consider one without the other. This concept of a prediction - knowledge couple is clearly recognizable in the following passage quoted from Shewart (24, p. 85):

> "Knowledge begins and ends in experimental data but....does not end in the data in which it begins. There are three important components of knowledge:
>
> a) the data of experience in which the process of knowledge begins,
>
> b) the prediction, P, in terms of data that one would expect to get if he were to perform certain experiments in the future, and
>
> c) the degree of belief, P_b, in the prediction, P, based on the original data or some summary thereof as evidence E.
>
> Knowledge begins in the original data and ends in the data predicted, these future data constituting the operationally verifiable meaning of the original data."

Note that each of the components stated above is related to and dependent on the other. If these components are in fact components of knowledge, then it must be concluded that prediction is a part of knowledge. In addition, the above concept indicates a spiral nature over time in the acquisition of knowledge; and implicit in this concept is the idea that knowledge is empirical. That is, knowledge comes from observations; and the observations must exercise a certain degree of stability* before they can be used for prediction.

<u>Knowledge is acquired through an information-feedback system</u>: The idea of a spiral nature over time in the acquisition of knowledge is

*The meaning of relative stability is discussed in the section entitled "Basic Characteristics of an Information-Feedback System."

referred to today as an information-feedback system. Forrester (11, p. 14) defines an information-feedback system as:

> "An information-feedback system exists whenever the environment leads to a decision that results in action which affects the environment and thereby influences future decisions."

This is a broad definition that encompasses all actions, whether it is an individual action, group action, or organizational action. Therefore, information-feedback systems are fundamental to all life and human endeavor. Every action that is taken, whether it is an individual, a group, an organization, or a society, is taken in the context of an information-feedback system.

In an information-feedback system it is always the presently available information about the present and past which is being used as a basis for providing future action. This information that is being used is in the form of observations. While we may say that we "know" the observations of the present and past, we may never "know" fully the relationship tying these together with the future. It cannot be asserted that such relationships do in fact exist in nature; for no matter how great the totality of observations comprising evidence in support of such an assertion, this totality of observations represents only a fraction of the infinite observations possible over time. Therefore, it is concluded that organizations operate with imperfect knowledge. Stating this conclusion in a slightly different manner: organizations have perfect knowledge only up to a probability distribution of all future states of the world. Thus, any organizational objective is formulated in a framework

of uncertainty. Consequently, it is proposed that for an organization to be operative there must exist some degree of allowable variation in its primary objective. The manner in which this framework of uncertainty affects objective formulation will now be examined.

Organizations Formulate Objectives in a Framework of Uncertainty

Knowledge depends on prediction; prediction depends on observation and the assumption that there exists "a" relationship between them. The value of observations is dependent on the manner in which the observations were taken and on the degree to which the assumptions and implications involved are understood. Inherent in observations then is a dependence on the stability of data, the fundamental aspect of the scientific method contributed by Walter A. Shewart.

Closely related to the idea of stability of data is the argument proposed by Simon and March (18, p. 180) that:

> Information is not given to the organization but must be obtained, that alternatives are searched for and discovered sequentially, and that the order in which the environment is searched determines to a substantial extent the decisions that will be made.

This argument takes on prime significance in any general theory of decision-making. Thus, the manner of search and the manner of choice become closely interwoven into any forecast (prediction). It is proposed that the underlying principle behind the process of search and the process of choice is an attempt to assure stability of observation.

Process of Search: The process of search itself is at the heart of organizational stability. Simon and March (18) offer the following set of hypothesis relative to search:

a) As the satisfaction of the decision-maker with presently available alternatives decreases, the search for new alternatives will increase.

b) As the search for new alternatives increases, the expected payoff will also increase.

c) As the expected payoff increases, the decision-maker's satisfaction with the alternatives under consideration will increase also.

d) As the expected payoff of the alternatives in hand increases, the aspiration level of the decision-maker also increases.

e) As the aspiration level increases, the satisfaction of the decision-maker with the alternatives available decreases.

It is interesting to note from this set of hypothesis that search decreases with satisfaction; thus, if little search is going on, there is a tendency to utilize existing alternatives.

It has been suggested that decision-makers will give special preference to alternatives which represent a continuation of activities already underway in the organization. There is a natural tendency to favor existing operating procedures, policies, programs, and general industry practice, as opposed to choosing alternatives which represent change. This may be due to: natural resistance to change, use of non-rational calculation of cost-of-change, requires deviation from traditional methods, and/or the "natural" feeling that the stability of existing activity is greater than new activity. However, it may well be explained by suggesting that the organization does not search for alternatives when those available are satisfactory; also decision-makers are more certain of their knowledge by continuing existing activities, i.e., their "confidence interval" becomes narrower with operational experience. Further, Morris (19, p. 505) states that:

"Search is also related to the difficulty which is encountered by the decision-maker in choosing between the alternatives which are perceived by him as being available. The following set of hypotheses suggest some possibilities:

If, among the alternatives perceived by the decision-maker, one is clearly preferred; and if this preferred alternative is acceptable, then there will be little difficulty in making the choice (decision).

If the decision-maker finds that all of his perceived alternatives: (a) cannot be compared so as to identify a preferred one, or (b) are not acceptable, or (c) lack predictions of the associated outcomes (uncertainty), then difficulty will be experienced in making the choice (decision).

The decision-maker will move to overcome this difficulty----."

Process of choice: General choice procedures can be summarized in terms of three basic principles: (1) use simple rules, (2) maintain the rules, and (3) avoid uncertainty. The first two of these principles require no further discussion, but the third needs additional clarification.

To all appearances, uncertainty is a feature of decision-making with which organizations must live. In the case of the business enterprise, there are uncertainties with respect to the attitude of stockholders, suppliers, competitors, customers, etc. Therefore, for alternatives where there is "significant" uncertainty, it is proposed that the first attempt to reduce the effect of this uncertainty will be to obtain more information (observations) about the possible outcomes. If this is not successful, then a search will be undertaken for new alternatives.

As a result, much of the modern decision theory (Operations Research, Management Science, etc.) has been concerned with the problem of decision making under risk and uncertainty. The solutions proposed by modern decision theory have been largely procedures for finding certainty

equivalents (e.g., expected values) or introducing rules for living with the uncertainties (e.g., game theory).

As contrasted to the modern decision theorist, studies of Cyert and March (6, p. 119) indicate quite a different strategy on the part of operating organizations. They say that:

> "Organizations avoid uncertainty: (1) They avoid the requirement that they correctly anticipate events in the distant future by using decision rules emphasizing short-run reaction to short-run feedback rather than anticipation of long-run uncertain events. They solve pressing problems rather than develop long-run strategies. (2) They avoid the requirement that they anticipate future reactions of other parts of their environment by arranging a negotiated environment. They impose plans, standard operating procedures, industry tradition, and uncertainty-absorbing contracts on the environment. In short they achieve a reasonably manageable decision situation by avoiding planning where plans depend on predictions of uncertain future events and by emphasizing planning where the plans can be made self-confirming through some control device."

It seems apparent from these studies that business enterprises devote little time, or if time is spent it is misdirected in many instances, to long-run planning (that has operational significance for capital expenditure decisions), especially when planning is dependent on long-run prediction. Thus, all managers put top priority on immediate (short-run) problems, i.e., they move from one crisis to another.

Modern decision theory recognizes that uncertainty is a feature of decision-making with which an organization must live, whereas the studies of Cyert and March indicate that organizations avoid uncertainty by controlling the environment and emphasizing short-term decision rules.

<u>The short-term versus the long-term viewpoint</u>: Why are decision rules emphasizing short-run reactions to short-run feedback used instead

of anticipating long-run uncertain events? It was stated in the section on goals and objectives that operational measurements for individual needs and satisfactions are not available. Further, it was implied that the only measurements available are those for measuring the traditional end-result variables such as costs, earnings, productivity, inventory, turnover, absences, etc. These end-result variables are generally measured within the framework of the existing accounting system; in fact, this is the purpose of the accounting system. Accounting then states the results of short-term performance (i.e., historically for the past week, month, quarter, year, or some other convenient period) and it does not state the relationship of the current period with prior periods nor does it attempt to show the effect of the current period on future periods.

Most managerial decision-makers know that it takes time and hard work to build and improve an organization; and that efforts at improvement are not likely to pay off immediately in decreased costs, increased earnings, and other related performance factors that the accounting system is designed to measure. The decision-maker is then faced with a choice: should he put on the pressure for production and earning and forget about organisational building, thereby achieving substantial personal earnings and the reputation for being highly productive; or should he seek to build an effective organization in terms of capital planning, communication, motivation, etc., even though his immediate earnings and productivity record will not be as good? The answer to this question depends on whether he takes the short-run or long-run viewpoint. If the odds are against the decision-maker staying in his present position in

the heirarchy for more than two or three years (short-term), he realizes that he will not reap many of the benefits from a long-term improvement program; therefore, he is likely to choose those alternatives which will give short-term, measurable results.

Consequently, in most enterprises the rules of the game are such that most managers will concentrate on short-term objectives; and they will control the environment in an effort to avoid long-range decisions which depend on uncertain future events. Budgets, performance ratings, and other factors on which the decision-maker is evaluated are almost always focused on the short-term. Accomplishments toward long-term objectives, by contrast, are more difficult to measure; and in most instances no attempt at measurement is even made.

Thus, short-term objectives receive the primary consideration of the decision-maker. Recall, it was stated that: only end-result variables are measured; these end-result variables are measured within the framework of an accounting system which shows the results of the most current accounting period, and decision-makers follow the "rules of the game." They use standard operating procedures and rules of thumb to make and implement choices. In the short-term the aforementioned procedures dominate the decisions made. The end-result variables are used in lieu of something which is not measurable; namely, the individual goals from which these short-term objectives are formulated. Thus, it is easier to control the environment through short-term feedback since only end-results are measurable. The procedures utilized to provide short-term feedback are the system parameters which assure the decision maker of good relative stability within the organization.

It is concluded that short-term objectives are formulated in an organizational environment which avoids, or at least suppresses, uncertainty; this is the organization's method of reacting to short-term feedback. Can an organization's primary objective, if one exists, be formulated in this short-term controlled environment?

If, as Barish (1, p. 217) suggests, one of the primary functions of top management is the "long range growth of the enterprise," and as Rothschild (22, p. 297) suggests that the "primary motive is long-run survival"; then any primary objective must be formulated from the long-term viewpoint. Barish, Rothschild, and others suggest that the long-term should receive primary consideration; yet this discussion has stated that managers emphasize the short-term as a means of controlling the environment thereby avoiding uncertainty.

Generally, the short-term objectives discussed here as a means of controlling the environment receive the primary attention of the decision-maker. That is, the decision-maker gives primary attention to short-term problems which are measured within the framework of an accounting system and over which his confidence interval of associated outcomes are narrower. These short-term objectives are the complex system of interconnections discussed previously; hereafter they will be referred to as secondary objectives.

It was pointed out that decision-makers emphasize the short-term as a means of controlling the environment and avoiding uncertainty; however, it was further pointed out that it is the long-term that has operational significance for capital-expenditure decisions. This

conflict is resolved by developing an overall, long-term objective within which the summation of the secondary objectives must align. Hereafter this long-term objective will be referred to as the primary objective.

Summary: Organizations formulate objectives in a framework of uncertainty; however, they maintain stability by utilizing search and choice processes which provide short-term feedback. They avoid uncertainty by controlling the environment through short-term feedback and emphasizing short-term decision rules; but it is the long-term that has operational significance for capital expenditure decisions.

Organizations Formulate Objectives Within a Closed Loop Information-Feedback System

Recall that knowledge is obtained through the use of an information-feedback system. It is not the intent of this thesis to explore the many aspects of mechanical, electrical, biological, or social feedback systems since these are adequately discussed in many fundamental references. It is, however, the intent of this thesis to show that objectives are formulated within the framework of an information-feedback system. The basic characteristics of an information-feedback system will be discussed; these basic characteristics will then be utilized as an aid in formulating the parameters within which the primary objective of a business organization is developed.

Basic Characteristics of an Information-Feedback System:* Feedback is that property of a system which permits the output quantity to be

*The ideas in this section are developed from Ref. 8, p. 3-32 and Ref. 9, p. 5-35.

compared with the input command so that upon the existence of a difference between the two, a signal arises which acts to bring the two into correspondence. This principle of feedback is not new; it surrounds every phase of everyday living. The study of feedback systems then deals with the way information is used for the purpose of control.

Generally, this control can be one of two types: open-loop system or closed-loop system. Depending on the type of control desired, control in either of these systems can be achieved through the use of electromechanical devices or through human action.

An open-loop (feedback) system is one in which the control action is independent of the output (or desired result). Figure 1 is a diagram of such a system.

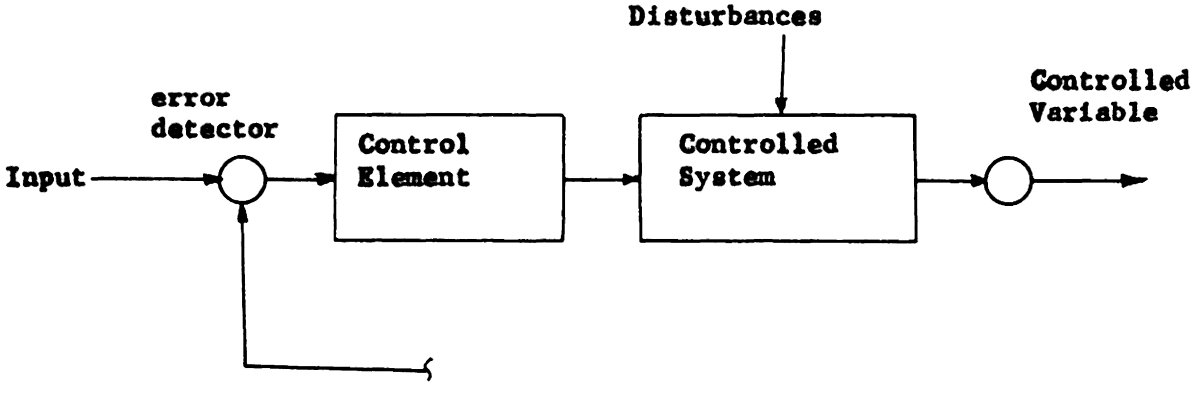

Figure 1. Block Diagram of an Open-Loop (Feedback) Control System

Such a system (open-loop) is exposed to disturbances, and control is achieved based on expected or calibrated conditions. As an illustration of such a system, consider the control of traffic by means of a traffic light placed at an intersection. If the traffic light mechanism is such that the green and red lights are on for predetermined, fixed intervals of time, then operation is open-loop. Here the volume of traffic in no way influences the time interval during which the light is red or green. The control action is provided directly by a predetermined input command. The outstanding features of such a system are: (1) its ability to perform accurately is determined by its calibration, and (2) it is usually easier to build since it is not generally troubled with problems of instability.

A closed-loop feedback system is one in which the control action is dependent upon the output. Figure 2 is a diagram of such a system.

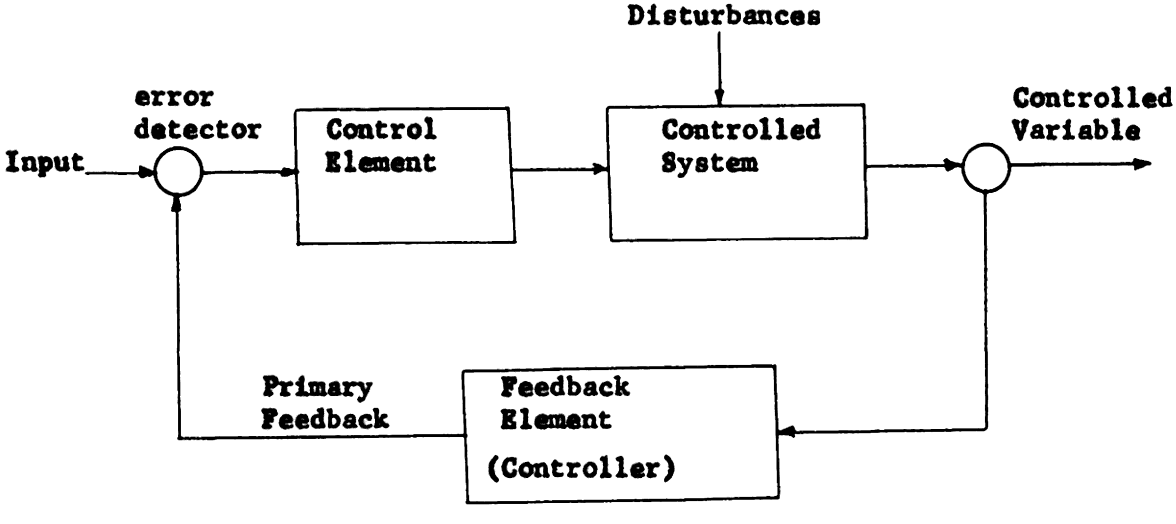

Figure 2. Block Diagram of a Closed-Loop Feedback System

Again consider the above example of a traffic light placed at an intersection. In the open-loop system the timing mechanism (predetermined input command) has no way of knowing if the traffic flow is much heavier in one direction, therefore, needing a much longer green light. Thus, if a system (policeman - human, or trip mechanism - electro-mechanical) which measures the traffic along both directions, compares the two, and then allows the difference to control the time period, feedback control results because now the signal is a function of the desired output. Such a system is a closed-loop information-feedback system. Decision making should take place within the explicit framework of such a system since it has the following outstanding features: (1) it has the ability to reproduce the input owing to feedback; and (2) it usually performs reasonably accurately even in the presence of nonlinearities, which is in direct contrast to the open-loop system.

Closed-loop information-feedback systems owe their behavior to three characteristics; structure, delays, and sensitivity. The structure involves the various system components (error detector, control element, controller, etc.) and how they are related to each other. The importance of structure is to create an integrated system that is more than the sum of the individual parts. To consider delays in the system is to recognize the importance of the element of time; delays will always exist in the availability of information, in making decisions based on the information, and in taking action on the decisions. Sensitivity is a consideration of the amplifications in the system (or the amount of correction required per unit of error). Amplification usually exists throughout

such systems; and it is manifested when an action is more forceful than might at first be implied by the information inputs.

Closed-loop information-feedback systems exhibit two basic behavioral patterns: Stable or unstable. Stability of the system is solely a function of the system parameters; therefore, there can be varying degrees of stability or instability. Figure 3 illustrates the meaning of relative stability.

