Studies in Accounting No. 1

CAPITAL–EXPENDITURE PLANNING AND CONTROL

Milton F. Usry

Bureau of Business Research
The University of Texas

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FOREWORD

With the publication of *Capital-Expenditure Planning and Control*, the Bureau of Business Research initiates its Studies in Accounting series. The author of this study, Dr. Milton F. Usry, is a professor of accounting, Oklahoma State University, Stillwater, Oklahoma. The present publication is an adaptation of his doctoral dissertation.

Developed in this study is a conceptual framework surrounding the implementation of a capital-expenditure planning and control program. Supporting the development of the conceptual approach is an extensive field investigation of one of the major oil companies in the United States, Continental Oil Company and its subsidiaries. The Bureau is pleased to be able to publish this correlated study of concept and application in a field for which interest has grown rapidly in recent years.

The manuscript was edited for publication by Mrs. Elizabeth R. Turpin. Other Bureau staff members assisting in the preparation of the copy for publication were Mrs. Juanita Hammons, Mrs. Lois Leonard, Miss Diana Rausch, Mrs. Margaret Smith, and Mrs. Carollin Smyth. Offset printing was done by Robert Dorsett and Daniel Rosas.

JOHN R. STOCKTON
Director

March 1966

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PREFACE

Throughout the course of this project, many individuals and groups assisted in the research investigation and the development of the study.

The writer particularly wishes to acknowledge the help of the many employees of Continental Oil Company and Continental Pipe Line Company who, on every occasion, offered the highest degree of co-operation. Those who were interviewed, many on more than one occasion, have been listed in the bibliography. Special thanks are extended to G. H. Hagle, senior vice-president; to H. W. Blauvelt, controller, who made it possible to do the field research with Continental Oil Company; and to M. M. Browning, budgets coordinator, who acted as liaison in working out the countless arrangements for securing information.

This study was made possible by a fellowship from the Arthur Andersen & Company Foundation. The conclusions, opinions, and other statements contained in this publication are those of the writer and not of the Foundation or of any other individual or group, except where quoted or paraphrased material has been identified specifically.

MILTON F. USRY

January 1964

CHAPTER I

BACKGROUND FOR THE STUDY

INTRODUCTION TO THE INVESTIGATION

Need

One of the major problems facing business organizations today is the effective administration of capital expenditures. Since such expenditures involve the commitment of resources in the hope of realizing future benefits during a relatively long period, they need to be planned and controlled carefully because (1) their long-term nature involves financial risk, (2) the correction of unwise decisions often involves severe financial penalties, and (3) the decisions made in this area provide the planning and control structure that supports the operating activities of a firm. As a reflection of basic company objectives, capital expenditures thus have a long-term, significant effect on the economic well-being of a firm.

Purpose

The importance of capital expenditures to the present and future economic health of an enterprise emphasizes the need for an effective capital-investment program. The total requirements of such a program are interrelated, from the origin of an idea through the follow-up of results. Consequently, it has been the purpose of this study to formulate these requirements into a framework for the implementation of all of the aspects of an effective program.

There has been, in the past, much attention devoted to the *administration* of capital expenditures, particularly with respect to procedures and to the development and use of techniques for the economic evaluation of proposed expenditures. Despite the existence of this type of managerial activity, there has been no coordinated body of literature covering the topic, primarily because little investigation has been devoted to an

overall approach.[1] Therefore, two methods were used in this study in defining, illustrating, and evaluating the requirements of an effective capital-expenditure planning and control program: (1) an examination of the available literature and (2) a depth field study of one large and complex organization, Continental Oil Company.

On the basis of a series of case studies of specific capital expenditures, the administrative process of implementing the capital-expenditure planning and control program within the selected company was analyzed, and a generalized framework, to be tested further through subsequent research, was proposed for the implementation of such a program.

Scope

Since the total requirements for any effective capital-expenditure program cover a broad area, an exhaustive treatment of each requirement was beyond the scope of this investigation. The field study, which was of a qualitative nature, was so designed as to formulate, illustrate, and evaluate further the requirements of the capital-expenditure program which had been developed from the survey of the literature. However, because of the qualitative approach taken in the field research, no attempt was made to test the generalized framework statistically.

Although it was necessary to disguise some of the data collected in the field research (e.g., names of persons and places, as well as certain of the quantitative information), these minor changes in no way restricted the scope or the effectiveness of the field-study investigation.

Significance

Recognition of the need for an overall approach to the planning and control of capital expenditures was evident in the various sources examined in the course of the literature survey. The following comment by Dean could be taken as representative of this point of view: "Capital budgeting has frequently been the neglected stepchild in the formulation of corporate policy."[2] Walker and Read went a step further: "Some

[1] In the course of the literature study, however, comments by various authors suggested the need for such a study.

[2] Joel Dean, "Capital Expenditures and Return on Investment," an address presented before the Annual Meeting of the National Society for Business Budgeting,

of us who have studied company budgeting policies for a number of years have found over and over again that there is no hard core of settled practice governing decisions on capital expenditures."[3] On the basis of the published literature, there would appear to be a general lack of adequate planning at the top level of management in the coordination of capital expenditures. This lack of coordination, which often results from the use of techniques and procedures that are not a part of an overall plan, only indicates further the need for developing a clearly formulated, comprehensive framework for carrying out a capital-expenditure planning and control program.[4]

EXAMINATION OF THE LITERATURE ON CAPITAL-EXPENDITURE PROGRAMS

Contributions from Published Sources

In the course of the investigation for this study, it was found that there was no coordinated body of literature in the area of capital-expenditure planning and control programs. While there were numerous articles, studies, and chapters found in recent books and periodicals, each covering individual aspects, there was relatively little evidence of any comprehensive framework which attempted to correlate *all* of these requirements for an effective overall program.

Up to the time of this study, apparently, the published sources had dealt either with specific portions of a program or with the sequential program activities having a strong procedural emphasis, such as annual budgets, requests for expenditures, control of construction and other asset-acquisition costs, and the analysis of capital-expenditure results. The topic which received more attention than any other, in the sources examined, concerned the theory and techniques of economic evaluation.

A few authors and associations, however, appeared to have recognized

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May 14–15, 1953, at Milwaukee, Wis.; the paper also was published in the *Annals* section of *Business Budgeting* (1953), p. 28.

[3] Ross G. Walker and Russell B. Read, "Capital Investment Control," in *Planning the Future Strategy of Your Business*, ed. Edward C. Bursk and Dan H. Fenn (New York: McGraw-Hill Book Co., Inc., 1956), p. 85.

[4] W. Freitag, in a book review of *Capital-Expenditure Decisions: How They Are Made in Large Corporations*, by Donald F. Istvan, in "Book Reviews—General," *The Accounting Review*, XXXVII, No. 2 (April 1962), p. 386.

not only the various individual segments of the program but also the importance of the program as a whole.

In 1951, in discussing capital budgeting, Dean recognized the need for dealing with organization for a capital-expenditure program, although he was concerned with it only in an incidental way.[5] In a 1954 article, he gave evidence of more recognition of the total requirements, by listing the following ten components of a capital-expenditure management program:[6]

1. Creative search for profitable opportunities.
2. Long-range capital plans.
3. Short-range capital budget.
4. Measurement of project worth.
5. Screening and selection.
6. Control of authorized outlays.
7. Postmortems.
8. Retirement and disposal.
9. Forms and procedures.
10. Economics of capital budgeting.

Several years later, Brock identified, as follows, eight phases which he considered to be basic to a successful planning and control program:[7]

1. The search for creative ideas for profitable investment.
2. The formulation of long-range overall plans and policies for future development, however tentative, towards which specific capital projects must contribute or with which, at least, they must not be inconsistent.
3. The development of financial forecasts to realize these plans and relate them to the expected financial resources of the company.
4. The development of sound procedures for estimating the cost of the proposed projects and evaluating their economic worth.
5. The screening and selection of specific projects for short-range execution and their integration into authorized capital expenditure programs and budgets.
6. The control of expenditures once a project has been authorized.

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[5] Joel Dean, *Managerial Economics* (Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1951), p. 553.

[6] Joel Dean, "Measuring the Productivity of Capital," in *Administrative Control and Executive Action*, ed. B. C. Lemke and James Don Edwards (Columbus, O.: Charles E. Merrill Books, Inc., 1961), pp. 520, 521–23.

[7] C. H. Brock, "Some Aspects of the Planning and Control of Capital Expenditures," *Cost and Management* (Canada), XXXII, No. 5 (May 1958), p. 184.

7. The post-completion audit of projects.
8. The appraisal of existing assets with a view to the more profitable investment of their realizable value.

At about the same time, Hill offered a total of fifteen aspects, using the life history of a proposal as the expository device:[8]

1. Conception.
2. Formalization.
3. Coordination.
4. Evaluation.
5. Screening and selection.
6. Capital budget formation.
7. Capital budget approval.
8. Project justification.
9. Application for authorization.
10. Unbudgeted project.
11. Authorization.
12. Capital expenditure.
13. Authorization closing.
14. Project performance.
15. Abandonment.

In a 1959 summary of the managerial approach to capital expenditures, the National Association of Accountants placed emphasis on the following four major points in a control program: (1) capital-expenditure budgets, (2) appropriations requests, (3) measurement of expenditures against authorizations, and (4) postcompletion audits or follow-up of realization from expenditures.[9] Along these same lines, a 1963 study of industrial practices grouped its findings, as follows: (1) capital budget, (2) authorization of capital expenditures, (3) financial evaluation of capital projects, (4) control of projects in progress, and (5) postcompletion audits.[10]

These selected comments from well-known writers in the field serve to illustrate the type of aspect identification of a capital-expenditure

[8] Horace G. Hill, Jr., "Capital Expenditure Management," in *Management of Corporate Capital*, ed. Ezra Solomon (Glencoe, Ill.: The Free Press, 1959), pp. 282–87.

[9] "Capital Expenditure Control Program," *N.A.A. Bulletin*, XL, No. 7 (March 1959), p. 4.

[10] Norman E. Pflomm, *Managing Capital Expenditures* (Studies in Business Policy No. 107; New York: National Industrial Conference Board, Inc., 1963), p. 1.

planning and control program offered in published sources. Even among those authors who had recognized a number of the segments of a total program, the emphasis generally was on either economic evaluation or procedural aspects, rather than on the program as a whole. Regardless of how important the various segments may be individually, attention needs to be directed toward a comprehensive framework for an overall capital-expenditure planning and control program which will cover not only these individual requirements but also their interrelationships and the problems of implementation.

Deficiencies in Published Material

The literature survey revealed several generalized deficiencies in the concepts surrounding capital expenditures, including the following: (1) identification of the total requirements of an effective program, (2) analysis of the interrelationships of these requirements, and (3) treatment of the problems of implementation of the total requirements of a program. In the course of the survey, it was found that the published source material also had failed to cover a number of the more specific aspects, including the following:

1. The relationships of the capital-expenditure program to the objectives, policies, and organizational theory and practices of the company often are poorly formulated.
2. There are always practical problems of implementation of theory and techniques, especially regarding the evaluation and follow-up activities in such a program. Implementation is affected materially by cost, time, and data limitations; the size and organization of the enterprise under consideration; and the nature and significance of specific capital expenditures.
3. The permeating and continuous nature of the nonsequential activities of screening, coordination, formalization, and evaluation should be stressed. There is an erroneous tendency to view evaluation and screening as being of a sequential nature.
4. A significant manifestation of the failure to recognize the interrelationships of framework requirements lies in the neglect of emphasis of the coordination activity, both as to the total program and as to specific capital investments. The question of who should perform the particular coordination activities is also worthy of further attention.

5. Treatment of the formalization activity has tended to neglect the contrast of routine and nonroutine capital projects, with respect to the degree of formal procedures, forms, and guidelines that can, and should be, spelled out. The notion of the process of formalizing (i.e., crystallizing) specific projects also should be stressed.
6. There appears to be some treatment of the importance of the tie of the periodic capital budget to long-range plans. However, an indicated lack of implementation suggests the need for further study.
7. The structuring and utilization of the accounting-information system, especially in the activities of in-process control and follow-up, appear to be areas in which much remains to be done.

While this listing is not all-inclusive, it should help to point up numerous areas in the literature which seem to be incomplete and warrant further research. In the four case studies which have been analyzed in several later chapters, various segments of Continental Oil Company's organizational structure have been examined in the light of a variety of routine and nonroutine capital expenditures. In these chapters, not only have the methods and activities been chronicled, but also the administrative philosophy governing these procedures has been evaluated in relation to the individual components of the model framework for a capital-expenditure planning and control program. Areas for additional research which were suggested in the course of this study have been listed in Appendix A.

Definitions Selected for the Current Study

Since some overlap in terminology was noted in the course of the literature study and the field survey, a few of the terms used frequently throughout the current study have been defined in the following paragraphs:

Framework. In this study, the term "framework" refers to the total requirements of an effective capital-expenditure planning and control program. Therefore, the terms "program," "administrative process," "structure," and "system," as used in the context of a capital-expenditure planning and control program, should be considered as synonymous with the term "framework."

Implementation. The term "implementation" in this study refers to the act of placing in motion and carrying out *all* of the requirements comprising the framework.

Capital Expenditures. The term "capital expenditures," as defined through Bierman and Smidt's interpretation of "investments," in this study includes "commitments of resources, made in the hope of realizing benefits that are expected to occur over a reasonably long future period of time."[11] In view of this generalized definition, the terms "capital expenditures," "capital investments," and "investments" all could be considered as interchangeable in this study.

Planning [Strategic Planning]. Any explanation of planning developed for this study should include the concept of "strategic planning." Sweet set forth the following generalized definition which was considered applicable here: "Strategic planning is a three-stage management function for achieving short-, intermediate-, and long-range goals."[12] Sweet also described the three basic stages in such planning as (1) preparation, (2) initiation, and (3) continuation.[13]

Control. In defining the term "control," Humble emphasized the essential interrelationship of strategic controlling to strategic planning, and cited the following four phases of control action as being particularly important: (1) evaluation of proposed courses of action, (2) appraisal of the continued soundness of planned strategies, (3) measurement of current performance, and (4) criteria to govern preventive and corrective control action.[14]

Program. The term "program" refers to the capital-expenditure framework as defined above. After the framework is in use, however, the term "program" includes also the summation at any given point in time of all capital-expenditure decisions or anticipated decisions, at varying stages of development, as they exist in the framework.

Continental Oil Company. Since the field research was confined to a depth study of the capital-expenditure planning and control program of Continental Oil Company, informal terms of reference have been employed in lieu of the company's full name. Those most commonly used have been "Continental," "Conoco," or simply "the company."

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[11] Harold Bierman, Jr., and Seymour Smidt, *The Capital Budgeting Decision* (New York: The Macmillan Co., 1960), p. 3.

[12] Franklyn H. Sweet, *Strategic Planning . . . A Conceptual Study* (Austin: Bureau of Business Research, The University of Texas, 1964), p. 132.

[13] *Ibid.*

[14] Thomas N. Humble, *Standards in Strategic Planning and Control . . . A Conceptual Study* (Austin: Bureau of Business Research, The University of Texas, 1966 [in press]).

METHODOLOGY AND APPROACH TO THE FIELD RESEARCH

In this study, the evaluation of the requirements for a capital-expenditure planning and control program considered both the design and implementation of such a program. In addition to defining more clearly the various aspects developed through the literature search, the detailed field research based on Continental Oil Company examined closely the interrelationship of the various components as parts of an overall framework. This depth study of the capital-expenditure program of a large and complex firm analyzed four capital expenditures of varying types and degrees of complexity. In addition to a description of the activities involved, an analysis of the administrative processes was made. The methods of securing the information needed in the course of the field research included the following: (1) a study of applicable company material (bulletins, forms, reports, organizational charts, and subject files), in order to collect part of the data needed for the case studies, and (2) interviews with personnel at all organizational levels in pertinent departments of the company.

An examination of the basic management organization as reflected in company materials was necessary to show the development of the firm's capital-expenditure program, since the design and implementation aspects of such a program would, in general, be affected significantly by the formal structure of the organization of which the program was a part. While the research was built around the formal organizational relationships, it was found that there were many informal relationships and singular characteristics of the individuals in the various management positions which had a bearing on how the organization actually operated.

Much of the information on the informal personnel relationships was secured through the many interviews with Continental's personnel. These interviews supplemented the other company source material, not only providing a thorough orientation but also aiding in the collection of detailed information regarding the organization of the company, the administration of its capital-expenditure program, and the selected case studies. In all, there were 44 Continental Oil Company employees interviewed, many of them on more than one occasion. For 36 of these participants, the interviews were tape-recorded and transcribed verbatim. For the other 8, the interviewer made notes regarding the content

TABLE 1

TYPES AND LEVELS OF CONTINENTAL OIL COMPANY PERSONNEL INTERVIEWED

Department	Organizational level of personnel interviewed				
	Headquarters			Region	
	Management	Technical	Nontechnical	Management	Nontechnical
Exploration	1	0	0	0	0
Production	2	0	2	1	1
Transportation and Supplies	2	0	0	n.a.	n.a.
Manufacturing and Engineering[a]	3	4	0	0	1
Marketing	3	0	2	1	1
Research and Petrochemical	1	0	0	0	0
Controller	4	0	3	n.a.	n.a.
Coordinating and Planning	1	2	0	n.a.	n.a.
Organization and Management Development	1	0	0	n.a.	n.a.
Treasury	1	0	0	n.a.	n.a.
Executive Management	1	0	0	n.a.	n.a.
Total number of personnel interviewed	20	6	7	2	3

[a]The Engineering Department was a unit of the Manufacturing Department and reported to the vice-president in charge of the Manufacturing Department. The Engineering Department's work was related primarily to the manufacturing and the petrochemical functions; other operating departments maintained separate engineering staffs.

of the interviews. In Table 1, the interviewees have been classified by department, organizational level, and position. These personnel represented all levels in all operating departments and in pertinent service departments. The positions held by the interviewees were classified as management, technical, and nontechnical. In some cases, the departments represented had no counterpart elsewhere in the company. Even though a manager was in a technical or nontechnical area, he was, nevertheless, classified under the management category. While a basic pattern of interview questions was used in discussing major points with the various personnel, the discussion was so guided as to leave the interviewees free to talk about whatever points were of particular importance to them.

TABLE 1 (CONTINUED)

Organizational level of personnel interviewed					
Division			District		
Management	Technical	Nontechnical	Management	Nontechnical	Total
1	0	0	n.a.	n.a.	2
1	1	1	0	1	10
n.a.	n.a.	n.a.	n.a.	n.a.	2
n.a.	n.a.	n.a.	n.a.	n.a.	8
0	0	0	1	0	8
n.a.	n.a.	n.a.	n.a.	n.a.	1
n.a.	n.a.	n.a.	n.a.	n.a.	7
n.a.	n.a.	n.a.	n.a.	n.a.	3
n.a.	n.a.	n.a.	n.a.	n.a.	1
n.a.	n.a.	n.a.	n.a.	n.a.	1
n.a.	n.a.	n.a.	n.a.	n.a.	1
2	1	1	1	1	44

n.a. = not available; personnel could not be interviewed because no formal organization existed for this department at this level.

MANAGEMENT ORGANIZATION OF CONTINENTAL OIL COMPANY

Overall Company Organization

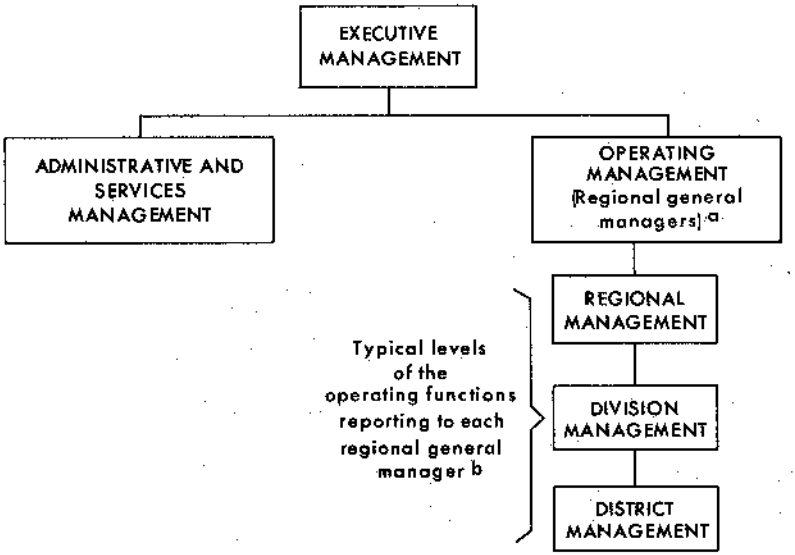
Continental Oil was an integrated oil company with global and domestic operations, and it had yielded a continuing profitable picture in a highly competitive industry.[15] The overall company's management organization consisted of the following:[16] (1) Executive Management,

[15] An integrated oil company is one which carries on a full range of activities (i.e., exploration, production, transportation, refining, and marketing operations).

[16] In February 1963, the basic organizational structure was summarized as shown in Exhibit 1, based on the full management diagram shown in Exhibit 2.

EXHIBIT 1

SUMMARY OF MANAGEMENT ORGANIZATION, CONTINENTAL OIL COMPANY, FEBRUARY 1963



[a] The regions were geographical units.

[b] Operating functions included exploration, production, manufacturing, and marketing.

Source: Adapted from a February 1963 management-organization diagram, Continental Oil Company, Houston.

(2) Administrative and Services Management, and (3) Operating Management. Throughout the Continental organization, there was a pervading philosophy of decentralization of operating authority (i.e., the placing of authority at the lowest feasible level).[17]

Beginning about 1948, there had been a continuing movement in the company away from a highly centralized operating authority toward a decentralized one, although, at the same time, it was recognized that certain policies and controls would have to be centralized.[18] As one of the company publications pointed out, "Authority is passed down to each level of supervision to permit the handling of most of the day-to-day problems that arise within that geographic area."[19] However, it was the company's policy to stress the concept of authority limitation rather than that of authority delegation. In other words, a manager at any given level was free to "run his shop" as he saw fit within the framework of the authority limitations assigned him. Top-level management expected a manager to act on his own initiative on any problem clearly within his own authority. Otherwise, he was to inform his supervisor or discuss a situation with the appropriate executive personnel. If the problem was related to other regions or other departments,[20] then it was also necessary

[17] Davis has commented that "a decision should be made at the lowest level in the organization that has the requisite competence, authority, and prestige." (See R. C. Davis, *The Fundamentals of Top Management* [New York: Harper & Bros., Pub., 1951], p. 307.) Although decentralization of authority can serve to facilitate the performance of the activities of the organization, Koontz and O'Donnell have observed that "there is a danger that decentralization of authority may become such a fetish as to cause top managers to overlook the importance of centralization of certain policies and controls." (See Harold Koontz and Cyril O'Donnell, *Principles of Management* [New York: McGraw-Hill Book Co., Inc., 1955], p. 282.) The individual position to which authority is delegated must assume a responsibility or accountability to the higher level for the performance of duties. The higher level (the delegating level) should establish the controls necessary to assure that delegated authority is exercised in accordance with prescribed policies.

[18] For example, in April 1963, Continental's movement toward decentralized authority was advanced by the Southern Region's decision to permit the approval at the division level of authorizations for expenditures for budgeted, allocated drilling wells. This approval previously had been retained at the regional level.

[19] Continental Oil Company, *Conoco Organization and Functions* ([mimeographed]; Houston, September 10, 1962), p. 7.

[20] Continental Oil Company, *Conoco's Philosophy of Management* ([mimeographed]; Houston, January 1960), p. 11.

to obtain their concurrence. This coordination of problems of a multi-department and/or multiregion nature was considered important at Continental Oil Company, and one of the main points developed in the case studies for this investigation concerned the implementation problems which were caused by the complexity of these interrelationships.

Executive Management

As shown in Exhibit 2, the Executive Management group at Continental consisted of the president and the six vice-presidents reporting directly to him. The top executive in each Administrative and Services Management department and in each Operating Management segment reported to one of these vice-presidents or directly to the president (see Exhibit 2 for the respective area responsibilities).

The members of Executive Management devoted their attention to broad managerial functions and were not preoccupied with routine administrative and operating details. A company publication described these personnel as follows: "From this group are born the ideals of the company, which, when combined with the ideas of how to achieve them evolved by the Administrative and Services group, form the basis of action by the Operating group."[21]

Executive Management functioned primarily as a unit, with both formal and informal group deliberation generally being employed for important decisions. The formal aspect was manifested in the Management Executive Committee, which was composed of the president as chairman, the executive vice-president as vice-chairman, the executive assistant to the president as executive secretary, and the senior vice-presidents as members. Although this committee assisted in developing top-level decisions, it had no authority or responsibility to issue instructions. The line authority to issue such orders rested with the individual member of Executive Management in his relationship to the managers of activities who reported to him. Similarly, the manager of each activity was directly accountable to a designated member of Executive Management.

Administrative and Services Management

Commonly referred to as the "Headquarters Group," the Administrative and Services Management group had as its prime function (see

[21] Continental Oil Company, *Conoco Organization and Functions*, pp. 3–4.

Exhibit 2) the determination of what must be done within particular spheres of activity to achieve overall company goals. Each department had one main area of activity (e.g., production, marketing, law, tax, industrial and personnel relations, etc.). All of these departments formulated their own plans, procedures, programs, and controls, which, when approved and put into effect by Executive Management, constituted the basis for action by Operating Management. In addition to the "formulation" function, each department had the task of reviewing, checking, appraising, and offering constructive criticism covering the various company-wide practices with which a particular department was concerned. Here again, though, the line channel was through Executive Management.

Both the domestic and the international Operating and Coordinating committees were established as one means of implementing the free exchange of information within the Administrative and Services Management group. The committees, which met weekly, each had as chairman a senior vice-president, who was also a member of the Management Executive Committee. This arrangement afforded a major link between the latter committee and the two Operating and Coordinating committees. The other members of the committees were heads of the various Administrative and Services departments, with four of these individuals serving on both the domestic and the international committees:

Manager—Public Affairs and Public Relations.
Treasurer—Treasury Department.
Manager—Coordinating and Planning Department.
General Manager—Research Department and Petrochemical Department.

It was the function of these committees purely to advise, study, and review. One of their main tasks was the coordination of the various Administrative and Services departments, although it was stressed that the committees were not to usurp responsibilities and authorities of these various departments.

Operating Management

The Operating Management segment of the organization was responsible for the execution of operating plans and programs. It was

EXHIBIT 2

MANAGEMENT ORGANIZATION, CONTINENTAL OIL COMPANY, FEBRUARY 1963

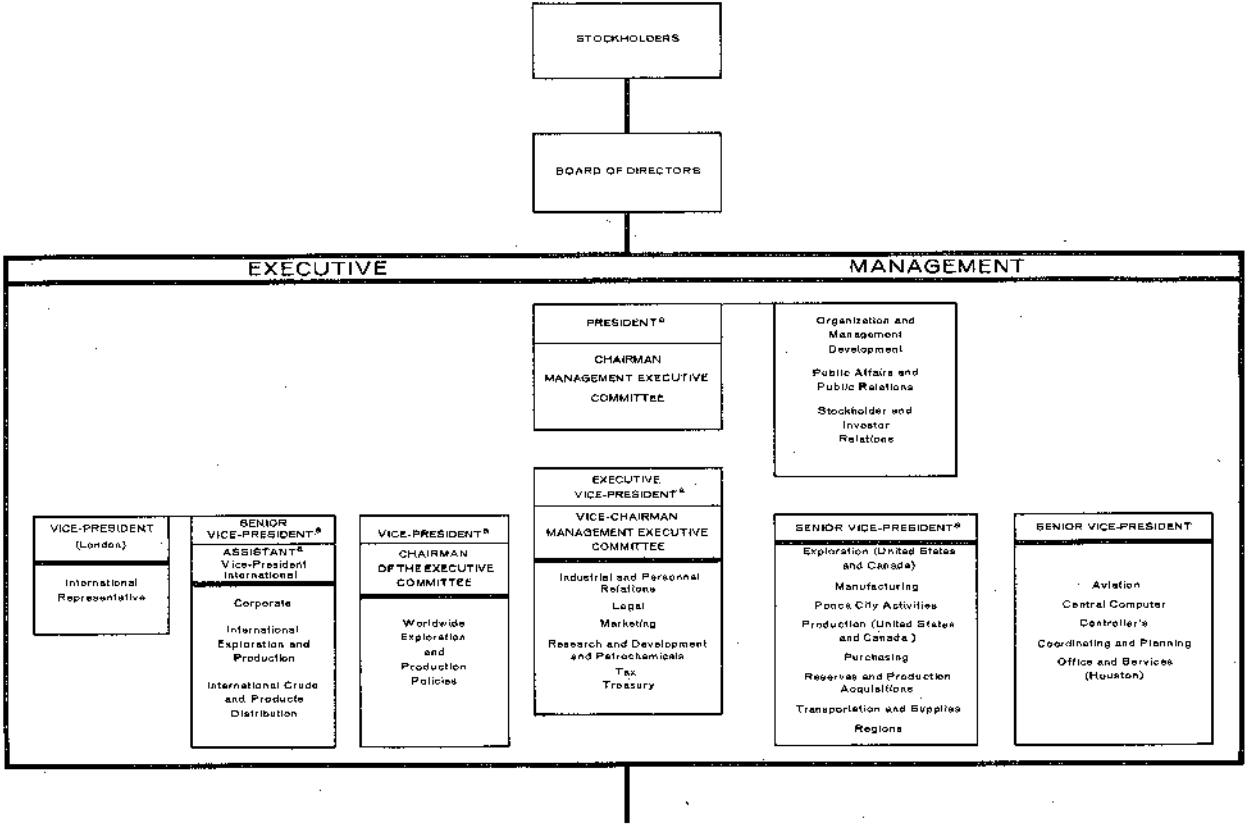
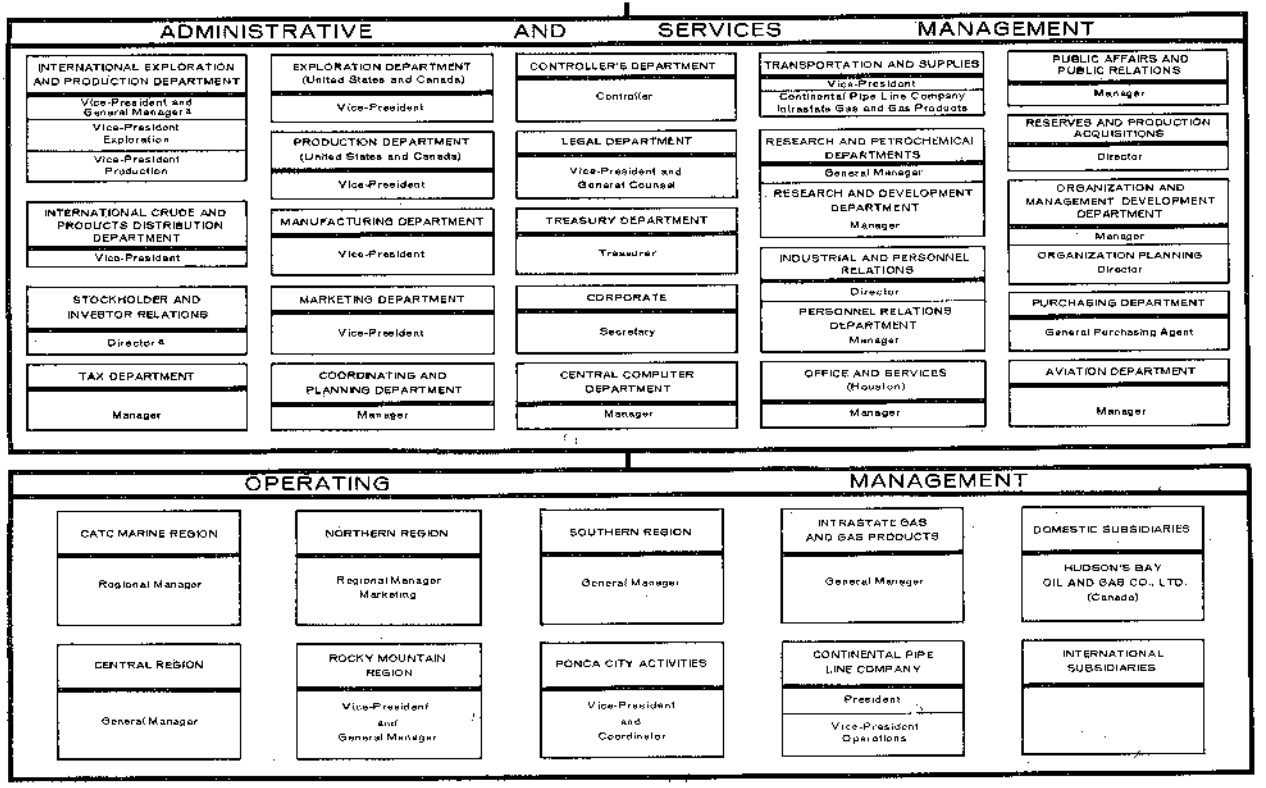


EXHIBIT 2 (CONTINUED)



Source: Adapted from a February 1963 management-organization chart, Continental Oil Company, Houston.

composed primarily of a group of regional general managers, each of whom had line authority over, and responsibility for, activities within a prescribed geographic region. The management of each affiliate was similar in its organization, with each operating manager having a line superior at the Executive Management level. For the regional general managers, the line superior was a senior vice-president. However, Administrative and Services Management did not have a line relationship with Operating Management, except for the functional authority delegated to them by Executive Management. For operating managers, the duties were basically "to take action on broad instructions of the Executive Management within the policies, programs, and procedures developed by the Administrative and Services Management and approved by the Executive Management."[22]

Each region served as a focal point for the coordination of its own overall activities. As can be seen in Exhibit 3, the typical region had regional managers for all of the operating activities (i.e., exploration, production, manufacturing, and marketing), and for the service activities (e.g., transportation, law, industrial and personnel relations, and land acquisition). These managers, who reported to the regional general manager as their line superior, also served as members of a Regional Advisory Committee, which planned overall regional activities and served as a vehicle for the exchange of ideas and information within the region.

Because of the complexity of operations and the size and geographic dispersion of the company, a considerable amount of liaison was needed among the regional managers of the various functions, the headquarters department managers, and the regional general manager. This need was especially important in cases of direct functional relationships, such as those developing among the regional operating managers of the four functional areas (exploration, production, manufacturing, and marketing) and the corresponding vice-presidents representing the various functions under Administrative and Services Management.

The operating structure for each function was subdivided further, with the extent varying with the different functions:[23]

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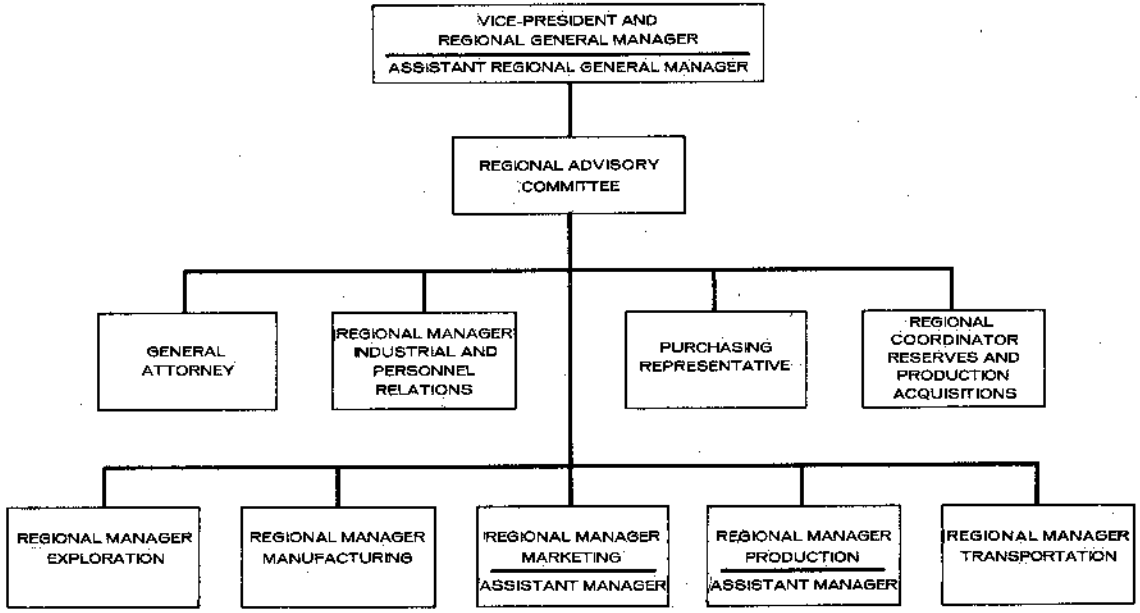
[22] *Ibid.*, p. 6.

[23] There were some exceptions, however. The Ponca City Refinery, for example, was not regionalized but reported directly to the Manufacturing Department headquarters.

Exhibit 3

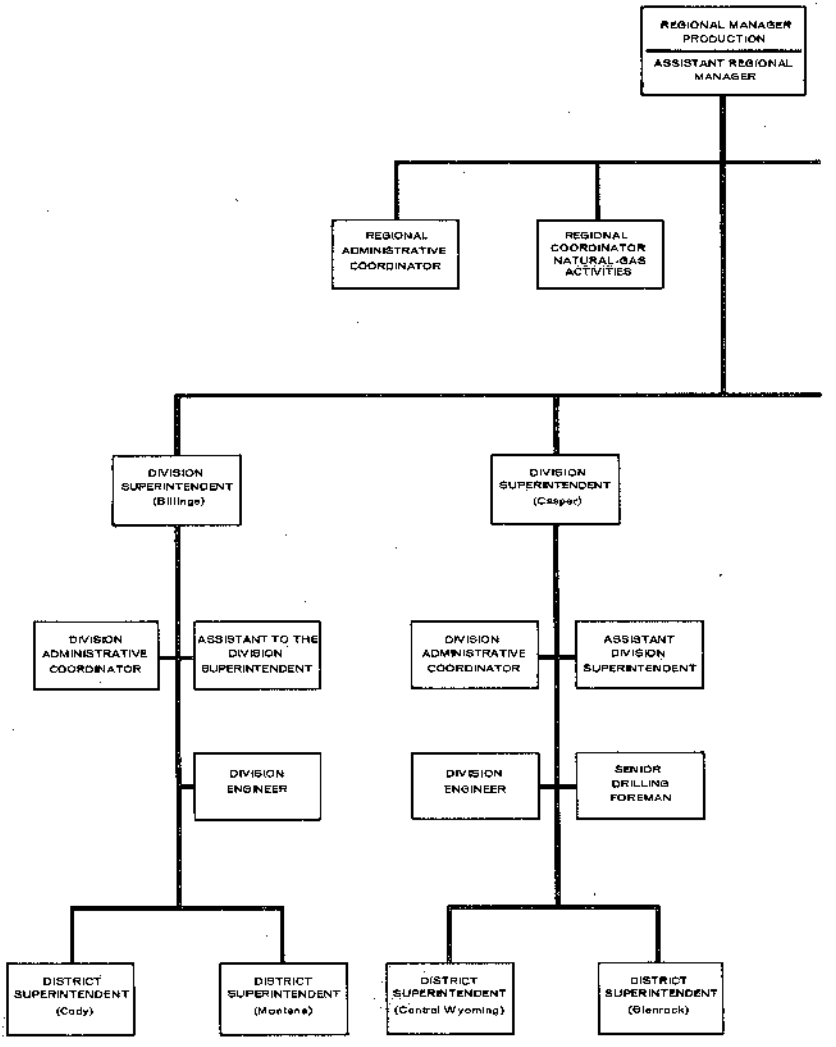
MANAGEMENT ORGANIZATION, ROCKY MOUNTAIN REGION, CONTINENTAL OIL COMPANY, NOVEMBER 1962



Source: Adapted from a November 1962 management-organization chart, Continental Oil Company, Houston.

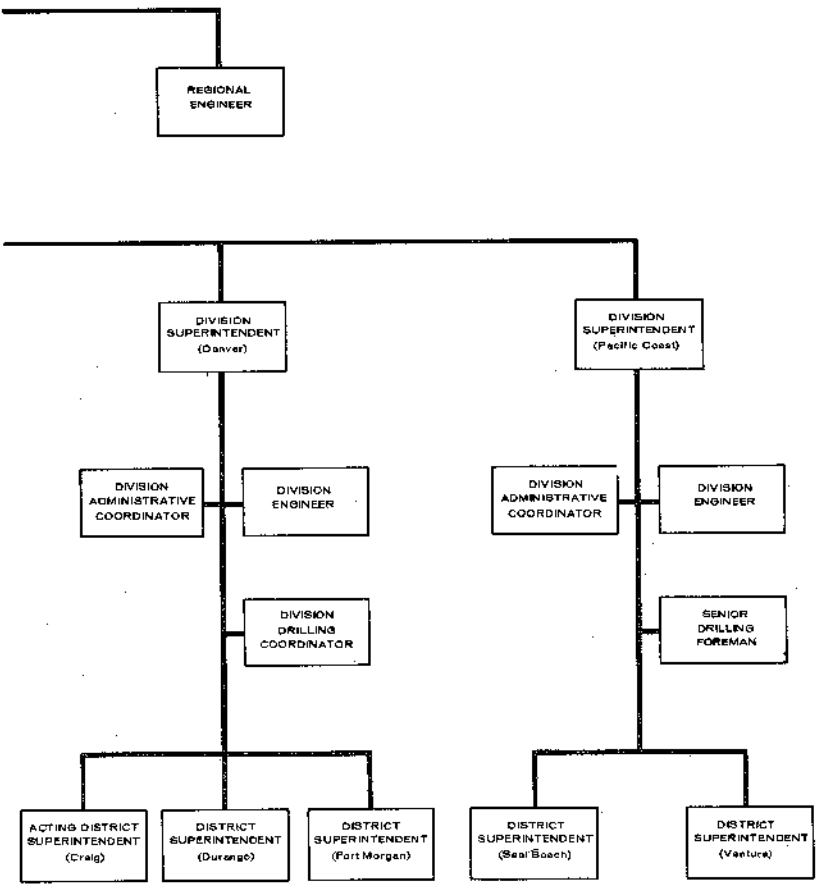
EXHIBIT 4

MANAGEMENT ORGANIZATION, PRODUCTION DEPARTMENT, ROCKY MOUNTAIN REGION, CONTINENTAL OIL COMPANY, NOVEMBER 1962



Source: Adapted from a November 1962 management-organization chart, Continental Oil Company, Houston.

Exhibit 4 (Continued)



Function	*Subdivisions*
Exploration	Divisions
Production	Divisions, districts, and areas
Manufacturing	Plants
Marketing	Divisions and districts

As an illustration of the typical breakdown within an operating function, an organizational chart of the Rocky Mountain Region Production Department (as of November 1962) has been included as Exhibit 4. This department was headed by a regional manager who reported to the regional general manager of the Rocky Mountain Region. Reporting to the regional production manager was an assistant regional manager and a staff group consisting of a regional administrative coordinator, a regional coordinator of natural-gas activities, and a regional engineer. The region was subdivided into four divisions, each headed by a division superintendent reporting to the regional production manager. All of the divisions had two staff members, a division engineer and a division administrative coordinator. Two of the divisions had assistant superintendents, and three had either a senior drilling foreman or a drilling coordinator. Each division then was divided further into districts.

Although not illustrated in Exhibit 4, a typical district included on its staff a district administrative coordinator, a drilling foreman, and a district engineer. The district also might be divided, for production purposes, into individual areas headed by a production foreman who supervised the roustabouts, pumpers, and operators in his unit.

Each of the positions mentioned in the preceding discussion was supported by staffs of assistants when warranted by the size of the task.

In the chapter which follows, a generalized framework of concepts needed for the effective implementation of a capital-expenditure planning and control program has been developed to incorporate the findings of both the literature investigation and the field research on Continental Oil Company. The framework then has been tested in four specific case studies of the company's capital-expenditure program (see Chapters III–VI).

CHAPTER II

DEVELOPMENT OF THE GENERAL FRAMEWORK FOR A CAPITAL-EXPENDITURE PLANNING AND CONTROL PROGRAM

In this study, a practical approach to evaluating the various factors necessary for a sound capital-expenditure planning and control program was developed from two points of view: (1) a thorough study of the available literature and (2) a detailed study of a large and complex industrial company. The basic components gathered from a study of the literature were assembled into a tentative framework (as shown in Exhibit 5). This grouping then was tested, evaluated, and refined on the basis of the field research, and those aspects of the basic components which were missing from, or not emphasized in, the literature were added.

In the following discussion, the basic components of an overall capital-expenditure planning and control program are outlined, and, as presented, the resulting framework is the product of both the literature search and the field study. The four individual case studies of various segments of Continental Oil Company's capital-expenditure planning and control program in the following chapters serve to illustrate various applications of such a framework.

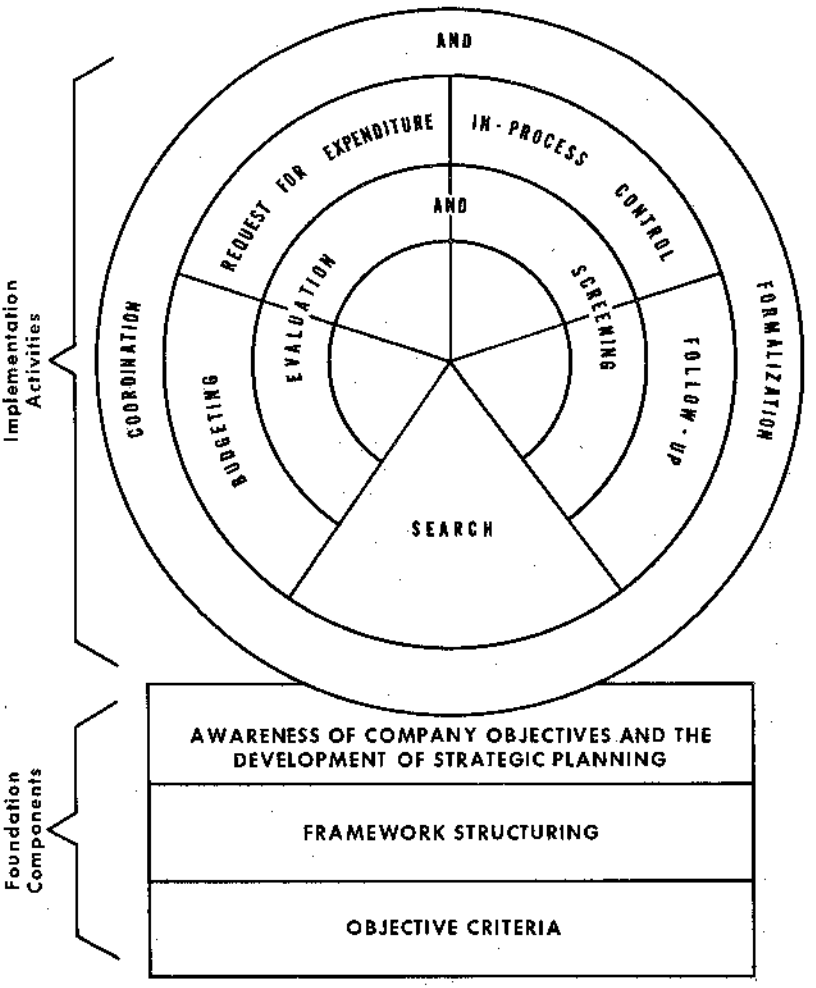
MAJOR SEGMENTS IN THE OVERALL FRAMEWORK

The general framework for the implementation of a capital-expenditure planning and control program was developed from twelve major segments classified under the two major groupings of (1) foundation components and (2) implementation activities. (A schematic representation is shown in Exhibit 5.)

The three foundation components upon which implementation activities should be built are: (1) awareness of company objectives and the development of strategic planning, (2) framework structuring, and (3)

Exhibit 5

FRAMEWORK FOR THE IMPLEMENTATION OF A CAPITAL-EXPENDITURE PLANNING AND CONTROL PROGRAM



objective criteria. Their development within a company will be dependent upon the degree to which a capital-expenditure planning and control program has been established within the firm. However, the recognition and evaluation of these components continue to be necessary in order to provide a sound basis and a proper perspective for implementation activities.

Of the nine separate implementation activities which have been identified, the following five are sequential: (1) search, (2) budgeting, (3) request for expenditure, (4) in-process control, and (5) follow-up. The remaining four activities, which tend to permeate the others, are: (1) coordination, (2) formalization, (3) evaluation, and (4) screening. Being nonsequential in nature, these last four activities may occur in any order, either singly or simultaneously. Coordination and formalization affect all other implementation activities, governing the entire program from the time that an idea is born until either it has been discarded or the project has been completed satisfactorily and placed in operation. Evaluation and screening apply to the sequential activities in the development of a project once it has been identified via the search activity and placed in the implementation cycle.

The basic framework should facilitate implementation of all the capital expenditures of an organization. The relationship between the total program and individual projects should be based on the fact that the entire capital-expenditure program of an enterprise at any point is the sum of all the capital-expenditure decisions, or anticipated decisions, at varying stages of development. Recognition of each project as a part of the total program, then, is essential in order to obtain a desirable balance and unity of direction in the total capital-expenditure program of an organization.

FOUNDATION COMPONENTS

Awareness of Company Objectives and the Development of Strategic Planning

Basic Approach. There must be a body of well-formulated broad objectives and detailed guidelines for a firm's entire organization and for the functions that comprise the total program. This requirement must be applied if a capital-expenditure program is to support progress toward the achievement of objectives. Such objectives may include both eco-

nomic and noneconomic factors, although the economic ones are needed for making capital-investment decisions in the economic sense.

While carefully formulated objectives are essential if a firm is to be successful, formulation alone is not sufficient. All levels of an organization must be conscious of the formulated objectives insofar as performance is affected at any given level. In addition, if stated objectives are to be achieved, plans must be made and carried out on the basis of such objectives, and this pattern is at the very heart of the overall management of any organization.

How well an organization plans, on the basis of objectives, can be observed in the area of capital-expenditure management. Since objectives and plans should complement one another, individual capital expenditures should not be made in a vacuum. In other words, each capital investment should be consistent with, and should support, the overall objectives and the resulting short-range and long-range strategic plans.[1]

Various organizational levels play different roles in connection with this component. Ideally, top management sets broad objectives; functional activities then develop specific policies and programs for action which, when approved, are executed by the operating levels of management. Thus, all levels of an organization need to be conscious of the firm's objectives.

Such consciousness in an organization requires good communication. The lower the level at which an expenditure is formulated and/or a decision is authorized to be made, the greater the need for specific guidelines. These should go all the way to the point of detailed procedures and standards of implementation and should cover such areas as "sales, costs, expansion, and competition, which top management wishes to have incorporated into expenditure plans for the budget period."[2] Projects not conducive to such detail require handling at a higher level. Such procedures are necessary in order to preclude major policy decisions being made at lower levels, although feedback from these levels should be considered in the revision of policies and procedures. On the other hand, a program would be in constant danger of bogging down if top management should persist in handling routine

[1] For a treatment of the general subject of strategic planning, see Franklyn H. Sweet, *Strategic Planning . . . A Conceptual Study* (Austin: Bureau of Business Research, The University of Texas, 1964).

[2] John B. Matthews, Jr., "How to Administer Capital Spending," *Harvard Business Review*, XXXVII, No. 2 (March–April 1959), p. 88.

matters that could be delegated to the company's lower echelons.

Individual projects ought to (1) be consistent with objectives, (2) be capable of blending into the operations of a firm, and (3) reflect a company's best interest. Projects that involve relatively large investments and that affect more than one operating function are strategic and have a significant impact upon a company's future. Smaller individual projects, though minor, when considered in groups, often have a significant impact. Thus, each expenditure must be viewed in its proper perspective with a firm's total program.[3]

Field Application. At Continental Oil Company, the management personnel and the various company publications indicated there were four core goals fundamental to the company's entire operations. The following statement of these objectives, while not all-inclusive, reveals Continental's general philosophy of operations:[4]

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[3] Even though a project may look desirable, if it is not compatible with basic guidelines, it may, in the long run, be delcterious. Several illustrations of such situations can be cited:

1. A decision to open a retail outlet which would compete with customers who purchase merchandise at wholesale from the firm might be profitable of itself but undesirable when the possible reaction of wholesale customers was considered.
2. Investment in cheaper manufacturing equipment might offer a higher profit in the present, but it might yield an inferior product, which could cause the loss of customers to the point that the long-run aggregate effect would be negative.
3. A project might appear profitable when viewed as a separate entity. However, related projects that also would have to be carried out should be included in such an evaluation (e.g., a plant expansion might necessitate an expansion of certain other plant service facilities). When all of the related projects were viewed as one consolidated project, the total effect could be marginal or even undesirable.
4. Also, the problem of balanced facilities must be considered. Increased capacity of one component in an assembly line would be pointless if the subsequent steps simply bottlenecked the added capacity.

[4] Continental Oil Company, *Conoco's Philosophy of Management* ([mimeographed]; Houston, January 1960), pp. 1–2. Consistent with this pattern of objectives, Chamberlain has observed: "Recent literature has emphasized that the modern corporation operates with multiple goals, of which profit is only one. . . . The firm, therefore, must operate with a rainbow of objectives which includes but is not limited to profit." Chamberlain continued, however, by noting that "most organizations, like people, have multiple goals, but it is precisely for this reason that it is important to identify the distinctive and distinguishing objectives. In the case of the business firm, there can be no doubt that this is the drive for profit. . . . The spread of budgeting in the business world has helped to reestablish and clarify the importance of the profit objective." (See Neil W. Chamberlain, *The Firm: Micro-*

1. To develop in our management organization a group of individuals who will command respect, not only for their business ability but also for their qualities as people, that is, individuals who have a high standard of integrity and fairness and a true sense of humanity in their dealings with others.
2. To so conduct our affairs that we shall always merit the confidence and trust of the public, the government, and other members of the oil industry.
3. To develop throughout our organization a high level of managerial competence in order that we may realize the maximum possible profits, consistent with our other objectives, from the facilities, capital funds, and opportunities which are at our disposal.
4. To discharge our joint responsibilities to our stockholders, our employees, and our customers in such a way that the maximum possible benefits will accrue to each group.

These company objectives, although important, need to be defined more specifically in terms of the profit objective, in order for them to be suitable for use in the formulation of capital-investment decisions, particularly in the economic sense. Evidence of this more specific refinement of the profit objective on the part of Continental's management was found in other company documents and practices. For example, management personnel had computed the cost of capital and had suggested a "normally expected level of return" for investments in various types of facilities. The company also had made the following assumption as to the type and area of operations: "We are an integrated oil company with a major interest in domestic operations but moving into the international area."[5] The management group had further defined the concentration of domestic marketing activity as an area of twenty-eight states. These definitions, and a myriad of more specific objectives and guidelines, had been established as the basis for planning Continental's capital expenditures.

The various organizational levels played vital, but different, roles in the formulation of objectives and guidelines and in the planning and execution activities designed for their achievement. The members of the executive management group had devoted their attention to broad functions, major decisions, broad guidelines, and ideals of the company.

Economic Planning and Action [New York: McGraw-Hill Book Co., Inc., 1962], p. 51.)

[5] Continental Oil Company, *Conoco Organization and Functions* ([mimeographed]; Houston, September 10, 1962), p. 2.

Each Administrative and Services Management department had performed the function of determining what had to be done within its particular sphere of activity in order to achieve these basic objectives already outlined for them. Then, each of these departments had spelled out additional guidelines for itself, usually in the areas of investment philosophy and criteria.[6] Within the functional compartments of a region, then, still further guidelines were developed,[7] but, at every level, the importance of the consistency and appropriate approval of specific guidelines and broad objectives was stressed. Management recognized that formulation must be followed by clear communication (both written and oral) to all levels which would be affected.

For Continental, the guidelines at the various levels were for long-range planning and for the preparation of the budget for a specific year. These objectives were not intended to dictate operation; rather, they were to serve as a frame of reference in which to work. Often, they were influenced significantly by the feedback from lower echelons, and top-management personnel were careful not to stifle the generation of proposals from the subordinate levels. Indeed, it was found that the lowest subsections of the organization had initiated the major portion of the company's projects.