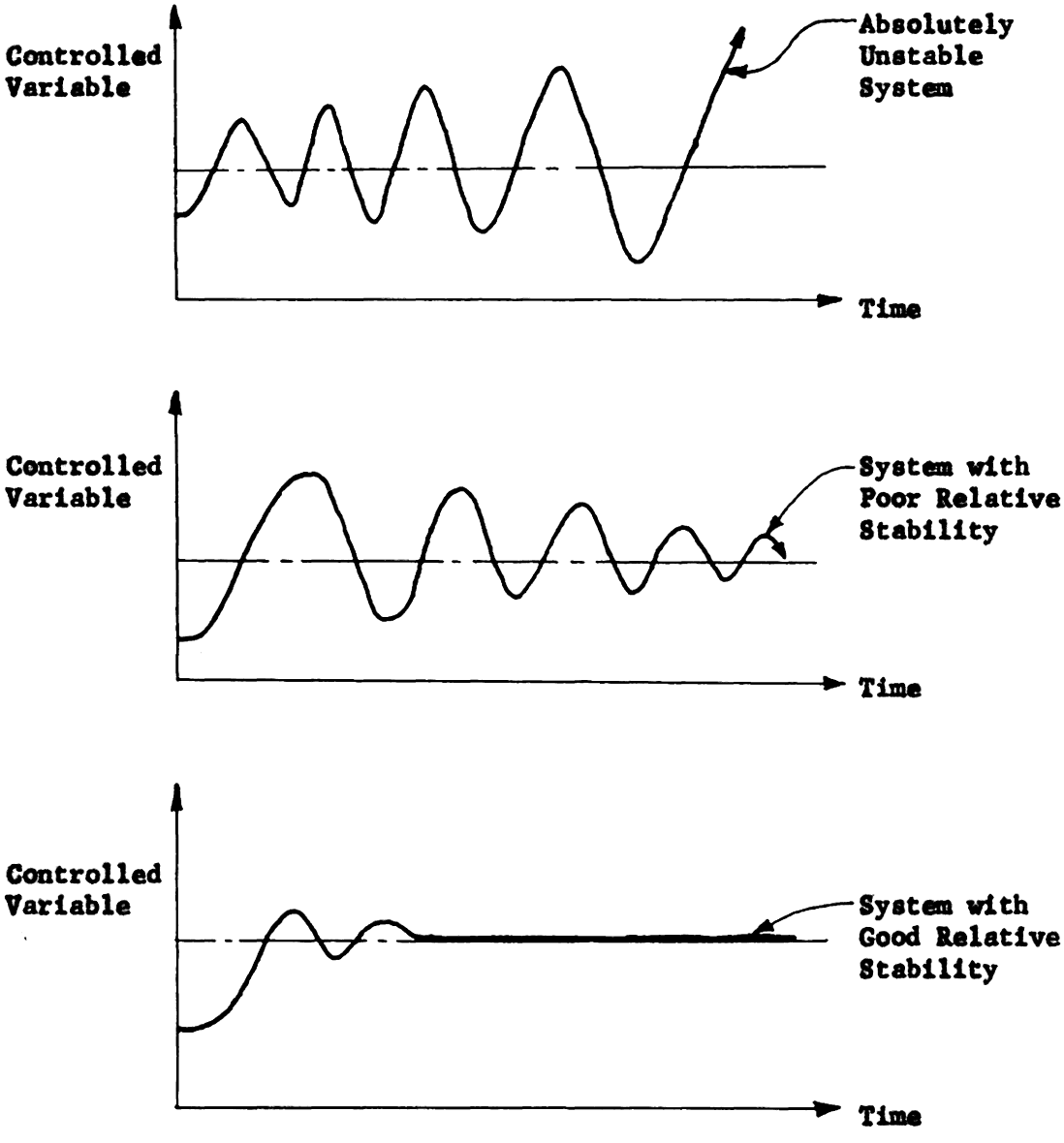

Figure 3. Meaning of Relative Stability

Observe from Figure 3 that a completely unstable system, if allowed to continue, will destroy itself over time since it will oscillate with greater amplitude. Whereas, a system that has poor relative stability will continue to function over time, but will never settle at the desired output. A system with good relative stability settles at the desired output in the minimum time.

The way in which the controlled variable(s) reaches the desired output is dependent on the manner in which the system is damped. Damping may be referred to as the tendency of the oscillations to decrease in amplitude as time progresses. Generally, there are three alternate ways in which a system may be damped to cause the controlled variable to reach the desired output rapidly; underdamping, overdamping, and critical damping. Figure 4 illustrates the basic difference between these types of damping.

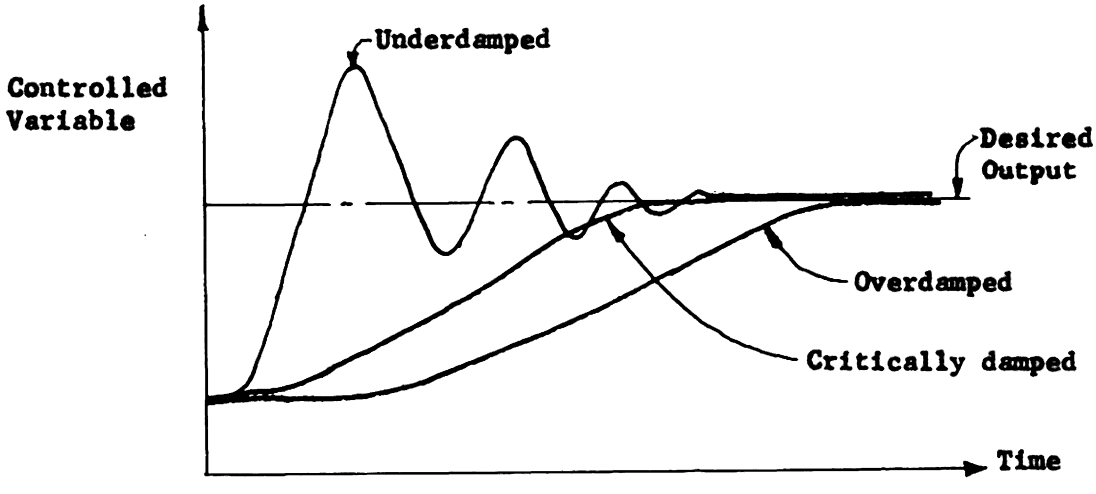

Figure 4. Damping of the System

Observe from Figure 4 that an underdamped system is one whose response time is relatively short, but it is one that causes the controlled variable to oscillate above and below the desired value as it approaches it. An over-damped system is one that does not overshoot the desired value; however, its time of response is relatively long. Between the underdamped and overdamped system is the critically damped system. The critically damped system is the one that allows the controlled variable to approach the desired output in the shortest possible time without overshoot. It is important to point out that there is only one critically damped system (for a given set of conditions), while there may be an infinite number of both underdamped and overdamped systems (for the given set of conditions). Therefore, the choice of damping for a system depends upon the speed of response desired and whether or not it is acceptable to allow the controlled variable(s) to oscillate above and below the desired output (or if allowed to oscillate, what amplitude will be acceptable?).

The following section will utilize these characteristics of a closed-loop, information-feedback system in formulating the parameters that affect the primary objective of a business organization.

Relationship of a closed-loop information-feedback system to objective formulation: Recall that the secondary objectives in an organization are a complex system of interconnections; they are the short-term objectives that receive the primary emphasis of the decision-maker as a means of controlling the environment. The secondary objectives are an n-dimensional array where the individual objectives within the system may in some respects be antithetical. It was emphasized that secondary

objectives have only limited significance for capital expenditure decisions since they are focused on the short-term and capital expenditure decisions must be focused on the long-term. Therefore, it is necessary for the organization to formulate a primary objective for capital expenditure decision making purposes.

Closed-loop information-feedback systems are systems that have the ability to reproduce the input; and they owe their behavior to three characteristics: structure, delay, and sensitivity. These characteristics of the closed-loop feedback system will now be used as a means of developing the parameters that affect the formulation of a primary objective.

The importance of structure in the closed-loop information-feedback system is to create an integrated system that is more than the sum of the individual parts. Secondary objectives are the individual components of the objective system which comprise the basic structure of the system. These are the short-term, end-result variables which are usually measurable by some aspect of the organization's existing accounting system. The system of secondary objectives of a business organization are controlled by so-called statistical controls (cost reports, sales reports, personnel reports, etc.) which provide the short-run feedback on the individual components. The sum of this system of secondary objectives is the endpoint towards which all activity in the enterprise is aimed - the primary objective. Therefore, the objective system must be structured such that the primary objective is equal to or greater than the sum of the individual secondary objectives when all interactions and overlaps are considered.

The behavior of this primary objective must exercise "a degree" of relative stability; otherwise the organization will become unstable and cease to function. Recall that stability of a system is solely a function of the system parameters; therefore, the parameters imposed on the objective system determine the system's, and thus the organization's, relative stability. Then parameters must be designed into the organization which cause the primary objective to exercise good relative stability, i.e., settle at the desired output in the minimum time.

Sensitivity in a closed-loop information-feedback system is a consideration of the amplifications in the system. Degree of sensitivity in the complex, interconnected system of objectives is determined by the damping methods (industry practices, standard operating procedures, policies, etc.) employed within the organization. At present, damping of the objective system appears to be established by trial and error over time; therefore, some objectives are underdamped while others are overdamped. However, there are rarely, if ever, any objectives that are critically damped because the organization operates with imperfect knowledge. Thus, oscillations will occur in the objective system; but short-run feedback will usually keep the system from becoming unstable. Consequently, organizations are constantly searching for ways to critically damp the individual secondary objectives. More important, however, is the search for the system that is critically damped. Then the process of organizational search, described in the section devoted to search, must be expanded to include search for parameters to damp the oscillations in the objective system.

It does not matter how well the structure of the system is designed nor how sensitive the system is, delays will always occur, i.e., information may not be available when needed; necessary decisions are not made at the most effective time; and action on decisions is not, or cannot, be implemented at the appropriate time. Therefore, delays cannot be completely eliminated from the system; but the system structure should be designed such that the effect of delays will not modify the system's stability or sensitivity. Thus, organizational parameters must be designed to compensate for reasonable delays.

Considering the foregoing relationships between the characteristics of a closed-loop feedback system and the system of objectives, it is concluded that in formulating a primary objective the organizational parameters that must be considered are those which: (1) cause the system of objectives to exercise good relative stability, (2) damp oscillations in the system of objectives, and (3) compensate for reasonable delays. These parameters must be structured so that the primary objective is equal to or greater than the sum of the secondary objectives; they must allow short-term feedback to keep the system from becoming unstable, and they must compensate for reasonable delays. The primary objective must be designed or formulated within the explicit framework of these parameters. Since capital expenditure decision-making is one of the basic top management functions around which other organizational activities must align, the primary objective of a business organization will be developed in relation to the capital expenditure process. The presumption was stated that maximum profitability to all members of the organization

is the primary objective. In developing a primary objective, this presumption will be examined as it related to the capital expenditure process.

The Primary Objective in the Capital Expenditure Process

The statement of firms seeking to maximize profits raises the following questions: (1) Is profit* a primary objective of a business organization? If so, over what period of time? (2) Does maximization really describe the organization's attitude towards profits? This section will be devoted to answering these questions.

Is profit a primary objective? The simplest way to attack profits as an objective of the organization is to present alternatives to this proposal. Papandreau (21) suggested that profit maximization was an unnecessarily special assumption and that a more fruitful theory would employ maximization of a general preference function. Becker (4) has proposed that firms may maximize a utility function that includes components other than profits. Baumol (3) has developed a model that substitutes revenues for profits in the objective function. Rothschild (22) has suggested that the primary motive is long-run survival of the organization; in this view, decisions aim to maximize the security level of the organization.

These alternatives (or arguments) can be viewed from two perspectives, ownership interest and management interest. Absentee ownership (stockholders) is characteristic of the majority of major U. S.

*Profit is used in this thesis to mean the excess of revenues over expenses (or costs).

corporations today. In the foreseeable future, the trend towards absentee ownership, or at least towards non-participating ownership in the operation of the organization, will increase because the structure of the economy is changing in such a manner that it is difficult, if not impossible, to establish an individual enterprise and survive since larger investments are being required to compete effectively. Further, the economic condition of the wage and salary earner is such that he has finances available for purposes other than providing the basic necessities of life, i.e., for investment or other non-essential purposes.

Since absentee ownership is characteristic of the majority of the major corporations in this country, the question arises: Does the ownership interest and the management interest have the same objectives? As long as it was plausible to assume that the ownership interests in the enterprise played the dominant role in determining the firm's activities, the hypothesis of a common objective (profit maximization) could be supported on grounds other than competitive necessity; namely, on grounds of self-interest seeking. However, with absentee ownership, as Donaldson points out, "Saying that management in pursuing corporate objectives as it sees them, in either the short or long-run, misstates the facts in certain important respects." (10, p. 117). Further, Donaldson (10) points to the following types of decisions as being areas where a possible conflict would likely occur between professional management and the stockholder: (1) measuring financial performance, (2) investment proposals, (3) sources of funds, and (4) assumption of voluntary risk. In spite of these areas of conflict, these groups agree that

"a profit" in the long-run must be made. That is, revenues must exceed expenses, otherwise the stockholder will not recover his investment, and the professional manager will establish the reputation of being an unsuccessful manager and probably lose his position.

Thus, all of the above discussion can be reduced to: how much profit is desired and when is this profit expected to be received? Many arguments, hypothesis, and theorems could and have been presented in answer to this question. However, for this discussion at this point, both of these groups agree that "a profit" is required in the long-run; if it is not, the business organization will cease to function. For any particular financial period (short-term), this need not be true. Secondary objectives such as employee welfare, customer relations, improved safety conditions, managerial ego, etc., may be the overriding considerations. In addition, accounting procedures in any particular period may be such that a profit will not be shown by the books, e.g., the choice of depreciation method could affect whether or not a profit is shown by the books, or the use of absorption costing techniques (charging the product with all costs incurred in the period) versus direct costing techniques (only charging the product with variable costs, fixed costs are charged off as a total amount in the period) could affect whether or not a profit is shown.

Therefore, one problem facing the organization (or decision-maker) is the different ways of defining or computing short-term profit; but this problem becomes rather insignificant in the long-term since it can generally be shown that, no matter which technique is selected, there

will not be a major difference in total profits (or loss) in the long-run. For example, in using absorption costing versus direct costing, a profit may or may not be shown for a particular period depending upon certain conditions; but in the long-run both of these methods of accounting will give the same total profit. The same is basically true of the different depreciation techniques except the time when profits are received will be changed due to income tax considerations; this means that in the long-run the total profit may be greater or less if one technique is selected instead of another due to timing considerations only. This discussion of the various ways of computing profits could be carried much further, but these basic illustrations serve the purpose of showing that the different ways of defining or computing profits has no major effect on profit as an objective. Therefore, it is concluded that the primary objective of a business organization is: <u>in the long-run, "a profit" must be made</u>. But is "a profit" the maximum profit?

<u>Is profit maximization the primary objective?</u> The attack on the assumption of profit maximization does not deny the importance of profits but questions the assumption of maximization. The maximum of any function without constraints is infinite. The assumption of infinite profits is unrealistic; therefore, the premise of maximum profits is subject to a set of constraint functions. For any individual situation (decision) the assumption is made that these constraints can be explicitly stated in either cost or profit terms. For example, in mathematical programming, an objective function is stated and the models then maximize (or minimize) an objective function subject to a set of constraints. Some

of the implications associated with these models are: (1) minimum cost is equivalent to maximum profit, (2) exact cost is either known or can be determined without difficulty, (3) no parameters other than those that can be expressed in quantitative terms have any effect on the decision. All of these factors could have the effect of leading to a mathematically optimum solution that does not necessarily optimize the long-term welfare of the enterprise.

In addition to the attack on profit maximization models, there is still another very important aspect of this problem, namely, the self-interest seeking of the decision-maker. McGregor suggests that man's motivators are organized in a series of levels, a heirarchy of importance. This heirarchy is arranged from the lowest order to the highest as follows: physiological; safety; social; egoistic; and self-fulfillment. When the needs at a lower level are fulfilled, then the needs at the next highest level begin to dominate man's behavior. Within this framework will the decision-maker always make those decisions that will maximize his profits? The answer to this question is obvious. He will not! As an example, consider the job choice of a management decision-maker (or any individual, for that matter). Usually the choice of a job is not made solely on the basis of individual profit maximization (highest paying job), but other criteria affect the choice. Today, almost any job in any business organization would satisfy the physiological and to some extent the safety and social needs; therefore, the real basis for the selection of a job is the fulfillment of other needs: Will it fulfill any additional social needs? Will it fulfill any ego needs? Will

it allow an opportunity for self-fulfillment? In the selection of a job, these questions are not likely to be considered as explicitly as they are here. But if the job does not normally satisfy these higher order needs, then the individual will seek one that does, either at a higher level within the organization or outside the organization. Therefore, it seems clear that any management decision will be made within the implicit framework of this heirarchy of motivators. It is simply a matter of degree. The purpose here was to show that management decisions are not made solely on the basis of profit maximization but on some other basis, namely, self-interest seeking. Consequently, this matter of degree will not be pursued; since, as stated earlier, operational measurements of individual goals (needs and satisfactions) do not presently exist.

Conversely, the desire of the stockholder is to maximize his profit;* this is the source of conflict regarding capital expenditure decisions pointed out by Donaldson (10) and stated in the last section. However, this conflict is realistically resolved by the professional manager making those decisions that allow the stockholder to receive a profit which may not be the maximum profit; but it is a profit that will satisfy the stockholder. For example, the majority of stockholders will be

*The argument may be proposed that the stockholder does not care so much about profit per se as growth of asset values. It is evident that the speculator (short-term investments) is interested in immediate profit maximization. It may not be immediately evident that the investor (long-term investments) is interested in profit maximization since he may be primarily interested in growth of asset values; however, he is still interested in maximum profits because they will provide the greatest long-term growth in asset value.

satisfied with a stock that pays a 20% return (profit) per annum and continues to show a steady growth in market value per share; although another alternative would give him a greater return per annum and also continue to grow in market value per share.

Therefore, the same rationale regarding profit maximization is generally true of the stockholder that is true of the manager. The manager will not maximize profits unless the profit maximization models include all relevant factors, both tangible and intangible; and he will not maximize profits (unless this is his only satisfactory alternative), if profit maximization conflicts with his self-interest seeking motives. Thus the manager makes capital expenditure decisions that will produce at least a predetermined minimum profit. The stockholder is willing to accept a profit that exceeds a predetermined minimum profit since he has imperfect knowledge, and his investment decisions were made in a framework of uncertainty.

The conflict between the professional manager and the stockholder is: what is the minimum acceptable profit? The minimum acceptable profit will vary from one industrial organization to another, and with the particular circumstances involved. Many basic Engineering Economy texts state factors that must be considered in establishing the minimum acceptable profit, e.g., see Chapter 9 of Reference 12. Therefore, this question will not be explored in this thesis.

Considering the above arguments, it seems plausible to conclude that both management and stockholders are willing to accept a capital expenditure decision that will "satisfy" constraints other than profit maximization.