Basically, Continental's management intended that all of the individual investment proposals forming the detail of both short-range (annual-budget) and long-range capital-expenditure plans should be consistent with both the overall existing broad objectives and specific guidelines.

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[6] For example, the Marketing Department might have communicated a desire to stress the upgrading of existing service-station locations as opposed to increasing the rate of investment in new locations.

[7] As an illustration, the regional exploration manager in the Southern Region might have felt that, in the Midland Divison, more emphasis should be placed on investments in dry-hole contribution agreements, as opposed to the drilling of exploratory wells. Smith and Brock explained the term, "dry-hole agreements," as follows: "Dry-hole agreements are often entered into when an operator plans to drill in a wildcat [unexplored] area. He obtains a commitment from owners of leases on nearby properties to pay him a specified sum of money if the well is found to be commercially unproductive. . . . The benefits to the contributor are readily apparent since he gets the area tested for production without incurring the full cost of drilling operations and also receives cores and results of analyses during the operation." (See C. Aubrey Smith and Horace R. Brock, *Accounting for Oil and Gas Producers* [Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1959], p. 124.)

Framework Structuring

Basic Approach. It will be found that, in effect, all firms have a framework for capital-investment implementation, either by design or by default. In other words, decisions are made to invest or not to invest; to invest profitably or unprofitably; and to invest in a manner that will contribute to, or detract from, the achievement of a company's objectives. Thus, an organization's established capital-expenditure framework forms the basis for the implementation of that organization's capital-expenditure program. However, it is not sufficient to have just any framework for carrying out a capital-expenditure planning and control program.

The framework exists within, and is affected by, the overall organizational structure of an enterprise. Naturally, both organizational structure and the degree of recognition and application of sound principles of organization vary widely, and, even among successful enterprises, such aspects differ considerably. Accordingly, Koontz and O'Donnell, as well as numerous other authorities, have pointed up the necessity for organizations to be tailor-made.[8]

It is essential that a company's working guidelines contain the requirements of a sound program constructed to fit that organization, so that the framework will be well structured. Such a framework, however, does not become a reality unless it serves as an effective vehicle in the implementation of the capital-expenditure program, nor does the need for framework structuring end at this point, for there is always a continuing need to review, reappraise, and improve.

Field Application. At Continental, a formalized capital-expenditure structure, including detailed procedures and forms, had been in use for a considerable period of time. There were several Controller's Department bulletins, outlining such aspects as the procedure for the appraisal of new capital investments, which had been prepared for each of several of the operating activities (including production, pipeline, manufacturing, petrochemical, and marketing). In addition, the headquarters departments could prescribe instructions and project-justification criteria over and above those set forth by the Controller's Department.[9]

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[8] Harold Koontz and Cyril O'Donnell, *Principles of Management* (New York: McGraw-Hill Book Co., Inc., 1955), p. 282.

[9] Continental Oil Company, *Capital Commitment Budget and A.F.E. Procedures* (Controller's Department General Office Bull. No. 4; [mimeographed]; Houston,

On the basis of the field research for the current study, there was ample evidence that Continental Oil Company was striving continuously to improve the framework of its capital-expenditure program. For example, at the time of this study, attention was being directed by several of the operating departments to the problem of follow-up; revisions of authority limitations for the approval of A.F.E.'s were being coordinated by the Organization Planning Department; and a recomputation of the cost-of-capital figure was being made by members of the Controller's and Treasury departments.

The direct relationship of the framework of the capital-expenditure program to the overall organizational structure and the theoretical policies of the company was considered essential. In this company, the close tie to the organization and the utility of principles of organization, as subscribed to by the company, appeared to be far more important to a capital-expenditure program than one might be led to believe by a study of the general literature. Strong evidence of this interrelationship was presented at all levels and in the pertinent functional areas by company personnel interviewed during the current investigation. For example, the responsibility and authority designations for capital expenditures were only a portion of the total responsibilities and authorities of the many managerial positions. While the total activities of the company had been coordinated with the overall capital-expenditure program, the program aspect remained only one interrelated part of the company's operations, and it was necessary, therefore, that the capital-expenditure projects be blended into the day-to-day operations of the company.

Objective Criteria

Basic Approach. The adequate use of objective criteria not only is vital to but also pervades an entire capital-expenditure framework. Specific guidelines and procedures can be used for spelling out what criteria are to be used and how they are to be employed. While a project may not be entirely adaptable to such detailed procedures in applying

November 23, 1948). This publication often was referred to simply as "Bulletin No. 4." Subsequent revisions and other bulletins added to this basic document. For example, the Production Department headquarters had issued, and updated as needed, a "Procedures Guide" that included a section dealing with capital-budgeting procedures to be followed in connection with the Production Department's capital expenditures.

such criteria, a firm should seek to plan and control its capital investments, and this effort is accomplished best by the use of performance standards, both preceding and following each capital-investment decision.

Standards of performance applicable to strategic planning and control are also useful in the planning and control of capital expenditures.[10] The criteria used by a firm and the extent of the sophistication of such standards may vary among different framework activities, among different operating functions, and among different classifications of proposals; and they may be influenced further by the significance of a particular investment proposal. Moreover, the appropriateness of various types of criteria may change over time, and their validity and reliability will be a function of their correct use, since the improper or inappropriate use of a tool may do violence to the system rather than benefit it. For example, certain criteria may be very difficult, if not impossible, to quantify; moreover, the appropriateness of criteria may change over time.

The criteria utilized should afford the identification of the degree of attainment of factors that indicate success. Desirable criteria are characterized as being objective, relevant, valid, reliable, measurable, accurate, uniform, compatible, and consistently applicable. The source data to which they are applied should be accurate, and persons using such criteria ought to be knowledgeable concerning the correct and appropriate use.

As to applications, some of the most prevalent criteria used in capital-expenditure programs deal with economic-evaluation techniques that are used in performing the evaluation activity. Some of these techniques described the most frequently in the literature pertained to the computation of a payback period and rate of return.[11] Other important criteria included risk, competitive forces, economic environment, legal requirements, governmental regulation, social responsibilities, and human relations. While all of these factors may be difficult, if not impossible, to measure in a valid manner, there will be other factors which will be quantifiable, such as the current traffic count for a gasoline service sta-

[10] For a discussion of the utility of standards and the measurement of performance, see Thomas N. Humble, *Standards in Strategic Planning and Control . . . A Conceptual Study* (Austin: Bureau of Business Research, The University of Texas, 1966 [in press]).

[11] See Appendix B for a listing of several economic-evaluation techniques.

tion or the oil reserves of an oil well already in production.

Although considerable work has been done in the area of criteria for before-the-fact economic evaluation, the question of which criteria are best is one which remains unsettled. This does not mean that the evaluation techniques are not useful. In fact, variations in available techniques may be highly desirable, because the best technique often depends on the circumstances involved.

The problem frequently is compounded by the evaluation of past decisions on the basis of criteria which are inconsistent with those used for the evaluation of the same decision on a before-the-fact basis. McLean, for example, in discussing the use of the discounted-cash-flow procedure, recognized this problem, as follows:[12]

> There is one major theoretical and practical problem in using the discounted-cash-flow procedure for which we have not yet found a fully satisfactory solution. This problem is that of developing a return-on-investment figure for whole departments or groups of departments which may be computed year by year and compared with the returns calculated under the discounted-cash-flow procedures at the time individual investment projects were undertaken.

Other activities in the capital-expenditure framework frequently are seriously lacking in the correct and appropriate utilization of criteria. However, the use of criteria is fundamental to any process in which planning and control are involved.

Field Application. Some criteria are always in use wherever facts and circumstances are related to such forms of measurement as standards, norms, tolerance limits, and acceptable practices. The utility of such an approach could be observed throughout Continental's capital-expenditure program. At Continental, these criteria were expressed in the form of guidelines, policies, and procedures, and they were significantly associated with the practical development of every activity.

Two principal criteria used by Continental in the development of projects were the payout calculation and the computation of a discounted-cash-flow (D.C.F.) rate of return. Although the approach to the collection of the data and the computations might vary from department to department, depending on the nature of the project, executive management at Continental attempted to spell out, by means

[12] John G. McLean, "How to Evaluate New Capital Investments," *Harvard Business Review*, XXXVI, No. 6 (November–December 1958), p. 69.

of guidelines and prescribed procedures, the specific criteria that should be considered in the analysis of investment proposals. Individual departments then would provide additional criteria, including those applicable to the follow-up activity.[13]

The various departments attempted to compare certain of the before-the-fact estimates and the actual follow-up data. Difficulty and cost in accumulating actual cash flows on many projects and the variations in follow-up computation methods created multiple problems in the measurement of actual estimates, as compared with the estimates of the discounted-cash-flow rate of return. Additional criteria also were compared (e.g., well-production volume, sales volume, and investment costs).

In the control of expenditures, the criteria prescribed for the execution of the various sequential activities were in the form of such features as tolerance limits on overexpenditure, approval-authority limitations, and reports of out-of-line costs. The objective criteria, consequently, were considered vital to the entire program, rather than being limited to such obvious applications as economic evaluation.

IMPLEMENTATION ACTIVITIES

Search

Basic Approach. The performance of the activities that constitute a capital-expenditure program will not yield the best results unless the best available proposals are considered. If it can be assumed that the foundation components already have been established, the search becomes the implementation activity which serves to bring into the capital-expenditure program those proposals and variations that merit consideration. Moreover, for each proposal, it is important that all reasonable alternatives be brought into the framework for evaluation and screening.

Some companies contend that they have a surplus of desirable capital-

[13] The accumulation of cost data for the location of a new service station, for example, could be geared to a prescribed format, while the same task for a major refinery expansion would require detailed estimates by the Engineering Department, as governed by the unique characteristics of the proposal. The computation methods also varied (e.g., uniform annual cash-flow projects, as opposed to those having nonuniform annual cash flow).

investment possibilities, whereas others complain of a dearth of profitable opportunities. All companies, however, regardless of the apparent number of proposals available, should search diligently, so that they can be as certain as possible of selecting the best from among the alternative investments available. A good procedure for evaluation is not used wisely unless the search phase has yielded the best ideas and alternatives for viewing under the evaluation microscope. As one author has commented:[14]

> No matter how simple or complex a system of analysis of capital expenditures may be, it is useless if it has nothing to analyze. The raw material, the proposals calling for capital expenditures, must be made available to the analytical system in sufficient quantity before the system can direct funds of the company to their most advantageous use.

Well-communicated guidelines, tempered by judgment, will create a frame of reference for the generation of ideas from all levels of an enterprise. The guidelines involve a delicate problem of proper balance, because the processing of proposals doomed to failure is costly; yet, costly too is the failure of a desirable project to get into the development stream.

What is the source of ideas? One writer has listed six means of discovering capital-investment opportunities:[15]

1. Audit of the economic effectiveness of existing facilities.
2. Industrial engineering studies of the technology of the operation or function.
3. Comparison of known competitive methods and facilities.
4. Maintenance of contact with salesmen of alternative resources.
5. Stimulation of the organization at all levels to think creatively.
6. Conducting of organized research.

Since ideas should come from all segments of an enterprise, each person in the organization should participate in the search activity within the bounds of his technical knowledge and ability, his authority and responsibility, his awareness of operating problems, and the existing management guidelines regarding desirable projects. Dean observed

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[14] Donald F. Istvan, *Capital Expenditure Decisions: How They Are Made in Large Corporations* (Bloomington: Bureau of Business Research, Indiana University, 1961), p. 9.

[15] Richard L. Smith, "Capital Expenditures—Control Today for Profit Tomorrow," *N.A.A. Bulletin*, XXXIX, No. 3 (November 1957), p. 24.

that "turning up profitable opportunities for investing the company's capital is in part a by-product of good management."[16] While grand designs typically may develop at the top levels, the ideas may come from all echelons; and, thus, the germ of a proposal that may later be nurtured at a higher level may have originated at a very unpretentious position in an organization.

Care must be taken to create an incentive to search out and bring good projects into the system. Once incentive is established, caution must be exercised to avoid its destruction. Incentive usually appears to be strong when there exists throughout an organization the genuine feeling that a worthy proposal will be reviewed through channels in a fair and objective manner.

Proposals should be searched out and further developed if warranted, regardless of the question of whether or not the funds are available. Financing problems and problems involving competition by projects for funds (feeding in through the various channels) should be undertaken by top management. Communication ought to be made to those below top management, stating the philosophy that, "if you have a project that appears to be a good one based on prescribed guidelines, submit it, and do not worry about where the money is coming from." This philosophy is applicable not only to the search activity but also to the subsequent screening procedures.

Field Application. Continental's top-level management group felt that most of its specific proposals, including alternative-proposal solutions, were generated at the lowest organizational subdivisions. This feeling was reinforced during interviews with members of management at all echelons, although it was reported that major proposals frequently were initiated at the headquarters level. As was pointed out earlier, however, the objectives and guidelines were communicated to all segments of the company for guidance in searching for proposals which merited consideration. The effectiveness of the upward or return communication, of course, depended on the communicative skills of the individuals involved.

The strict application of specific search criteria (e.g., prescribed expected discounted-cash-flow rate of return for a certain kind of capital-expenditure project) could deter the submission of some projects by

[16] Joel Dean, "Measuring the Productivity of Capital," in *Administrative Control and Executive Action,* ed. B. C. Lemke and James Don Edwards (Columbus, O.: Charles E. Merrill Books, Inc., 1961), pp. 518–34.

lower levels of the company, even though, because of some other worthwhile aspects, such projects should be submitted.[17]

Regarding incentive, Continental's controller observed that, on many occasions, the president had said that, if a proposal seemed worthwhile, it should be submitted without any concern as to the source or availability of funds. Yet, since all projects submitted could not receive final approval, the controller concluded that there was a problem of striking a balance which would not do violence to the incentive to submit proposals and yet which would grant approval only to those projects that would best meet all selection criteria and the overall objectives. Through the discussion of this point with a number of company employees, especially at the lower echelons, the author found that a general feeling existed that a worthy proposal would be reviewed through channels in a fair and objective manner. The personnel interviewed had recognized that quite often a project might be rejected by a higher level when the proposal was viewed in a broader perspective or was compared with other proposals.

Screening

Basic Approach. The process of screening may be defined as the activity of (1) passing of useful proposals to the next higher level in the chain of approval and (2) ultimate approval of only those proposals that are worthy of further development and use in a company's capital-investment program. In this guise, screening is an investment-control device. Where alternatives for the accomplishment of a project exist, screening is of two dimensions: (1) the screening out of all but the most desirable alternative and (2) the decision as to whether or not to pass upward and continue a project. Lower levels may eliminate proj-

[17] A manager in the Production Department commented on this particular problem as follows:

Comment: Now we don't care whether the [discounted-cash-flow] rate of return is 19.7 or 23.4 as long as it is good enough.

Question: What would this "good enough" be?

Answer: I think it depends on the circumstances. . . . We do not have any straight number. Now we have been trying in our department to wash away the number that was once mentioned as a bench mark . . . let's say ___ is the number because of the risk. Well, we did not want to put out such a number, but you cannot operate in a vacuum and that number got out and we have had to fight it as a bench mark because we don't want to stifle projects being sent in from down below.

ects or proposed alternatives that obviously are undesirable, while higher levels may make the decision as to the selection from the more desirable possibilities presented to them. While the decision to eliminate a project entirely is possible at any point, a major portion of the screening function usually occurs during the building of the budget and as the individual projects subsequently are submitted for authorization of the expenditure. In general, the discussion in the literature indicated screening as being limited to the budget and capital-expenditure authorization activities.[18] In actual practice, however, the screening process was found to be applicable throughout the development and useful life of a capital-expenditure project.

The quality of the screening process will depend on the success that management has had in communicating the guidelines, techniques, and procedures for investment selection. In this regard, economic evaluation plays a key role. The quality of the performance of the screening activity also will depend on the technical skill, sensitivity to the economic environment, and sound business judgment of those who are involved in the screening activity.

As was noted in the discussion of the search phase, all levels should develop projects which appear desirable, as based on available guidelines. Istvan described screening at lower levels as including the following procedure:[19]

1. Proposals are screened to insure that the calculation is accurate and the estimates reasonable.
2. Proposals are compared roughly as to economic worth. In cases where approval at higher levels is required, proposals that are clearly not feasible are weeded out, and only those that appear economically adequate are forwarded for further consideration.

Top management, then, serves as a clearinghouse to assure overall balance in the capital-expenditure program, as related to the availability of funds and their appropriate use.[20] The amount of flexibility and the degree of judgment involved in screening generally increases at higher echelons. However, even at the highest levels, business judgment and the right to overrule decisions of subordinates should be exercised only after a full cognizance has been taken of the opinions

[18] Dean, "Measuring the Productivity of Capital," p. 522.
[19] Istvan, p. 17.
[20] *Ibid.*, p. 18.

and analyses presented by the lower levels of the organization.

In the performance of the screening function, unnecessary duplication of effort should be avoided because of the administrative cost involved. A useful rule to apply is that, if a level does not contribute something to the review or development of a project, then procedures should prescribe that the noncontributing level be bypassed.

Ideally, the company should screen out undesirable projects before excessive costs are incurred. However, new developments or a more sophisticated analysis may take place at any time. A firm should be sensitized to the possibility of screening out a project even after construction has been started. In some instances, after a project is completed and in use, if continued development would have a greater detrimental effect than its immediate termination, then the latter action should be taken.

Field Application. At Continental, management made every effort to perform all screening activities before a project was begun.[21] Even so, the company recognized that such factors as technological obsolescence or long-term depressed market conditions might necessitate disinvestment. For this reason, the screening activity was considered applicable throughout the entire development period and the useful life of any capital expenditure. The potentially heavy cost of postinvestment screening underscored, however, the need for careful preinvestment screening, and Continental's general program indicated a conscientious effort to eliminate project proposals which were inconsistent with prescribed guidelines.

Coordination

Basic Approach. Coordination involves the relating of activities with respect to objectives and guidelines, and, as such, it bears a vital relationship to the entire development and eventual utilization of capital

[21] The screening performed by the Production Department in the preparation of the annual capital budget has been included in the discussion of the budget activity. That screening existed subsequent to the budget preparation was indicated by the fact that, as was typical of the industry, about 40 percent of Continental's budgeted oil wells never were drilled. Likewise, it was noted that the company found it necessary to drill many wells that were not anticipated at the time the budget was prepared, a situation created primarily by postbudget developments. In addition, a more sophisticated reevaluation of data at a higher level might influence a decision to accelerate, delay, or cancel a project.

expenditures. In any capital-expenditure program, coordination is one of the most difficult and complex activities facing management, since this activity pervades, and is essential to, all other types of implementation activities. Welsch aptly defined coordination as "the process whereby each subdivision of a concern works toward the common objectives, with due regard for all other subdivisions, and with a unity of effort, . . . developing and maintaining the various activities within the concern in proper relationship to each other."[22]

Of the two basic types of coordination, the first is the overall approach necessary for an effective capital-investment program and is referred to as procedural coordination. This approach is dependent on an adequate overall capital-investment administrative framework, which, in turn, is a part of the total organizational structure of an enterprise. The second type is the coordination of the content of the total program and of individual projects within the existing administrative structure. Usually, there will be serious coordination problems present in decisions of major consequence; almost inevitably, these decisions will cut across two or more functional areas and involve liaison with groups or individuals external to the firm.[23]

Procedural coordination encompasses compliance with company and departmental procedures. Such procedures generally will be prescribed on a company-wide basis in order to assure uniformity and efficiency in the administration of the program. Procedures peculiar to only one segment of the company may be prescribed at a lower level as long as the possibility of conflict with other company segments is not involved. Where feasible, forms and instructions are useful in performing the

[22] Glenn A. Welsch, *Budgeting: Profit Planning and Control* (Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1957), pp. 7–8.

[23] Regarding project coordination, Hill has cited several examples: "The first question raised by the department head will be whether any other department needs to be consulted. A simple labor-saving or fuel-saving scheme will generally involve no other part of the company. An increase in manufacturing capacity might present problems of procuring raw material or disposing of additional finished product. Upgrading a product might flood a market and bring no increase in revenue. Improved means of transportation might entail major changes in receiving facilities at many points. Countless possible complications could be listed which might affect the total cost of the project to the whole company or the incremental increase in expense or revenue." (See Horace G. Hill, Jr., "Capital Expenditure Management," in *Management of Corporate Capital*, ed. Ezra Solomon [Glencoe, Ill.: The Free Press, 1959], p. 283.)

various activities of the framework. Large-volume, routine tasks are especially adaptable to procedural coordination. These tasks may apply to the total program (e.g., the annual budget), to parts thereof (e.g., projects requiring contract bids), or to individual project types. Although, for routine-type proposals, coordination procedures can be prescribed, the coordination of complex projects is quite another matter. Nevertheless, there should be subroutines for the coordination of specific steps, even for the largest of projects (e.g., process design, contract bids, and construction supervision). In addition, major projects usually call for a high degree of creativity and originality in the execution of the coordination task, and this fact leads to the lack of rigorous routine as to the exact methods by which the task is to be accomplished.

The content of the capital-expenditure program and the individual projects must be coordinated, and this type of coordination is a direct responsibility of the management hierarchy. The coordinator of individual projects may be either an individual or a group; and, oftentimes, the coordinator will be the project sponsor. Certain tasks may be redelegated (e.g., coordination of construction plans by the engineering department). Whoever does the coordinating should do so with the full approval of his superior, and the superior, in turn, should be certain that the coordination responsibility is assigned and that there is a unity of this responsibility. Content coordination of the total program requires that projects be related by types, by company organizational segments (departments), and to the capital-expenditure program of the company. The periodic capital budget represents the specific program-coordination plan.

The coordination of procedures and content requires a myriad of coordination contacts. These contacts within the firm are both vertical and horizontal, wherein vertical coordination refers to relationships with other organizational levels, and horizontal coordination refers to direct relationships with personnel on the same level (whether in the same or in other segments of the company). With respect to the content of specific projects or in financial arrangements, coordination with individuals and organizations outside the company also is necessary.

Both formal and informal committees may be of value in the coordination activity, and, according to a recent National Industrial Conference Board study, "the use of formal [financial] committees . . . is gaining wider acceptance," primarily because of the necessity for strengthening communications and control and because of company

growth, decentralization, and increased complexity of operations.[24]

Greater concern over the interrelationships of the requirements of an effective capital-expenditure program should serve to strengthen this very critical activity, both as to the total program and to the individual capital-investment projects.

Field Application. For Continental, the annual capital expenditures for property, plant, and equipment, plus investments and advances, had averaged $140 million during the period 1953–1962, and these costs covered thousands of projects annually. The project types were of a wide variety as to the operating functions involved, strategic significance, size of investment, and the routine or nonroutine nature of the projects. Consequently, such a program involved virtually everyone in the organization.

With net property, plant, and equipment, together with investments and advances totaling approximately $837 million (as of December 31, 1962), an average annual rate of capital investment of $140 million would suggest that the future of the company would be in jeopardy, and rather quickly, unless activities were guided carefully and coordinated adequately within an effective framework for capital expenditures. The essential and fundamental nature of coordination of all activities of the framework and of all projects developed within it appeared to be paramount among the implementation activities at Continental.

The company prescribed policies and procedures that recognized the need to coordinate the total process as well as the individual investment opportunities. Most of the coordination of the procedures of preparation of the budget, A.F.E.'s, economic appraisals, and other documents and reports was centralized through the Controller's Department in order to achieve uniformity.

While the coordination of procedural activities was the controller's responsibility, many members of the management team contributed to the content of the program. The use of Regional Advisory committees, the two Operating and Coordinating committees, the Management Executive Committee, and a number of groups such as the Coordinating and Planning Department and the Process Center of the Engineering Department represented the coordination function in action. In ad-

[24] Norman E. Pflomm, *Financial Committees* (Studies in Business Policy No. 105; New York: National Industrial Conference Board, Inc., [1962]), p. i.

dition, departments, departmental subunits, and individual sponsors commonly played key roles in coordination. The coordination of content was twofold: (1) coordination of appropriate segments of the program, depending on the responsibility and authority of the management in a given position in the organization, and (2) coordination of individual projects. Coordination of routine projects was not a serious difficulty, especially if uniform procedures were in use. However, for major projects, particularly those involving several departments, a high degree of tailor-made coordinated effort was needed.

Formalization

Basic Approach. The activity of formalizing permeates all other framework activities. The formalization process involves two key ideas: (1) using a formalized pattern of procedures and forms in administering the total program and the individual projects and (2) crystallizing plans during the entire time span of the evolution of a project.

A pattern is needed to perform the basic activities of the framework, with the detailed nature of the procedures and forms being greater for routine, commonly occurring tasks. Even for unusual tasks, such as a unique project, certain basic patterns are applicable (e.g., economic appraisal methods, budget approval, and A.F.E. summary forms and approval).

Good organization calls for an orderly, routine, uniform system. Also needed are instructions for the manner in which activities are to be performed and a clear indication regarding designated authority and the responsibility to perform. Thus, as a general rule, companies should follow written procedures and use prescribed forms and techniques in the preparation of their annual budgets, in submitting individual projects for approval, in the expenditure of funds, and in the follow-up programs.[25] For example, routine projects usually will be more adaptable to detailed forms than will those of a nonroutine nature. However, the procedures should not be so detailed and rigid as to hamper the smooth, effective operation of programs, since "all facets of operations can suffer either from too much red tape or from an organization's failure to properly evaluate capital proposals."[26]

[25] "Capital Expenditure Control Program," *N.A.A. Bulletin,* XL, No. 7 (March 1959), pp. 3–4.

[26] John B. Matthews, Jr., "Capital Expenditure Policies and Procedures" (unpublished Ph.D. dissertation, Harvard University, Boston, 1957), p. 129.

Formalization with respect to the design of procedures and forms should be centralized, unless unique for only a part of the company. Centralization should facilitate uniformity and reduce administrative costs through the routine treatment of similar tasks. Preparation of the detail required as a part of various activities ought to be performed at the level at which a project is developed. If needed, specialized technical staff assistance from other levels or departments should be made available. Procedures should not be followed blindly, because inquisitive, challenging minds also are needed.

The second key idea involves the crystallization of plans during the entire development of a project. Formalization, in a broader sense, should involve the total plans for a project and, in this respect, would be related closely to coordination, although the extent of detailed procedures and forms might vary, depending on the nature of the project and the phase of the project involved.

Formalization is affected by the problem of proper balance. On the one hand lies the problem of excessive work by engineers and others in developing detailed justifications, plans, specifications, and arrangements with potential contractors, vendors, and customers for projects that may not be approved. On the other hand, a great deal of time and cost may be necessary to give a proposal a proper evaluation and a reasonable chance for development. However, many companies "require a minimum of supporting detail at budget time, preferring to examine such data at the time the request for permission to expend funds is made. Exceptions to the usual practice occur when there are special or unusually large projects,"[27] in which case the sponsor of a particular project may have detailed analyses that he will simply update and use in support of the request for expenditure.

Formalization may be delayed because of lack of complete data. For example, the production district of an oil company might want to include in its budget a provision to drill three wells on a particular lease but might not know at budget time the specific locations of the wells on the lease.

The degree of formalization of a project at any point in time is a function of the cost of formalization, the nature of the project, the availability of data, time limitations, and the conviction that the project

[27] Norman E. Pflomm, *Managing Capital Expenditures* (Studies in Business Policy No. 107; New York: National Industrial Conference Board, Inc., 1963), p. 14.

will be approved.[28] This conviction should come via assurance from the approval authority that the project probably will be received favorably.

Field Application. At Continental, uniform and detailed written instructions and forms had been prepared for such activities as the annual budget, request for expenditure, and economic evaluation, all of which were coordinated through the Controller's Department. For other activities, such as in-process control and follow-up, formalization took place at the departmental level. The actual task of preparing the details called for in the procedures (for such activities as the budget, request for expenditure, or follow-up) usually was performed at the level of project development, with review and summary performed at higher levels. Whenever needed, specialized technical staff assistance could be obtained from other levels and departments.

Relevant data, moving into or out of the accounting-information system, were coordinated by liaison between the Controller's Department and the originators and recipients of the data or their representatives. Some pertinent examples of this type of procedure included the following:

1. Indication by the Engineering Department of sub-A.F.E. accounts needed to accumulate detailed cost data on a construction project.
2. Requests for accounting data needed for the purpose of making follow-up calculations.
3. Requests for maintenance-expense reports for various pieces of equipment for use in making equipment-replacement decisions.
4. Arrangements for periodic cost reports on designated construction projects.

The Controller's Department also had been designated to assist in the interpretation and implementation of procedures which were in force.

The formalization of individual projects depended on several factors. Routine projects, such as new gasoline service-station locations and production oil wells, could be covered by the detailed forms and related instructions. Obviously, nonroutine projects were not so adaptable to such detail in format. However, for all projects, certain aspects (e.g., methods of appraisal calculations, A.F.E. summary forms, etc.) were prescribed on a uniform basis wherever possible. The volume of projects and the large number of individuals involved in the performance

[28] It was noted in the literature survey that these factors, and the permeating nature of formalization, were not emphasized sufficiently in the sources examined.

of the various activities in this large organization emphasized the need for a systematic approach.

The company recognized that, as a practical matter, other factors also affected the formalization of projects. Since the administrative cost of carrying out various procedures was relatively high, very minor projects generally did not warrant the degree of formal analysis that might be justified for a major project. In addition, emergencies sometimes necessitated immediate action, in which case the related "paperwork" might be formalized subsequently. For these reasons, there was a reasonable amount of flexibility found in the formalities. The point at which a proposal was formalized often depended on the availability of data. On the basis of a common practice found in the Manufacturing Department, the timing of proposal formalization appeared to be essentially a function of the extent of conviction that a project would be approved. In the Manufacturing Department, on large construction projects, the contractors' bids commonly were received before the A.F.E. was approved. This degree of prior-to-approval formalization was based on informal verbal assurance (from the appropriate management level having approval authority) that the project would be approved.

Evaluation

Basic Approach. While the activity of evaluation has received more attention in the literature than any other part of the framework, the views presented were found to be widely divergent, both as to theory and practice.[29] However, if this activity is to contribute to the effectiveness of the capital-expenditure program, evaluation tools must be understood thoroughly and used properly.

Evaluation covers the basic theory, techniques, and procedures for evaluation and reevaluation through the course of a project's development. If an environment in which worthwhile proposals are brought to light can be assumed, it is management's job to evaluate such proposals in order to eliminate unprofitable proposals and those that do not fit into the pattern of objectives of the enterprise. Those projects passing an initial screening should be grouped according to company needs (e.g., oil wells and service stations) and arrayed in the order of their

[29] As used in the above discussion, "evaluation" refers to the precompletion appraisal. While postcompletion appraisals constitute a type of evaluation also, they are covered primarily under the discussion of follow-up.

desirability within each such group. Management then can select projects within these groups, in order of desirability, until the limit of the total capital expenditures that the firm is capable of making, or is willing to undertake, has been reached.

While, as used in the literature, the term "evaluation" usually referred to the economic evaluation of an individual project, other factors that might need to be evaluated in a particular decision could include the "consequences of not buying [equipment], the future of the product, possibility of equipment obsolescence and ordinary shop judgment."[30] Thus, both economic and noneconomic factors, some of which may not be quantifiable, need to be considered.

In general, evaluation affects the sequential activities subsequent to search (i.e., budget, request for expenditure, in-process control, and follow-up). However, evaluation subsequent to a project's completion is considered part of the follow-up activity. A number of evaluations of a single proposal may be necessary because of the following:

1. Changing circumstances that occur during the time span from the origin of the project idea to the completion of the project.
2. Varying alternative solutions of the problem that the project is designed to solve.
3. Varying assumptions as to the amount and time pattern of cash flows.

Management's judgment always can override the order of ranking of projects for inclusion in the budget, since certain expenditures must be made because of tactical or legal requirements. For example, a manufacturer might be forced into the production of a less-profitable product because of competitive pressure; recreation facilities might be installed for employee use; regulations on air and stream pollution might necessitate an expenditure for a waste-disposal unit. Some projects either might be emergencies or be so obviously necessary that the use of an evaluation technique would be superfluous (e.g., the washout of a section of a railway trestle). Other projects, though indicating a good economic return, might be rejected because of (1) lack of funds, (2) failure to fit into overall objectives, (3) failure to meet other criteria (such as corner locations for service stations or estimated oil-well reserves), or (4) other extraneous circumstances.

[30] Richard P. Connelly, "Judgment Factor in Capital Planning," *N.A.A. Bulletin*, XLI, No. 10 (June 1960), p. 49.

Therefore, the best available evaluation tools should be used appropriately, coupled with a recognition that there may be a danger in overreliance on quantitative answers that are based on many assumptions and estimates. Management thus should guard against faulty criteria, such as some types of "urgency" which result in uneconomical, inadequate stopgap action which might have been prevented by adequate planning.[31]

For the area of economic evaluation, the following topics are of significance:[32]

1. Classification of capital expenditures.
2. Requisites of a good evaluation tool.
3. Cost of capital.
4. Allowing for risk and uncertainty.
5. Cash flow.
6. Economic-evaluation techniques.
   a. Payback.
   b. Average return on investment.
   c. Present value.
   d. Discounted cash flow (D.C.F.).

Economic evaluation and related techniques have received center-stage attention in the literature dealing with capital-investment programs. The more sophisticated of these methods consider the time value of money in computing an estimated return on investment. Indeed, this is an important segment of the evaluation activity. In the final analysis, the firm must earn a reasonable return on invested funds if it is to satisfy the profit objective of the enterprise. Yet, it is only one part of the evaluation activity. In actual practice, evaluation criteria other than economic-evaluation techniques may have a significant bearing on the capital-expenditure decision. Oftentimes, additional quantifiable data, such as projected volume in units, will be relevant. Many imponderables also may affect the decision (e.g., competition, legal requirements, social responsibilities, and emergencies). In any case, the accuracy of source data can have a material effect on the results of an evaluation analysis. Furthermore, there is a need to select invest-

[31] For example, equipment replacement should be based on a policy that considers cost comparisons and timing rather than simply using a machine until an emergency occurs, when uneconomical replacement is required.

[32] For a coverage of these items, see the sources cited in Appendix B.

ments that will keep a firm in balance and which are consistent with objectives.

Evaluation methods usually are adaptable to uniform procedures and forms. The computations involved generally are prepared by the level of origin of the proposal, although special talents or manpower may be required for complex or major projects. Initial consideration of the computations should be made at the originating level, with subsequent review at the designated approval levels.

The inclusion of a proposal in the budget generally does not, and should not, constitute final approval. A reevaluation should be made just prior to acquisition, in the event that intervening circumstances or a more detailed scrutiny might fail to support the validity of the original evaluation of a project. In many companies, the reevaluation represents a point of greater sophistication in the use of evaluation techniques than does the initial evaluation that determines whether or not a project is to be included in the budget. For extensive projects, the reevaluation process could be applied several times throughout the development period.

Those who use the criteria or "answers" based on evaluation should be placed on notice as to how the estimates and computations were made. Those who compute the results, and those who use them as tools to aid in decision-making, should have a thorough knowledge of how and when to use the various methods. This need supports the desirability of written procedures and preprinted forms. For routine, frequently occurring types of investments, the steps and forms can be quite detailed.

The circumstances of each situation must be considered in passing judgment on the criteria used. And, even then, there could be justifiable differences of opinion with respect to the criteria chosen to govern a particular situation. The mechanics of manipulation are important; however, of greater importance is the relationship of this activity to the overall implementation process. Evaluation tools are of the most value when understood by the users, when used for their intended purpose, and when employed on a uniform basis, because the misuse of perfectly adequate criteria can do more harm than good. The manager still must make the decisions, and he should, therefore, make every effort to exercise sound business judgment. Under such circumstances, it is hoped that evaluation tools, properly designed and used, will assist him in performing his function effectively.

Field Application. At Continental, various types of evaluation criteria were utilized throughout the company's capital-expenditure program, although not all of them were readily quantifiable. The criteria most generally used were two economic-evaluation methods—payback and discounted cash flow (D.C.F.).[33]

The company normally expected that a computation of these two criteria should be prepared for each project on a special form (see Exhibit 9) which was to accompany the request for expenditure. Furthermore, a project submitted for inclusion in the annual capital budget was much more easily justified if supported by an appraisal statement.[34]

The circumstances that did not demand the preparation of the appraisal form were specified clearly, as follows:[35]

1. Proposals on which it is impossible to make the necessary calculations, such as proposals which are for:
   a. Safety or fire prevention.
   b. The prevention of stream or air pollution.
   c. The construction of employee camps or houses.
2. Proposals which are for additional or replacement equipment when:
   a. The only alternative is continued severe loss.
   b. A good payout and return is obvious.
   c. The new investment required is minor in relation to the original cost of the existing investment.

One of the various departments, the Exploration Department, generally did not prepare formal economic appraisals, because the anticipated future cash flows were so wildly unpredictable that quantification was not feasible. Even so, the company did make some attempt to calculate the *probability* of a successful exploratory well.

In addition to the general company criteria, other evaluation techniques were prescribed by various departments, examples of which have been discussed in the case studies which comprise succeeding chapters of this study. In these studies, a great deal of quantitative data regarding the proposed oil well and the gasoline service station were

[33] See Appendix C for a discussion of the instructions for the use of these two methods and of Continental's decision to apply D.C.F. as an evaluation criterion.

[34] However, the appraisal attached to the request for expenditure would not necessarily have to be a new one, since it might simply be an updated version of the appraisal made at the time of the preparation of the budget.

[35] Continental Oil Company, *Production Department—Producing Operations, Procedure for Appraisal of New Capital Investments* (Controller's Department General Office Bull. No. 16; [mimeographed]; Houston, September 1, 1965), p. 1.

called for in the documents supporting the request for expenditure. These details were used by management in evaluating the proposals to supplement their consideration of the projects on the basis of estimated payback period and D.C.F. rate of return. Evaluation computations for a proposal usually were prepared by personnel in the originating group, with the initial consideration at this level subject to subsequent review at various approval levels.

For many projects, particularly larger ones, a number of evaluations often were prepared because of (1) changing circumstances that resulted during the time span from the origin of the project idea to the completion of the project, (2) alternative solutions for the problem that the project was designed to solve, and (3) varying assumptions as to investment cost and resulting revenue and expense patterns over a period of time. There was a relatively high degree of sophistication in Continental's evaluation activity area, with procedures being prescribed sometimes in great detail. As a result of interviews with Continental employees, it became evident during this study that D.C.F. and payback could be very valuable tools if used properly. In many cases, however, there were other criteria (some of which entailed imponderables), which appeared to have a significant bearing on the decision-making process.

A headquarters manager commented on the danger of overreliance on quantitative results yielded from raw data which include a number of assumptions and forecasts. In his comments quoted below, he made the point that, while the "answers" certainly might be useful, management personnel always should recognize how these results have been obtained:

> My present great cry is that business has developed a large number of worshippers at the feet of the computer idol. I believe that many accountants in the last ten to fifteen years have developed a marvelous ability to explain to executive management the weakness in their own figures as they present them and to say: "Look out now. This thing shows this. But, remember, if we had made a slight change in this, the whole thing could have changed." The accounting profession has become excellent in this and lo and behold just about the time they got the ear of executive management, and began to have these numbers understood and properly used, along comes a new cult. They take the very figures that the accountants have just put the feathers on. They put them in the computer. They present to executive management a finished document with a single answer and say: "It has got to be that answer because it

came out of the computer." Executive management in many businesses unfortunately has been spellbound and mystified. This computer is something management cannot put their fingers on. They have the feeling that the computer must do this because the darn thing costs so much.

Although the published literature did not stress the issue, the company personnel interviewed repeatedly indicated that, since the nature of the raw data used in the evaluation computations were basic to the resulting "answers," such data should be screened carefully.

Budgeting

Basic Approach. The broad area of budgeting can be related generally to the more specific area of the formal periodic capital budget, which provides a plan for the centralized coordination and control of capital expenditures. A good budgeting program (1) motivates responsible individuals to plan their operations in detail, (2) creates effective two-way lines of communication, (3) causes supervisors to become more conscious of cost, (4) provides a yardstick for measuring performance, (5) provides information for division- and company-wide planning, (6) enables convenient management appraisal of company operations, and (7) clearly establishes limits of responsibility, authority, and accountability.[36] The periodic capital budget, then, "constitutes the first point of control for management in the capital-expenditure control program,"[37] and, to some extent, it "insures that all objectives of a capital-expenditure program will be realized. Management must usually choose among projects to develop a well-rounded and profitable program."[38] Most companies include a periodic capital budget as a part of their capital-expenditure program, since "almost all projects are desirable to a degree, and management must appraise the relative advantages of each. The budget is the only opportunity to see projects side by side and so evaluate the contribution of each for future periods."[39] In one study, 93 percent of the 424 responding companies reported that they developed definite capital-expenditure budgets.[40] Another recent study

[36] Earl D. Bennett, *Case Commentaries—Cost Administration: Cases and Notes* (Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1960), pp. 106–107.

[37] "Capital Expenditure Control Program," p. 10.

[38] *Ibid.*, p. 5.

[39] *Ibid.*

[40] Burnard H. Sord and Glenn A. Welsch, *Business Budgeting* (New York: Controllership Foundation, Inc., 1958), p. 91.

of more than a hundred manufacturing companies reported that in excess of 75 percent of these companies regularly prepared an annual capital budget, and several that did not then prepare formal capital budgets planned to do so in the near future.[41]

The individual annual capital budget must be blended into a firm's total annual budget, which should, in turn, be related to the long-range capital-expenditure plans of a firm.[42] In general, "capital-expenditure budgeting begins at the lowest levels of responsibility and works through management levels to the president and board of directors."[43] Projects that are searched out, screened through the various levels, coordinated, formalized, and evaluated are presented for approval of ideas as a part of the periodic budget. These above steps occur throughout the year and should be based upon guidelines established by management. The budget, then, is simply an effort to present to management a snapshot of plans for the coming period for which approval is sought, as those plans appear at the time the budget is prepared. The capital budget generally is not regarded as an authorization to commit funds, but, rather, it is an opportunity to consolidate overall plans by looking at projects for the entire organization, side by side. However, the observation has been made that "one of the main problems in developing a good facilities program is the tendency to view it as an end in itself rather than as an integrated part of an overall business planning program."[44] Apparently, most companies fail to integrate with their capital budgets whatever long-range plans they may have.[45] However, the capital budget, when consolidated with other budgets for the enterprise, including operating budgets, must be reconciled with these long-range plans and with the availability of funds, a major source of which is internally generated; and it is also important that a firm be willing and able to secure external funds when needed. While a detailed analysis of financing sources and methods was not within the scope of this study,

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[41] Pflomm, *Managing Capital Expenditures*, p. 6.

[42] For a more detailed discussion of these two points, see Welsch, pp. 193–203.

[43] "Capital Expenditure Control Program," p. 9.

[44] Ross G. Walker and Russell B. Read, "Capital Investment Control," in *Planning the Future Strategy of Your Business*, ed. Edward C. Bursk and Dan H. Fenn (New York: McGraw-Hill Book Co., Inc., 1956), p. 89.

[45] "Building a Sound Capital Investment Program," *The Management Review*, XLVII, No. 8 (August 1958), p. 56.

the significance of this area as a controlling factor should not be overlooked.[46]

There are certain commonsense limits as to what might be expected to be approved in any one budget year because of a recognition of the need for a year-to-year and department-to-department investment balance. The administrative process cannot be expected to be geared to handle a budget of $X this year and $10X the year following; and, unless there are highly unusual circumstances, such demands should not be made. Thus, *inordinate* fluctuations from year to year, within functional classifications and in total, are to be avoided. However, the administrative process should still be flexible enough to handle *reasonable* increases or decreases in expenditures from one period to the next.

It must be recognized that plans will tend to be more subject to change over longer time periods. Also, the nature of the business or external factors may cause even the annual plans to change before they are executed. Some projects may never materialize, and others may be added during the budget year. Thus, the budget must be adaptable to changing needs within the limits of prescribed authority and responsibility designations.

A formal budget-preparation procedure is needed for all but the smallest firms. But even the smallest firm should plan its future capital-investment needs, although a formal procedure may not be employed. A great deal of the detail in building the budget should be accomplished at the level originating the projects, with technical staff assistance available as needed. The extent of development of the detail for plans for a specific project will vary, and projects generally are not formalized at budget time to the extent that they will be when the request for expenditure is processed. Moreover, higher levels will be served best by summaries of detail, except in the case of major projects. Since the budget is passed through a number of management levels as it moves toward final approval by top management (often as far as the board of directors),[47] the ultimate approval of the capital budget, as to its broad outline, should be centralized at the top-management level. However, a clear explanation of the content of the final budget should be communi-

[46] For a coverage of this topic, see Ernest W. Walker and William H. Baughn, *Financial Policy and Planning* (New York: Harper & Bros., Pub., 1961).

[47] "Capital Expenditure Control Program," p. 9.

cated through channels to all echelons, as a means of avoiding misunderstandings. Finally, an appreciation, throughout an entire organization, of the purpose of budgeting is essential, if the budget is to fulfill its role in the capital-expenditure program of a firm.

Field Application. At Continental, an annual capital budget was prepared. Because of the significance of the company's capital-expenditure program, the ultimate approval of the overall budget was centralized at the top-management level, a practice which generally appears to be desirable.

While there was no formal procedure in use for long-range planning at Continental, each department was encouraged to make its plans extending as far beyond the one-year budget period as was useful. Oftentimes, a department or operating level might include "memorandum" items in its annual budget simply as a means of giving notice of major plans beyond the one-year budget period.

The excerpt from a company bulletin (shown in Exhibit 6) reveals some of the attitudes and procedures involved in the budget activity.[48] Part of the instructions referred to in this excerpt (see Sec. II-A of Exhibit 6) had to be channelled to the division and district levels. As the instructions moved downward, departmental and regional instructions were added to those already issued by the Controller's Department. Some departments also had standing instructions included in their procedure manuals. A great deal of time, effort, and liaison contact was necessary in the levels below the regional departments in order to maintain a high degree of coördination in the overall budget activity. Perhaps an appreciation of this phase of annual-budget activity would be conveyed best by the following description of the buildup of the budget in the Production Department:

1. The search for projects and the accompanying accumulation of data occurred throughout the year.
2. In July, the district superintendent, district engineer, and district administrative coordinator met to take a preliminary look at development wells and other investments that were contenders for inclusion in the budget. Many items were conceived by the district engineer and his staff; others were originated by the district superintendent;

[48] Continental Oil Company, *Capital Commitment Budget and A.F.E. Procedures* (Controller's Department General Office Bull. No. 4; [mimeographed]; Houston, May 15, 1962), pp. 1–3.

EXHIBIT 6

EXCERPTS FROM BULLETIN NO. 4, CONTROLLER'S DEPARTMENT, CONTINENTAL OIL COMPANY

I. Budget Requirements

A. A Capital Commitment Budget covering the following proposed commitments for the next calendar year shall be prepared and transmitted to the controller on the date prescribed by him (usually during the last week of October), for submission to the chief executive officer.

1. Additions, betterments, and improvements to fixed assets.
2. Firm rent of long-term leases of marketing retail outlets (annual rent discounted at 5 percent for the term of the lease, plus options, but not in excess of 20 years).
3. Direct loans on marketing retail outlets at the face amount of the loan.
4. Indirect loans on marketing retail outlets at two-thirds of the face amount of the loan.
5. Purchases of capitalizable equipment to be charged to Account 770, Marketing Equipment and Supplies.

B. A revised Capital Commitment Budget will not be made at mid-year; however, increases or reductions of particular items in the original budget may be made if it appears advisable. These changes should be prepared and submitted to the controller on the date prescribed by him.

II. Preparation of Proposed Budgets

A. Detailed letters of instruction on the preparation of proposed budgets and the number of copies required will be issued by the controller to headquarters department managers, who in turn shall advise regional general managers and regional department managers.

B. Generally, however, proposed budgets shall contain:

1. Specific projects (all anticipated individual and blanket projects).
2. Unallocated funds (funds to cover unforeseen projects).

C. Proposed budgets shall show for each project, the project number, description of project, number of gross and net units (where pertinent), and amount (rounded to the nearest $100).

EXHIBIT 6 (CONTINUED)

III. Submission of Proposed Budgets

A. Regional department managers shall submit their proposed budgets to regional general managers on the dates prescribed by them.

B. After review and revision, regional general managers shall submit their approved regional department budgets for other than furniture and office equipment to headquarters department managers having functional control on the dates prescribed by them.

Regional general managers shall submit their approved regional furniture and office equipment budgets by departments to the controller on the date prescribed by him.

C. After review and revision of regional department budgets and consolidation with proposed budgets covering headquarters department activities, headquarters department managers shall submit their proposed consolidated departmental budgets for other than furniture and office equipment to the controller on the date prescribed.

Headquarters department managers shall submit their proposed headquarters furniture and office equipment budgets to the controller on the date prescribed.

D. After summarization and consolidation, the controller will submit the proposed budgets together with appropriate analytical and comparative data to the chief executive officer, and members of the Management Executive and Coordination committees.

E. After review and revision of the proposed budgets by the chief executive officer and members of the Management Executive and Coordination committees, the controller will prepare and submit a report on the proposed consolidated budget to the chief executive officer on the date prescribed by him.

IV. Issuance of Approved Budget

After final approval of the consolidated budget, the controller will issue and distribute complete and partial copies of the approved budgets, as required.

Source: Adapted from Continental Oil Company, *Capital Commitment Budget and A.F.E. Procedures* (Controller's Department General Office Bull. No. 4; [mimeographed]; Houston, May 15, 1962).

some came from other sources in the district; and still others stemmed from higher levels. Most of the supporting data at this point were of a technical rather than of an economic-evaluation nature.

3. The next steps, as described by the district administrative coordinator, were as follows:

> We make notes during the district meeting and jot down the projects that we want to do. At that time, we are getting an understanding on the district level as to what projects we are going to submit, and then the engineering staff and my staff go to work and we prepare the supporting paperwork in pencil form. The information that we have worked up is substantially what will go in the completed project once it is finished.[49] We also work up a summary of all projects we plan to submit.

4. The district administrative coordinator in the Production Department described the fourth major step, as follows:

> We take all of this information to the division meeting in August. Also, we will take maps over there with us and pin them up on the wall and the people over there can see exactly where we are drilling and it gives them an idea of what the lease is and what the offset development has been. . . . The division people examine each project very critically. . . . At the division meeting, we get an idea of what division will approve and division gets an idea of what we are going to send in. . . . Actually, when we get through with this meeting, the budget that we will submit is just nearly set.

At times, however, a division might add projects that had not been included by a district, as follows:

5. The finished product, including necessary supporting detail, was then sent from district to division. The district administrative coordinator noted further:

> They [division] check the work we send in and perhaps revise it or in some cases decide that we should resubmit it. . . . Once they are satisfied with it, it goes to the region.

6. An interview with division production personnel continued the story:

> A meeting is scheduled with regional production personnel. They either come to this office, or, in last year's case, we went to the district offices.

[49] The support for a drilling well at the time the authority for expenditure was requested generally included an appraisal form, data on offset and other nearby wells, and a map of the well location and surrounding area.

> This is a three-level discussion [district, division, and region]. We sit down and go through these things in some detail.

After necessary changes arising out of these meetings, the budget entered the series of steps described in Exhibit 6 (see Sec. III).

The functional headquarters departments usually received the budget and relevant support by mail and did not have the regional personnel come into headquarters to present their budgets. One headquarters department manager described the communication that did occur:

> *Question:* When the budgets come in from the regions, do you get only the paperwork, or do the people come in for conferences?
> *Answer:* No, we just get the paperwork. Let me call your attention to this point, however. All during the year, through many kinds of communications, but mainly personal contact, we pretty well get an idea of what these budget projects are. We talk about them at some stage during the year.

Departmental managers observed also that, when the budget was approved, they tried to communicate to the regions as clearly as possible, both orally and in writing, an explanation for why certain items had been postponed, deleted, or added. The regions, in turn, expected this explanation to be communicated through channels to the lower levels. This practice seems important, if good human relations are to be maintained.

The Coordinating and Planning Department furnished vital staff assistance in building the budget and in handling individual projects. The Economics section of this department sought to communicate data concerning overall economic forecasts, and the New Projects section of the department frequently assisted in the development of plans for projects, by assuming the role of independent evaluator.

According to Bulletin 4 (see Exhibit 6, Sec. III-D), the data were summarized and consolidated by the Controller's Department. Although supporting data were available, ordinarily they were not included at this level (unless the project was very large and/or controversial or unless specifically requested). A copy of the summary went to each member of the Management Executive Committee and to both of the Operating and Coordinating committees. The review and revisions of these committees involved a number of committee and subcommittee meetings, with the Operating and Coordinating committees (Domestic

and International) channelling their recommendations to the higher-level Management Executive Committee.

At Continental, the Treasury Department assumed primary responsibility for cash management and took the lead in making financial arrangements. In an interview with a member of the Treasury Department management group, the following two important points were made concerning the general subject of the annual capital budget:[50]

1. For any given year, it was important that there be a balance in the proposed "project mix" (e.g., a proper balance of capital investments in a year should not call for a large number of service stations and no producing oil wells, or vice versa). Proper balance called for an annual consideration of the needs of all of the company's activities. Of course, depending on a variety of circumstances, the allocation of funds in a given year might stress certain types of investments within reasonable limits, although extremes were to be avoided.
2. There was a need for a year-to-year balance and continuity in the capital budget, including a tie to long-range plans. It also meant that the staffing needs of the company (i.e., management talent, technical staff, and construction forces for implementing a capital-expenditure program) made it undesirable to have unreasonably drastic shifts in total capital expenditures from year to year.

As a practical matter, many budgeted projects did not materialize, whereas there were many unbudgeted projects added during the fiscal year. Actually, the budget was simply an approval of a plan based on circumstances as they appeared at the time of the preparation of the budget. While a sound capital-expenditure program, such as Continental had developed, should aim for a carefully planned budget, it should be flexible enough to adapt to changing conditions.

Request for Expenditure

Basic Approach. The request for expenditure serves as a control device with respect to the expenditure of funds. Most companies agree that the periodic budget is primarily an approval of ideas and does not

[50] While these points were not stressed in the published works examined in the literature survey, they were brought out in a number of the interviews held with the various members of Continental's management personnel. For evidence of the company's adherence to the philosophy expressed in these two comments, see Table 2. The lack of inordinate fluctuations within functional classifications and in the total from one year to another can be observed.

TABLE 2

DISTRIBUTION OF CAPITALIZED EXPENDITURES OF CONTINENTAL OIL COMPANY, BY FUNCTIONAL CLASSIFICATION, 1953–1962
(Millions of Dollars)

Year	Exploration and production	Manufacturing	Marketing	Transportation	Other	Total
1953	64	16	12	3	2	97
1954	84	10	13	2	5	114
1955	103	3	11	1	6	124
1956	98	10	11	4	6	129
1957	129	10	12	4	3	158
1958	85	7	5	1	2	100
1959	134	14	9	4	3	164
1960	117	17	17	3	10	164
1961	85	28	18	8	9	148
1962	98	9	26	21	4	158
Total	997	124	134	51	50	1,356
Average	100	12	13	5	5	136

Source: Adapted from Continental Oil Company, Annual Report 1962 (Houston, 1963), pp. 32-33. All figures are for Continental and majority-owned subsidiaries, both domestic and international. Capital expenditures are recorded primarily as additions to gross property accounts.

grant automatic approval to commit funds.[51] Authority to commit funds and commence work, other than necessary preliminary work such as engineering, should come by means of a request for expenditure and ordinarily should be based on individual projects. The term sometimes applied to the approval process for such requests is "authority for expenditure" (A.F.E.).

The A.F.E. procedure is a sequential step in which evaluation and screening activities occur, and it is one in which the activities of coordination and formalization also are required. The degree of sophistication as to the support and justification for a project usually will be greater at the time an A.F.E. is approved than when the project is incor-

[51] V. J. Reilly, "Capital Budgeting for Manufacturing," in *Planning and Justifying Capital Expenditures*, ed. Arthur Lesser, Jr. (Hoboken, N.J.: Stevens Institute of Technology, 1959), p. 11.

porated as a part of the budget, since the A.F.E. will result in a more careful analysis of all the pertinent factors than may have been feasible when the budget was allocated.[52] Thus, the A.F.E. is, in effect, a good second look at budgeted projects, and the procedure also should provide for an up-to-date set of documents justifying and describing the expenditure.