A proposed primary objective: In prior sections of this chapter the following conclusions have been made: (1) any organizational objective is formulated in a framework of uncertainty: (2) any organizational objective should be formulated within the explicit framework of a closed-loop information-feedback system; i.e., it should exercise good relative stability, it should damp oscillations in the system, and it should compensate for reasonable delays; (3) primary objectives must be in long-range terms, thus there must be some degree of allowable variation in this objective; (4) "a profit" is necessary if the organization is to survive; and (5) "a profit" is based on a "satisfying" theorem (satisfying to both the stockholder and the professional manager) and this profit has no necessary relationship to a theoretical maximum.

A realistic examination can now be made regarding the upper and lower boundaries of this long-term "satisfying" theorem of profits. The upper limit will first be examined.

$P \leq P_{U_1}$ where: P = Profit

P_{U_1} = Maximum profit imposed by the consumer (more generally society as a whole)

This upper limit (P_{U_1}) imposed by the consumer is usually in the form of the product's or service's ultimate selling price which in turn determines profit. Factors which are non-measurable and/or factors where there is imperfect knowledge such as consumer needs and satisfactions, degree of competition, marketing strategy, and industry or product precedence play a primary role in the determination of the ultimate selling price. Therefore, the upper limit of profit (P_{U_1}) is dependent

upon the state of the society as a whole; thus P_{U_1} is indeterminable, since no techniques are available to evaluate the state of the whole society.

It is proposed that any capital expenditure decision-maker operates in an environment that is more restrictive than P_{U_1}, and an environment which causes "a profit in the long-run" to exercise some degree of relative stability. This environment is created by the organization itself, by a governmental agency, or by governmental influence; therefore, the upper limit of profit is restricted to:

$P \leq P_{U_2}$ where: P_{U_2} = an upper limit of profit imposed by organizational policies and procedures (e.g., policies utilized in establishing selling prices, etc.), or by governmental agency (as in the case of public utilities and recently in the steel industry and others).

The lower limit of the "satisfying" theorem of profits will now be examined.

$P \geq P_L$ where: P_L = interest rate paid by banks on savings accounts

<u>or</u>

equivalent return on tax free governmental bonds, i.e., the interest rate of the bond plus the amount of taxes paid by the investor on this interest.

The long-term profit that a business organization makes serves three basic purposes: (1) it measures the long-term performance of the business, (2) it covers the cost of staying in business, and (3) it insures the supply of future capital. Analyzing these purposes one will observe that items (1) and (2) are the minimum profit needed for survival if no risks or uncertainties are involved; this minimum profit is equivalent to P_L. Item (3) is the minimum long-term profit needed for survival since some degree of risk and uncertainty (imperfect knowledge) prevails in any organization. Therefore, P_L is unsatisfactory if the organization is to survive. A refinement can now be made on the lower boundary of profits:

$P \geq P_{L_1}$ where: P_{L_1} = minimum acceptable profit to assure a sufficient supply of capital to survive. This minimum is established by organizational policies and procedures.

Each organization must establish for itself what it considers to be the values of P_{L_1} and P_{U_2}. Any decision that is made which causes profit to be in the range, $P_{L_1} \leq P \leq P_{U_2}$, may be considered a satisfactory profit. However, an organization cannot be satisfied just to survive. If it stops growing,* it starts going downhill; there is no in-between. Thus, the minimum long-term profit must be greater than P_{L_1}, since profit

*Growth as used here does not mean just expansion or getting bigger. Rather, it means improving one of the following factors which serve as parameters in making a product useful to man: function, quality, cost, date, or auxiliary criteria.

produces the additional capital needed for growth (either directly by means of self-financing out of retained earnings or indirectly by providing an inducement for new capital outside the organization). In general a further refinement can be made on the lower boundary of profits:

$P \geq P_{L_2}$ where: P_{L_2} = acceptable profit to provide a sufficient supply of capital to assure organizational growth. This point is determined by the existing market value of capital plus a satisfactory allowance for risk and uncertainty associated with the individual organization.

Recall that there may be a conflict between what the manager sees as a minimum acceptable profit and what the stockholder sees as a minimum acceptable profit. Thus, in the long-term, the desired value of profits (or optimum profit) is the point where conflict between the manager's desires and the desires of the stockholders is minimized. This desired value of profit will be defined as:

$P = P_v$ where: P_v = desired value of profit or optimum profits. Level of profit where conflict between the decision-maker and the stockholder is minimized.

In most business organizations profits will probably oscillate in the range $P_{L_2} \leq P \leq P_{U_2}$; however, the oscillations must be damped around P_v in such a way that the system of objectives, and therefore profit, will not become unstable. Organizational parameters which

aid in damping the oscillations will be discussed in Chapter IV. The following hypothesis is now proposed as the primary objective of a business organization in relation to capital expenditure decisions.

> In the long run a profit, which has no correlation with a theoretical maximum and oscillates in the range $P_{L_1} \leq P \leq P_{U_2}$, is necessary if the organization is to continue to function. If the organization is to grow, a long-run profit that oscillates around P_V and in the range $P_{L_2} \leq P \leq P_{U_2}$ is necessary.

All other organizational objectives must be framed within the limits imposed by this primary objective. In addition, any capital expenditure decision that produces a profit in the range $P_{L_2} \leq P \leq P_{U_2}$ will satisfy both the manager and the stockholder.

A proposed corallary with the above hypothesis is:

> Rate of organizational growth is dependent on the long-term size of P. If P <u>consistently</u> approaches P_{L_1}, the organization becomes stagnant. If P consistently approaches P_{L_2}, the rate of growth will be slow. If P consistently approaches P_V, rate of growth is accelerated. If P consistently exceeds P_V and approaches P_{U_2}, organizational growth is limited only by the manager's abilities and decisions; since, in general, any amount of additional capital can be secured.

Organizational growth, as defined previously, seems to be a governing objective of all managers since organizational growth will satisfy to some degree all members of the organization. Ownership growth will satisfy the stockholder; it will provide job security for the manager and his subordinates; and it will provide management self-fulfillment through creative thinking.

The "key" to attaining the proposed primary objective of a business organization and organizational growth is eminently "good" capital expenditure decisions. Therefore, the capital expenditure decision is

either an implicit or explicit element in the planning, coordinating, and controlling of any business organization, both long-term and short-term. Organizational parameters should be viewed with continued attention so that the capital expenditure process forms an explicit part in these phases of organizational life.

Summary

A distinction has been made between goals and objectives; goals are individualistic in nature and objectives are organizational in nature. As such, the objective system is a complex system of interconnections. However, an organization reduces the complex system of objectives to an overriding primary objective which serves as a base for capital expenditure decision-making purposes.

Objectives are formulated in a framework of uncertainty; however, relative stability is maintained by utilizing search and choice processes which provide short-term feedback. Further, organizations emphasize short-term feedback as a means of controlling the environment, but it is the long-term that has operational significance for capital expenditure decisions. Therefore, the primary objective must allow for some degree of variation.

Knowledge is obtained through the use of an information-feedback system; consequently, the relationship of the basic characteristics of a closed-loop information-feedback system to the complex system of objectives has been utilized as a means of formulating the primary objective.

A primary objective that has operational significance for capital expenditure decisions has been developed. This primary objective provides the basic framework within which the capital expenditure process must function.

IV

ORGANIZATIONAL PARAMETERS AFFECTING THE CAPITAL EXPENDITURE PROCESS

In most business organizations profits will oscillate in the range $P_{L2} \leq P \leq P_{U2}$ (as discussed in the preceding chapter); otherwise in the long-run the organization will cease to function. However, the oscillations must be damped around P_V in such a manner that the system of objectives, and therefore profit, will not become unstable.

Historically, organizations have utilized some aspect of the organizational structure and/or some administrative process to damp oscillations in their objective system. The organizational structure, administrative processes, and economic evaluation techniques utilized by the organization are the parameters that affect the planning, coordinating, and controlling of capital expenditures. The economic evaluation techniques have received and are continuing to receive the primary attention of those interested in capital budgeting; therefore, this work will not attempt to compare, relate, or contrast the various economic evaluation techniques. The remainder of this work will be devoted to examining some of the major effects of the organizational structure and administrative procedures on the capital expenditure process.

Growth Patterns - Effect on Organizational Structure and the Capital Expenditure Process

Growth was used in the previous chapter to mean improving one of the following factors which serve as parameters in making a product useful to man: function, quality, cost, date, or auxiliary criteria. Hereafter growth will be used to mean an increase in the magnitude of the organization.

Statistics show that the number of corporations, as compared with individually owned enterprises and partnerships, is increasing thus indicating a tendency towards large-scale production and mass-financing with growth in size of the industrial unit and its operations. Several factors, other than an increase in the size of the enterprise, could be presented as having an influence on these statistics, e.g., advantages of corporate tax laws and other legal conditions. The fact remains, however, that many industrial organizations are now of vast size and are tending to increase.

One of the most striking features of modern industrial organizations is this increase in size of the industrial undertaking. Primary reasons for this increase in size may be enumerated as follows: (1) economic laws of production, e.g., an increase in quantity of product will generally reduce the unit cost, since the fixed elements of cost will be distributed among more units of production; (2) protection from competition, e.g., an increase in size generally increases the enterprise's influence on and/or control of the market; (3) natural desire on the part of an individual or group of individuals to build up a large organization simply for the love or satisfaction of so doing, the fulfillment of higher order needs as discussed in the last chapter; and (4) modern methods of so-called "promoters" who are not members of either enterprise(s), but stand to achieve personal gain if individual enterprises are combined; that is, bankers, and/or professional promoters who visualize some economic, financial, and/or commercial advantage in combining enterprises and then convince all concerned that these advantages will accrue.

Regardless of the specific reason(s), growth of industrial organizations has generally been in two directions: (1) growth in the size of the individual enterprise, and (2) growth by the centralization or consolidation of like or unlike enterprises under some form of common control.

Does an increase in size have any effect on an organization? If so, how? More especially, does an increase in size have any effect on the capital expenditure process? This section will discuss basic patterns of organizational growth, characteristics of these basic patterns, and their effect on organizational structure and administrative processes, and in turn their effect on capital expenditure decisions.

Kimball and Kimball (15) state that industrial organizations tend to increase in size in one or all of three basic ways: (1) aggregation, (2) consolidation, and (3) integration.

Aggregation: Aggregation may be visualized as "concentric" in character, the organization enlarging around its original nucleus without marked change in character; thus it is basically the duplication of existing facilities. The older enterprises grew, generally, by simple aggregation, i.e., a large factory being an enlarged small factory.

Aggregate growth may be the result of: (1) increasing the size of the product which requires larger equipment, e.g., ships built fifty years ago as compared to those built today; (2) increasing the number of pieces of equipment of each kind and size, but without marked change in the size of the same, e.g., one versus two automobile assembly lines; or (3) either by adding equipment of a larger size or by adding to the equipment of any size, e.g., chemical plants.

If an organization of a general character is expanded by the addition of smaller and/or larger equipment or equipment of a slightly different character, there is little change necessary in its general organizational structure or administrative processes. However, if such an organization is expanded by adding a significant amount of equipment of the same size and character to each unit (division, department, etc.), there is an increased opportunity for: (1) sub-dividing the work-increased specialization; (2) automation - increased transfer of skill; (3) data processing - centralized record keeping, and (4) new methods of management - new scheduling techniques, new departmentalization, and application of modern decision theory.

At one stage or another in their development, most major U. S. corporations have grown by this latter method. That is, adding equipment of the same size and character to each unit. In fact, this type of growth basically describes the mass production industries of this society. The advantages enumerated above have contributed to this type of growth. Increase in size, however, is not without its disadvantages. The most widely recognized disadvantage of large organizations is the tendency to become unwieldy and, as a consequence, inefficient. There is also a tendency to become inflexible. Further discussion of these points will be deferred until the other basic types of growth patterns are discussed.

<u>Consolidation</u>: Consolidation is combining industrial enterprises of a similar character, producing similar products, under one management. Such a growth may be visualized as "horizontal" in character; the organization enlarging without a marked change in raw materials, processes, or

products. It tends to cut "across" the flow of materials and supplies at some stage of their progress from raw material to finished product.

The economic advantages that accrue from consolidation are significant. These advantages accruing from this type of growth may be summarized as: (1) centralization of major activities, e.g., purchasing, advertising, engineering services, research, etc.; and (2) exertion of stronger competitive power, since a consolidation can more widely control market prices.

Organizational characteristics of consolidated combinations would appear to be quite simple. However, the general tendency of the simple, consolidated, combination is towards more complex forms of organization; since as the organization grows, it has a greater opportunity to expand into areas where it previously could not compete. The consolidated enterprise, for example, may have enough demand for a given material or supply to justify manufacture, whereas the original enterprise could not. In a similar manner, the by-product(s) of the original enterprises might not be sufficient to bother with, whereas the by-product(s) of the consolidated group would be sufficient to warrant a plant for its fabrication. Thus, for any extended period, only a very few enterprises will remain in their pure, consolidated form. Rather, they will tend to become, at least partially, integrated.

Integration: Growth of an industrial enterprise by integration is an effort to acquire control of all stages of manufacture and distribution of a product, or line of products, from the basic material to the final product. Integration then may be visualized as a "vertical" combination. A fully integrated enterprise contains within itself all the processes

necessary to manufacture and distribute a marketable product(s) from the basic material. Thus, there can be many degrees of integration, from fully integrated to only the integration of two stages in the manufacture of a marketable product.

The economic advantages of integration are evident: (1) greater control of its basic materials in terms of requirements, specifications, and time of delivery; (2) saves intermediate marketing costs which results in more profit of the product being kept in the enterprise; and (3) greater opportunity for further by-product development.

Integrated enterprises differ in one important particular from consolidated enterprises. Normally without integration the individual enterprise would not have been competitors in the market; whereas the consolidated group would have been competitors if they had not joined together. Therefore, the manner in which an enterprise grows determines to a large degree how the final product will compete in the market.

Organizational Characteristics Common to All Growth Patterns: It seems obvious that the general economic advantages of size that accrue by each of the basic patterns of growth apply, potentially at least, to combinations of the patterns. Many U. S. Corporations can be cited that have grown by a combination of the basic patterns, e.g., Ford Motor Company, American Telephone and Telegraph, U. S. Steel Corporation, and General Motors Corporation.

It was stated earlier, however, that the most widely recognized disadvantage of large organizations is the tendency to become unwieldly, and as a consequence, inefficient. There is also a tendency to become

inflexible; since policies, practices, and rules must be emphasized in an effort to plan, coordinate, and control the organization. These disadvantages result from sheer size; therefore, they are not the consequence of a particular growth pattern. Rather, they are the result of growth only. In each stage of growth, however, certain general characteristics may evolve which affect the organization's structure, administrative processes, and in turn the capital expenditure process regardless of whether it occurred in the form of one of the basic patterns or combination thereof. The general characteristics of an organization that evolve as a result of an increase in size (irrespective of the manner in which it increased) may be stated as:

1. Increased number of levels in the heirarchial structure of the organization with increasing delegation of authority, staff positions, span of control, and channels of communication.
2. Increased specialization of land, equipment, and personnel.
3. Increased decentralization of production function, usually accompanied by increased departmentalization.
4. Increased planning, coordination, and control of the central office group.

These common characteristics tend to require a rigid organizational structure which designates degree of delegation of authority, degree of responsibility or accountability, formal channels of communication, and span of control. In addition, administrative processes such as policies, procedures, and rules are superimposed on this organizational structure. Thus, in order to assure maximum control, the organization attempts to

approach a pure bureaucracy. Since this type of organization is inflexible, parameters are placed upon the capital expenditure process because it must be undertaken in a framework which was designed for maximum control. The ways in which these parameters affect capital expenditure decisions will be discussed after the unique characteristics of each basic growth pattern are presented.

Organisational Characteristics Unique to Each Basic Growth Pattern: In addition to the general characteristics that evolve as a result of growth, there are some characteristics that are unique to each of the basic patterns.

An organization that has grown by aggregation only would be in a different competitive environment than one that has grown by one of the other basic patterns; since aggregate growth does not occur in an attempt to control any part of the market. This type of growth occurs as a result of and/or anticipation of market conditions. In the long-term, this type of enterprise would likely be in a market condition which approaches pure competition. In the short-term, however, this may not be the case because it may have a unique product that is protected by patent rights, or it may possess a unique process capability.

An organization that has grown by aggregation only exhibits some unique characteristics. Some of these of principal importance are:

(1) The conditions that result, in both the long and short-term, from the competitive nature of the product.

(2) Labor relations tend to remain relative to one industrial union as versus two or more, e.g., the steel companies with the Steelworkers. Labor relations may affect product and process strategies.

An organization that has grown by consolidation only exhibits some unique characteristics. Some of these of principal importance are:

(1) Consolidation of similar units from different organizations. For optimal effectiveness, this consolidation may require that the organization be completely redesigned in terms of personnel, departmentalization, etc.

(2) Competitive power in the market is increased. If all enterprises producing the same product, or essentially the same product, consolidate a monopolistic situation will exist. There are laws prohibiting monopolies, but it is highly probable that an oligopolistic market condition will result. An increase in competitive power will affect pricing and promotional strategies.

(3) Opportunity for centralization of many common activities of the separate enterprises.

(4) Requires greater coordination between separate enterprises, since the product of this type enterprise is only one stage of many in the manufacture and distribution of the marketable product.

(5) Labor relations tend to remain relative to one industrial union as in aggregate growth; however, increased coordination is required between the labor leaders and management of the separate enterprises as they consolidate which may affect product and process strategies.

An organization that has grown by integration only exhibits some unique characteristics. Some of these of principal importance are:

(1) Integration of dissimilar enterprises into one cohesive enterprise. In a fully integrated enterprise, it may require integrating a mining enterprise, manufacturing enterprise, and distribution enterprise.

(2) Since it has control of more stages of manufacture and distribution of a marketable product, its competitive power is increased. The number of competitors, however, is not altered as in consolidation. Thus, it has greater control of pricing and product-line strategies.

(3) Must establish transfer-pricing policies. Since the product passes from one stage of development to another within the enterprise, it is necessary to establish pricing policies between the units. Transfer-pricing techniques influence all cost data which, in turn, affects all uses of these data and subsequently profits.

(4) When any particular stage (or unit) in the chain of the integrated enterprise is idle or demand is lessened, the entire enterprise may be idle or nearly so.

(5) It is difficult for this type enterprise to adapt to changes in production requirements or shifts in general consumer demands, since it would require changing many stages of production as compared to a consolidated enterprise which would require changing only stage of production. Thus, product-line

strategies must be developed and selected within such a framework.

(6) Labor relations tend to become more involved since integration is concerned with more stages in the manufacture and distribution of the product; therefore, the enterprise will tend to become involved with more unions, e.g., Mineworkers, Electrical-workers, Steelworkers, etc.

An organization's structure and administrative processes must be designed to cope with these unique characteristics of the individual types of growth patterns as well as those that are common to all growth patterns. Further, if growth occurs by a combination of the patterns, the common characteristics are intensified and complexity of the organization is increased; since the organization must consider a combination of the common and unique characteristics. Therefore, the structure of an organization and its administrative processes are largely a result of its growth patterns.

Effect of Growth Pattern on Capital Expenditure Decisions: The common and unique characteristics of the basic growth patterns as they affect the total organization have been presented. These same characteristics place parameters on the capital expenditure process; since presumably capital expenditure decision-making is the primary top management function about which all other activities of the organization align.

The common characteristics of growth that place significant parameters on the capital expenditure process are: (1) The organizational

structure that results in an effort to effectively plan, coordinate, and control the organization, and (2) the administrative processes that result in further effort to plan, coordinate, and control the organization.

The unique characteristics of growth that place significant parameters on the capital expenditure process are: (1) type of competitive environment, i.e., pure competition, oligopoly, monopoly, or some basic deviation from these which affects all pricing, promotional, and product-line strategies; (2) coordination and control of similar or dissimilar units into one cohesive organization for decision-making purposes, i.e., designing a structure and administrative processes to fit the entire needs of the organization without specific regard to the capital expenditure process; (3) pricing policies between separate organizations and/or between units in the same organization which may significantly affect all data utilized in the decision-making process, i.e., buying and selling to separate organizations as in consolidation versus buying and selling to other units in the same organization as in integration; and (4) involvement with different labor organizations which may affect product and process strategies.

The common characteristics of growth that place parameters on the capital expenditure process will receive the primary attention of the remainder of this thesis because they are not limited to a particular type of organization. Since it is essential that parameters be placed on this work, the unique characteristics of each basic pattern of growth will be discussed only as they have an impact on the common characteristics. However, this writer believes that a significant contribution

could be made by exploring the unique characteristics of each type of growth as they relate to the capital expenditure process. For example, economists have done a significant amount of work in studying the various types of competition and their effect on the organization in general; and accountants have done a significant amount of work in the area of transfer-pricing. But there remains the task of integrating this basic work of the individual disciplines into a theory that has operational significance in the capital expenditure process.

Therefore, organizational structure, principal types, and the place of capital expenditure decisions within each, and centralized versus decentralized organization as it affects the capital expenditure process will occupy the remainder of this section. The following section will be devoted to administrative processes (search processes, evaluation processes, and choice processes) as they affect the capital expenditure process.

Principal Types of Organizational Structures - The Capital Expenditure Process Within Each

The primary purpose of an organization's structure is to assure that all activities of the organization will be planned, coordinated, and controlled in an effort to achieve some organizational objective(s). As an organization increases in size, the complexity of the organizational structure also increases in an effort to effectively deal with both the common and unique characteristics of growth enumerated in the preceding section. The particular details of an organization's structure will differ in terms of its unique or particular needs. There are, however,

five principal types of organizational structures with varying degrees of complexity appropriate to all industrial organizations in terms of size, type of product, type of competition, etc. These principal types of structure are: (1) line; (2) line and staff; (3) pure functional; (4) line and functional staff; and (5) line, functional staff, and committees. Actually, these types of structure may be viewed as the evolution of an organization's structure, with the exception of pure functional, as it increases in size. It is necessary to understand the place of the capital expenditure process within each of these types of structure in order to understand how the structure of an organization places a parameter on the capital expenditure process.

Line organization: Line organization is the simplest form of structure. It is the framework on which a more complex organization may be built as needs arise. Here the owner(s) delegates the job of accomplishing a desired result to a superintendent(s) who in turn delegates part of his assignment to the foremen. The framework of line organization is symbolized by Figure 5. Line organization assumes a direct straight-line of responsibility and control from the owner(s), to the superintendent, to the foreman, and to the workman.

Since in this type organization there are straight-lines of responsibility and control and only a few levels of management (in Figure 5 there are only three levels, but there may be more); planning, coordinating, and controlling capital expenditure decisions can be carried out with relative ease. Each person does whatever planning, doing, and verification necessary to accomplish his delegated task. However,

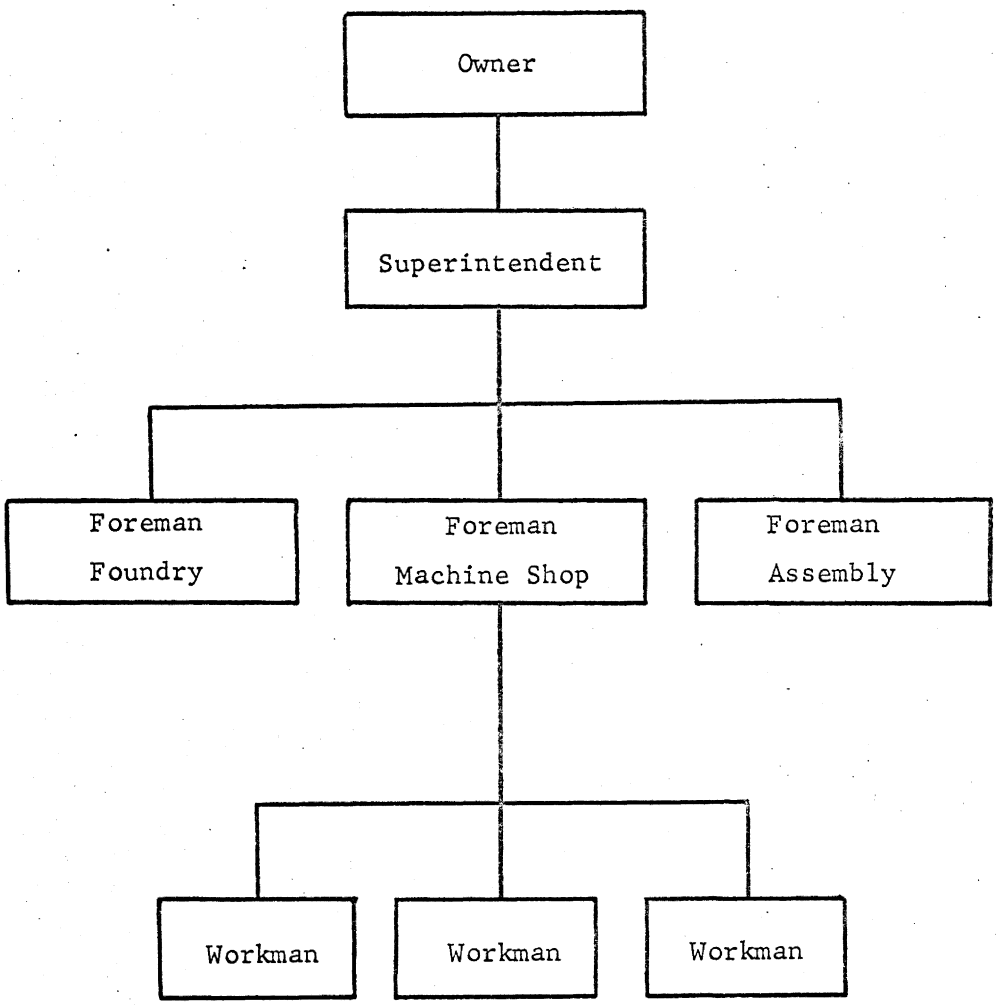

Figure 5. Line Organization (16, p. 81)

capital expenditure decisions are usually kept in the domain of the owner(s) with possibly some small amount of delegation to the superintentent.

Line and Staff organization: Owners recognized as their enterprises grew from simple to complex organizations, that a small number of managers could not personally assume direct responsibility and control for all functions such as selling, buying, personnel, accounting, maintenance, design, budgeting, etc. Therefore, one of the first moves toward reorganization as an enterprise increased in size and complexity was to appoint assistants, advisors, or consultants who provide general counsel to the line. Specific advisory responsibilities were delegated each of these assistants. Such an organization is symbolized by Figure 6. The superintendent and foremen retained supervisory authority and control over all the activities of the personnel in their particular departments. The advisors were specialists in such fields as law, engineering, accounting, etc. As the activities of the advisors increased, other personnel were added to assist in these activities. Eventually, the work centering around an advisor was organized into a department which was known as a staff department; this department then supplemented the line organization of the enterprise. In this type of structure, the only basic difference in the capital expenditure process from that of line organization is that the decision-maker may obtain advice from the advisors.

Functional organization (pure): The development of staff departments led quite naturally to attempts toward complete reorganization on a functional basis. This removed the staff specialist from his "assisting" capacity and gave him authority and responsibility for supervision and

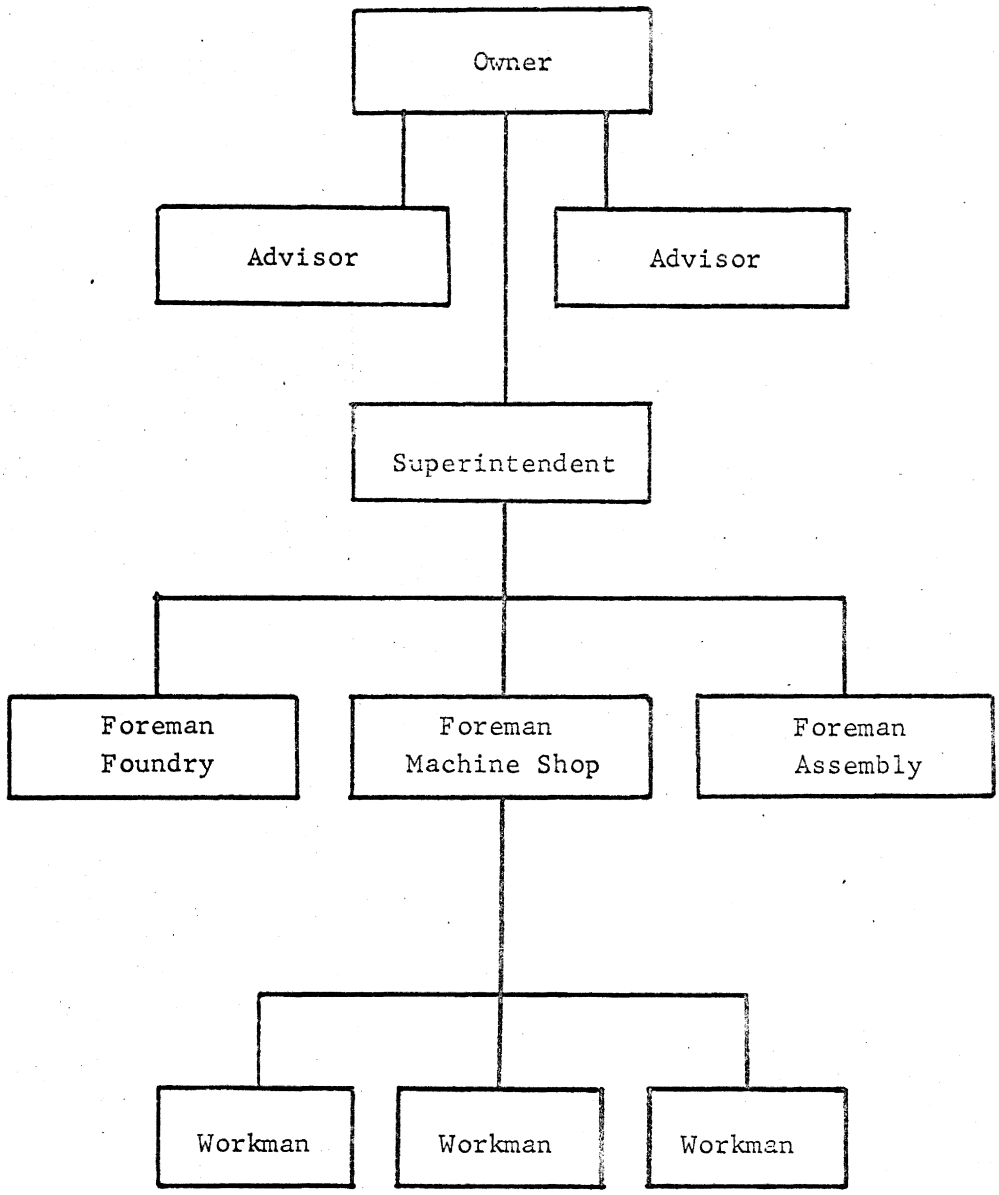

Figure 6. Line and Staff Organization (16, p. 82)

adminstration of the function, replacing the operating foreman. The movement was led by Fredrick W. Taylor. Taylor (working in the early 1900's) proposed the functions shown in Figure 7.

This type of functional organization proved to be a failure because each worker had a multiplicity of bosses, i.e., one for production, one for inspection, one for maintenance, etc. Therefore, such a system is a direct violation of one of the main principles of organization. This method as a whole failed because of its inherent weaknesses. Today the work of five of Taylor's foremen is vested in organizational units of staff status, and the remaining three are vested in the line supervisor. The objectives which Taylor sought are, therefore, being attained more effectively today by line and staff structure.

Although no longer in use as such today, the pure functional type of organization is mentioned here to illustrate that: (1) early emphasis was on shop organization; (2) certain activities of the enterprise were considered to be in the domain of the owner or manager, e.g., capital expenditures; and (3) it led to functionalized staff departments.

Line and Functional Staff organization: The functionalized organization of foreman as advocated by Taylor ultimately led to the establishment of functional staff departments whereby many of the advantages of both the line and staff organization and the functional type of organization could be retained. Through this type of organization, functional staff departments were given responsibility and authority, within existing company policy, over specialized activities. Figure 8 symbolizes such an organization.

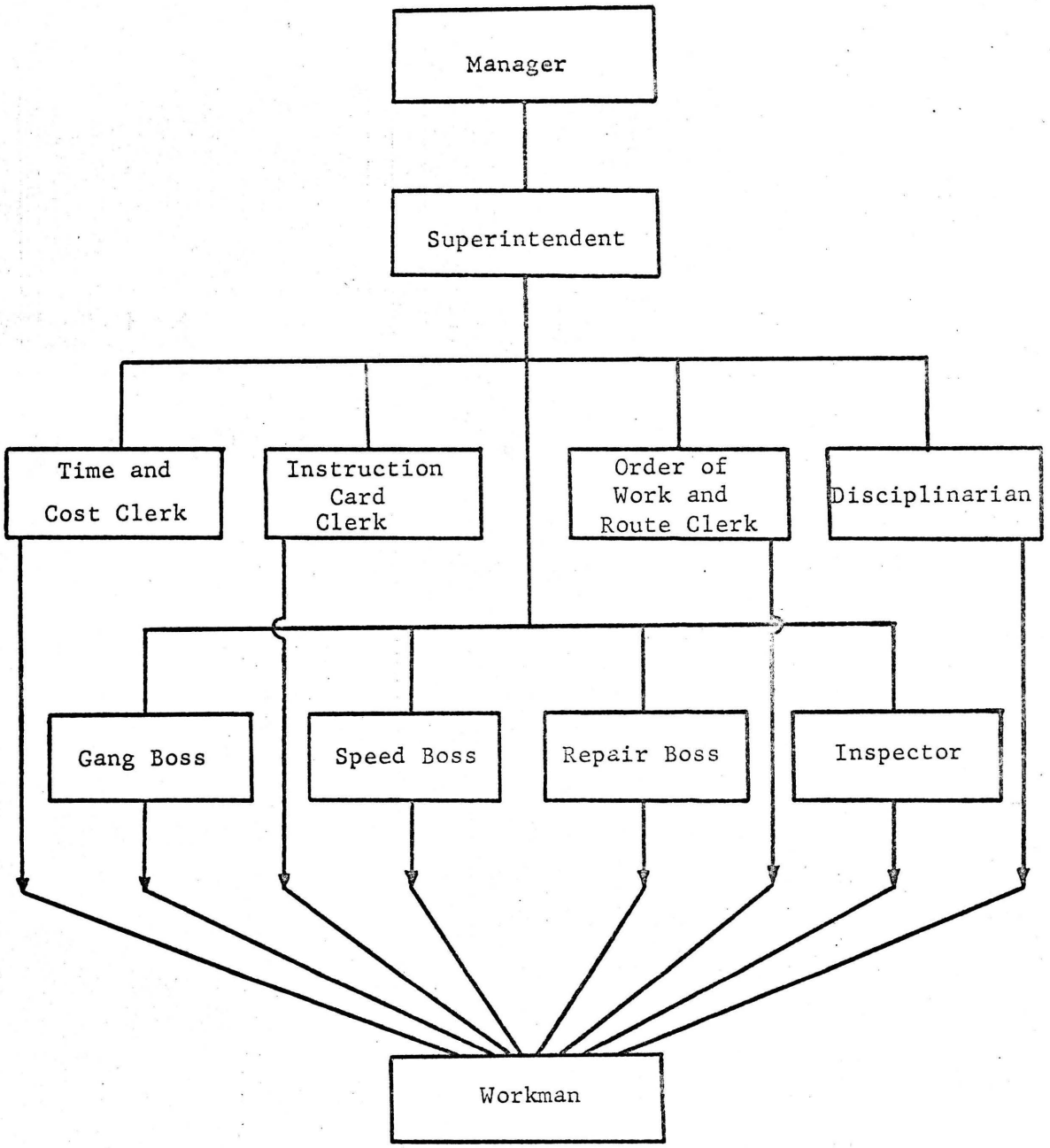

Figure 7. Taylor's Shop Organization (16, p. 84)

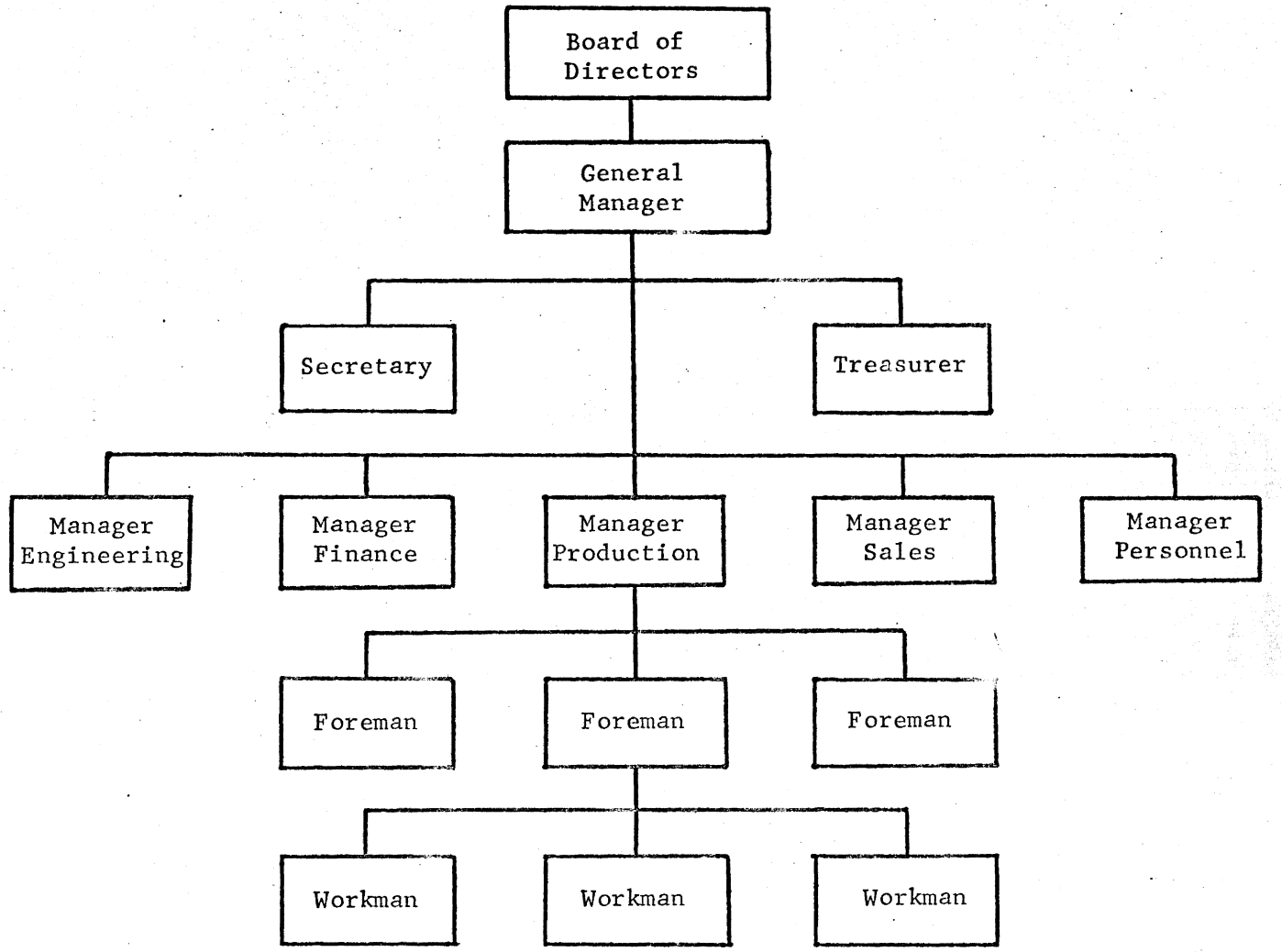

Figure 8. Line and Functional Staff Organization

Observe that the organization has increased in complexity. There are more levels in the heirarchal structure, the activities or tasks of the organization must be assigned or delegated to the units, and the activities of the individual units must be coordinated and controlled.