With regard to format and procedures, a study of the appropriation procedures of 40 firms indicated that nearly all had adopted standard forms and format for writing up appropriation requests.[53] One author observed that "the documents of an appropriation [A.F.E.] request usually consist of a summary containing all key information, an economic justification, an engineering report, and a capital cost estimate."[54]

The A.F.E. and the supporting detail for it should be originated at the level at which the expenditure will occur, using available staff assistance, if needed. The detail included at the time of preparation of the annual budget ought to be updated to incorporate changing circumstances and/or more sophisticated analysis. As a practical matter, a very nominal capital expenditure might not require a separate A.F.E. Instead, the charge might be against designated blanket A.F.E.'s.

The approvals required for an A.F.E. will depend largely on the degree of decentralization of authority in any given firm, the size of the company, the amount and significance of the expenditure, and whether or not the project was included in an approved budget. Limitations might be set up as follows:[55]

Limitation (dollars)	*Managerial personnel responsible*
0 — 1,000	Plant manager
1,001 — 2,500	Vice-president, Production
2,501 — 5,000	President
5,001 — 15,000	Executive Committee
15,001 and over	Board of Directors

[52] L. J. Moser, "Control of Capital Expenditures," *Business Budgeting*, III, No. 5 (April 1955), p. 4.

[53] Hamilton R. Wager, "The Appropriation Request," *Chemical Engineering Progress*, LII, No. 10 (October 1956), p. 403.

[54] C. G. Edge, *The Appraisal of Capital Expenditures* (Ontario: The Society of Industrial and Cost Accountants of Canada, 1959), p. 19.

[55] Clark I. Fellers, "Problems of Capital Expenditure Budgeting," *N.A.C.A. Bulletin*, XXXVI, No. 9 (May 1955), p. 1210.

If a project had not been included in the budget, then an approved amendment to the budget would have to be obtained before approval could be secured for an A.F.E. As a practical matter, minor unbudgeted projects should be committed against a budgeted contingency of miscellaneous unforeseen projects. However, whatever the approvals required, the "lines of approval authority should be clearly marked to avoid confusion and to insure uniformity of action."[56]

Approval of the A.F.E. should be delegated to the lowest organizational level having the necessary competence to make the decision, as opposed to passing every A.F.E. on to top management for approval. While the philosophy regarding the extent of decentralization of approval authority will vary from company to company, the amount and significance of the expenditure and whether or not the project was budgeted ought to be considered in determining the required level of approval. Required approvals also may be governed by whether or not designated criteria are met (such as prescribed D.C.F. rates of return for various kinds of projects). As a company grows larger, its management must be willing to delegate authority, if organizational bottlenecks are to be avoided. With the decision to delegate comes the necessity to communicate clearly to approval-level subordinates the objectives, policies, and procedures that are to be followed. In addition, checks must be made to be sure that the specified frame of reference is being followed and that the lines of approval authority are being designated clearly.

The A.F.E. does not afford control over administrative costs, either before or after A.F.E. approval. This area constitutes a control problem that should be dealt with, by those supervising the administration of the various segments of the capital-expenditure program, through the use of observation, direct contact, and reports.

During the budget year, management should have periodic reports prepared which compare cumulative approved A.F.E.'s to the approved capital budget, by categories. Such comparison should be provided for the organizational levels which originate the requests for expenditure, as well as for those granting A.F.E. approval. Higher echelons should receive summaries of this information, with the out-of-line items reported in greater detail.

[56] Horace G. Hill, Jr., "Management of Capital Expenditures," *Business Budgeting*, III, No. 4 (March 1955), p. 3.

Field Application. At Continental, a request for expenditure (A.F.E.) procedure[57] was prescribed as a prerequisite to the commitment of funds. However, the engineering work, the receipt of bids, and tentative arrangements often were accomplished prior to formal A.F.E. approval on the basis of verbal assurance that the project would be approved.

Commitments were effected by an A.F.E. That is, if the project were specifically budgeted (i.e., an allocated item), the A.F.E. was committed against it. Otherwise, the A.F.E. was committed against the appropriate unallocated fund or against an approved amendment to the budget. As a rule, the A.F.E. was originated at the level at which the expenditure was to occur. The support for such an A.F.E. varied, but it generally included an economic appraisal, narrative description and justification, maps and/or drawings, data prescribed by the functional department, additional support that the sponsor of the project felt was suitable, and additional information that the approving authority considered necessary. For projects specified in the budget, the support often had been detailed at budget time and simply was updated to reflect changing circumstances and/or a more sophisticated analysis.

The Controller's Department Bulletin No. 4, which was quite explicit with respect to A.F.E. procedures, was made up of numerous sections containing detailed written procedures. The following selected section headings should serve as an indication of the type and variety of these procedures:[58]

Commitments against the Budget.
Restrictions on Commitments.
Redelegation of Authority to Approve Commitments.
Overcommitments of the Budget.
Transfer of Budgeted Funds.
Commitment Records and Reports.
Authority for Expenditures (A.F.E.'s).
Minimum A.F.E. Requirements.
Specific A.F.E.'s.
Blanket A.F.E.'s.

[57] As used here, the terms "request for expenditure," "authority for expenditure," and "A.F.E." are synonymous.

[58] Continental Oil Company, *Capital Commitment Budget and A.F.E. Procedures*, pp. 1–17.

Overexpended A.F.E.'s.
Net-over-Expenditures.
Casualty Loss A.F.E.'s.
Approval of A.F.E.'s.
Numbering of A.F.E.'s.
Distribution of A.F.E's.
Cancellation of A.F.E.'s.
A.F.E. Completion Reports.
Statement of Open A.F.E.'s.
Maintenance, Retirement, Salvage, and O.M.S. A.F.E.'s.

The company felt that a project could be budgeted and allocated yet restricted. Essentially, this meant that the restricting level had an opportunity to review the A.F.E. prior to its commitment. If not restricted, a project's A.F.E. was approved in accordance with the published *General Authority Limitations* (see Appendix E, which has been adapted from a summary of these authority limitations).[59]

With only a few exceptions, A.F.E.'s were required for only those items over $1,000. Expenditures for lesser amounts generally were charged against a blanket A.F.E. for a particular kind of expenditure. Depending on the nature of the project, certain staff assistance was available. For example, in projects for manufacturing, petrochemical, and selected other departments, the Process Center and the staff of the chief design engineer assisted in process design, economic evaluation, contract-bid procedures, scheduling, etc.

In Bulletin No. 4, the company specified that the controller was to maintain a record of approved A.F.E.'s and that he was to submit quarterly reports (monthly reports, if necessary) to headquarters department managers, regional general managers, and regional department managers. These reports were to compare the managers' capital-commitment budget with the cumulative commitments (A.F.E.'s) that had been made against it. Line managers also were to be kept informed on a timely basis by their subordinate echelons concerning the status of the A.F.E.'s in relation to the budget. In addition, a formal midyear budget

[59] Unless otherwise indicated, the approval authority could be redelegated. In addition to Appendix E, Appendix F has been included as an illustration of the further delegation of authority to levels below the regional general manager. As has been noted previously, the philosophy of delegation of authority to the lowest feasible level prevailed. Appendixes E and F contain illustrations of the company's application of authority delegation in the request-for-expenditure activity.

review was conducted by all departments. At this time, requests often were made through channels to the Board of Directors for additions to the budget. During the year, however, it was still possible to carry a major unbudgeted proposal individually through channels to the board, if circumstances made such action necessary or timely.

In-Process Control

Basic Approach. A procedure for the control of cost, time, and quality is needed to cover the period from project approval to completion. The control process described under the in-process portion of the framework involves primarily the commitment and expenditure of funds for the accomplishment of approved A.F.E.'s. Of course, some costs are incurred prior to the approval of the A.F.E. in order (1) to justify budgeting the item, (2) to support the A.F.E., and (3) to make necessary preparatory arrangements involving authorized contact with potential process designers, construction contractors, raw-material sources, customers, etc. Other necessary administrative costs which occur after A.F.E. approval, though generally not charged to an A.F.E., should not be permitted to get out of proportion. In-process control efforts, as well as other facets of the capital-expenditure framework, involve complex coordination problems, particularly for large and/or multidepartmental projects. The importance of in-process control has been cited by Owen, as follows: "The successful execution of a project depends on the control of project commitments and expenditures. This ensures that (1) the purpose of the project is accomplished and (2) expenditures do not exceed the estimated cost of the project."[60] The in-process activity also may involve formalizing, evaluating, and screening. Since, for many expenditures, it is necessary to accumulate costs of acquiring assets, data should be maintained "in a manner that will yield good detail for fixed asset records."[61]

A plan for asset acquisition is presupposed. Costs will be found to originate either from a single source or from many sources, to be incurred in an instant (e.g., acquisition of an automobile), or to be spread over an extended period (construction of an office building). Further-

[60] G. E. Owen, "Project Commitments and Expenditures—Their Effective Control," *N.A.A. Bulletin*, XL, No. 9 (May 1959), p. 89.

[61] R. A. Chapman, "Control of Capital Construction Expense," *The Accountant*, CXXVIII, No. 4083 (March 21, 1953), p. 330.

more, the cost to the acquiring firm may be fixed definitely (e.g., a turn-key contract), or it may be subject to variation (e.g., a cost-plus fixed-fee contract or a self-constructed asset).

As in job-order cost accounting, or more generally in the total context of cost accounting, there is the problem of cost control as well as cost finding or cost accumulation, assuming an expenditure for which the cost is subject to variation:[62]

> Once a project is begun, there is a continuing need to control the expenditure with the budgeted data serving as a standard against which to measure. This need is particularly applicable in expenditures involving construction projects, mainly because they commonly cover an extended time period. Problems include assurance that the project progresses according to specifications; that it is not delayed to the point that lost revenue or lost cost savings become significant; and that costs are incurred in a manner consistent with the budget.

Such regulation also implies control of specifications and time as well as the restriction and supervision of costs.

The responsibility for control needs to be designated clearly, together with the recognition that assistance from (and coordination with) many individuals and groups, both within and external to the company, will be necessary in order to complete the approved expenditure successfully and to place the project in operation.

To be effective, control in any cost-accounting environment must be timely. Actual results should be compared to approved plans (the A.F.E. and related support), with variations being reported to responsible authorities, so as to facilitate corrective action as quickly as possible. On-the-scene observation and supervision can be an effective control device, particularly since such control can be exercised at a point in time close to the incurrence of cost and thus afford the needed rapid corrective action. However, this control is possible only if competent personnel, who have the information and authority necessary to carry out their tasks, perform this function.[63]

Those responsible for control not only should have available the nec-

[62] Milton F. Usry, "PERT/COST and the Capital Expenditure Control Program," *The Journal of Accountancy*, CXV, No. 3 (March 1963), p. 83.

[63] Those personnel directly involved usually comprise an engineer, who has the responsibility for all field construction, and a construction auditor, who is in charge of all office operations. (See J. W. Brandt, "Control of Construction Cost Let under Contract," *N.A.A. Bulletin*, XXXIX, No. 3 [November 1957], p. 48.)

essary technical staff assistance, but also they should be furnished useful control data emanating from the company's accounting-information system. While the accumulation of detailed expenditure data is important for the maintenance of adequate historical (fixed-asset) records, unless such data are accumulated and reported in a timely manner, they may be of very limited use in providing effective control.[64] However, deficiencies in the timeliness and content of accounting information appear to be characteristic of many capital-expenditure programs.

Construction engineers have long used such devices as bar charts for planning and controlling the timing of project activities. Quality typically is controlled by observation. Modern data-processing equipment may offer assistance by making available better control tools.[65] Even so, the in-process control activity may become quite complex, particularly in large projects stretching over an extended time period. The approved plan should be coordinated and controlled carefully if the objectives of a finished project, completed in accordance with the projected plans, are to be achieved.

Field Application. At Continental, it was recognized that, in the coordination and formalization of a project, there was a need to control costs, time, and quality related to capital expenditures, both before and after A.F.E. approval. Preapproval expenditures were found to be related to the administrative cost of developing a project up to the point that authorization was given to commit and expend funds. Postapproval expenditures were related primarily to the funds committed against an approved A.F.E. Since both technical and nontechnical personnel were involved in developing a project, both before and after A.F.E. approval, the cost of their efforts comprised practically all of the preapproval

[64] As King has pointed out, "The manufacturing concern which constructs its own buildings and other facilities needs standard costs just as much for such operations as for its manufacturing operations." (See John S. King, "A Method of Controlling Company Construction Costs," *N.A.A. Bulletin*, XXXIX, No. 3 [November 1957], p. 81.)

[65] For example, a newly developed technique, commonly referred to as "critical path scheduling" (C.P.S.) or "critical path method" (C.P.M.), is adaptable to the computer, and it should afford the means of improving the planning and control of construction-type capital expenditures related to time and cost. For a bibliography of material on this general topic, see Hugh E. Voress, Elmer A. Houser, Jr., and Fred E. Marsh, Jr., *Critical Path Scheduling—A Preliminary Literature Search* (U.S. Atomic Energy Commission, T.I.D.–3568; Washington, D.C.: Office of Technical Services, Department of Commerce, 1961).

expenditures and carried over into the postapproval time period. However, the in-process control of commitments charged against approved A.F.E.'s did not include these administrative costs, although the company was aware that these costs were real and that they should not be allowed to get out of proportion. The key control devices over administrative costs were the progress reports to higher levels, indicating the status and extent of efforts devoted to the development of capital-expenditure proposals.

The acquisition of assets should be well planned by means of the coordinating and formalizing activities, and such a plan should include specifications as to time, quality, and cost. At Continental, this task was performed by a project's sponsor (coordinator) or his designated assistants, together with any necessary staff assistance, which was available from other levels or departments. For example, the use of such staff assistance was found to be normal and essential for some nonroutine construction projects or those requiring bids.

Monthly A.F.E. status reports were prepared from information accumulated by the Controller's Department. However, because of the time span between cost incurrence and the report on it, such records did not, for most projects, afford a vehicle for timely corrective action and requests for any additional funds needed. Such records, however, did provide necessary historical data for the company's accounting purposes. An A.F.E. completion report, which was required as soon as possible after the completion of a project, served for all interested parties as an official notice of completion and as a signal to the Controller's Department to transfer the accumulated costs to the appropriate fixed-asset records. This department prepared annually, as of November 30, a statement of A.F.E.'s which had not been closed for one year or more after approval. On the statement, it was required that the estimated date of completion be shown for each entry.

Several other timely control activities were in use at Continental. Independent drilling contractors were used for all drilling wells, exploration and development. A drilling foreman who was a Continental employee was assigned to each well in process for liaison and control purposes. In the drilling-well situation discussed in a later chapter, daily well-log reports were noted to be important gauges of the progress being made, because such reports indicated number of feet drilled as related to time, types of formations encountered, etc. Also, in the production district offices, clerks accumulated individual well costs from

invoices as they were processed for routing to the Controller's Department for payment. In the refineries and chemical plants, project engineers or, on occasion, internal auditors or their representatives were assigned for these same purposes. Staff assistance and special data also were provided, depending on the nature of the project. The Process Center and the Engineering Department might perform such services as construction supervision, plant start-ups, and analysis of inefficient or off-specification production.

Follow-Up

Basic Approach. Follow-up is the process of comparing and reporting actual results as related to the outcome predicted at the time the investment project was evaluated and justified. Another term frequently applied to this process is "postcompletion audit."

A follow-up appraisal has the following two principal advantages: (1) the decision-maker and his superiors are able to evaluate performance flowing from the expenditure, and (2) the decision-maker and others should gain knowledge that would improve the future selection of investments.[66] Moreover, "if an analyst knows that his estimates are to be postaudited, he is unlikely to leave any stone unturned in making his original estimates as reliable as possible."[67]

Although a survey of the literature indicated a wide and increasing recognition of the importance and desirability of follow-up,[68] the actual work in this area has tended to lag behind advances made in other components and activities of the administrative framework. Such factors as administrative cost, failure of the accounting system to produce needed information, difficulty in quantifying the results of certain types of investments, lack of personnel qualified to perform the follow-up,

[66] Daniel R. Toll, "Appraising the Results of Decisions," an address presented before the Conference of Accountants, The University of Tulsa, April 26, 1962, at Tulsa, Okla.

[67] Gerald J. Matchett, "Discussion—Post Auditing," in *Planning and Justifying Capital Expenditures*, ed. Arthur Lesser, Jr. (Hoboken, N.J.: Stevens Institute of Technology, 1959), p. 29.

[68] A study published in 1963 has pointed out that "most companies make some postcompletion audits to determine whether forecast benefits are in fact being realized. . . . In contrast, according to an earlier Conference Board report, as little as ten years ago very few companies had postaudit requirements of any kind." (See Pflomm, *Managing Capital Expenditures*, p. 80.)

difficulty of comparing results arising from inconsistencies of technique and application, as well as the resentment of those being audited, have been reported as common hindrances to effective follow-up procedures.

Practices regarding follow-up vary widely,[69] particularly with respect to the timing and repetitive nature of such work.[70] For example, Pflomm reported that most companies audited projects requiring large outlays or having major significance to management, whereas some companies audited on a formal, routine basis and others on a special-request basis. If the review were made at management headquarters, it was usually a controller's function; if made by local personnel, the work usually was performed by accounting and/or industrial engineering personnel.[71]

For uniformity, efficiency, and independent review, a centralized group, as designated by management, may prescribe procedures and audit the performance of the follow-up activity independently. The computations and explanations of variances should be performed by those having the necessary technical background within the respective operating departments. An exception would be a project involving several departments, in which case a designated centralized group, technically qualified, should be assigned the follow-up duty. The technically skilled group in the operating departments should have at its disposal the necessary data from the accounting-information system. Close liaison and cooperation would be required.

The starting point should be a formalized and coordinated follow-up routine with clear designations as to (1) the projects to be audited, (2) the frequency, (3) the length of time to be covered, (4) the procedures and format to be followed, and (5) the personnel responsible for prescribing procedures, performing the follow-up and independent review, and taking action. This statement is not intended to imply

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[69] According to one author, "Some form of report on accomplishment should be prepared on all projects which are undertaken on a savings or return-on-investment basis." (See Arthur V. Deekens, "Did We Realize on That Capital Investment?" *N.A.A. Bulletin*, XL, No. 9 [May 1959], p. 86.) On the other hand, Jaedicke has commented, "It seems to me that accountants are sometimes too quick to advocate follow-up reporting as an absolute necessity regardless of what is being reported on. . . . If the cost of the [follow-up] system is high and the information of below-average usefulness, follow-up on a project basis is not the answer." (See Robert K. Jaedicke, "Rate-of-Return Verification by Follow-Up Reporting on a Project Basis," *N.A.A. Bulletin*, XLI, No. 10 [June 1960], p. 64.)

[70] Pflomm, *Managing Capital Expenditures*, pp. 89–96.

[71] *Ibid.*, pp. 81–89.

that follow-up of *all* projects for extended time periods is either necessary or desirable. However, it does mean that the follow-up activity should be spelled out and administered accordingly. Justification of the extent of the activity should be the value received as related to the cost of obtaining the follow-up information.

There are many criteria for judging the effectiveness of an investment decision, just as there are many criteria for evaluating proposed investments. In addition to return on investment, there are (1) quantitative measures, (2) competition, (3) balance of investments, and (4) legal, strategic, and social considerations. It is of primary importance that care be taken to compare data that are indeed comparable. For example, if an aftertax D.C.F. rate of return, as projected in support of the A.F.E., is compared in the postaudit procedure to the average annual return on original investment for a given year, the results could be quite misleading.[72]

The utilization of follow-up data as a control device demands that the results be reported to the levels of management which exercise the control function; and, under such conditions, follow-up summaries may be an effective tool for higher levels of management. The results of individual projects may be reported at operating levels, with reports of only out-of-line projects being routed upward in detail and the remainder being reported in summary only. Out-of-line results then should trigger corrective action. However, regardless of the methods used, those who perform the routine activities and those who take action on the results should have a thorough understanding of the techniques in use, both as to their purposes and their limitations.

Field Application. At the time of this study, the follow-up process employed at Continental had been largely on a special-study basis. However, where feasible, there appeared to be a movement away from the individually initiated and the special-request types of follow-up toward more formal, routine procedures. As in the past, it appeared that the follow-up activity would continue to be executed at the departmental level. This arrangement was considered desirable, because it was felt that each department should be aware of its own individual follow-up needs and should have the technical competence to perform its own

[72] One of the best comparisons for a firm using the D.C.F. rate for evaluation purposes is a recomputation of the D.C.F. rate based an actual data to date and a reestimation of future data.

follow-up activity. However, the desirability of having uniform procedures and the detachment in position of a group such as the Controller's Department were strong factors in favor of the centralized coordination of procedures and the independent review of a representative number of project follow-up computations. While it was felt that the origin of the computations and the explanation of variances should remain within the respective operating departments, it was considered essential that the design of the follow-up procedures not only should meet the needs of those using the follow-up data but also should recognize the importance of uniform methods and independent reviews.

Some of the follow-up activity already had become routine company procedures at the time of this study. In the case of producing-well leases, payout-status reports had been used on a routine basis for many years and were being prepared on tabulating equipment. Since 1959, the Production Department headquarters had been preparing a well data card for each producing well, based on actual data to date and on a reestimate of future data. This form was completed at the end of the first two full calendar years of production. The Marketing Department received a tabulated report by service stations that included a return-on-investment calculation. In 1963, the Petrochemical Department had established a formal procedure for the analysis of certain types of investments.[73]

The interviews with various levels of Continental personnel during the course of this investigation revealed widespread employee interest in the follow-up area throughout the entire organization. At the same time, there was an awareness that follow-up procedures were not suitable for some projects. For example, a project might not be one designed to increase revenue and/or reduce cost. Even if it were justified on the basis of estimated future increased revenue and/or reduced cost, the data that measured the incremental results might be very difficult to sort out. Also, it was noted that variations in the follow-up computation methods, as compared to the original evaluation methods employed, might yield data that were not comparable.

The investigation found that uncontrollable factors often provided the explanation for variations from the expected (e.g., an unanticipated economic recession). It was recognized, too, that there are many criteria

[73] All of these were routine company procedures which have been noted and discussed in the individual case studies in succeeding chapters.

for judging the effectiveness of an investment decision, just as there are many criteria for evaluating proposed investments.

The follow-up analyses of major and/or out-of-line projects were presented in detail to higher levels of management, and summary reports of return on investment by types of investment (e.g., classified by project, such as service stations or oil wells, and by geographical units) also were utilized.

Continental's management had long been aware of the importance of follow-up in its capital-expenditure program. Recognizing the importance of this activity, the 1954 study group that investigated capital-investment procedures summarized company attitudes in the following recommendation included in its report:[74]

> Wherever it is feasible to do so, accounting and statistical procedures should be developed which will make it possible to compare the actual earnings of new investments against those projected at the time the investment is made. These comparisons should be summarized by divisions, regions, and functional areas and reported to top management on a continuing basis.

In the chapters which follow, several case studies of specific capital-expenditures for both routine and nonroutine projects at Continental have been presented in detail. The guidelines and policies which have been outlined and discussed in the current chapter are reflected in the discussion and analysis of these four projects.

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[74] As quoted in Harvard University, *Continental Oil Company—Appraisal of Capital Investments* (ICH C12, Admin. Acctg. 117; Cambridge, Mass., 1955), p. 7.

CHAPTER III

CASE STUDY OF A COMPANY PRODUCING WELL: THE J. F. CLARK WELL NO. 1

BACKGROUND INFORMATION

Characteristics of the Case

The drilling of a development oil well constituted a routine-type capital investment by the Production Department of Continental Oil Company. The analysis of this project revealed the nature of the production segment of the oil industry, and it offered the opportunity of examining the administrative process for implementing a specific capital expenditure.

Among the aspects covered by the investigation were: (1) the basic planning and control features of a common, repetitive-type investment decision, involving primarily one department and a relatively small amount of funds; (2) the chronological development of specific details regarding the drilling of the J. F. Clark Well No. 1, which began production in November 1959;[1] and (3) the operational approach used by the Production Department in implementing the investment within the context of Continental's overall capital-expenditure program.

Some of the more specific features of the case included: (1) a comparison of Continental's capital expenditures for exploration and production with those of the oil industry as a whole; (2) the expenditure of budgeted unallocated funds; (3) the source of investment ideas and the guidelines for producing-well investments; (4) the procedure for the processing and approval of A.F.E.'s, including illustrative forms; (5) the supervisory control of the expenditure of funds, including illustrative forms; and (6) the follow-up procedure, including illustrative forms.

[1] For purposes of anonymity, this well has been disguised as being located in the Rocky Mountain Region of Continental Oil Company.

TABLE 3

DISTRIBUTION OF CAPITALIZED EXPENDITURES OF THE OIL INDUSTRY IN THE UNITED STATES, 1957–1961

Year	Total capital expenditures (millions of dollars)	Capital expenditures for exploration and production		All other capital expenditures	
		Amount (millions of dollars)	Percent of total	Amount (millions of dollars)	Percent of total
1957	6,400	4,525	71	1,875	29
1958	5,300	3,650	69	1,650	31
1959	5,275	3,850	73	1,425	27
1960	5,175	3,735	72	1,440	28
1961	5,100	3,525	69	1,575	31
Total	27,250	19,285	71	7,965	29

Source: Adapted from Frederick G. Coqueron, Petroleum Industry 1961 (New York: The Chase Manhattan Bank, 1962), p. 18.

Nature of the Exploration and Production Functions

Although a routine activity, the drilling of development oil wells has served the continuing need to replace and increase vital crude oil reserves—the raw material for the oil industry. The costs for this activity have been a part of the aggregate expenditures for finding and developing crude oil, costs which represent a very large percentage of the total annual oil-industry investment. The significance of the aggregate location and development costs can be seen in Table 3, which shows the distribution of capital expenditures of the oil industry in the United States, 1957–1961.[2]

The total capital expenditures by Continental for the same period, including both international and domestic activities, can be seen in Table 4.[3] These percentages indicate the significance of the exploration and production capital expenditures for Continental's operations as well as for the total oil industry. The related quantity data for Continental shown in Table 5 indicate still further the scope of the company's ex-

[2] Frederick G. Coqueron, *Petroleum Industry 1961* (New York: The Chase Manhattan Bank, 1962), p. 18.

[3] Continental Oil Company, *Annual Report 1962* (Houston, 1963), pp. 32–33.

TABLE 4

DISTRIBUTION OF CAPITALIZED EXPENDITURES OF CONTINENTAL OIL COMPANY, 1957–1961

Year	Total capital expenditures (millions of dollars)	Capital expenditures for exploration and production		All other capital expenditures	
		Amount (millions of dollars)	Percent of total	Amount (millions of dollars)	Percent of total
1957	158	129	82	29	18
1958	100	85	85	15	15
1959	164	134	82	30	18
1960	164	117	71	47	29
1961	148	85	57	63	43
Total	734	550	75	184	25

Source: Adapted from Continental Oil Company, Annual Report 1962 (Houston, 1963), pp. 32-33.

ploration and production activities. (In this table, the term "net wells" refers to Continental's ownership share in gross wells.)

For production wells, economic appraisals were made assuming a successful well based on the types of wells found in the particular field in which the well was to be drilled. It was expected that management then would view the resulting evaluation based on the existing probabilities of drilling a dry hole or an atypical well in the geographical location involved. Wells drilled with the hope of finding a new oil deposit were designated as exploration or wildcat wells but, once oil had been discovered at a given depth in a geographic area, any subsequent wells were classified as development wells.

Budget and Request for Expenditure

Each year, the annual budget for the Production Department of Continental included unallocated funds as a contingency provision for unscheduled or unforeseen projects. Production wells, included under the allocated category as a specific, individual blanket project, had been anticipated, and appraisal data usually had been prepared at the time that the budget was made up (beginning in July of the preceding year

TABLE 5

DATA ON EXPLORATION AND PRODUCTION QUANTITY, CONTINENTAL OIL COMPANY, 1957–1961

Item
Net acreage for Continental and consolidated subsidiaries, as of December 31 (thousands of acres)
Domestic acreage
Held by production, fully or partially developed
Undeveloped, held by leases or options
International acreage
Gross domestic exploratory and development wells completed
Net domestic exploratory and development wells completed
Net development wells completed
Oil wells
Gas wells
Dry holes
Net exploratory wells completed
Oil wells
Gas wells
Dry holes
Gross international exploratory and development wells completed
Net international exploratory and development wells completed
Oil wells
Gas wells
Dry holes
Dry holes as percent of total net
Domestic
Development
Exploratory
International development and exploratory

Source: Adapted from Continental Oil Company, Annual Report 1962 (Houston, 1963), pp. 34-35

at the production-district level), although, even for some allocated wells, the precise location and economic data for each well were not available at that time.

About 40 percent of the budgeted, allocated wells were never drilled. On the other hand, it was often necessary to drill a number of wells that had not been anticipated at the time the budget was prepared. Consequently, allocated funds for cancelled wells were added to unallocated funds, although funds against which A.F.E.'s had not been committed could not be carried forward to the following budget year. Because of the dynamic nature of oil-well drilling operations, such circumstances as unexpected action by neighboring competition, a dry

TABLE 5 (CONTINUED)

1957	1958	1959	1960	1961	Total
66,265	47,847	49,410	56,944	80,008	--
8,082	6,910	7,630	9,084	9,123	--
495	540	636	646	713	--
7,587	6,370	6,994	8,438	8,410	--
58,183	40,937	41,780	47,860	70,885	--
756	592	893	863	671	3,775
511	422	638	611	412	2,594
428	365	553	511	325	2,182
348	303	466	415	221	1,753
22	18	24	31	39	134
58	44	63	65	65	295
83	57	85	100	87	412
14	13	12	14	16	69
9	3	5	7	4	28
60	41	68	79	67	315
192	202	202	210	228	1,034
110	105	105	103	113	536
70	59	67	62	80	338
12	14	9	11	11	57
28	32	29	30	22	141
14	12	11	13	20	14
72	72	80	79	77	76
25	30	28	29	19	26

hole, or a very attractive development in a field might reshape an area's program of drilling activity significantly. These factors emphasized the importance of a capital-expenditure system that was sufficiently sensitive and flexible enough to adjust to the need for rapid change but still to afford a sound control mechanism.

In 1959, authorized (by A.F.E.) allocated wells required the approval of the regional production manager,[4] unless circumstances had changed

[4] In 1963, this approval authority was passed down to the division production superintendents.

significantly from those that had existed at the time of budget preparation. If, in the judgment of the regional production manager, circumstances had changed materially, then he was supposed to follow the approval procedure required for unallocated wells, which needed the approval of the headquarters Production Department manager.[5] However, in emergencies, such approvals could be obtained very quickly.

CHRONOLOGICAL DEVELOPMENT OF THE PROJECT

A.F.E. Development and Approval

During the first half of 1959, the Cody (Wyoming) Production District cancelled eight budgeted, allocated drilling-well projects. This cancellation resulted from new geological and geophysical knowledge indicating that a field in which Continental held lease acreage was considerably more limited in its boundaries than had been anticipated previously. The strongest evidence was that three unsuccessful wells (dry holes) had been drilled by the XYZ Oil Company on leases in close proximity to those held by Continental. A conference with division and regional management led to a decision to suspend drilling temporarily in the field until more industry participation could be obtained for drilling activities.

After these funds were transferred to the unallocated section of the budget, the district superintendent instructed the district administrative coordinator and the district engineer and their staffs to prepare A.F.E. documents for six wells which had been planned tentatively for inclusion in the 1960 budget. Among these six wells was the J. F. Clark Well No. 1, for which the following forms and map comprised the A.F.E. detail (see Exhibits 7, 8, 9, and 10): (1) authority for expenditure (the Production and Exploration Department), (2) detail sheet for the authority for expenditure, (3) appraisal of new capital investment (Production Department), (4) data on offset and other nearby wells, and (5) Geological Department map (not included in the referenced exhibits). These data were accumulated through the joint effort of the staffs of the district administrative coordinator and district engineer, and the technical data were furnished by the engineers.

[5] In 1963, this approval authority was passed down to the regional production manager, provided certain requirements were met.

In Exhibit 9, the total original investment is shown as $40,200, with the future investment given as $6,000, discounted to present value. A factor of 18 percent normally was used to discount future investments, since it represented a bench mark of minimum expectation on funds invested in production wells. The revenue flow was broken into three periods, each representing a fairly constant rate of flow. The remarks section on the form explained the basis for estimates of reserves, production rate, and the sales price, and the gross recovery (line 8a) was reduced to Continental's net interest of 87.5 percent (line 9a). The remaining 12.5 percent was payable to the landowner, with no operating costs paid by him, which was a normal arrangement in the oil industry. Data on offset and other nearby wells (Exhibit 10) and the reference map furnished additional information useful to management personnel in their task of evaluating risk and making a decision. At times, further justification in narrative form might be appended to the supporting data.

If the J. F. Clark Well No. 1 had been budgeted and allocated, then the data illustrated in the above exhibits would have comprised the support for the form (shown in Exhibit 11) submitted at the time the annual budget was prepared. Although original budget data might not contain as much detail, this total package was gathered for budgeted, allocated wells for which the specific location was known at the time of the budget. If the precise location had not been determined, the budget support, of course, was not this detailed. Then, at the time the A.F.E. was processed for approval, the task became primarily one of furnishing more details and of updating the data already included at the time the budget was prepared.

Budget and A.F.E. data generally were prepared entirely by district personnel according to a rather routine procedure, as can be seen from the following excerpts from an interview with a district administrative coordinator:

> *Comment:* What staff assistance do you receive in budget and A.F.E. preparation? Of course, in your job you have a lot of contact with the engineers who are here at the district level. But do you ever go to division or region to get special kinds of expert assistance?
> *Reply:* These things are more or less standardized as to the procedures. We have a Production Department clerical procedures manual. We also use Controller's Bulletin Nos. 4 and 16.
> *Comment:* So the instructions are spelled out to the point that you really carry the ball almost without exception here in district?

Exhibit 7

AUTHORITY FOR EXPENDITURE, PRODUCTION AND EXPLORATION, CONTINENTAL OIL COMPANY

(Sample Copy)

DEPARTMENT Production REGION Rocky Mtn. DISTRICT Cody AFE NO. 5-45 6334

Cash & Warehouse Outlay Amount $ 40,200 (Conoco Net)

For: Drill and equipment.

J. F. Clark No. 1.

Field, Plant or Block Southeast Eureka

TD & Obj. Horizon (s) 5050' Red Fork

Investment (X) Maintenance ( ) Lease No. Nonproducing 70796

(1) Location, (2) Division of Interest, (3) Justification

(1) 660' fm N and 660' fm W lines of Section 30, T28N, R10W, Joiner Co., Wyoming.

(2) Continental Oil Company - 100%.

(3) To continue development in the Red Fork zone, increase production, and develop reserves.

There is no gas purchaser in this area.

DAJ-L3
GHH WEG EAA DWS TWS EHL RGP CRW (3).

(USE ONLY FOR DEV. WELLS) Daily Allowable 15 Bbls. Oil MCF Gas

EXHIBIT 7 (CONTINUED)

(USE ONLY FOR EXPL & LIM EXPL WELLS) Distance and Direction From Nearest Town: _____
Blk. No. _____ Gross Ac. _____ Net Ac. _____
First Exp. _____ Bulk Exp. _____ Annual Rent _____
Distance to Nearest Pipe Line _____ Name of P. L. Co. _____

Budget Project No. _____ Unallocated or Contingent
Amount Budgeted $ _____ Project No. 1 Date Prepared 7-27-59

APPROVALS:	DATE		GROSS	CONOCO NET
(Initiated by District Administrative Coordinator and District Engineer)		Material On Hand	$	$ 100%
(Signed by)		Material Purchases	$ 14,500	$
G. H. Orr (District Superintendent)	7-28-59	Depreciable Intangibles	$ 1,500	$
Lewis McGuire (Division Superintendent)	10-20-59	Total Depreciables	$ 16,000	$
E. A. Austin (Regional Manager, Production)	10-23-59	Expense Intangibles	$ 24,200	$
M. H. Dubrow (Manager, Headquarters Production)	10-29-59	Grand Total	$ 40,200	$
		Cash & Warehouse Outlay	$ 40,200	$

Source: Continental Oil Company, Houston.

AFE No. 5-45 6334

EXHIBIT 8

DETAIL SHEET, AUTHORITY FOR EXPENDITURE, CONTINENTAL OIL COMPANY
(Sample Copy)

TYPE
1. (X) Drill & Equip.
2. ( ) Miscellaneous
3. ( ) Drill & Test

GROUP
1. (X) Development
2. ( ) Maintenance
3. ( ) Exploratory
4. (X) Investment

RATES

Footage	5050'	@	$ 2.50
Daywork	1 day	@	$600
Daywork	2 days	@	$500
Daywork		@	

D & E J. F. Clark No. 1
A. F. E. Description (Limit to 31 Spaces)

10-29-59	$ 16,000	$ 24,200	$ 40,200	11-16-59
Date Approved	Material & Depr. Int.-Net	Drilling Cost Exp. Int.-Net	Total Auth. Net	Date Completed

70796	100%	5050'
Property Number	Conoco Interest	Proposed Well Depth

Description	ACCT. NO. FTRE	Mtl. & Depr. Intangibles Gross	Mtl. & Depr. Intangibles Net	ACCT. NO. FTRE	Expense Intangibles Gross	Expense Intangibles Net
Second Hand Equipment — Warehouse	8	$	Conoco 100%		XXXXXXXXX	XXXXXXXXX
Material Purchased — Dr.	9	14,500			XXXXXXXXX	XXXXXXXXX
Total Material		$ 14,500			XXXXXXXXX	XXXXXXXXX
Fuel, Water, Lubricants, Electricity	103	$		403	$	Conoco 100%
Location Damages, Roads — Bridges	107	300		407	1,000	
Salvage & Dismantling Costs	108			408		
Drilling Contract — Footage	111			411	12,600	
Drilling Contract — Daywork	112			412	1,600	
Drilling Bits & Reamers		XXXXXXXXX	XXXXXXXXX	413		
Fishing Tool Expense		XXXXXXXXX	XXXXXXXXX	414		
Directional Drilling Costs		XXXXXXXXX	XXXXXXXXX	415		
Mud Materials, Chemicals, & Services		XXXXXXXXX	XXXXXXXXX	416	1,600	
Cement & Cementing Service		XXXXXXXXX	XXXXXXXXX	417	1,500	
Noncontrollable Materials	118	400		418	700	
Tender Costs and Rentals		XXXXXXXXX	XXXXXXXXX	419		
Bontel Service	120			420		
Special Drilling Tool Rental		XXXXXXXXX	XXXXXXXXX	421		
Coring Costs	125			425		

EXHIBIT 8 (CONTINUED)

Drill Stem Tests		XXXXXXXXX	XXXXXXXXX	426		
Perforating		XXXXXXXXX	XXXXXXXXX	427	500	
Acidizing, Fracturing, Shooting		XXXXXXXXX	XXXXXXXXX	428	1,500	
Well Surveys, Electrical & Mud Logging		XXXXXXXXX	XXXXXXXXX	429	1,700	
Transportation	131	300		431	500	
Boats, Barges, Tugs — Cost — Rental	132			432		
Helicopters, Planes — Cost — Rental		XXXXXXXXX	XXXXXXXXX	433		
Overhead — Partner Operated	136			436		
District Expense		XXXXXXXXX	XXXXXXXXX	437	200	
Company Labor & Supervision	138			438	200	
Contract Labor	139	500		439	300	
Platforms — Fabrication & Installation	141			441		
Platform Maintenance	142			442		
Keyways — Well Structures		XXXXXXXXX	XXXXXXXXX	443		
Sales Tax (Controllable Material)		XXXXXXXXX	XXXXXXXXX	444	300	
Miscellaneous Costs	145			445		
Subtotal — Intangibles		$ 1,500			$ 24,200	
Dry or Bottom Hole Contributions Rec.		XXXXXXXXX	XXXXXXXXX	448		
Total Intangibles		$ 1,500			$ 24,200	
Total Cash & Warehouse Outlay		$ 16,000			$ 24,200	
Material on Hand	I				XXXXXXXXX	XXXXXXXXX
Grand Total		$ 16,000			$ 24,200	

MATERIAL DETAIL: $40,200

Casing - 8 5/8" O.D. 24# J-55 ST&C - 300'	$ 900
4 1/2" O.D. 9.5# J-55 ST&C - 5,050'	6,200
Tubing - 2 3/8" O.D. 4.70# J-55 EUE T&C - 5,000'	3,500
Regular Line Pipe - 2 3/8" O.D. 3.75# C.W. T&C - 1,700'	700
1 Production packer.	600
1 Low-pressure metering separator, complete.	1,100
Miscellaneous connections and fittings.	500
Well-head assembly and connections.	1,000
	$14,500

A. F. E. No. 5-45 6334

Source: Continental Oil Company, Houston.

Exhibit 9

APPRAISAL OF NEW CAPITAL INVESTMENT, PRODUCTION DEPARTMENT, CONTINENTAL OIL COMPANY
(Sample Copy)

FOR: J. F. Clark Well No. 1 - 660' FWL and FWL Section 30, T28N, R10W, Joiner County, Wyoming

CONOCO WORKING INTEREST: 100 %

NET INTEREST: 87.5 %

CONTINENTAL NET INVESTMENT

		ORIGINAL INVESTMENT	FUTURE INVESTMENT 4th YR.	FUTURE INVESTMENT ____ YR.	TOTAL
1.	DEPRECIABLE INVESTMENT	$ 16,000	$ 6,000	$	$ 22,000
2.	INTANGIBLES	24,200			24,200
3.	TOTAL INVESTMENT	$ 40,200	$ 6,000	$	$ 46,200
	DISCOUNTED TO PRESENT VALUES AT 18 %				
4.	DEPRECIABLE INVESTMENT	$ 16,000	$ 3,600	$	$ 19,600
5.	INTANGIBLES	24,200			24,200
6.	TOTAL DISCOUNTED INVESTMENT	$ 40,200	$ 3,600	$	$ 43,800

		FIRST YEAR	MIDDLE PERIOD	END PERIOD	TOTAL LIFE OF PROJECT
7.	ESTIMATED DURATION - YEARS	1	4	10	15
8a.	GROSS RECOVERY - OIL - BBLS.	8,030	24,820	43,050	75,900
8b.	GAS - MMCF				
	(USE AVERAGE ANNUAL FIGURES)				
	(REVENUE BEFORE TAXES)				
9a.	NET RECOVERY - OIL - BBLS.	7,026	5,429	3,767	66,413
9b.	GAS - MMCF				
10a.	AVERAGE CRUDE PRICE PER BBL.	$ 2.74	$ 2.74	$ 2.74	$ 2.74
10b.	AVERAGE GAS PRICE PER MCF	$	$	$	$
11a.	GROSS REVENUE: OIL (9a x 10a)	$ 19,251	$ 14,875	$ 10,322	$ 181,972
11b.	GAS (9b x 10b)				
11c.	TOTAL	$ 19,251	$ 14,875	$ 10,322	$ 181,972
12.	OPERATING COST	3,000	3,000	3,000	45,000
13.	NET BEFORE TAXES (11c — 12)	$ 16,251	$ 11,875	$ 7,322	$ 136,972

EXHIBIT 9 (CONTINUED)

		(INCOME TAX CALCULATION)			
14.	INTANGIBLE COSTS (total line 5)	$ 24,200			
15.	DEPRECIATION (6.3% of line 4)	1,235	1,235	1,239	
16.	DEPLETION (24% of line 11c)	4,620	3,570	2,477	
17.	TAXABLE INCOME (line 13 – 14, 15 & 16)	$ (13,804)	$ 7,070	$ 3,610	
18.	INCOME TAX (50% of line 17)	$ (6,902)	$ 3,535	$ 1,805	$ 25,288
19.	NET CASH FLOW AFTER TAX (line 13 – 18)	$ 23,153	$ 8,340	$ 5,517	$ 111,684
20.	INVESTMENT FACTORS — 22 % RETURN	0.82	2.04	1.46	
21.	PRESENT VALUES (line 19 x 20)	$ 18,985	$ 17,014	$ 8,055	$ 44,054
22.	PAYOUT PERIOD = 3.5 YEARS (Application of line 19 to total line 6)				

BASIS OF RESERVE CALCULATIONS

PAY ZONES	ACRES PER WELL	N. E. P. FEET	REC. FACTOR %	RECOVERABLE BBLS. AF	RECOVERABLE MCF AF	POROSITY %	F. V. F.	I. W. S. %
Red Fork Sand	33	25	18	92		13.1	1.2993	35

REMARKS: Recovery based on core analysis of Hall No. 2. Crude reflects trucking charge of 31¢/bbl. It is anticipated that artificial lift equipment will be installed at the end of the third year. Daily production for first three years was assumed to be 22 BOPD. Only 33 acres attributed to this well due to correction lines which reduces the number of acres in this section.

Prepared by: J. M. Duffie-LS Date 7-28-59

Distribution: WEG RGP CRW FILE.

Source: Continental Oil Company, Houston.

EXHIBIT 10

DATA ON OFFSET AND OTHER NEARBY WELLS, CONTINENTAL OIL COMPANY
(Sample Copy)

PROJECT DESCRIPTION: J. F. Clark Well No. 1 - 660' FNL and 660' FWL Sec. 30, T28N, R10W, Joiner County, Wyoming

S* P F GL	Daily Rates Oil Bbls.	Water % or Bbls.	Gas MCF	Choke Size 64th	FTP PSI	Gravity Degrees	GOR	Daily Allowable (Bbls.) (MCF)	Cumulative Production To 6-30-59
F	343	0	230.4	14	625	36.5	674	15	New Completion
F	354	0	157.5	12	600	38.0	445	15	1284
F	224	0	157.5	14	600	38.2	703	15	437
F	276	0	136.8	14	500	38.3	556	15	801
F	272	0	882.0	14	1260	38.3	3243	15	76

In reporting drill stem tests, column headings may be disregarded and data presented in narrative form.

Reply: In most cases, we can. If we have trouble, of course, we get some help on it from division. For example, if we cannot interpret a bulletin, we will ask division for assistance. Very seldom do we go to the region. It would be unusual if we did.

In Exhibit 9, a discounted-cash-flow (D.C.F.) rate of approximately 22 percent and a payout period of 3.5 years were indicated. According to the interviews with individuals at all levels in the department, the personnel throughout the company appeared to be generally aware of

EXHIBIT 10 (CONTINUED)

DATE: 7-27-59

Well Name and Location	Producing Formation and Perforated Zone(s)	Date of Test	Type of Test (IP) (LMT) (TBC)*
Conoco's			
Cobbett Heirs No. 1 SW SE Sec. 19, 28N, 10W	Red Fork Perf. 4966-4990' NEP 31'	7-28-59	IP
M. J. Hall No. 1 NW SE Sec. 19, 28N, 10W	Red Fork Perf. 4968-4982' NEP 17'	5-20-59	IP
M. J. Hall No. 2 NE SE Sec. 19, 28N, 10W	Red Fork Perf. 4961-4974' NEP 16'	6- 8-59	IP
J. F. Bishop "A" No. 1 NE SW Sec. 19, 28N, 10W	Red Fork Perf. 4962-4975' NEP 15'	6-13-59	IP
J. F. Bishop "A" No. 2 NW SW Sec. 19, 28N, 10W	Red Fork Perf. 4964-4976' NEP 21'	6-27-59	IP
E. J. Hill NW SE Sec. 30, T28N, 10W	Red Fork Perf. 4970-4977'	Testing on 10-23-59 Flowed 25 bbls. oil— 24 hrs.	

*IP--Initial Potential LMT--Latest Monthly Test TBC--Test Before Completion
P--Pumping F--Flowing GL--Gas Lift S--Swabbing

Source: Continental Oil Company, Houston.

the uses and limitations of the D.C.F. method as a primary yardstick for evaluation. The following excerpts from an interview with a member of headquarters production management were typical:

> *Comment:* What do you think of D.C.F. as a decision-making tool?
> *Reply:* I think D.C.F. is a valuable tool because you cannot escape the fact that you cannot put money in and let it just sit there without an adequate return, . . . but at the same time you cannot escape the fact that it might be a lot better to have say 11 percent return on a $30 million invest-

EXHIBIT 11

CAPITAL COMMITMENT BUDGET FOR A WELL, CONTINENTAL OIL COMPANY
(Sample Copy)

I REGION: _____ BUDGET PERIOD _____ PROJECT NUMBER _____

OPERATOR _____ CONOCO COST: _____ % W. I. _____ % DEV. EXP. OR LIM: _____

LEASE & WELL NO(S).: _____ BLK. OR FIELD: _____

LOCATION _____ OBJECTIVE HOR: _____

COUNTY: _____

DOES LOC. CONFORM TO STATE & FED. RULES? _____ STATE: _____

LSE. NO. _____ GROSS ACRES: _____ EXPIRES: _____ ROYALTY RATE _____ OVERRIDES & OIL PAYMENTS: _____

II (USE ONLY FOR EXPL. & LIM. WELLS) DISTANCE & DIRECTION FROM NEAREST TOWN: _____

BLK. NO.: _____ GROSS ACRES: _____ NET ACRES: _____ FIRST EXPIRE: _____ BULK EXPIRE: _____ ANNUAL RENTAL: $: _____

MONTHS WORK NEEDED: LAND: _____ EXPLOR: _____ ; _____

ROYALTY ACRES: OWNED: _____ TO ADD: _____

NEAREST PIPE LINE COMPANY & DISTANCE: _____

III (USE FOR EXPL. & DEVEL. WELLS)

EXPLOR. METHOD: _____

TYPE STRUCTURE: _____

PROSPECTIVE ZONES & DEPTH	(P): PRODUCES IN FIELD	FEET TO CORE	NO. DST'S	PROSPECTIVE ZONES & DEPTH	(P): PRODUCES IN FIELD	FEET TO CORE	NO. DST'S

T.D. & FORM.: _____ SPECIAL LOGS & SERVICES: _____

OVER-ALL RIG DAYS: _____

EXHIBIT 11 (CONTINUED)

IV

CASH OUTLAY:	COST OF PRODUCER (USE FOR BOTH DEVELOPMENT & EXPLORATORY WELLS) GROSS AMOUNT	CONOCO PORTION	COST OF DRY HOLE (USE ONLY FOR EXPLORATORY WELLS) GROSS AMOUNT	CONOCO PORTION
DEPRECIABLE INVESTMENT	$	$	$	$
EXPENSED INTANGIBLES	$	$	$	$
TOTAL CASH OUTLAY	$	$* ⊗	$	$
MATERIAL ON HAND	$	$	$	$
TOTAL COMMITMENT	$	$	$	$

(USE ONLY FOR DEVELOPMENT WELLS)

YEARS PROB. NET CASH FLOW INVESTMENT FACTOR PRICE PRICE
PAY-OUT: _____, LIFE: _____; AFTER TAXES $ _____ RETURN _____ % CRUDE: $ _____ GAS: $ _____
NET PER WELL ULT. GROSS MMCF DAILY ALLOW. O MCF
PAY: _____ FT.; ACRES: _____ BBLS. OIL: _____, GAS: _____ BBLS. OIL: _____, GRAV. _____ GAS: _____

DATE: _____

	PRESENT DAILY GROSS PRODUCTION BBLS. OIL	BBLS. WTR.	MCF GAS	CALENDAR DAY ALLOWABLE
LEASE:				
FIELD:				

DATE: _____

CUMULATIVE DIRECT LIFTING COST BBL.	DIRECT GAIN (OR LOSS) CURRENT YEAR
$	$
$	$

V Reason for Drilling: A. General; B. Data on Nearby Wells; C. Contract & Well Obligations; D. Probable Contributions; E. Critical Lease Dates or Other Reasons for Drilling Soon; F. Map Reference for Exploratory Well. (Explain A, B, C, D, E & F Fully or Write "None", for More Space Use Reverse Side Tumble Style)

APPROVALS: (INITIALS & DATE) PRODUCTION DEPARTMENT	EXPLORATION DEPARTMENT	REGION MANAGEMENT

COMMENTS (FOR HEADQUARTER'S USE ONLY)

TOTAL CONOCO CASH OUTLAY PRODUCER: $ _____ ⊗
GROSS WELL(S): _____ NET WELL(S): _____
OBJECTIVE HOR.: _____
BLK. OR FIELD: _____
DATE ORIGINATED: _____
PLACE " : _____
BY: _____ PROJ. NO. _____

Source: Continental Oil Company, Houston.

ment than a 45 percent return on a $100,000 investment. You cannot get away from cash flow, . . . but if you look only at the D.C.F., why you are making as big a mistake as you would if you did not have it.

Comment: I understand that you discount future cash flows, subject to legal production-rate allowables, assuming that the well will be a good producer based on what is typical for surrounding wells. You do not consider risk and uncertainty of a dry hole and perhaps other factors until after the D.C.F. rate is figured.

Reply: That is right. You cannot overlook the fact that there are a lot of numbers that have to be estimated. . . . It depends a great deal on whether you agree with some of these basic numbers [that were used in the calculation]. Changing these numbers can change the rate of return rather substantially. . . . You apply a lot of judgment.

We also cannot escape the fact that our calculations are based strictly on Production Department expenditures. We do not incorporate into our figures the exploration costs. However, we have a pretty good overall idea about what that does to our rate of return. . . . Maybe we are paying rentals on leases and by drilling a well we will find out whether we should or should not [renew the leases]. . . . There are a whole multitude of things to consider. I mentioned earlier the case where there was about a 7 percent return on drilling a well, and yet it opened up the way to drilling twenty or thirty wells. Now the boys who sent this up wrote a narrative justification. We justified it to ourselves, and the strange part about it was that the Controller came down and said, "Why are you drilling a 7 percent well or is this a mistake?" We explained the reasoning, and he said, "That makes sense."

In-Process Control

Once the project for the J. F. Clark Well No. 1 had been approved and the drilling contract let, the immediate responsibility passed to the district drilling foreman. Continental contracted the drilling of all wells, but the foreman supervising the work received a copy of (1) the A.F.E. and its support and (2) the proposed well plan (shown in Exhibit 12)[6] prepared by the district engineering staff. This well plan served as a "blueprint" for the drilling of the well, with the drilling foreman acting as the liaison between the company and the drilling contractor. The drilling foreman exercised the most significant control over cost and specifications of the work to be done, and the nature of

[6] Since the data for the form shown in Exhibit 12 were highly confidential, only the blank form has been included to indicate the classes of data used.

this type of in-process control was described in the following excerpts from an interview with a production district administrative coordinator:

> *Comment:* The drilling foreman is really looking after the best interests of the company to be sure that you are getting what you want. Now, what kind of reports does he receive to use in performing this control activity?
> *Reply:* We do not get very formal on this. Most of his control comes from on-the-scene observation and the well-log data that are maintained by the contractor. Since the foreman has the A.F.E. detail and the well plan, he knows almost immediately if an unusual cost comes up.
> *Comment:* He is the man that keeps an eye open for the possibility of having to submit a supplementary A.F.E.?
> *Reply:* He is one of them. We all watch for it. We keep cumulative costs here in the office. We have a cost clerk who keeps a running record of the costs as he receives them. Of course, he necessarily records anywhere from a few days to a week or so behind, because he works primarily from invoices.
> *Comment:* I suppose that the headquarters Production Accounting Division [all accounting records were maintained at headquarters] send back cost reports on capital projects.
> *Reply:* Yes, they send a monthly status report that shows the total of each A.F.E. that has not been completed. When a well is completed, they send a report with the same breakdown as on the A.F.E.—about forty different features. Of course, this is thirty days or so after the fact. It is too late to do anything about it if you are trying to watch the cost. Even our cost clerk here lags behind. So, the control comes with the drilling foreman. He reports daily to the district superintendent and to the assistant district superintendent. Between the three of them, they are constantly alert for any change in the cost picture. Of course, we need these reports from headquarters, too, because they are the official records.

From the preceding discussion, it would appear that a basic principle of cost accounting was quite applicable to this work—that effective cost control must be as near as possible to the time and place that the cost is incurred in order to enhance the feasibility of timely corrective action.