Some basic factors affecting the capital expenditure process resulting from this type of organization are: (1) any proposal made at a lower level must pass through additional higher levels before approval or rejection, (2) additional investment proposals may be generated by the staff groups, and (3) any influence or assistance provided by the staff group(s) may affect the decision. In addition, the owner(s) must decide how much of his responsibility or authority he will delegate and to whom; the manager must decide how much of the responsibility and authority delegated him he will delegate and to whom he will delegate it. Thus, the complexity of the capital expenditure process will increase with the addition of functional staff groups which results in policies, procedures, and rules in an effort to define each unit's and/or individual's responsibility in the system.

In the modern organization utilizing this type of structure, the primary responsibility of the capital expenditure process is delegated to a functionalized staff unit, usually the budget function (commonly called the Comptroller, Budgeting and Accounting, Accounting and Business Analysis, and other varied titles). Regardless of the title given such a unit, its basic, delegated, responsibility is to "prepare the financial plans for the enterprise which will aid in the utilization of the resources of that enterprise in such a manner as to return a

specified and sustained profit to the investor" (16, p. 137). The budget function in carrying out this delegated responsibility provides financial policies, evaluation techniques, selection criteria, and methods for control which are the essence of the capital expenditure process. The ultimate capital expenditure decision, however, remains with the manager or other delegated line official since the functionalized staff unit is in an "advisory or assisting" situation. Thus, planning and control (capital budgeting as defined in Chapter II) in the capital expenditure process is divorced from decision-making.

It should be observed then that in this type of structure the normal responsibility of the budget function is to prepare plans only. It does not execute them and thus does not exercise control.

Line, functional staff, and committee organization: In order to facilitate a cooperative relationship within a large organization, many enterprises (especially large multiplant operations) now add a network of committees to the line and functional staff type of structure. Figure 9 symbolizes such an organization.

The committees shown in the chart of Figure 9 are those that have responsibilities which require continuity over a long period of time. Other committees have assignments that are of a special nature and are established for that purpose; these are disbanded when they have performed their function. This latter type of committee is not generally shown on the organization charts of an enterprise.

There are two basic reasons for use of committees:

"1. The specialization of personnel into narrower and narrower areas of knowledge requires the assembling of a number of people in order that the whole problem can be analyzed satisfactorily.

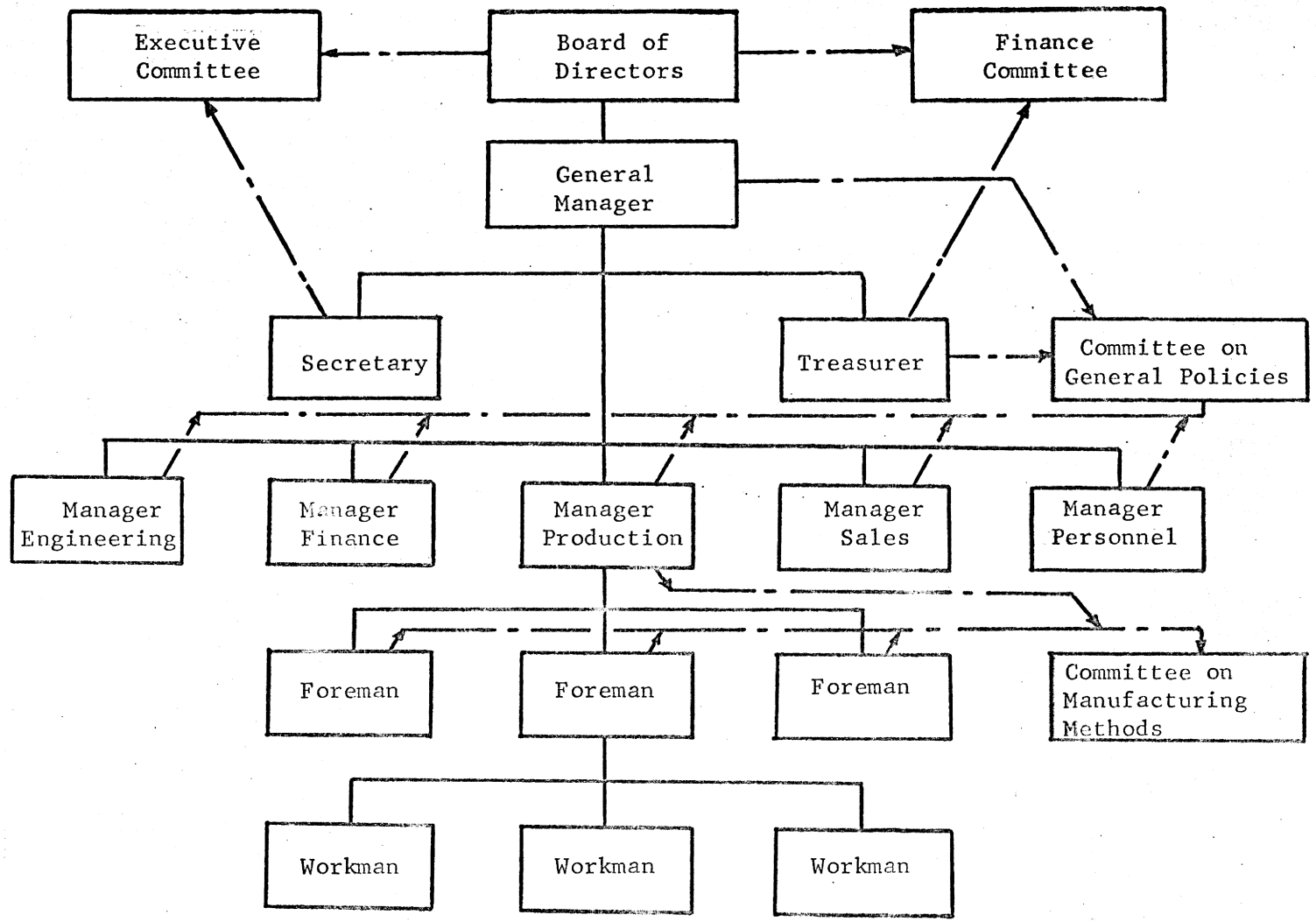

Figure 9. Line, Functional Staff, and Committee Organization

2. Committees assist in getting the advice and consent of those who will ultimately have to carry out decisions or orders. ----" (16, p. 85).

Further, Laitala (16, p. 85) states that: A committee should be looked upon as an advisory group set up to investigate problems or questions, to make recommendations or formulate procedures, and to turn the results of such deliberations over to the proper decision-maker in the line organization. In many cases, however, the committee may be delegated authority for the actual decision, e.g., the finance committee may be delegated the authority to approve all capital expenditures or to approve all capital expenditures exceeding some fixed amount.

Thus, the addition of committees to the line and functional staff type of organizational structure increases the number of advisors or advisory groups, increases the problem of delegation of authority, and increases the need for coordination and control between units. In addition, many times confusion exists because members of these committees may be "action takers" (decision-makers); thus people tend to think they are action committees.

Line, Functional Staff, and Committee organization with Divisionalization: Eventually the ideals of the formal organization cannot be reached by either of the previously mentioned forms of organizational structure. Then the so-called divisionalized (or decentralized) structure comes into being. The divisionalized organization comes into being as a result of growth, marketing situations, production complexities with many plants, increased technology, and diversity of products.

Alfred P. Sloan, Jr., is credited with the contribution of the concept of the divisionalized organization in 1921. Bowman and

Fillerup (5, p. 63) state that his basic concept was:

> "to divide it (the enterprise) into as many parts as consistently can be done, place in charge of each part the most capable executive that can be found, develop a system of coordination so that each part may strengthen and support each other part; thus not only welding all parts together in the common interests of a joint enterprise, but importantly developing ability and initiative through the instrumentalities of responsibility and ambition - developing men and giving them an opportunity to exercise their talents, both in their own interests as well as in that of the business."

In the past two decades, many enterprises have adopted some form of divisionalization (or decentralization) because of the growth of their operations in both size and complexity. However, the concepts of Sloan are still more academic than is practiced.

As practiced, the divisionalized form of organization first divides the work to be done by product, process, or geographic location and then uses the line, functional staff, and committee type organization for each of the divisional units. For the most part, decentralization has been undertaken to relieve central management of day-to-day operating decisions so that it could presumably spend its time developing and coordinating over-all objectives, plans, and procedures for the entire organization. Theoretically then, central management manages by means of setting objectives for the operating divisions and then controlling the decentralized management of the divisions by operating and financial policies.

Then a typical decentralized organization will consist of a number of independent divisions with a divisional manager responsible for each. In a full-scale decentralized organization, the divisional manager will be delegated complete responsibility for the division that he controls,

including capital expenditure decisions and profitability. In most instances, however, the divisional manager is only partially responsible for his operation, i.e., full decentralization of the capital expenditure process has not occurred. Although the divisional manager may be held responsible for earning a satisfactory profit (as pointed out in Chapter III), maintaining and/or improving product quality, meeting specified production levels, providing "good" and safe working conditions, etc.; he is delegated only partial authority for capital expenditure decisions. For example, Istvan (14, p. 20) in his study of 48 firms found that:

> "In six firms, there is complete delegation of capital expenditure decision-making authority. In four firms authority rests in a committee composed of high-level officers and individual members of the board. This special committee (called variously the executive committee, advisory committee, operations committee, or planning committee) acts as the ultimate decision-maker in approving those proposals that require high-level arbitration. In the remaining two firms in this group, the highest level of authority rests in the executive vice-president in one case and in the various divisional vice-presidents in the other.
>
> "Delegation of authority for approval or rejection of capital expenditures exists to some degree in 42 firms. In this group are the six companies discussed in the preceding paragraph plus the 36 concerns in which the board of directors makes final decisions in some cases, and authority is delegated for the remainder. The person or group to whom authority is delegated varies, of course, in relation to the amount involved. The following table gives a typical breakdown of such delegation.

TABLE I
EXAMPLE OF DELEGATION OF DECISION-MAKING AUTHORITY

Size of Capital Expenditure	Decision-Maker
Over $200,000	Board of directors or specified top management committee
$100,000 to $200,000	President and/or chairman of the board of directors
$25,000 to $100,000	Vice president in charge of division
$5,000 to $25,000	Plant manager
Under $5,000	Persons delegated by plant manager

"The dispersion around this sample is not great: Four firms limit the plant managers to expenditures of less than $2,000; in seven firms the upper limit of non-board authority is as low as $20,000; and in one firm it is the unreasonably low figure of $1,500. By contrast, four firms allow division heads to approve or reject expenditures as high as $300,000.

"An interesting variant of the delegation of the decision-making authority was found in nine of the firms studied. The board of directors grants a blanket approval for a maximum amount of expenditure to a subordinate official of the firm. This official is then allowed to authorize expenditure of this amount of money. The plan allows a plant manager, for instance, to approve proposals that do not exceed $5,000 each, but he is limited, perhaps, to a $50,000 total of such approvals throughout the year. This technique can greatly facilitate the processing of many smaller projects."

Although the above study is only a small sample of the total number of enterprises in American industry, the sample covers a reasonable cross-section of the major types of industries. Further, when the study was made, the firms making up the study accounted for approximately 25 per cent of the plant and equipment expenditures reported by the U. S. Department of Commerce. It is believed that the findings would not be significantly different if a larger sample were taken today.

The capital expenditure decision is, therefore, more centralized than decentralized. How does centralized capital expenditure decision-making in a complex organisational structure affect the capital expenditure process?

<u>Principal Effects of Organisational Structure on Capital Expenditure Process</u>: As discussed thus far in this section, organisational structures have changed with an increase in size of the enterprise in an effort to effectively deal with both the common and unique characteristics of growth. As the organisational structure of the enterprise

changed, the capital expenditure process was affected. It is emphasized, however, that major capital expenditure decisions, even in large enterprises, essentially remain in top-management's domain with some degree of delegated decision-making relative to some fixed size of investment. Thus, there has not been a significant change in the place of major capital expenditure decisions within an enterprise; although the capital expenditure process has been affected with an increase in size and complexity of the organizational structure.

The principal reason given for complete lack of delegation of the capital expenditure decision can be summarized as follows: "Present capital expenditures are the framework from which future profits are created; the board of directors is directly responsible to the stockholders for these future profits; therefore, only the board of directors should be responsible for present capital expenditures" (14, p. 19). Of course, this line of reasoning should hold true for all actions undertaken by the enterprise - employee recruitment and selection, products and product-line strategies, pricing strategies, promotional strategies, etc., not just capital expenditures. Logically then, there should be no delegation of authority and no managing personnel other than the board itself. It is recognized that this is completely unreasonable in any enterprise. As a consequence, there has been some degree of delegation for capital expenditure decisions as pointed out previously; but it has not been as pronounced as in other areas of organizational life.

The major factors favoring centralization of capital expenditure decisions normally evolved early in an organization's history before

it reached the complex structure that characterizes most major U. S. enterprises. Those factors favoring centralized capital expenditure decisions may be enumerated as follows:

1. Central control allows the enterprise to have greater financial strength than would be possessed by the "sum" of the individual divisions.
2. Central control of the enterprise's funds is one of the basic sources of strength for a large enterprise. It gives the divisions greater cash resources in the short-run than would be the case if they were operated as separate enterprises.
3. Central control over capital expenditures solves directly the problem of coordinating the investment plans of the divisions among themselves and coordinating these plans with the availability of funds for the enterprise.
4. Central control of capital expenditures may be the primary means of finding out and controlling what is going on in the divisions. Capital expenditure decisions, therefore, may be centralized as the result of utilizing the capital expenditure process as the primary means of organizational control (assuring relative stability).
5. Central control of capital expenditures may be the basic means of implementing the strategic, long-range plans of the enterprise.

The above factors favoring centralization of the capital expenditure decision (either wholly or partially) raise the need for:

1. Making explicit estimates of all costs and benefits to be expected from the capital expenditure, i.e., reducing all costs and benefits to a common denominator (dollar amounts, rate-of-return on investment, or other common base) so that decision making executives can compare proposals submitted by the various divisions. These estimates of costs and benefits must be done at the divisional or plant level which:

   a. Causes suppression of risk. When information is passed from one organizational unit (or level) to another, variability in data is often omitted in favor of summarizing parameters, and the non-measurable items are eliminated.

   b. Reduces the aspects of uncertainty. Often assumptions formulated at one level in the organization become facts for another level or another unit.

   c. Requires divisional and/or departmental management to make decisions on how much data will be gathered and the manner in which it will be gathered and presented.

   d. Increases specialization of personnel. Data are gathered by one group, screened or evaluated by another group, and decisions are made by still another.

   e. Assumes all factors relevant to the decision can be reduced to a common base.

   f. Assumes there will be no bias. Individual goals may significantly affect any estimate of costs or benefits.

2. Some type of check on the statements made by the divisions in support of their proposals, since those factors affecting the estimates of costs and benefits are significant.
3. A scheme for controlling the capital expenditures of the enterprise, and also matching the results achieved with the predictions and estimates that were made.

It now seems obvious that the factors needed for centralization of the capital expenditure decision to be effective are as significant, or nearly so, as those factors favoring centralization. If an enterprise centralizes its capital expenditure decisions, as most enterprises do to some degree, then the enterprise must find methods, techniques, policies, or procedures which insure that: (1) explicit estimates of all costs and benefits can and will be made; (2) divisional managers know and will act in the best interests of the enterprise, i.e., all possible alternatives are searched for, bias is eliminated, etc.; and (3) there is a complete capital expenditure control system for the enterprise. In an attempt to assure a reduction in the effect of these items, enterprises have established rigid administrative processes or procedures with which the capital expenditure process must align. A discussion of these administrative processes and their effect will be deferred until decentralized capital expenditure decisions are discussed.

Everyone recognizes that it is unrealistic to believe that all decision-making in an enterprise can be completely centralized. As already pointed out, some degree of decentralized capital expenditure decision-making has occurred in many enterprises. Those factors

favoring some degree of decentralization of capital expenditure decisions may be enumerated as follows:

1. It will give a quicker reaction time on proposals. The time required for a proposal to reach the central office and for a decision to be made may be substantial, and in the meantime conditions may have changed in terms of costs, timing, and other significant factors. For example, the lead time required in governmental budgets is quite long and conditions change in this period which may require additional allocation of funds.
2. It is closely aligned with other incentive aspects of decentralization in general. When a manager is delegated the responsibility for his division, capital expenditure decisions should be included; otherwise he does not have the control to determine the destiny of that division. If the manager's rewards are related to his achievements, then he should presumably have complete responsibility and authority for all aspects of the division's operation including long and short-term capital expenditures; otherwise his decisions may favor short-term results.
3. It reduces the "rubber stamp" effect for those investments which are generally agreed to be essential and justified. If central office generally approves such proposals, they might well be handled at the operating levels.
4. It avoids using up the energies of top management, especially for "small" proposals, and allows them time for developing

plans and strategies, coordinating, and controlling the entire enterprise without regard to specific divisions.

5. It allows more evaluation of the non-measurable factors. Therefore, the impact of the so-called intangibles will likely receive more emphasis. For example, it is traditional to suppress risk and uncertainty associated with a proposal and to favor summarizing data when it is written up for transmission. Moreover, there is seldom a conventional, effective means of expressing risk and uncertainty.

6. It aids in the development and training of broad management personnel.

Complete decentralization of capital expenditure decisions does not solve the total problem of the capital expenditure process. Complete decentralization raises the need for:

1. Assuring that divisional managers will make capital expenditure decisions that are in the best interests of the entire enterprise, not just their division. This means that the divisional manager must know what actions will be in the enterprise's best interest, that he will be motivated to take such action, and that the performance of the division can be effectively evaluated.

2. Coordination of investment plans between divisions and coordinating these plans with the availability of funds for the entire enterprise.

3. An integrated capital expenditure evaluation and control system for the entire enterprise. At present, for example, evaluation

is based on rate-of-return on investment or some derivative thereof; and control is exercised by the authority channels of the formal organizational structure. These means of evaluation and control have inherent weaknesses which make complete decentralization appear impracticable.

Giving consideration to both those factors favoring centralization and those favoring decentralization, it is not surprising to find that the capital expenditure decision is neither completely centralized nor completely decentralized in most enterprises. It would appear that the better organizational design would lie somewhere between these extremes. However, a combination of centralized and decentralized decision-making in the capital expenditure process raises the need for:

1. Making explicit estimates of <u>all</u> costs and benefits to be expected from a capital expenditure. A satisfactory means for expressing, evaluating, and communicating risk and uncertainty is needed.
2. A means of assuring that the goals of the individual decision-makers at all levels in the organizational structure are consistent with the objectives of the organization. As the number of decision makers increase, probability of conflict between the decisions made and the desires of the stockholders increases.
3. Utilizing decision-makers at all levels who have a general knowledge of the operation of the entire enterprise, rather than just a specialized segment of it.

4. Establishment of an optimal criteria on which to determine those proposals approved or rejected by top management and those by divisional management. In present practice a fixed dollar investment is the criteria used. Is a fixed investment size the optimal criteria regardless of type of project (for example, replacement, expansion of existing product, expansion to produce a new product, research, etc.)?
5. A means of controlling the decisions of divisional managers in terms of (a) total commitments by the division, and (b) matching the results achieved with the predictions made for those proposals that were approved by top management.

Basically, the factors enumerated above can be thought of as a summation of those factors needed for both complete centralization and complete decentralization of the capital expenditure decision; but the effect of each factor on the capital expenditure decision is dependent upon the degree of centralization or decentralization in the particular enterprise at a particular time with a particular type of structure.

It seems reasonable to conclude that the optimal organization design for the capital expenditure process is not in one of the purer forms of organization, either highly centralized or highly decentralized within a particular type of structure. Rather, the optimum design would appear to be in a "combination." However, there is no theory available to determine the optimum degree of either within a particular type of structure. In fact, this writer could not find any kind of published research in this area, either theoretical or experimental. In actuality,

then, organizations search or "hunt" for a "workable combination" within their particular structure.

Historically, as pointed out by Istvan's study (14), a "workable combination" has been based upon a fixed size of investment without regard to type of organizational structure, type of expenditure, associated risks, particular types of individuals at each level in the structure, and/or rate-of-return on investment. Thus, in arriving at this "combination", the primary factor taken into consideration is the size of the investment. This "combination" is then implemented by specified administrative processes.

Considering the aforementioned factors relative to centralization and/or decentralization of the capital expenditure decision, it is concluded that a "combination" based on such a scheme within any of the principal types of organizational structure places a limiting parameter on the capital expenditure process.

If an operating organization recognizes that a "combination" based on the fixed size of investment approach is a parameter, it is then faced with the problem of "hunting" for the optimal combination since no theories or guidelines are presently available. This "hunting" may cause the organization to oscillate and hence become unstable. Since maintenance of relative stability is extremely important to the organization (as discussed in Chapter III), significant "hunting" for an optimal combination will not normally occur. Any "hunting" that may have occurred in the past has normally been the result of internal and/or external pressures or by chance, and it has not had as its objective to seek the optimal combination.

Therefore, administrative processes that result from a "workable combination" based on fixed size of investment will be explored in an effort to show how additional organizational parameters are placed on the capital expenditure process.

Summary: The primary purpose of an organization's structure is to assure that all activities of the organization will be planned, coordinated, and controlled in an effort to achieve some organizational objective. There are five principal types of organizational structure with varying degrees of complexity appropriate to all enterprises in terms of size, type of product, and type of competition. As the organizational structure of the enterprise changes, the capital expenditure process is affected. The place of the capital expenditure process within the principal types of structure has been presented.

Eventually the ideals of formal organization cannot be reached by either of the principal types of structure; then the so-called decentralized organization comes into being. Full decentralization, however, for the capital expenditure decision has not occurred. In most instances, the divisional manager is only partially responsible for his operation; major capital expenditure decisions, even in large enterprises, essentially remain in top management's domain with some degree of delegated decision-making relative to some fixed size of investment.

Considering those factors favoring centralization and those favoring decentralization, it is not surprising to find that the capital expenditure decision is neither completely centralized nor completely decentralized in most enterprises; therefore, the optimum organizational design

would appear to be in a "combination." A "combination" based on a fixed size of investment within any of the principal types of organizational structures places a limiting parameter on the capital expenditure process.

Administrative Procedures Affecting the Capital Expenditure Process

It was stated that organizational parameters must be designed to: (1) cause the system to exercise good relative stability, (2) damp oscillations in the system, and (3) compensate for reasonable delays. Therefore, a good organizational design is one which plans, coordinates, and controls these elements in accordance with the organization's primary objective.

Recall that the boundaries (P_{L2} and P_{U2}) on the enterprise's primary objective is determined by its policies and procedures or by a governmental agency or governmental influence, and that oscillations within these boundaries must be damped around P_v in such a manner that the system does not become unstable. To accomplish stability within the framework of the primary objective and the organizational structure, most enterprises utilize some administrative procedure to perform the following activities relative to the capital expenditure process:

(1) Search for investment opportunities

(2) Evaluate the opportunities

(3) Choose between the opportunities

(4) Implement the selected proposals

(5) Follow-up on the implemented proposals

One of the major problems facing the enterprise in its capital expenditure process is to determine which of these activities (and to

what extent) should be performed by each of the organizational units (staff, line, committee, department, division, etc.). Since the enterprise does not have an explicit method or technique available, it establishes administrative procedures within the framework of its existing organizational structure. The manner in which these procedures affect the capital expenditure process will occupy the remainder of this chapter.

Search for Investment Opportunities

No matter how simple or complex an enterprise's capital expenditure process may be, it is useless if it has nothing to analyze or no alternate courses of action from which to choose. The raw material of the capital expenditure process is the investment proposals, and these proposals must be made available in sufficient quantity before the funds of the enterprise can be put to their most advantageous use.

The process of search was discussed in general in Chapter III. In this section details of the search process will be discussed as it relates specifically to search for investment proposals. How does search for investment opportunities occur, or more importantly, how and where do investment proposals originate? Sometimes alternate courses of action are given, sometimes they are forced upon the decision-maker, and sometimes they must be discovered or developed. If the courses of action are given or are forced on the decision-maker, then there is no opportunity to search for alternatives; however, conditions such as these occur infrequently in the capital expenditure process. Consider, for example, that a law existed which stated that air pollution must be controlled at a

certain level and the enterprise was affected by this law; it still should search for a device that would meet the requirements, perform at "minimum" cost, and require the smallest investment, or change its process or product. That is, the enterprise should search for alternatives and make comparative evaluations. Therefore, in the capital expenditure process alternate courses of action should be searched for and developed; otherwise the enterprise is satisfied with existing courses of action.

Before going on to further discussion of search for investment opportunities, it is important to suggest some of the conditions which lead to the assumption that alternative courses of action are given. Morris (19, p. 90) suggests several hypothesis which may be summarized as follows:

"1. If it is believed that no alternatives exist beyond those already under consideration, it is natural to assume that the alternatives are to be taken as given. If it is believed that there are no better alternatives than those under consideration, or if the cost of discovering better alternatives is believed to be excessive, then the same assumption will be made.----.

2. The assumption that alternatives are given is used differently at different levels and positions in the organization.----As one moves up the ladder of line responsibility, often the opportunity and necessity to obtain new alternatives increases. ----.

3. Many of the conditions which lead to the assumption that the courses of action are given can be captured with the term "institutional rigidity." This term suggests those features of the firm which lead it to reject the search for new alternatives.----. Tradition and ego involvement may play an important part in restricting the range of alternatives which are considered. Perhaps most important is the influence of past decisions on the alternatives which are considered.----.

4. It is probably true that the stronger the pressures of time and routine activity upon the decision maker, the less likely it is that new alternatives will be sought. Finding new alternatives takes time, energy, and money, which may not be available.

5. If the conditions leading up to a decision problem have been met repeatedly in the past, then a policy may emerge which will specify the alternatives to be considered.----."

Thus, we come to a basic hypothesis advanced by March and Simon (18) which states: Most human decision making, whether organizational or individual, is concerned with the discovery and selection of satisfactory alternatives; only in exceptional cases is it concerned with the discovery and selection of optimal alternatives. This hypothesis suggests a number of insights into the question of accepting the given alternatives or searching for new ones; and it leads back to the hypothesis proposed in the last chapter as the primary objective of a business organization in relation to capital expenditure decisions, i.e., a satisfactory profit for survival is one where $P_{L1} \leq P \leq P_{U2}$ and a satisfactory profit for growth is one where $P_{L2} \leq P \leq P_{U2}$.

These hypotheses suggest the principle that: search will be expected to continue only until an alternative is discovered which is acceptable, i.e., one where $P \geq P_{L1}$ or $P \geq P_{L2}$ depending on the organization's attitude toward growth. Under this principle, the determination of the characteristics of an acceptable alternative is required in advance. Therefore, in capital expenditure decisions under assumed certainty, this principle might take the form: search for investment opportunities until one is discovered which will yield a return on investment of 12 per cent. The key to the usefulness of this principle is the process of establishing P_{L1} or P_{L2}. It is proposed that this is the guiding principle by which search for additional investment opportunities occurs in the capital

expenditure process of most U.S. enterprises, i.e., search activity is characterized by an attempt to discover satisfactory alternatives.

Then how does an enterprise go about searching for (or discovering) additional alternative capital expenditure proposals? Much of the answer to this question may be tied up in the study of creative thinking, and the development of imaginative and creative approaches to the capital expenditure process. A study of creativity is a fascinating, but very specialized, topic which will not be discussed here. Rather, the approach will be taken of how enterprises actually generate alternative proposals.

At this point capital expenditures will be classified into two categories only: minor expenditures and major expenditures. The minor category includes replacement of existing facilities, cost-saving expenditures, small additions, and new methods of manufacture. The major category includes expansions, large additions, entry into new fields of endeavor, or new product lines. It is recognized that there may be multiple classifications in practice; however, this classification will serve as a base for a discussion relative to search for investment opportunities.

Capital expenditure proposals in any enterprise originate from two sources: top management and/or operating personnel - personnel who are not considered members of top management.

Using the above classification, it is usual to find minor proposals originating from operating personnel, whereas major proposals generally come from top management. This situation appears logical on the basis of the inherent scope and ability of the originators. Thus, the majority

of expenditure proposals originate among the operating personnel. This dependence upon the operating personnel for the conception and formulation of specific proposals is the result of two major conditions:

(1) In the large corporation with line, functional staff, and committee type structure with divisionalization, there has to be a broad delegation of authority and responsibility which includes responsibility for the enterprise's capital facilities.

(2) It is expected that most enterprises have more expenditures in the minor category (replacements, small additions, etc.) than they do in the major category (major expansions, new product lines, etc.).

Therefore, as one would expect, those most competent to suggest these types of expenditures are the operating personnel in the lower echelons of the enterprise, since they are in close contact with the existing facilities.

Two conditions exist in any enterprise which act as a stimulus to the personnel, either top management or operating personnel, to search for capital expenditure proposals:

(1) Competition with other enterprises in an industry act as a constant and real stimulus. Individual enterprises strive to lower average unit cost, provide more efficient service, and create new and/or better products. These efforts result in a flow of expenditure ideas.

(2) The same is true of internal competition within an enterprise. This type of competition is almost exclusively directed towards

cost reduction and the "maximization" of profits. Promotion based on merit provides division, plant, and departmental managers with incentives for reducing costs and increasing efficiency. Many enterprises have adopted some type of profit-sharing as a means of increasing the manager's stimulus; and many enterprises have adopted some type of suggestion system as a means of increasing the stimulus of non-management personnel. These and/or similar means will all result in a flow of expenditure ideas.

Thus, competition, either internal or external, provides the stimulus for proposal origination; and as a result produces an abundant supply of capital expenditure proposals. It is proposed that most enterprises do not make any special efforts to stimulate ideas for capital expenditures except those where there is a basic research group. In fact, Istvan (14) states in his study that 47 out of 48 firms make no special efforts to stimulate ideas for capital expenditures. It is concluded that, contrary to popular belief, in most enterprises the origination of proposals receives no special stimulation. Sufficient proposals of merit arise out of the normal manner of doing business.

If no special stimulation is undertaken by the enterprise for proposal origination, then several factors relevant to search for opportunities can be identified:

(1) Search decreases with satisfaction. Thus, under assumed certainty, search does not occur if the opportunities available are satisfactory. Further, organizations avoid uncertainty by

using decision rules emphasizing short-run reaction to short-run feedback and by arranging a negotiated environment utilizing plans, standard operating procedures, industry tradition, and uncertainty - absorbing contracts on the environment.

(2) Decision-makers will give preference to alternatives which represent a continuation of activities already underway in the enterprise. Then search will probably begin with an existing alternative and modifications will be made to this "base" alternative. Therefore, one would expect more proposals in the minor category than the major category.

(3) Search is also related to the difficulty which is encountered by the decision-maker in choosing between alternatives. In most enterprises search can be expected to occur when:

(a) The decision-maker cannot compare the opportunities available so as to identify a preferred one.

(b) None of the opportunities available are acceptable, i.e., meet the criteria of minimum profit discussed previously.

(c) The opportunities available lack prediction of associated outcomes. If the opportunities available are "risky" or have a "large degree" of uncertainty associated with them, then search activity will increase.

Analyzing the above factors, one will observe that search activity in the capital expenditure process is primarily dependent on the difficulty encountered by the decision-maker in discovering and choosing satisfactory alternatives; and that ample opportunities for capital expenditures result from the normal manner of doing business. Therefore, the attitude

of most enterprises in searching for capital expenditure opportunities can be summarized in the statement: the enterprise is not concerned with having an ample supply of proposals, instead its concern is with obtaining the funds to implement these proposals.

This limitation on search activity often serves as a parameter on the entire capital expenditure process, since the proposals are the inputs to the process. The capital expenditure process then becomes a means of searching for and evaluating satisfactory alternatives.

Submission techniques as a parameter: Although no special stimulation is normally given to proposal origination, or the search process, most enterprises feel that standard procedures and/or forms for proposal origination and submission are desirable. Advantages derived from the utilization of standard forms and procedures are:

1. Proposals from the various departments or divisions of the enterprise can be compared when a uniform method of compiling and presenting data is utilized.
2. It is then simpler to make optimum use of the funds available to the enterprise as a whole.
3. It is a more efficient approach to the paper work involved in processing a proposal.

It is important to realize, however, that standard forms and procedures employed in the capital expenditure process should be utilized with extreme care. They must set out the specific information to be provided for economic justification as well as all the necessary, relevant information for the most advantageous decision-making. Since there may

be many non-measurable factors associated with a capital expenditure proposal, standard forms and/or procedures may not present all the necessary and relevant information needed by the decision-maker; especially if he is in the central office group of a divisionalized enterprise and the proposal originated at a much lower level in the enterprise. Therefore, in centralized decision making, it is necessary for the decision-maker to apply his own evaluation to the non-measurable factors based on his individual goals and experiences. Thus, the utilization of standard procedures and/or forms leads back to the attendant needs and advantages and disadvantages of centralization in general that were discussed previously.

It should be recognized that certain types of proposals may conform to standard patterns much better than others, e.g., equipment replacement versus new product lines since it is more difficult to predict the outcome associated with the latter. Therefore, standardization of procedures and/or forms for proposal origination and submission should be dependent on the type of expenditure proposal.

Time pattern of submission as a parameter: The timing of proposal origination and submission is closely tied to the capital budgeting techniques employed by the enterprise. That is, proposal submission is tied to the process of estimating any future needs for funds and/or the allocation techniques and timing of existing funds to be utilized for capital expenditures. Istvan (14) identifies three general situations concerning the timing of proposal submission to be included in the capital budget:

1. Periodic submission - Originator's may submit their proposals only at a specified time, e.g., two to three months prior to the beginning of a new fiscal period.

2. Continual submission if budgeted - Originator's may submit proposals any time during the year, but only if they were previously included in the capital budget.

3. Continual submission regardless of budgeting - Originator's are encouraged to submit their proposals any time during the year whether or not they have been included in the budget.

Of the three situations, the third is the most conducive to an up-to-date flow of ideas. In enterprises where submission occurs only once a year, it is possible that an excellent proposal conceived a short time after the deadline for submission will remain unprocessed for almost a year. This is also the case where the proposal must first be included in an annual budget; furthermore, there is a danger that originators will view proposal submission as an annual chore rather than as a continuous aspect of normal operations.

Therefore, the enterprise must provide for continual submission of proposals; otherwise the time pattern of submission can seriously affect the capital expenditure process.

Evaluation of Investment Proposals

It has been pointed out that opportunities for investment result from the normal manner of doing business, and only in exceptional cases was there any added stimulation to produce alternatives. Thus, sufficient proposals of merit resulted. This section will be devoted to the administrative processes for evaluating these proposals.

Once a proposal has been submitted, how is it processed? In the capital expenditure process of most enterprises, there are specified

channels through which the proposal must flow before a decision is made. The first step is the implicit or explicit classification of the proposal.

Classification of proposals: Capital expenditure proposals were classified previously into major and minor categories; however, this classification may place limitations on the processing and/or evaluation of proposals. In some enterprises, all proposals regardless of dollar size, purpose, length of service, etc., are processed and evaluated in a similar manner; whereas in other enterprises expenditure proposals are classified into groups. The principal reason for classifying proposals into groups is for convenience in processing and/or evaluation. The following questions arise relative to classification of capital expenditure proposals: (1) Should all proposals be processed and evaluated in a similar manner? (2) How do enterprises actually classify capital expenditure proposals? (3) Does the actual classification of expenditure proposals affect the capital expenditure process?