The completion time for the J. F. Clark Well No. 1 was two weeks. A report was required when the project was in operation and also when the A.F.E. was completed, with the same form being used for both reports (see Exhibit 13). This form, when signed by the district superintendent and forwarded to the Production Accounting Division, was the division's authorization to close the accumulated costs out of the work-

EXHIBIT 12

PROPOSED WELL PLAN, CONTINENTAL OIL COMPANY
(Sample Copy)

WELL NAME_____ FIELD_____ DATE_____
LOCATION (Surface)_____' fm_____ and_____' fm_____lines of section_____
Twp._____, Rge._____ (or) _____

_____County, _____State _____Elevation
LOCATION (Bottom Hole)_____

OBJECTIVE_____

Proposed T. D._____
SPACING_____Anticipated daily allowable _____Bbls. oil _____MCF Gas

GEOLOGICAL ESTIMATES

ZONE	TOP	THICKNESS	CONTENT	ZONE	TOP	THICKNESS	CONTENT

DRILLING TIME_____

SAMPLING_____

EXHIBIT 12 (CONTINUED)

NO.	CORING TYPE	HORIZON	INTERVAL FROM - TO	FOOT-AGE

NO.	CORING TYPE	HORIZON	INTERVAL FROM - TO	FOOT-AGE

DRILL STEM TESTS

NUMBER	HORIZON	NUMBER	HORIZON

WATER SHUT OFF TESTS

NUMBER	HORIZON	NUMBER	HORIZON

WELL SURVEYS (List types by code numbers as follows: Directional and/or Deviation (1); Deflection (2); Caliper (3); Temperature (4); Electrical (5); Radioactive (6); Geolograph (7); Photoclinometer (8); Mudlogging (9); Other (10) and name of that type.)

TYPE	NUMBER	DEPTH POINTS	REMARKS

FUEL AND WATER (SOURCE)

EXHIBIT 12 (CONTINUED)

WELL NAME _____ FIELD _____ DATE _____

LOCATION (Surface) _____' fm _____ and _____' fm _____ lines of section _____

Twp _____, Rge _____ (or) _____

_____

_____

_____ County, _____ State _____ Elevation

LOCATION (Bottom Hole) _____

_____

OBJECTIVE _____

_____

_____ Proposed T. D. _____

SPACING _____ Anticipated daily allowable _____ Bbls. oil _____ MCF Gas

NOTE: ABOVE PORTION TO BE COMPLETED ONLY WHEN PAGE No. 1 IS NOT USED

CASING AND CEMENTING (List type of string by code letters, i.e. Conductor (C); Surface (S); Intermediate (I); Production (P); Liner (L); Preperforations (PP).

TYPE OF STRING & INTERVAL (FT.) FROM - TO	CASING O. D. SIZE	WT. PER FT. #	GRADE	TYPE JT.	CEMENT SACKS	TYPE	% GEL	CALCULATED FILL UP

EXHIBIT 12 (CONTINUED)

CENTRALIZERS AND SCRATCHERS (List type of string by code letters, i.e. Conductor (C); Surface (S); Intermediate (I); Production (P).

TYPE OF STRING	CENTRALIZERS		SCRATCHERS		OTHER ACCESSORY EQUIPMENT (Such as Degassers, Mud Centrifuge, Float Collars, etc. — Specify)
	NO.	INTERVAL FROM - TO	NO.	INTERVAL FROM - TO	

MUD PROGRAM

DEPTH INTERVAL FROM - TO	TYPE	WT. LBS./GAL.	WT. LBS. CU./FT.	THINNING AGENTS	WATER LOSS AGENTS

COMPLETION METHODS AND/OR SPECIAL INSTRUCTIONS (If additional space needed, use reverse side of sheet, tumble style, or an additional plain sheet.)

APPROVED

District Engineer	Div. or Dist. Geologist	Region
Drlg. Supt. or Foreman	Division Engineer	
District Supt.	Division Superintendent	

Source: Continental Oil Company, Houston.

Exhibit 13

NOTICE OF PROJECT IN OPERATION OR A.F.E. COMPLETION, CONTINENTAL OIL COMPANY
(Sample Copy)

13-8 PB
Rev. 4-1-61

NOTICE OF PROJECT IN OPERATION ( )
OR A.F.E. COMPLETION ( )

Region_____. District_____.

A.F.E. No._____. _____.
(Brief description of title and lease name.)

Date PROJECT placed in operation_____ 19__. Notice submitted_____ 19__.

A.F.E. completion date_____ 19__. Notice submitted_____ 19__.

If A.F.E. covered drilling, deepening, or plug-back, well was completed as oil ( ),

gas ( ), dry ( ).

NOTE: Prepare sufficient copies so that upper portion will only have to be filled in once for both operation and completion portions when both are required. ("Notice of Project in Operation" not required for dry hole, or A.F.E. under $10,000 net.)

Distribution: Production Accounting Division.

_____
District Superintendent

Source: Adapted from Continental Oil Company, Houston.

in-process account and into the appropriate asset or expense records (after allowing thirty days for any late charges).

Follow-Up

Interviews with production managers at headquarters, regional, division, and district levels indicated that two major follow-up procedures were used:

1. Estimated reserves of the well after its completion were compared with the estimated reserves at the time the A.F.E. was submitted.
2. Monthly production quantity reports were compared with production estimates on the A.F.E. appraisal.

One manager at the division level noted, "If the well is making what we anticipated in our D.C.F. and payout calculations that it would make, then we rest fairly well assured that we are doing all right."

The accounting records for wells (called "payout-status reports") were maintained on a cash basis rather than on an accrual basis in order to show the cash-payout position of each lease,[7] but, typical of the industry, the company maintained these cash-flow data by lease rather than by well, with a consequent commingling of data for wells, except in rare cases in which there was only one well on a lease. This arrangement of data in the accounting records made it very difficult to make follow-up studies of actual cash flows on individual wells (via a recomputation of D.C.F. based on actual results). The company did, however, maintain a record of the cost of drilling and equipping each well and of its production. Although there was no formal procedure, production management at any of the levels might request a recomputation of the D.C.F. based on the actual data to date (see Exhibit 14).

The reappraisal for the J. F. Clark Well No. 1 was made at the end of twenty-five months of production, showing the actual well investment and the reestimated projections for total life and reserves. Actual production to date and a reestimate of future production were priced at the crude oil price one year after completion. When operating costs were reestimated, the overall reappraisal indicated a rate of 17 percent and a payout period of 4.67 years, as compared with the original appraisal of 22 percent and 3.50 years.

[7] For an excellent discussion of payout reports in the oil industry, see Atticus Wayne Bramlett, "Payout Status Records and Reports" (unpublished M.A. thesis, The University of Tulsa, Tulsa, Okla., 1954).

EXHIBIT 14

REAPPRAISAL OF NEW CAPITAL INVESTMENT, PRODUCTION DEPARTMENT, CONTINENTAL OIL COMPANY
(Sample Copy)

FOR: J. F. Clark Well No. 1

CONOCO WORKING INTEREST: 100 %

NET INTEREST: 87.5 %

		CONTINENTAL NET INVESTMENT			
		ORIGINAL INVESTMENT	FUTURE INVESTMENT 4th YR.	YR.	TOTAL
1.	DEPRECIABLE INVESTMENT	$ 16,365	$ 6,000	$	$ 22,365
2.	INTANGIBLES	24,219			24,219
3.	TOTAL INVESTMENT	$ 40,584	$ 6,000	$	$ 46,584
	DISCOUNTED TO PRESENT VALUES AT 18 %				
4.	DEPRECIABLE INVESTMENT	$ 16,365	$ 3,600	$	$ 19,965
5.	INTANGIBLES	24,219			24,219
6.	TOTAL DISCOUNTED INVESTMENT	$ 40,584	$ 3,600	$	$ 44,184

		FIRST YEAR	MIDDLE PERIOD	END PERIOD	TOTAL LIFE OF PROJECT
7.	ESTIMATED DURATION - YEARS	1	6	11	18
8a.	GROSS RECOVERY - OIL - BBLS.	6,450	31,350	42,200	80,000
8b.	GAS - MMCF				
	(USE AVERAGE ANNUAL FIGURES)				
	(REVENUE BEFORE TAXES)				
9a.	NET RECOVERY - OIL - BBLS.	5,648	4,572	3,357	70,000
9b.	GAS - MMCF				
10a.	AVERAGE CRUDE PRICE PER BBL.	$ 2.70	$ 2.70	$ 2.70	$ 2.70
10b.	AVERAGE GAS PRICE PER MCF	$	$	$	$
11a.	GROSS REVENUE: OIL (9a x 10a)	$ 15,250	$ 12,344	$ 9,064	$ 189,000
11b.	GAS (9b x 10b)				
11c.	TOTAL	$ 15,250	$ 12,344	$ 9,064	$ 189,000
12.	OPERATING COST	3,600	3,600	3,600	64,800

EXHIBIT 14 (CONTINUED)

13.	NET BEFORE TAXES (11c — 12)	$ 11,650	$ 8,744	$ 5,464	$ 124,200
	(INCOME TAX CALCULATION)				
14.	INTANGIBLE COSTS (total line 5)	$ 24,219			
15.	DEPRECIATION (6.3% of line 4)	1,258	1,258	1,258	
16.	DEPLETION (24% of line 11c)	3,660	2,963	2,175	
17.	TAXABLE INCOME (line 13 — 14, 15 & 16)	$ (17,487)	$ 4,523	$ 2,031	
18.	INCOME TAX (50% of line 17)	$ (8,744)	$ 2,262	$ 1,016	$ 16,004
19.	NET CASH FLOW AFTER TAX (line 13 — 18)	$ 20,394	$ 6,482	$ 4,448	$ 108,196
20.	INVESTMENT FACTORS — 17 % RETURN	.85	2.74	1.94	
21.	PRESENT VALUES (line 19 x 20)	$ 17,335	$ 17,761	$ 8,629	$ 43,725
22.	PAYOUT PERIOD = 4.67 YEARS (Application of line 19 to total line 6)				

BASIS OF RESERVE CALCULATIONS

PAY ZONES	ACRES PER WELL	N. E. P. FEET	REC. FACTOR %	RECOVERABLE BBLS. AF	RECOVERABLE MCF AF	POROSITY %	F. V. F.	I. W. S. %

REMARKS: Reappraisal 2 years plus 1 month after well was completed, showing actual well cost, price per barrel, operating expenses, as well as actual production history and its effect as to decline and total expected recoverable reserves and life of project.

Prepared by: _____ Date _____
Distribution:

Source: Continental Oil Company, Houston.

Well records were maintained by headquarters on all wells completed (beginning in the year 1959). These records, on McBee Keysort cards, offered a multitude of easily accessible information on each producing well. The record for the J. F. Clark Well No. 1 (shown in Exhibit 15) included the capital-appraisal data, which afforded a comparison of the A.F.E. estimated data and the actual figures for net investment, reserves, production, revenue, initial producing rate per day, and price. The price figure used was the price one year after production began. The well records were maintained for the remainder of the calendar year in which a well began producing and for the next two years.

The following replies were given by an analyst in the Production Department regarding the appraisal data shown in Exhibit 15 and the general problem of follow-up:

> *Reply:* Now you understand that it is almost impossible to go back and actually appraise a well on the same basis that you did in the original because (1) actual cash inflows are kept by leases; (2) allowables may have increased or decreased; (3) prices of crude oil may have increased and decreased; (4) maybe you were developing on one spacing pattern and that has been changed so that you are not going to get the reserves that you originally thought. . . . The net revenue to Conoco [for twenty-five months] was A.F.E.'d at $35,365 and is recomputed as $29,557 or 84 percent of what it was originally supposed to have made. This is pretty good. . . .
>
> *Comment:* You do not compute another D.C.F. rate?
>
> *Reply:* No. I figure that if we are that close, we are doing well. Assume that the new rate were 20 percent. We are still doing all right on the well.
>
> *Comment:* Now, if you had a very poor well you might—
>
> *Reply:* If we had a very poor well, then one well is probably all that we would drill on that lease. Our people in the field would recognize in the very beginning that we could not support any more wells on that lease.

Regarding reporting the follow-up data to headquarters management, the analyst gave the following replies:

> *Reply:* Now all I provide our management in here [headquarters] is a summary [by regions] of all the wells drilled during the year on which I am reporting. [Wells completed during 1959 could be summarized when all data for the year 1961 were available.] For example, I might say we were perhaps optimistic on reserves by 30 percent, and our revenue was maybe 33 percent less than we predicted, and include an explanation in general terms.
>
> *Comment:* If you found that you were way out of line, then you might

try to narrow it down to see what districts were causing the trouble? *Reply:* It could be followed down that far. We could even report a breakdown by individual wells if needed.

If there were definite patterns of consistently poor performance, inquiries were made through channels to the operative levels. In extreme cases, corrective action might entail the withdrawal of approval authority and reassignment at a higher organizational level.

CASE ANALYSIS OF THE ADMINISTRATIVE PROCESSES

Awareness of Company Objectives and the Development of Strategic Planning

Continental was committed to an overall objective of operating as an integrated oil company, and fundamental to the achievement of this objective was the maintenance of the necessary crude oil and gas reserves. The long-range nature of reserve requirements emphasizes the need for long-range planning in finding and producing reserves to supply both current and future needs. A single development well would not be of great significance, but, as a part of a total development process, the drilling program and each well in it become quite important.

Framework Structuring

The company's framework within which the capital expenditure for development wells was made had been well established. The procedures had been worked out in detail, and the recent changes in the follow-up procedure and in the approval authorities indicated a continuous effort by management to improve. At the same time, management appeared to recognize that changes in procedures were costly and that potential benefits should justify the expense involved. In addition, the company realized that confusion and uncertainty very well might result if changes were made too frequently in the levels at which approvals were granted or if alterations in procedures were not prefaced by adequate preparation.

Routine development projects usually originated at the operating level. These projects had to blend into current operations, and the personnel who were involved directly in the capital expenditures also had operating responsibilities. Consequently, the capital expenditures com-

Exhibit 15

WELL DATA CARD, CONTINENTAL OIL COMPANY
(Sample Copy)

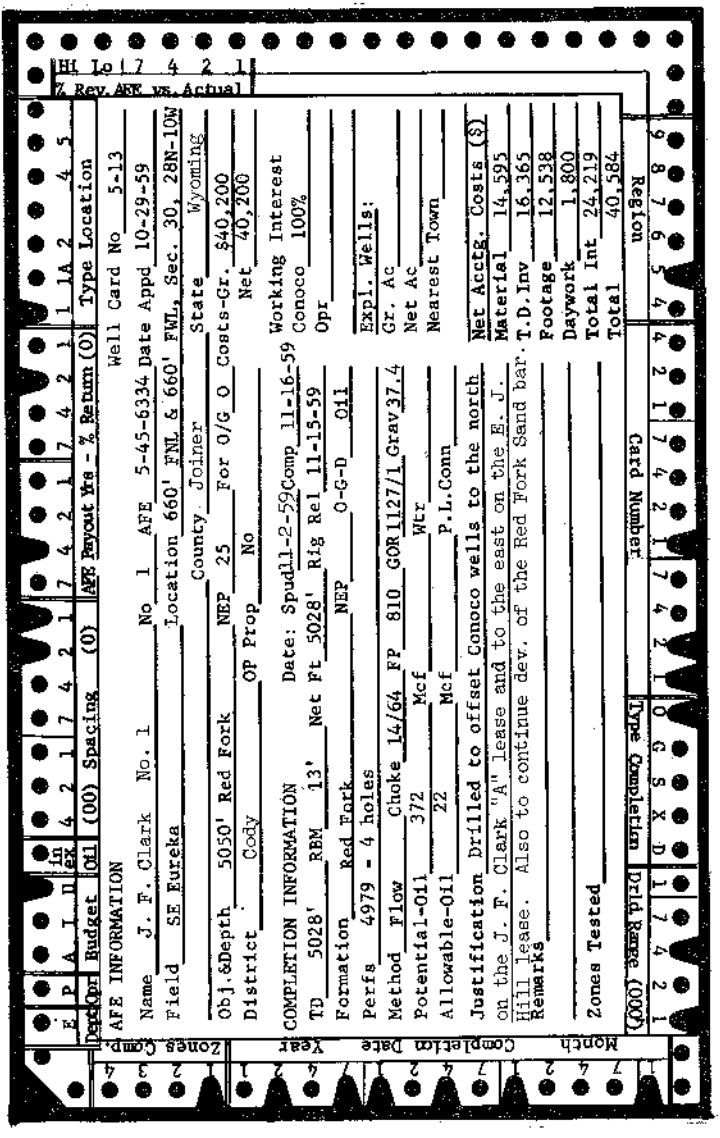
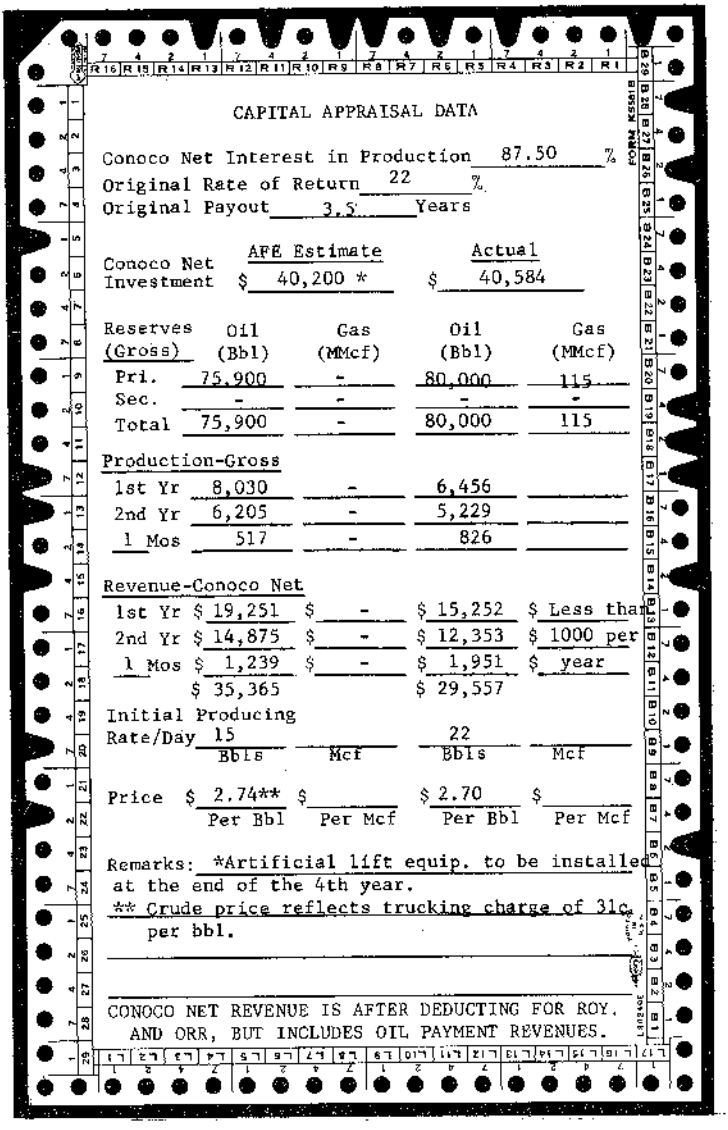


EXHIBIT 15 (CONTINUED)



CAPITAL APPRAISAL DATA

Conoco Net Interest in Production 87.50 %
Original Rate of Return 22 %
Original Payout 3.5 Years

	AFE Estimate	Actual
Conoco Net Investment	$ 40,200 *	$ 40,584

Reserves (Gross)	Oil (Bbl)	Gas (MMcf)	Oil (Bbl)	Gas (MMcf)
Pri.	75,900	-	80,000	115
Sec.	-	-	-	-
Total	75,900	-	80,000	115

Production-Gross				
1st Yr	8,030	-	6,456	
2nd Yr	6,205	-	5,229	
1 Mos	517	-	826	

Revenue-Conoco Net				
1st Yr	$ 19,251	$ -	$ 15,252	$ Less than
2nd Yr	$ 14,875	$ -	$ 12,353	$ 1000 per
1 Mos	$ 1,239	$ -	$ 1,951	$ year
	$ 35,365		$ 29,557	

Initial Producing Rate/Day	15 Bbls	Mcf	22 Bbls	Mcf
Price	$ 2.74** Per Bbl	$ Per Mcf	$ 2.70 Per Bbl	$ Per Mcf

Remarks: *Artificial lift equip. to be installed at the end of the 4th year.
** Crude price reflects trucking charge of 31¢ per bbl.

CONOCO NET REVENUE IS AFTER DEDUCTING FOR ROY. AND ORR, BUT INCLUDES OIL PAYMENT REVENUES.

Source: Continental Oil Company, Houston.

prised an integral part of both short- and long-range operations, not only of the department but also of the entire company.

Objective Criteria

Since the finding and producing of petroleum reserves is a highly technical business, engineers and other technical experts must utilize objective criteria throughout the location and development process. However, these criteria may change over time. For example, drilling and production methods may improve, or a state may change its regulations regarding the spacing of wells or the allowable production rates. Such technical data were found to be the prime source of information for the procedures used for economic evaluation, in-process control, and follow-up.

Search

Although reduced to a more or less routine procedure, the search for crude oil and gas reserves was considered vital, and it was an activity requiring a very high degree of technical skill. The company was interested in locating those drilling opportunities in which the risk of an unprofitable oil well was low, even though, obviously, there would always be some risks involved. For example, the well might be a dry hole; the reserves estimated could be much lower than had been projected; the rate of production might be unsatisfactory; the quality of the oil might be lower than had been anticipated; drilling costs might be excessive; etc. On the other hand, the value of information, even if the well were a dry hole, which might be used in further drilling activity had to be considered.

In the computation of the profitability of a well, these various factors generally cannot be reflected quantitatively. However, guidelines on such factors as desirable rates of return and present and future oil reserve needs of specific kinds of crude oil are important in the search for desirable locations.

Screening

The cancellation of eight budgeted drilling wells because of new information indicated the need to screen out projects throughout the sequential framework activities. As was indicated earlier, conditions such as the drilling of a dry hole could alter conditions rapidly. One of operating management's prime duties was constantly to be aware of,

and quick to react to, such changes in order to eliminate proposals that had become undesirable and to add more desirable ones. Since the review of production data and the economic appraisal by several competent technical personnel at the district level and higher were needed in weeding out the less-desirable proposals, technical knowledge and proficiency were considered fundamental to the screening process.

Coordination

Since the drilling program of the district had to be coordinated with higher echelons (i.e., division, region, and headquarters), the budget, A.F.E.'s, and day-to-day personal contacts were employed to develop this liaison. The district production superintendent was the senior manager in the district and the logical coordinator of the district's program. Under his supervision, the office personnel and the engineering staff in the district worked together with a high degree of coordination in order to transform technical data into the required procedural patterns. This coordination was achieved by direct supervision, direct contacts between office and engineering personnel, and a well-defined understanding of areas of responsibility and authority. This designation of authority and the responsibility for the coordination activity for procedures, program segments, and projects appeared to be fundamental requirements which affected all other framework activities.

The drilling of a well was the coordination responsibility of the district drilling foreman. His coordination effort involved the drilling contractor, company technical personnel, office personnel, and his superior (the district production superintendent).

Formalization

The routine nature of drilling-well investments permitted the use of standard forms designed especially for that type of project, and the procedures could be spelled out in considerable detail because of the relatively large volume of projects falling into this category. Both of these circumstances contributed to uniformity and permitted more delegation of the formalization activity to lower levels than might have been possible otherwise. Routinized forms and procedures, to the extent possible, were used even for projects for which the volume was small. Even if a new project was of an unusual nature, one for which a form with specified blanks to be filled in was not applicable, the usual pro-

cedures for estimating taxes, useful life, computation of the D.C.F. rate, etc. could be applied.

Depending on the stage of development, the degree of formalization of projects at the time of the preparation of the annual budget varied widely, with some budget projects being much nearer activation than others. Consequently, as projects developed, the formalization increased, continuing to affect other administrative processes.

Evaluation

Continental's management recognized the limitations of the D.C.F. rate of return. After predicting an average successful well as to cash flow, the analysts incorporated a consideration of risk and uncertainty. This risk consideration, after the calculation of the D.C.F. rate, was based on a technically oriented review of all available data. For example, data on other nearby wells (such as that shown in Exhibit 10) would be employed in weighing the risk for a new well. Recognizing the danger of inaccurate source data, Continental's management appeared to feel that the review of the appraisal data by several competent technical personnel served to guard against this danger. Once the data had been accumulated, the computations were routine, because uniform evaluation methods were in use. For this reason, the critical factor was the initial accumulation of data, not the later clerical computation.

In the D.C.F. rate, the current outlay and Continental's predicted cash profit were considered. However, although prior leasehold and exploration costs also were expenditures necessary for the ultimate drilling and completion of a well, they were not included in the calculation. Production Department personnel were fully cognizant of this omission and took it into account in appraising the projected rate of return. Generally, this omission resulted in the estimated D.C.F. rate being somewhat higher than if these other costs had been included.

The A.F.E. support included an itemized listing of estimated costs, an appraisal estimate which included a payback and D.C.F. calculation and estimated reserves, data on offset and other nearby wells, and maps. It was interesting to observe that a great deal of data (in addition to the D.C.F. rate of return) were made available to management for use in appraising the proposal for this well. Management cited certain strategic factors that had to be considered in appraising a proposal

(e.g., the value of additional lease data resulting from the well and action by competition in the area), thus emphasizing the company's practice of considering all factors in evaluating a proposal.

Budgeting

As utilized at Continental, the budgeting activity indicated efforts to plan and coordinate capital expenditures at all levels and in all areas of the company's operations. In this case, the dynamic nature of oil-well drilling operations illustrated the importance of a budget that not only was flexible but also afforded a sound control mechanism. A provision for unforeseen projects, through budgeted but unallocated funds, gave both flexibility and control to the drilling function. The budget detail for these projects was originated at the district level, as would seem desirable, since the district-level management was the nearest to the situation in the production district.

Request for Expenditure

Since the drilling project described in this case had not been detailed in the budget, it required a higher level of approval than was the case for allocated, budgeted wells. This requirement in the request-for-expenditure procedure served as a vital *control* device with respect to the expenditure of funds. The detail related to the A.F.E. was prepared at the district level, which was the origin of the request and the level at which the supervision of the expenditure and the subsequent operation of the well were to occur. Since the nature of the detail required for a production-well A.F.E. was spelled out in procedure manuals, standard forms could be used, although assistance from higher echelons was available, if needed. Such specific procedures and standardized forms had been found quite useful at Continental when the volume of a particular type of expenditure justified their cost.

In-Process Control

Considerable control during the drilling of the J. F. Clark Well was exercised by the drilling foreman. His basic guide was the proposed well plan which he compared with the daily reports of drilling activity. A procedure was in use for formal notification of the completion of a project, in order to coordinate the records of the operating areas and the historical accounting records in the Controller's Department and to

make possible the computation of any A.F.E. overexpenditures. Although the district clerical staff accumulated approximate cost data, the expenditure occurred over such a short time span that the formal accounting reports were useful for historical purposes only, thus supporting the point of view that historical records do not necessarily serve as vehicles for control.

Follow-Up

In the follow-up activity on this drilling project, the estimated reserves and the actual production quantities, as compared to A.F.E. estimates, were considered to be important gauges. Since payout records were maintained by leases (a typical practice in the industry), the cash-flow data for each well were commingled with records from other wells on the lease. In individual well analyses, this arrangement created difficulties in the computation of the payback period and the D.C.F. rate of return. However, the Production Department management felt that, if the production record maintained for each well were in line with the production estimated in the A.F.E. appraisal, this was strong follow-up evidence that the actual results were in line. Since this conclusion would be valid unless crude oil prices or production costs had changed markedly, the follow-up activity usually was accomplished in a reasonably effective manner, without the additional cost of accumulation of detailed cash-flow data for each well. Production headquarters maintained well data cards which afforded a two- to three-year report of revenue, an estimate of reserves, and actual capital costs, with all being compared to the respective A.F.E. estimates. On special request, the A.F.E. appraisal sheet could be recomputed, showing approximate actual cash flow to date and a reestimate of future cash flows. These well data cards, which comprised the only formal procedure for individual wells, were designed and utilized in the Production Department headquarters.