The argument may be presented that all proposals should be processed and evaluated in a similar manner since they commit the resources of the enterprise; thus determining its future courses of action. However, all proposals do not commit the resources for the same length of time, all proposals do not commit the same share of the resources, all proposals do not serve the same purpose, all proposals do not have the same degree of risk and/or uncertainty associated with them, and all proposals do not meet to the same degree the goals of the individual decision-makers. If all expenditure proposals in an enterprise are submitted to a similar method of processing and evaluation, the method must have factors built into it which properly consider these and similar conditions.

A single method is certainly desirable; however, due to the many variables involved, no universal method exists today. In fact, no single method exists which considers all the major variables for all proposals within a single enterprise. In those enterprises that utilize a standard method for processing and evaluating all expenditure proposals many factors are left to the discretion of the decision-maker. Further, either completely centralized or completely decentralized decision-making exists with its attendant advantages and disadvantages.

Many researchers and enterprises have recognized the shortcomings of a single method for processing and evaluating expenditure proposals. This is evidenced by the fact that much of the literature develops and presents specialized methods for dealing with certain classes of expenditure, e.g., replacement models. Thus, for convenience in processing and evaluating proposals, many enterprises have adopted some type of classification system. The classification system utilized by the enterprise is closely tied to its definition of what constitutes a capital expenditure. As pointed out earlier, there is no universally accepted definition of capital expenditure nor capital budgeting; however, from the literature general classification patterns evolve. The major implicit or explicit patterns that evolve are:

1. Classification only into the major or minor categories discussed previously; or classification into the major and minor categories on the basis of dollar size regardless of type, purpose, etc.
2. Classification into two categories only: replacements and expansions. The expansion category covers additions to

existing facilities and the creation or purchase of new facilities for any reason. The replacement category covers replacements brought about by physical uselessness of existing facilities, by cost-saving proposals, and by regulatory dictum. There may be minor deviations to this classification system in both title and definition, but these differences are not significant enough to lead to other categories.

3. Multiple classifications: This system facilitates slightly different processing and/or evaluation and/or accounting for the different classes of expenditures. Three typical examples of multiple classifications are:

<u>Example 1:</u> Proposal classification utilized by a railroad.

(a) Expenditures required by regulatory commission.

(b) Expenditures dictated by safety even though not required by regulation.

(c) General replacements of existing facilities regardless of dollar amount.

(d) New facilities (not replacements of existing facilities)

<u>Example 2:</u> Proposal classification utilized by an equipment manufacturer.

(a) Major projects - any project for any purpose in which the final cost is $1 million or more.

(b) All others, broken down as follows:

Class I - expansion projects

Class II - product improvement projects

Class III - cost reduction projects

Class IV - necessity projects

Class V - government-owned facilities

Example 3: Proposal classification utilized by a chemical firm.

(a) Replacements

(b) Cost reduction projects

(c) Expansion of productive facilities

(d) New plant or new business units

(e) Other - this category includes projects which do not readily fit into any of the above classifications, e.g., improvements to working conditions.

The information required to justify any expenditure necessarily depends on the nature and purpose of the project. This is evidenced by the fact that many enterprises utilize multiple classifications for convenience in processing and/or evaluating proposals. Although a multiple classification system may allow the enterprise to standardize the information needed for processing and evaluating each class of proposal, it may increase the complexity of choice. For example, if a cost-saving proposal and an expansion proposal is submitted and all factors are equal including the basic selection criteria, which one should the decision-maker choose if he is limited to only one of them? Theoretically, it does not matter which proposal is selected; however, based on the choice process discussed previously, the decision-maker would choose the cost-saving proposal; since it represents a continuation

of existing activities. Parameters affecting choice of proposals will be discussed in further detail in a subsequent section.

Implicit, therefore, in existing classification systems is the idea that they are based on the degree of risk and/or uncertainty associated with each particular class of proposal, e.g., there is less risk and uncertainty associated with a cost-savings proposal as compared with an expansion proposal. Analyzing the typical classification systems outlined above, one would conclude that these enterprises are utilizing, to some degree, the classification system as a means of dealing with risk and uncertainty. If the classification system is the method employed by the enterprise for dealing with risk and uncertainty, then definite parameters are placed on the entire capital expenditure process; since it is natural to assume that there is little risk and uncertainty associated with certain type proposals (e.g., replacement and cost-saving) as compared with other types (e.g., new product lines).

It appears as though the classification system utilized by the enterprise has been the outgrowth of its organizational structure and administrative procedures, rather than the structure and procedures being influenced by the classification system. Therefore, the classification system determines how the proposal will be processed and evaluated within the existing administrative procedures and organizational structure.

Once a proposal is submitted, the classification system employed by the enterprise is the first administrative procedure that it encounters. The classification that a proposal receives then determines how it will be processed and evaluated; thus it determines how the proposal will flow

through the organizational structure before a decision is made. The classification system employed is, therefore, a parameter in the processing and evaluation stages of the capital expenditure process.

Proposal flow: The path that a proposal follows through the administrative channels of an enterprise from originator to ultimate decision-maker is closely aligned with the organizational structure and proposal classification system utilized by the particular enterprise. The assumption will be made, in this discussion, that the line, functional staff, and committee organization with divisionalization is employed; this assumption is realistic for most major U. S. enterprises. Further, even though a multiple classification system may be utilized by the enterprise, it is proposed that the path which a proposal follows through the administrative channels of the enterprise is determined primarily by the major and minor categories defined previously. Therefore, if a proposal is submitted which is classified in the minor category (replacements, cost-savings, etc.), it will be processed in a different manner from one that is in the major category (new product lines, etc.).

In practice today, the pattern of proposal flow is further tied to the dollar size of investment. This fact is pointed out by Istvan's study (14) which was quoted previously, i.e., if a proposal exceeds a fixed dollar size, it must flow to a higher level in the heirarchal structure before a decision is made. Therefore, the path that a proposal follows from originator to the ultimate decision-maker in a particular enterprise, is primarily dependent on the type of organizational structure, the implicit or explicit classification into a major or minor

category, the dollar size of investment, and originating source. In general, however, two basic patterns of flow emerge.

One pattern of flow is generally associated with proposals that originate from operating personnel. Recall that minor proposals normally originate from operating personnel; consequently, a pattern of flow emerges that is normally associated with minor expenditures. In this pattern, the proposal goes from originator to a reviewer in some subordinate echelon in the organizational structure (department, plant, etc.) who ensures the accuracy of the information included in the proposal; but this review is not designed to measure the proposal's acceptability in light of over-all corporate objectives other than to insure that it meets some minimum criteria. If the proposal meets the minimum criteria, it then flows up through the organizational structure (with additional review) until it reaches a level that is authorized to make a decision on that dollar size investment.

In this type of proposal flow, several organizational parameters are placed on the capital expenditure process. Principal parameters are:

1. The review or screening mechanism itself. This will be discussed after the other major pattern of flow is presented.
2. Flow through the normal authority-responsibility channels. Theoretically, after the reviewer insures accuracy of information and the proposal meets the minimum criteria of acceptability, then it should flow directly to the decision-maker. In practice, however, the proposal flows through the normal authority pattern of the organizational structure which is

designed for "maximum" control. This type of arrangement assumes that each member through which the proposal flows has some responsibility associated with it. Yet they do not have the authority to approve it; but they can reject it. Therefore, since they have responsiblity they will view the proposal in terms of their individual goals and modify, reject, or allow it to pass to the next level on this basis. Only those proposals that meet the individual goals of those through which it passes reach the ultimate decision-maker; thus some proposals that may be preferred in terms of over-all corporate objectives never reach a decision-maker that can approve it, whereas other proposals that may be less desirable in over-all terms do reach the decision-maker. It seems that much of the authority pattern should be short-circuited if centralized decision-making is employed in the capital expenditure process of the enterprise.

3. Timing of approval. The timing of proposal approval or rejection is directly related to the level of authority needed to grant approval; the higher a proposal has to go in the structure before a decision is made, the longer the time lag between proposal submission and proposal approval.

The other major pattern of flow is generally associated with those proposals that originate from top management. Recall that major proposals normally originate from top management; consequently, a pattern of flow emerges that is normally associated with major expenditures. In this pattern, the proposal goes directly from the originator to a reviewer at

the top management level. It then makes its way directly to the decision-maker. In this type of proposal flow the principal organisational parameters are:

1. Major proposals would normally get priority over minor proposals even though they may require larger investments, have more risk and/or uncertainty associated with them, and commit the resources for longer periods since it is natural to satisfy top management first.
2. Creates problem of information flow to operating personnel. The cooperation and support of operating personnel is necessary if any proposal is to be implemented; therefore, these personnel must be kept informed of proposals at the top-management level in which they had little or no part in formulating. Otherwise, once a decision is made to implement a proposal, the operating personnel may accept the decision as a dictum; thus not giving it their whole-hearted support, especially if it conflicts with their individual goals.

The screening process: In both patterns of flow, capital expenditure proposals are first submitted for review or screening. At this stage, they are checked to insure that they are submitted according to the prescribed method for that class proposal and that they contain all the information necessary for evaluation. Istvan (14) states that there are four main approaches to the review or screening procedure among the firms studied. These approaches may be summarized as:

1. All proposals flow directly from the originator to the decision-maker who is in sole charge of review as well as approval or rejection.

2. Screening is an intermediate step between originator and decision-maker, but is a secondary duty to a person or persons with other duties.
3. Screening is an intermediate step between originator and decision-maker, but it is performed by a specialist or team of specialists whose primary duty is to analyze capital expenditure proposals.
4. Screening is performed by specialists for major proposals whereas minor proposals receive the attention of non-specialists.

The exact functions performed by the reviewers vary according to which of the above approaches is used. However, in all cases the first screening process will include the following:

1. Checking to insure accuracy of any calculations.
2. Checking to insure reasonableness of any estimates.
3. Comparing proposals as to their economic worth. For those proposals where approval at higher levels is required, only those that appear economically adequate are forwarded for further consideration, and those that appear infeasible are eliminated from further consideration.

Those proposals that get through this first screening process and where approval is required at a higher level may be processed either by flowing through the organisational structure to the decision-maker or they may flow to a top-management screening body before reaching the decision-maker. The general case is for the proposal to flow to a top management screening body which:

1. Repeats the testing for arithmetical accuracy and reasonableness of estimates.
2. Considers those aspects of the proposal which affect the company as a whole.
3. Considers those aspects of the proposal which may not be within the knowledge of the lower levels. For example, to provide a warehouse at an individual plant even though the proposal is highly acceptable, when the company is planning to build warehouses in major cities for more effective distribution of all products.
4. Compares the economic worth of a proposal with other proposals that have been submitted in the past in an effort to insure that corporate funds are being expended to the best advantage.
5. Recommends approval or rejection. This recommendation is usually followed by the decision-maker, although he is not required to do so.

It is concluded that unless the review or screening is performed by an individual or group of individuals who are familiar with the operation of the entire enterprise, utilize sound evaluation principles, know what funds are available or can be obtained for capital expenditures, and that all proposals to be compared are available, then the screening process does not fulfill its purpose nor does it optimize profits. This is not to say that the screening process does not serve a useful purpose; it reduces the time and effort spent by a decision-maker with diverse responsibilities to a minimum.

Since the entire screening process plays such a significant role in terms of which proposals reach the decision-maker, it is imperative that the administrative procedures associated with it be carefully designed in terms of where it will be done, who will do it, and how it will be done. Otherwise, the entire capital expenditure process becomes nothing more than a screening process which insures arithmetical accuracy.

It is obvious that the screening process is designed for weeding out those proposals that are clearly not feasible. If it is to serve this purpose effectively, then it must utilize sound evaluation techniques. Therefore, the techniques utilized by the enterprise for economic evaluation is a key element in the evaluation phase of the capital expenditure process.

The evaluation process: The evaluation process is a vital part of the capital expenditure process; without it all prior discussion becomes superfluous. It is the process for determining the most advantageous allocation of funds among the various proposals.

Basically, there are two stages in the evaluation process of a capital expenditure. The first stage involves the determination of the dollar size of the investment proposal, the expected costs associated with the proposal, and the estimated advantage to be gained from making the expenditure. This stage emanates from the originator or the originator in consultation with others who provide data and/or advice; and is primarily concerned with the collection, compiling, and assembling of data. While this stage is a vital part of the capital expenditure process, it is not the intent of this thesis to discuss the details of

data gathering other than to emphasize the impact of this stage on the total capital expenditure process. It should be clear that the capital expenditure process is no better than its raw material or inputs; therefore, the success or failure of the capital expenditure process is dependent on this stage. The first stage of the evaluation process provides the raw material for the second stage - the measure of acceptability. The basic purpose of the measure of acceptability should be to allocate the funds of the enterprise in a manner which will add the greatest long-range profitability to the enterprise. It should insure that the advantages of the various proposals compare favorably with the minimum level of acceptability (P_{L1} or P_{L2}); and when funds for capital expenditures are limited, it should insure that only the best proposals are implemented.

Judging from the volume of literature, there is a great deal of interest in techniques for measuring the acceptability of capital expenditure proposals. These techniques have received and are continuing to receive the primary attention of those interested in capital budgeting. In fact, judging from the literature, one not familiar with the total capital expenditure process might believe that there are many techniques available to measure the acceptability of a proposal; and that these techniques are the primary component in the process. Actually there are only five basic techniques (with variations), each with its advantages and disadvantages; they are:

1. Subjective judgement.
2. The payout period (payback, payoff, etc.), i.e., number of years needed to recover the investment.

3. The simple rate-of-return, i.e., not adjusted for time value.
4. Special formula methods, e.g., Machinery and Allied Products Institute Method (commonly called the MAPI method).
5. The time adjusted rate-of-return, i.e., methods for calculating the rate-of-return which consider time value.

These methods are listed in descending order of sophistication. In addition to these basic methods, there are methods in the literature which are concerned with explicit techniques for evaluating risk and uncertainty. Two general approaches are employed in these methods:

1. Models using some probabilistic method of evaluating proposals as a basis for decision. Such models include the most probable future, aspiration level, expectation-variance, etc.
2. Models that assume little or no knowledge about the probability of outcome and rely on game theory as a basis for decision. Such models include the dominance principle, minimax strategy, LaPlace (Principle of Insufficient reason), Hurwicz principle, etc.

The utilization of any one or combination of the above techniques is closely related to the type (or class) of proposal under consideration. However, no attempt will be made in this thesis to state types of proposals or conditions where each of the techniques are applicable; nor will this thesis attempt to compare, contrast, or relate the advantages and disadvantages of each. Literature in the areas of Accounting, Engineering Economy, Operations Research, Industrial Engineering, and Management Science contains sufficient discussion in these areas.

While the technique utilized for measuring acceptability is another vital component in the over-all capital expenditure process, it is suggested that what is most significant in understanding and improving this process is not so much the particular technique utilized (if it considers all available relevant data); but rather the arrangements by which the enterprise reaches a capital expenditure decision. As an analogy, consider a home heating system. It is impractical to use a thermometer that measures room temperature to the nearest one-hundredth degree if the entire system is only capable of reacting to the nearest degree; thus it is important to understand the operation and capabilities of all components in the system before choosing a thermometer. This analogy is also true for the evaluation technique employed in the capital expenditure process. Therefore, fit the evaluation technique to the proposal, not the proposal to the evaluation techniques. Fitting the evaluation techniques to the proposal requires an over-all knowledge of the entire capital expenditure process with its related parameters. It appears as though the multiple classification system discussed previously in a step towards allowing evaluation techniques to be fitted to particular types of proposals.

Once the proposals have been evaluated by one or a combination of the aforementioned techniques, it is then necessary to choose from the proposals available those which will be implemented.

Choice of Investment Proposal

General choice procedures were presented previously. They were: (1) use simple rules, (2) maintain the rules, and (3) avoid uncertainty.

These procedures are utilized to some degree in all stages of a capital expenditure proposal from originator to ultimate decision-maker in terms of which proposals will be submitted and which proposals will ultimately be implemented. In the capital expenditure process, however, some specific parameters can be identified which have a significant effect on the choice of a proposal.

The basic objective as it affects choice: Before a choice can be made at any level in the enterprise, it is necessary to identify the basic or primary objective. In addition to identifying the primary objective, it is necessary to communicate this objective to all members of the enterprise engaged in any phase of the capital expenditure process.

A common practice in the capital expenditure process of many enterprises is to identify and communicate a minimum acceptable rate-of-return (or other minimum criteria such as a payout period, etc.) which may or may not be identical with the lower limit of the primary objective as established in Chapter III. Further, many enterprises establish a minimum acceptable rate-of-return (or other minimum criteria) which is different for different proposal classifications. Within this framework, as proposals are discovered and/or developed which do not meet these specified minimum criteria, they are "weeded" out. Thus, the enterprise can and does influence the choice by arbitrarily establishing the minimum criteria; since it is logical to assume that all individuals direct their efforts to the fulfillment of objectives and measurements that are established.

The minimum criteria established by the enterprise for its capital expenditure process must be consistent with the lower limit of the primary

objective; otherwise choice will be exercised in a manner that affects the entire capital expenditure process.

Individual goals as they affect choice: Recall that the goal(s) of members of an organization vary, that an individual expresses his goals operationally in terms of needs and satisfactions, that the needs and satisfactions of an individual are not completely determined by the individual himself, and that individual goals can be and are changed by indoctrination, training, etc. Thus, the type of choices made by an individual decision-maker will largely be determined by his training and the environment within which the choice is made.

The individual enterprise, therefore, determines to a significant degree the type of capital expenditure choices that will be made. First, by specifying and/or controlling the environment, it establishes the framework within which a choice is made; therefore, insuring good relative stability. By specifying and/or controlling the environment, the enterprise can and does change the goals of the decision-maker as time elapses.

Secondly, in the complex enterprise of today it is highly probable that a decision-maker will be selected who has spent his entire educational and organizational career specializing in a small segment of the enterprise. Obviously, an individual who has spent his educational and organizational career in one subfunction of the enterprise will have different goals from some other individual who has spent his career performing another subfunction, e.g., engineering versus accounting versus sales. Therefore, specialization has created a parameter that

seriously affects capital expenditure decisions because any decision requiring qualitative analysis will be made within the implicit or explicit framework of the decision-maker's prior experiences. Some enterprises are employing training and/or management development programs in an effort to modify individual goals; thus reducing the effect of this parameter.

The organizational structure as it affects choice: The primary purpose of the organizational structure is to plan, coordinate, and control all the activities of the enterprise. The location in the organizational structure where a choice is made determines to a large degree the type of choices that will be made, i.e., choice is influenced by the level in the organization where it occurs.

A common statement relative to capital expenditure decisions is: the type of capital expenditure decisions in which a manager engages depends on his position in the organizational structure. As stated previously, a common practice in many enterprises is to specify a fixed dollar size of expenditure as a basis for choice at various organizational levels. For example, a plant manager can exercise choice for those proposals that are less than $20,000; for any proposals that exceed this amount, the manager can reject or allow them to flow to higher levels. The rationale behind this mode of operation is to insure the "optimum" coordination and control among proposals; however, this mode of operation influences the choices made. Choice, therefore, in the capital expenditure process is closely aligned with the degree of centralized decision-making employed in the enterprise.

In the typical complex enterprise of today, it is a common practice for the planning and coordination of capital expenditure proposals to be

on one organizational unit (usually a functional staff group as discussed previously) whereas the choice of a proposal and its implementation occurs in another unit (usually a line unit). As pointed out in the discussion of "the screening process," it is a common practice for the reviewers or screeners to recommend that a proposal be accepted or rejected; thus limiting the choice of the decision-maker to acceptance or rejection. Therefore, it should be recognized that the organizational units and their structuring can and do influence the choice of capital expenditure proposals.

Search activity as it affects choice: The process of search was discussed in general in Chapter III; search activity for investment proposals has been discussed in further detail in this chapter. In both of these discussions it was pointed out that search activity increases with the difficulty encountered by the decision-maker. Thus, the process of search and the process of choice are closely interwoven and cannot be completely separated.

It was stated in the discussion of the prediction-knowledge relationship that the value of observations is dependent on the manner in which the observations were taken and on the degree to which the assumption and implications involved were understood. Thus, the manner in which the environment is searched determines to a substantial extent the decisions (or choices) that will be made.

Therefore, search activity and procedures cannot be completely divorced from choice procedures. It is important to recognise that a relationship exists between search and choice, and to design the capital

expenditure process in a manner to effectively deal with this couple.

The classification system as it affects choice: The principal reason for a classification system is for convenience in processing and/or evaluating proposals. However, the classification system used by the enterprise can and in many instances does influence the choices that are made.

If, for example, the implicit or explicit classification system emphasizes that certain types of proposals have more risk and/or uncertainty associated with them than other types (e.g., new product lines, replacements, etc.), then the classification system influences the choices that are made. That is, the decision-maker may exhibit preference for those proposals within a particular classification which normally have a "small" degree of risk and/or uncertainty associated with it.

Therefore, in establishing and utilizing a classification system for convenience in processing and/or evaluating proposals, the enterprise should be aware that the classification system has an impact on choice; and it may become a major parameter affecting choice.

Proposal flow and the screening process as they affect choice: In the principal patterns of proposal flow from originator to decision-maker, proposals are submitted for review or screening. Four main approaches to the review procedure were discussed. The manner in which each of these approaches affect choice will be examined.

In the first approach all proposals flow directly from the originator to the decision-maker who is in sole charge of review as well as approval or rejection. When this approach is used, proposal flow and screening procedures have no influence on the choices made.

In the second approach screening is an intermediate step between originator and decision-maker, but it is a secondary duty to a person or persons with other duties. Since screening of capital expenditure proposals is a secondary duty, it may or may not have an influence on the choices made. The influence exerted on choice in this approach is dependent on both the reviewer's and the enterprise's attitude towards screening. Most likely in this approach, the review will primarily determine if the proposal is submitted according to prescribed method, check for accuracy of calculations, and for reasonableness of data. If these are the primary duties of the reviewers, then choice will not be significantly affected; however, if the duty of the reviewer is to perform more than these tasks, then choice may be affected in two ways. First, the reviewer may not be competent or have the time to effectively compare, contrast, and analyze proposals. Since the review is not a primary duty it may seriously affect choice if the decision-maker utilizes it as an aid in making a choice. Secondly, if the reviewer is competent and has the time, then the effect on choice will be the same as that discussed in the next approach.

In the third approach screening is an intermediate step between originator and decision-maker, but it is performed by a specialist or team of specialists whose primary duty is to analyze capital expenditure proposals. This approach is the preferred method of screening. As pointed out previously, however, when proposals flow from one organizational unit and from one organizational level to another, variability in data is often omitted in favor of summarizing parameters and the non-measurable

elements may be eliminated. Further, if screening is an intermediate step at the top-management level for centralized decision-making, then a premium is placed on utilizing decision-makers who are familiar with the operation of the entire enterprise as well as the techniques, principles, and methods utilized by the specialists who do the screening. This arrangement affects the choices that are made in two ways. First, if the decision-maker is not competent in the principles, techniques, and methods utilized by the specialists then he is limited to accepting or rejecting their recommendations with the probability being much higher for acceptance since the screeners are specialists whereas he is not. In this case, choices are primarily made by the specialists with the decision-maker's approval. In other words, proposal approval is utilized as a means of informing rather than as a means of choice. Thus, saying that choice occurs at any level higher than that of the screening body is superfluous. Secondly, if the decision-maker is competent in the principles, techniques, and methods utilized by the specialists, then he will add his own implicit or explicit evaluation to that of the screeners. In either situation, the choice process is limited to acceptance, rejection, or additional study of acceptable proposals which is a parameter placed on the generalized choice procedures.

In the fourth approach screening is performed by specialists for major proposals whereas minor proposals receive the attention of non-specialists. This approach affects choice of major proposals in the same manner as that discussed in the third approach, and it affects choice of minor proposals in the same manner as that discussed in the second approach.

The evaluation system as it affects choice: Generally in the capital expenditure process, the analyst and the decision-maker are primarily concerned with the explicit techniques utilized in evaluating the proposals. It is agreed that these evaluation techniques can and do affect choice; however, the over-all evaluation system (e.g., accounting system and/or performance rating system) utilized by the enterprise has more impact on choice than does the specific evaluation techniques employed. If the over-all evaluation system is designed to emphasize short-term measurable results, for example, then it is natural to choose those proposals that will produce these type results as contrasted to proposals which will not produce results until the distant future. Therefore, it is concluded that the over-all evaluation system has more impact on the choices made than the specific evaluation techniques employed to evaluate the proposals. This over-all evaluation system places an implicit or explicit parameter on the capital expenditure process which affects the choices made; thus in the design and operation of the capital expenditure process, the enterprise must recognize this effect and design a system which compensates for it.

Summary: Several elements affecting choice of capital expenditure proposals have been presented. Although these were presented separately, it was implied and in several cases it was stated specifically that there is an interlocking relationship between these elements. Depending on the particular administrative procedures and the organizational structure, the choice process in any enterprise is more sensitive to some of these elements than to others. However, all of the aforementioned elements

affect choice to some degree in the capital expenditure process of all enterprises; thus the process must be designed within the framework of a closed-loop information-feedback system to effectively deal with these parameters.

Action on the Selected Proposals

After a proposal is selected (decision is made), those writers concerned with capital budgeting and other aspects of the capital expenditure process do not link the decision with its implementation nor with its verification. A capital expenditure process cannot be designed or improved without considering the entire system. A study of the individual components may be helpful; however, if a system is to perform in an optimum manner, the components must be integrated. Optimizing one component in the system does not always improve the system; in some instances it may cause the system to degenerate. Therefore, this section is concerned with the major parameter associated with linking the planning and action phases of the capital expenditure process; linking these phases with the verification phase is the topic of the next section.

Interactions and overlaps between the planning, implementation, and verification phases of the capital expenditure process must be accomplished; however, many of the present day organizational structures and administrative procedures are not designed to foster this interlocking relationship. In fact, most enterprises tend to separate planning and doing in the capital expenditure process so that "economies of scale" may be achieved; thus creating a group of "planners" and a group of "doers." Therefore, the organizational framework within which the capital

expenditure process must function is based on the traditional line-staff organization utilizing administrative procedures as a means of coordination and control. In this arrangement, there is normally either a group of planners who are not involved in day-to-day operations and who lose contact with operating problems, or operating managers who are primarily engaged in day-to-day operations and who also do the planning.

In the situation where there is a group of planners who are not involved in day-to-day operations, restrictions are placed on the implementation phase of the capital expenditure process; since they lose contact with the immediate dynamics of the enterprise's operation, become narrow specialists, and lose much of the perspective and experience necessary to implement a proposal. In the situation where operating managers do the planning, restrictions are placed on the planning phase of the process because middle and lower management tend to regard planning as a responsibility of top management. As a result these managers only concern themselves with the day-to-day operations. Thus, it is apparent that the divorce of planning and doing creates a parameter that affects the operation of the capital expenditure process.

For the capital expenditure process to function in an optimum manner an organizational structure must be designed which will integrate planning, both long and short term, and operations so that one reinforces the other. It is not the intent of this thesis to design components of a complete capital expenditure process; however, one possible means of integrating these phases would be to have a project or product structure instead of a departmental structure. That is, instead of having specialization in a

department or division, have specialization in a vertical framework. It is recognized that this proposal has limitations; but it is presented here to illustrate that it is possible to integrate these two phases, thus reducing the effect of this parameter.

Follow-up on Selected Proposals

The basic components of any endeavor are: planning, doing, and verification. In the capital expenditure process, organizational parameters affecting planning and doing have been discussed; although these were presented separately, they cannot in reality be divorced nor can they be divorced from verification. Verification in the capital expenditure process is a follow-up on the selected proposals to: (1) determine the actual performance results (profitability, years to return capital invested, etc.); (2) compare the actual results with those predicted in the proposal from which a choice was made; and (3) take corrective action regarding any differences between the actual performance and the predicted performance. The follow-up or verification in the capital expenditure process is frequently referred to as the postaudit.

Istvan (14) indicated in his study of 48 firms that only 24 performed a postaudit on any part of their implemented proposals. Why does such a large percentage of enterprises fail to consider this component of the capital expenditure process? Three major reasons may be given. First, the enterprise may not have refined its planning and doing components sufficiently for the postaudit to be meaningful; in this situation, the entire process must function in a haphazard manner. Secondly, the actual decision cannot be postaudited since the enterprise cannot know what would

have happened if another decision was made; this type of thinking is based on a complete lack of understanding of the purpose and benefits of the postaudit. Third, a dependence on the traditional accounting system which is designed to measure end-result variables to provide the necessary feedback for a comparison between actual and predicted performance. As an instrument for measuring performance results the accounting system may be satisfactory; however, it does not contribute to improving the capital expenditure process because it only shows the end results, i.e., it does not suggest areas for improvement; nor does it aid in the prevention of unfavorable results in the future.

In either of the above cases, what is needed is further education of policy-makers regarding the entire function of the capital expenditure process; since they place a major parameter on the entire process.

Why the postaudit: Recall that knowledge is acquired through an information-feedback system. The postaudit is the component through which feedback occurs in the capital expenditure process; it is the primary feedback element in the information-feedback system. If the postaudit is not performed, then the control action in the process is not dependent upon its output; therefore, it operates in an open-loop manner with its attendant disadvantages.

Although the decision itself cannot be postaudited, the estimates (data) on which the choice was based can and should be postaudited. The postaudit is a highly useful tool if it is properly applied in the information-feedback system; it has the unique advantage of bringing about an improved capital expenditure process by its power to improve the

abilities of those concerned with any aspect of this process. It is simply an added expense, however, if it is performed for its own sake or as a means of "policing" the process.

What to postaudit: The estimates (data) on which a decision was made can and should be postaudited; thus the types of information sought in the postaudit are directly dependent upon the information employed in making the proposal and reaching the decision for approval.

Theoretically then a postaudit should be made of all implemented projects; however, the cost of performing such studies may be prohibitive if thousands of individual projects are included. Selection may, therefore, be necessary. If selection is necessary, it should be based on a large enough sample of all types of projects so that it will provide enough information to refine and improve the abilities of those performing any component of the process.

Who performs the postaudit: The true worth of the postaudit lies in education through information-feedback; therefore, it should be performed by a postauditor through whom the most information can be gained.

Two approaches may be taken in regards to who actually performs the postaudit. First, the originator may gather and compile the data for the postaudit or, in the case of those proposals originating from top-management, by the specialized staff group who evaluated the proposal. This arrangement appears logical because these people are directly concerned with the project and have been familiar with it since its inception; however, those who were in any manner connected with the project in its early stages might tend to bias the data (either consciously or unconsciously) in an attempt to match the orignal estimates.

Self-preservation or pride of authorship could be the motives for such an act. Secondly, the complete postaudit is pefformed by members of a designated staff group who have not been connected with the proposal. This manner of performing the postaudit assures more accuracy in the data; however, it is more costly since the members of the staff group are not as familiar with the project.

To gain the most benefit from the postaudit, the individual enterprise must achieve a balance between these two approaches.

Summary: If the capital expenditure process is to function in an effective manner, a postaudit of estimates (data) is necessary so that knowledge can be gained through an information-feedback system. The postaudit has the unique advantage of bringing about an improved capital expenditure process through its power to improve the abilities of all those connected with any aspect of this process.

V

CONCLUSIONS

The contention of this thesis is that there are some principal organizational parameters affecting the design and operation of an enterprise's capital expenditure process. Although detailed design considerations are beyond the scope of this thesis, attention has been given to developing some of the more important parameters affecting this process. These parameters should be explicitly considered in the design, redesign, or operation of an enterprise's capital expenditure process.

A primary objective that has operational significance for capital expenditure decision-making purposes has been developed. The primary objective was formulated in a framework of uncertainty utilizing the basic characteristics of a closed-loop information-feedback system. Since it was formulated in a framework of uncertainty, it allowed for variation; therefore, the limits (or boundaries) of this objective were established. The enterprise damps oscillations in its complex interconnected system of objectives to assure relative stablility within the limits of the developed primary objective. The damping methods employed by the enterprise place parameters on the capital expenditure process.

The important parameters that were discussed are:

1. The common and unique characteristics that evolve from the pattern in which an enterprise increased in magnitude.

2. The organizational structure that evolves in an effort to plan, coordinate, and control all activities of the enterprise.

3. The administrative processes utilized within the framework of the primary objective and the organizational structure to perform all activities relative to the capital expenditure process.

The major points discussed within each of these parameters are enumerated in the following manner:

1. The common and unique characteristics that evolve from the pattern in which an enterprise increases in magnitude.

   The common characteristics that affect the capital expenditure process are:

   a. The particular organizational structure that results in an effort to plan, coordinate, and control all activities of the complex enterprise as it increases in magnitude.

   b. The administrative processes that result in a further effort to plan, coordinate, and control the enterprise.

These characteristics received the primary attention in this work; however, the unique characteristics that affect the capital expenditure process in each growth pattern were enumerated. These are:

a. The competitive environment in which the enterprise operates.

b. The design of the organizational structure and administrative processes to foster coordination and control of similar or dissimilar units into one cohesive organization.

c. The pricing policies between separate organizations and/or between units in the same organization.

d. The degree of involvement with different labor organizations.

These unique characteristics of the growth patterns were discussed only as they had an impact on the common characteristics.

2. <u>The organisational structure that evolves in an effort to plan, coordinate, and control all activities of the enterprise</u>.

Principal types of organizational structure and the place of the capital expenditure decision within each are:

a. Line organization. In this type of organization capital expenditure decisions are usually kept in the domain of the owner(s) with possibly some small amount of delegation to the superintendent.

b. Line and staff organization. In this type of organization, the primary difference in the capital expenditure process from that of line organization is that the decision-maker may obtain advice from advisors (staff).

c. Functional organization (pure). Although this type of structure is no longer in use today, it was presented because it led to functionalized staff departments.

d. Line and functional staff organization. In this type of organization the primary responsibility of the capital expenditure process is delegated to a functionalized staff unit; however, the decision remains with the owner(s) or delegated line official.

e. Line, functional staff, and committee organization. In this type organization the primary difference in the capital expenditure process from that of line and functional staff is that the decision-maker may get additional advice and/or consent from those who will have to carry out the decision; or the committee may be delegated authority for the actual decision.

Eventually the ideals of the formal organization cannot be reached by any of these structures, then the decentralized structure comes into being; however, full decentralization of the capital expenditure decision has not occurred. The manner in which centralized or decentralized decision-making affects the capital expenditure process was discussed in detail. It was concluded that the optimal organizational design for this process is neither highly centralized nor highly decentralized within a particular type of structure; rather the optimum design is in a "combination" of these. A "combination", however,

based on a fixed size of investment, places a limiting parameter on the capital expenditure process.

3. <u>The administrative processes utilized within the framework of the primary objective and the organizational structure to perform the following activities relative to the capital expenditure process</u>:

   a. Search for investment proposals. Contrary to popular belief, the origination of proposals receive no special stimulation in most enterprises. Search activity in the capital expenditure process is primarily dependent on the difficulty encountered by the decision-maker in discovering and choosing satisfactory alternatives; and ample opportunities for capital expenditures result from the normal manner of doing business.

   b. Evaluation of the opportunities. The primary elements affecting the evaluation of a capital expenditure proposal were presented.

   c. Choice of alternative. The primary elements affecting the choice of a capital expenditure proposal were presented.

   d. Implementation of the selected proposals. The traditional line-staff relationship tends to divorce planning and implementation. This relationship depends on administrative procedures as a means of coordination and control. For the capital expenditure process to function in an optimum manner, however, an organizational structure must be designed

which will integrate planning and operations so that one reinforces the other.

e. Follow-up on the implemented proposals. Why the postaudit, what to postaudit, and who performs the postaudit was discussed. If the capital expenditure process is to function in an effective manner, a postaudit of estimates is necessary so that knowledge can be gained through information-feedback.

Thus the characteristics resulting from the manner in which an enterprise increases in size, the organizational structure, and administrative processes are the major parameters that affect planning, implementation, and verification in the capital expenditure process.

It seems obvious that these parameters, numerous and complex as they are, must be explicitly considered if an enterprise is to have an effective and efficient capital expenditure process. A significant amount of work remains to be done in dealing with each of these parameters; however, an awareness that they exist and have an impact on decision-making can contribute to improved capital expenditure decisions within an existing capital expenditure process. In the design or redesign of a capital expenditure process, it appears essential that they be considered.

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ABSTRACT OF THESIS ON

SOME PRINCIPAL ORGANIZATIONAL PARAMETERS AFFECTING

THE CAPITAL EXPENDITURE PROCESS

In order to optimally design and utilize any system or process, it is necessary to know the parameters within which the process must function. This thesis developed some of the more important organizational parameters affecting the capital expenditure process.

A primary objective that has operational significance for capital expenditure decision-making purposes was developed. The primary objective was formulated in a framework of uncertainty utilizing the basic characteristics of a closed-loop information-feedback system. Since it was formulated in a framework of uncertainty, it allowed for variation; therefore, the limits of this objective were established. The enterprise damps oscillations in its complex interconnected system of objectives to assure relative stability within the limits of the developed primary objective. The damping methods employed by the enterprise place parameters on the capital expenditure process. The important parameters that were discussed are:

1. The common and unique characteristics that evolve from the pattern in which an enterprise increases in magnitude.
2. The organizational structure that evolves in an effort to plan, coordinate, and control <u>all</u> activities of the enterprise.
3. The administrative processes utilized within the framework of the primary objective and the organizational structure to perform all activities relative to the capital expenditure process.

Although detailed design considerations were beyond the scope of this thesis, it was emphasized that an awareness on the part of the decision-maker that these parameters exist and have an impact on decision-making can contribute to improved capital expenditure decisions within an existing capital expenditure process. In the design or redesign of a capital expenditure process, it appears essential that they be considered.