In the follow-up activity, trends indicated by summaries by leases, fields, districts, divisions, and regions were key control indicators for the respective Production Department management levels. In using follow-up data as a basis for corrective action, management recognized that these investments often carried a rather high degree of risk and uncertainty. However, although a reasonable number of variances from estimates could be expected, corrective action might be required in any area in which inordinate miscalculations reoccurred frequently.

CHAPTER IV

CASE STUDY OF A COMPANY RETAIL OUTLET: COMPANY-OWNED GASOLINE SERVICE STATION AT ADDICKS, TEXAS

BACKGROUND INFORMATION

Characteristics of the Case

As in the study of the drilling-well project, the location of a gasoline service station constituted a routine-type capital investment for Continental Oil Company. However, the expenditure in this case involved the Marketing Department, a completely different segment of Continental's organization.

The analysis covered (1) the basic planning and control features of a common, repetitive-type investment decision, involving primarily one department and a relatively small amount of funds, (2) the chronological development of specific details regarding the location of a company-owned gasoline service station which went into operation in May 1960,[1] and (3) the operational approach used by the Marketing Department in implementing the investment within the context of the company's overall capital-expenditure program.

Some of the specific aspects of the case included the following: (1) the nature of investments in gasoline service stations; (2) the expenditure of budgeted, allocated funds; (3) the source of investment ideas and guidelines for marketing investments; (4) the purpose and preparation of the annual budget; (5) the procedure for the processing and approval of A.F.E.'s, including the supporting detail and illustrations; (6) assignment of responsibility for control during the construction period; and (7) a follow-up procedure, including the use of follow-up data for control.

[1] For purposes of anonymity, the station was disguised as being located in metropolitan Houston.

Nature of Marketing Department Capital Expenditures

The Marketing Department's capital investments were devoted primarily to bulk-plant and service-station facilities used to market petroleum products through wholesalers or directly to customers. A major aspect of this investment program was devoted to service-station outlets for gasoline, and the investments were largely for the establishment of new stations or for the upgrading of existing facilities. The ownership of the company's service stations fell into three categories, as follows:

1. *Owned*—All assets were owned by the company.
2. *Ground lease*—Land was leased from someone outside the company, but all other assets were owned by the company.
3. *Three-party lease*—Land and buildings were leased, but the equipment was owned by the company.

In addition, financial assistance in the form of direct or indirect loans was available for the installation or improvement of noncompany stations. These indirect loans were made through banks but were guaranteed by the company.

Under the classifications cited above, the project in this case could be described as the location of a new company gasoline service station for which the company owned all the assets.

Source of Proposal Ideas

A district operations manager in the Marketing Department noted that "investment ideas come from the joint thinking of all of us in the district and the field people, and our search for investment opportunities is a continuous process." These persons included district management, district sales representatives, real estate representatives, and operations personnel. The Houston District, in which the new station was to be located, was divided into sixteen areas, with each being the responsibility of a district sales representative. The real estate representatives performed market research on the district level and handled the compilation of data regarding new locations, whereas the upkeep and upgrading of facilities were largely functions of the operations personnel.

Guidelines for Expenditures

While proposals arose largely from the district level, it was important that the search for, and the submission of, ideas be made within the

framework of guidelines as developed by top management. The company had adopted a primary assumption of being an integrated oil company, a role which called for a full range of activities from finding crude oil reserves to the marketing of oil products to the ultimate consumer. Such an operating environment called for a balance among various activities, so that one function did not represent an unusable capacity or a limiting bottleneck for other functions. Hence, production, pipeline, and manufacturing facilities all had to be considered in determining the scope of marketing activities, with respect to capacity and cost as well as to geographic location. Another guideline was the limitation of domestic marketing activities to an area of twenty-eight states. Within this area, the most significant representation and market-share portion was the seven-state Rocky Mountain Region.

The location of service stations in new and/or growing housing developments and shopping centers and along major highways was stressed. Corner locations were preferred, although the purchase of station sites to be held for future use was discouraged. Thus, the proposals for stations usually recommended immediate activation. Furthermore, although potential trade sometimes was considered if cogent, the site generally was required to have a current traffic count of a certain number of cars per day.[2] Finally, management was interested also in directing funds to the upgrading of existing facilities.

Annual Budget Activity

Instructions concerning the preparation of the annual budget usually were received by headquarters from the Controller's Department in August. By early September, these instructions would be grouped with the Marketing Department guidelines and sent to the regional offices. The regions, in turn, would add their instructions and pass them through the marketing divisions to the district offices. The budgets usually were scheduled to be processed through channels to be received by the Controller's Department in late October.

In this case study, since the Marketing Department headquarters had had some idea of the total funds to be available for marketing during

[2] In February 1963, a company real estate clinic was conducted in which additional criteria were presented. While the specific criteria which were to be incorporated in a forthcoming revision of the instructions concerning supporting data for investment proposals were considered confidential, their major purpose was the improvement of the selection of station locations.

the forthcoming year, the department was able, without stifling the flow of ideas, to have some control over projects submitted, through the guidelines it provided at budget time. However, communication was kept open throughout the year, and not just at budget time, by means of personal contacts, meetings, and written correspondence and instructions.

Details for the budget under discussion had originated largely at the district level. After the initial preparation, the budget was consolidated under three major headings: (1) plant additions, (2) major improvements, and (3) miscellaneous projects. Almost all the available funds were allocated. Oftentimes, these funds were designated for a given number of stations, with the location by approved area rather than by exact site, although the district usually had certain specific locations in mind. The appraisal data submitted with the budget to support these locations were at varying degrees of completion, depending on whether the site had been selected and/or how soon construction was scheduled to begin.

The budget proposals were channelled from the district to the division, to the region, and to headquarters. A district operations manager expressed, as follows, a commonly held viewpoint regarding the submission of projects: "We always work under the theory that if you can find a good deal that will make money for the company, then it should be submitted." The marketing and other departmental budgets were processed through the Operating and Coordinating Committee and the Management Executive Committee, followed by approval by the president and by the Board of Directors.

The next step was for headquarters to channel downward an indication of the extent of budget approval and provide additional guidelines and restrictions applicable to the expanding of the funds. A regional operations manager indicated that, in addition to written communication, the following technique was used in his region:

> After the budget came back [from headquarters], we took the district's budget to the district and talked to the district manager, his sales manager, the real estate representatives, and the operations managers. We anticipated taking half a day in each district. In most, it took a full day. We explained the budget as approved and the thinking behind it.

At the district level, the type of reaction to the annual budget, with particular emphasis on its use in short- and long-range planning, was

reflected in the following excerpts from an interview with a district operations manager:

> *Comment:* If you had to justify the cost of a capital-expenditure program, on what basis would you do it? Suppose someone said: "Why not eliminate all of this time and paperwork on the budget and just submit A.F.E.'s as you want to spend the money and just have that as the capital-expenditure program?" What would be your answer? How would you justify all the other things that are done?
> *Reply:* Well, I look at it this way. In a corporation as large as ours, there are many departments, and management needs to know what new money we are going to need. I think it is a way of allowing management to do some forecasting, and I think it is a way of planning your work. I think that anyone who has a workable program has to have plans, and I think that the field people and everyone in district need to know the program that we have set up.

Request for Expenditure

When the approval for an expenditure was requested, the district submitted an A.F.E. and supporting data. Procedures for the preparation of the required forms were prescribed by Controller's Department bulletins and by instructions from the Marketing Department headquarters.

Retail outlets might be either company owned or not. If company owned, a profitability analysis was required for certain capital investments, which would include new locations, rebuilds, stall additions, additional land, and the exercise of options to renew leases. Investments in new or rebuilt bulk plants carried a similar appraisal requirement. If financial assistance were given in connection with a noncompany station, a profitability analysis was required, showing the profit position both of the company and of the individual who was to receive the loan.

At the time of this case, the A.F.E.'s for new service stations required the approval of the headquarters department manager. In early 1963, stations indicating an aftertax D.C.F. of at least 8 percent could be approved by the regional marketing manager, provided other criteria such as traffic count were met. If these restrictions were not met, it was necessary to submit the proposals to headquarters, usually accompanied by a narrative explanation as to why the investment was warranted. A project on which the return was less than 8 percent required the approval of the executive vice-president.

CHRONOLOGICAL DEVELOPMENT OF THE PROJECT

Selection of the Site

The service station chosen for this case study was located in Addicks, Texas, a town four miles west of the Houston city limits on U.S. Highway 90, a four-lane highway for which State Highway 385 served as a major north-south feeder street. The service station under study was located at the corner of State Highway 385 and Star Street, three blocks north of U.S. Highway 90.

The Houston marketing district had recognized a need for additional representation in the west part of Houston. In July 1958, therefore, an option was secured to purchase the property described above, and a proposal was included in Continental's 1959 budget.

A detailed market analysis, authorized by the district marketing manager, was made in early 1959 by a real estate representative. The study indicated a traffic count of approximately 11,900 cars per day on State Highway 385 and 2,900 cars per day on Star Street. Based on an assumed average annual sale of 219,000 gallons, it was estimated that the investment should produce a $6,507 appraisal cash contribution and an aftertax D.C.F. return of 11 percent.

A.F.E. Development and Approval

The A.F.E. data gathered by the real estate representative consisted of the following:

Authority for expenditure.
Authority for expenditure (detail sheet).
Project-analysis summary form.
Proposed-location form.
Property-analysis form.
Profitability analysis of proposed new investment: retail outlet, company service station.

The content of the A.F.E. form has been summarized as follows:

> Marketing Department.
>
> Authorization No. 7–35 6811.
>
> We propose to purchase a service station site fronting 120.0 feet on State Highway 385 and 117.0 feet on Star Street in Addicks, Texas, at the

southwest corner of the intersection for $30,250 including $250 for survey and legal expense. An 07-2 building is to be constructed on the site for $32,500, as per the attached detail sheet, for a total investment of $62,750. The site is in Harris County, Texas, and construction of a "two-stall" service station is permitted [in the zone in which the site is located].

State Highway 385 is growing in importance as a feeder street into U.S. 90. We presently have no distribution in Addicks on Highway 385 north of U.S. 90. Good average residential areas surround the site, and Long Point Road, one block north, is a good neighborhood shopping area. Traffic count past the site is approximately 11,900 cars per day on State Highway 385 and 2,900 cars per day on Star Street.

The sellers are William F. Leggett and Lillian K. Leggett. Our option on the site terminates July 1, 1959.

Based on an average annual sale of 219,000 gallons, this investment should produce a $6,507 appraisal cash contribution and an aftertax D.C.F. return of 11 percent.

The station will be served by truck transport delivery from the salary-operated Houston bulk plant.

Summary of estimated cost:

Land	$30,000
Survey and Legal Expense	250
Equipment	7,500
Building and Improvements	25,000
	$62,750

The approval signatures for the A.F.E. included those of the real estate representative, district marketing manager, division marketing manager, regional marketing manager, regional general manager, and headquarters marketing manager.

The A.F.E. detail sheet included specific estimated costs for (1) equipment and (2) building and improvements; in addition, the project-analysis summary form provided space for the following items:

Purpose of A.F.E.
City or town.
Population.
Location.
Property size.
Ownership or leased.
Type of building.

Cost.
Payout.
Return on investment.
Date option expires.
Final approval required.
Remarks.

In submitting the information, the division marketing manager had made the following notation:

> We feel that two pump islands are sufficient for the near future. But, suggest that the layout plans provide for an additional island on Highway 385 in the event that business justifies this addition a few years from now.

In addition to the data contained in the project-analysis summary form, the proposed-location form included a desirability analysis, which has been outlined as follows:

	Outstanding (10)	Average (6)	Poor (2)
1. Location	7	--	--
2. Adequacy of size and shape	7	--	--
3. Visibility	8	--	--
4. Approachability and accessibility	9	--	--
5. Neighborhood potential	--	6	--
6. Highway potential	8	--	--
7. Traffic pattern and volume	9	--	--
	Outstanding (6)	**Average (3)**	**Poor (1)**
8. Street grades	6	--	--
9. Stability of area	--	3	--
10. Future possibilities of area	4	--	--
	Outstanding (4)	**Average (2)**	**Poor (0)**
11. Gasoline price conditions (previous 12 months)	--	2	--
12. Product acceptance	4	--	--
13. Scarcity factor (service station sites)	--	2	--

Total points, 75	Outstanding	(75–100)
	Average	(50–74)
	Poor	(0–49)

The property-analysis form further indicated the extent of the data that accompanied an A.F.E. Its nineteen sections provided the following very detailed analysis of the property site:[3]

1. Location.
2. Inside lot _____, corner lot _____ (N.E. _____, N.W. _____, S.E. _____, S.W. _____); size _____ (Give footage on all streets, with principal street first.)
3. Owner's name.
4. Estimate of property's value.
5. Estimated cost of service station improvements; building type.
6. Estimated capital investment.
7. Property information.
   a. Zoning and permit situation.
   b. Utilities.
   c. Present taxes.
   d. Estimated taxes.
   e. Encumbrances.
   f. Present improvements; Conoco's estimated salvage value.
8. Traffic.
   a. Traffic analysis: light _____, moderate _____, heavy _____, very heavy _____; neighborhood _____, highway _____.
   b. Traffic count: estimated _____, actual _____ cars per day; average speed _____; traffic light _____, stop sign _____.
   c. Highway route past site.
   d. Highway (street) importance.
9. Community information.
   a. Population.
   b. Population trend.
   c. Important industries.
10. Neighborhood information.
    a. Estimated number of homes in potential area.
    b. Class of homes.
    c. Ultimate number of homes expected.
    d. Area's estimated potential gallons.
    e. Percent of potential expected.

[3] It was interesting to note that the following also was part of the instructions: "Fill in all sections—if information [is] not available, check [the] section to indicate that it was not overlooked."

11. Comparative properties.
12. Competitive representation in potential area (company, building type and age, and estimated distance from site).
13. Continental representation in potential area (building type and age, and estimated distance from site).
14. Continental's position in community.
15. Method of supply.
16. Price structure conditions (previous 12 months): excellent ....., average ....., depressed .....
17. Site's estimated annual gasoline gallonage first five years. [Estimated at 219,000 for each year for Addicks proposal]; estimate (percent): neighborhood gallons ....., transient gallons .....
18. Option price and expiration date.
19. Remarks.

The form suggested the attachment of maps, photographs, and other supporting data, when such items would aid management in reaching a decision.

The form illustrated in Exhibit 16, with the data included for the Addicks, Texas, service station, is a profitability analysis of a proposed new investment for a retail outlet (i.e., a company service station).[4] This analysis form assumed uniform annual cash flows. The potential reflected in the D.C.F. rate thus was a function of the second-year estimate of cash flow (line 1c). Since the flow was assumed to be uniform, the discount factor (payback period) of 8.2 was used in finding the D.C.F. rate of return. Since the estimated life was twenty years, reference to the twenty-year line in the table in Appendix D would indicate the factor nearest 8.2 as 7.96. According to the rate in this vertical column, the approximate rate could be noted as 11 percent. The form also provided for the determination of pretax D.C.F. return on booked investment. In this example, the pretax return was 21 percent. This latter computation was made each year for follow-up purposes. In regard to this analysis, a Manufacturing Department executive observed:

> The profitability analysis includes only those figures directly related to the project. Yet, the proposal must make a profit which, when combined

[4] A detailed guide for the completion of this analysis was provided by the Controller's Department General Office Bulletin No. 8.

Exhibit 16

PROFITABILITY ANALYSIS OF A PROPOSED NEW INVESTMENT, RETAIL OUTLET, CONTINENTAL OIL COMPANY SERVICE STATION
(Sample Copy)

Project (Check)			Location	
New Retail Outlet:	Owned S/S	X	Town	Addicks
	Ground Lease S/S		State	Texas
	3-Party Lease S/S		Street Address	State Highway 385 and Star Street
New S/S on Site on Hand			B/P Town	Houston, Texas
B/S Rebuild			Supply Point	Exchange
S/S Stall Addition				

(1)	Annual Gasoline Sales Gallons (Calendar Year)			
	(a) Highest volume company station this town last year (S/S No. 1)			219,000
	(b) All company station average this town last year (No. of S/S's 4)			198,000
	(c) Estimated volume this station second year			219,000
(2)	Investment			
	(a) Land (including $250 legal and survey expense)			$ 30,250
	(b) Equipment			7,500
	(c) Building & Other			25,000
	(d) Fixed Rent Commitment ($ /Year X 5% Disc. Factor for lease period including options not to exceed 20 years)			
	(e) Total			$ 62,750
	(f) Less End Value of Land (0.31 X 2a)			9,378
	(g) Appraisal Investment			$ 53,372
(3)	Gross Margin		¢/Gaso. Gal.	$/Year
	(a) Gasoline Gross Margin		5.28¢	$ 11,563
	(b) Plus Other Products Gross Margin (10% or 4% X 3a)		0.53	1,156
	(c) Total		5.81¢	$ 12,719
(4)	Direct Cash Costs			
	(a) Commissions or Salaried B/P Expense		0.60¢	$ 1,314
	(b) Operating Supplies			100
	(c) Repairs & Maintenance: Equipment (4% X 2b) $ 300			
	Building & Other (1% or 0.5% X 2c) 250			550
	(d) Property Taxes			628
	(e) Gallonage Rent Expense		-- ¢	--
	(f) Rent (Income)		(1.25)	(2,738)
	(g) TBA (Income		(0.15)	(328)
	(h) Total		0.22¢	$ (474)
(5)	Cash Contribution Including Manufacturing Profit (3c - 4h)		6.02¢	$ 13,193
(6)	Less Estimated Manufacturing Profit		0.75	1,642
(7)	Cash Contribution Excluding Manufacturing Profit		5.27¢	$ 11,551
(8)	Depreciation (4.5% X 2b and 2c)			1,462
(9)	Amortization (2d ÷ lease period including options not to exceed 20 years)			--
(10)	Taxable Cash Contribution (7 - 8 - 9)			10,089
(11)	Income Taxes (50% X 10)			5,044
(12)	Appraisal Cash Contribution (7 - 11)		2.97¢	$ 6,507
(13)	Discount Factor (2g ÷ 12)	8.20		
(14)	After-Tax DCF Return on Appraisal Investment			11 %
(15)	Pre-Tax DCF Return on Booked Investment			
	(a) Booked Investment (2a + 2b + 2c)			$ 62,750
	(b) Cash Contribution Including Manufacturing Profit (5)		6.02¢	13,193
	(c) Less Annual Rent Expense (2d + 4e)			--
	(d) Discount Factor (15a ÷ 15b)	4.76		13,193
	(e) Pre-Tax DCF Return on Booked Investment			21 %

Source: Continental Oil Company, Houston.

with profits from all other marketing operations projects, will cover indirect costs such as administrative overhead and still yield a desirable return on investment.

The strongest criticism of the profitability analysis involved the method of computing the value of the gross margin per gallon. The computation was developed as the three-year average gross margin for the bulk-plant area for the preceding three years, as reported in a company report. The complaint, expressed by both management and nontechnical personnel in the Marketing Department, was largely that these margins were dated and might distort seriously present and estimated potential margins. It was pointed out that temporarily depressed prices in the past were frequently the cause of such distortion. While it was recognized that, if the sponsor of a project felt that the margins did not picture the current status accurately, his opinion could be spelled out in the remarks section, one manager in the headquarters group offered the following criticism:

> If we are not careful, our competition controls where we put our outlets because of the emphasis we place on return on investment. The gross margin has a substantial influence. . . . So, we have to backstop our judgment by looking at those areas where inherently if there is any profit to be made, we ought to get our share. . . . For computation purposes, we often take out extremes that distort the gross margin.

This same manager offered the following possible solution to this problem:

> We have been toying with the question of whether there is some gallonage-per-dollar-invested figure that would help supplement our analysis. In other words, could we say that we ought to do an annual volume of three gallons per dollar invested in site and equipment?

The extensive data in the above described forms suggest that many factors were being considered in addition to the D.C.F. rate of return.

Additional communications which were not prepared by the real estate representative but which pertained to the A.F.E. included the following two items which were prepared by senior analysts in the headquarters Marketing Economics Section: (1) a letter summarizing basic A.F.E. data was prepared for headquarters management, and (2) a letter of notification of project approval was prepared for routing to all interested parties.

In-Process Control

The A.F.E. for the service-station location was approved June 26, 1959. In accordance with the land-sale contract, the seller of the property was given ninety days following the sale to remove two frame houses. The construction of the station was begun in January 1959 and completed in May 1960. The in-process control for this project was considered the joint responsibility of Continental's marketing district real estate representative and the district operations manager. The Legal Department assisted in closing out the purchase of the land, and the district operations personnel provided the most effective control through on-the-scene observation of construction work.

The A.F.E. was closed on July 31, 1960, and the accumulated costs were transferred to the appropriate fixed-asset accounts. The actual total cost was $63,598.12, as compared to an estimated total cost of $62,750. These actual costs were itemized using the same breakdown as that employed in the preparation of the detail sheet for the A.F.E.

Follow-Up

At the time this case was investigated, an annual follow-up procedure for service stations was in operation for the Addicks station, and data were available for the partial year 1960 (on an annualized basis) and for the full year 1961.

For each station and each bulk plant, these postcompletion data were reported on a punched-card, accounting-machine-tabulated report concerning the profitability analysis of bulk-plant and service-station business. For the Addicks station, the data shown on the report for the year 1961, and for the comparable data from the original A.F.E. profitability analysis (see Exhibit 16), were as shown in Table 6. The booked investment of $64,118, which was the gross investment as of December 31, 1961, included some minor additions which had been made after the A.F.E. was closed out in July 1960 at $63,598.12. The rate of return for 1961 was computed by dividing $64,118 by $13,597 and finding the factor nearest the resulting quotient of 4.71 in the table of discount factors (see Appendix D) for a twenty-year life. While the ratio of gallons per dollar invested was not computed on the original A.F.E. analysis, the necessary data were included (i.e., 219,000 gallons and $62,750). A senior analyst in the Marketing Department headquarters observed:

TABLE 6

COMPARISON OF INITIAL ESTIMATE AND FOLLOW-UP REPORT FOR THE COMPANY-OWNED SERVICE STATION AT ADDICKS, TEXAS

Item	Comparative analysis	
	Follow-up report (as of 1961)	Initial estimate (in A.F.E.)
Booked investment (dollars)	64,118	62,750
Cash contribution including manufacturing profit (dollars)	13,597	13,193
Pretax D.C.F. return on booked investment (percent)	21	21
Annual gasoline sales (gallons)	205,353	219,000
Number of gallons per dollar invested	3.20	3.49

Source: Adapted from Exhibit 16.

> The next year we would do the same thing. We would divide the cash flow for that particular year into the gross investment and that would give us the factor to look up. The result would be the pretax return assuming that the cash flow was that [the current year's cash flow] every year for the next twenty years.
>
> The year 1961 was just about what we thought we would do. What next year will be and what the year after will be cannot be determined until that time. But, the station is starting out very well.

Another senior analyst commented on a disadvantage of the follow-up procedure:

> This is a fallacy in using D.C.F. on an after-the-fact basis. We are using only the current year's cash flow and projecting that same cash flow for the next twenty years against a gross investment that may be one year old or fifteen or twenty years old.

A member of the Marketing Department headquarters staff com-

mented on the following factors that easily could contribute to variations in actual results as compared to those estimated on the A.F.E.:

1. Variations in actual and estimated sales gallonage.
2. Variations in actual and estimated gross margins.
3. Unanticipated competitive action.
4. Unanticipated street and highway construction [widening of street or redirection of traffic].
5. Unexpected developments of centers of interest [e.g., new shopping center in another part of town could have a diverting effect].
6. Unexpected changes, or rate of change, in the character of the neighborhood.

This staff member emphasized that the explanations of such variations should cover those factors known to have influenced the results of a specific project. He observed also that these factors were among those that management had to recognize as possible risks when evaluating the project prior to granting approval for the expenditure.

Headquarters management asked that particular attention be given to service stations which were considered to be below standard. Below-standard cutoff limits for the three categories of the company stations had been established, and a station not achieving at least one-half of the standard was placed on a preliminary below-standard list. The computations then were remade, using an average gross margin for the entire company rather than for the location of the outlet in question. If the station still did not meet the full amount of the standard, it was left on the substandard list. The only exception was one in which the investment met the standards using the current market value of the investment. Conversely, it was noted that, for property that had increased greatly in value, this type of analysis sometimes could result in a decision to dispose of the property and reinvest elsewhere.

The assistant director of marketing economics summarized investment control as being of a threefold nature:

> In the first place, through marketing research we have developed a rather comprehensive set of criteria for measuring the potential at a service-station site. Number two, it [a proposed station] has to be approved by a series of managers at the various levels including headquarters marketing and marketing research. Number three, there is a feedback process whereby we continually inform the regions and they subsequently inform the districts of their performance.

CASE ANALYSIS OF THE ADMINISTRATIVE PROCESSES

The following discussion presents an analysis of the Addicks service-station project, in terms of the necessary administrative processes, and indicates the relationship of these processes, not only to each other but also to the overall capital-expenditure planning and control program.

Awareness of Company Objectives and the Development of Strategic Planning

Other functional areas of the company were considered in determining the scope of marketing activities, thus demonstrating the need to reconcile all functions with plans which would point toward the achievement of enterprise objectives, since all activities, whether interdepartmental or intradepartmental, should point in the same direction. To avoid conflict, coordination is needed among members of management, whose task it is to set broad objectives, and the managers of functional areas, whose responsibility it is to formulate the implementation policies and procedures for their areas. Continental's management usually attempted to communicate this information through written instructions, clinics (such as the real estate clinic referred to in the case), and personal contacts. The marketing-investment guidelines suggested the preferred types of investments and geographic areas and provided the broad outline for more detailed appraisal information needed to support expenditure proposals. Since the major objectives were economic in nature, the guidelines and required appraisal information were designed to do the best possible job of identifying those opportunities which would be the most profitable.

Framework Structuring

The Marketing Department had devoted considerable attention to the selection of new service-station sites. The methods for the development of this type of project were under continuous review for improvement, and management was not hesitant to adopt new procedures which appeared useful. For example, since market research was viewed as a key to market development, the data from a study of market-research and related location-selection concepts and procedures were reported in a company real estate clinic and incorporated in the appraisal of pro-

posed locations. Although procedures were structured for a specific kind of investment, such projects were a part of the total capital-expenditure program and required coordination with both the procedures and content of the overall program. In addition, it was necessary that all activities be consistent with the organizational framework of the company and the capital-expenditure program of which these investments were a part.

Objective Criteria

The Marketing Department had quantified or verbalized criteria for use throughout the capital-expenditure program in those activities involving searching out, screening, and evaluating, and in the sequential steps of budget preparation, request for approval, in-process control, and follow-up. Objective criteria were used extensively in the many facets of the capital-expenditure program, although their detailed use varied among different kinds of projects. For example, detailed criteria could be applied more easily to commonly occurring projects than to unique ones. Nevertheless, there are some detailed procedures or objective criteria which would be usable at some point in almost all projects.

The department sought to use compatible criteria in the preinvestment economic evaluation and follow-up. However, the follow-up D.C.F. rate made use of current year cash-flow dollars only, thereby assuming they represented cash flow for the next twenty years. The method was, therefore, subject to criticism as a basis for comparison to the estimated D.C.F. rate and has been discussed further in the analysis of the follow-up activity.

Search

The search, at all levels, for good investment opportunities was encouraged, although district personnel generated most of these proposals. Basic investment categories comprised the location of new stations and the upkeep and upgrading of existing locations.

Since the project described in this case was of a common type, a detailed description of the characteristics desired for a new service-station location was feasible. With such detailed instructions, the lower levels of management were equipped to perform the search activity more effectively. While district personnel felt that any proposal which was consistent with broad objectives and with more specific evaluation

criteria would be considered by higher levels in a fair and objective manner, they were equally aware that screening might result in projects being dropped by a higher level in the process of the consolidation and reconciliation of proposals, either with other marketing districts or with the overall operations of the company. The use of judgment in the submission of proposals also was encouraged. In other words, even though a proposal might not conform to the detailed criteria, a project which seemed desirable for other reasons should not be denied consideration.

Screening

Preinvestment screening was described as a device for the control of investments. In this case study, this type of initial screening occurred in the use of criteria for measuring the potential of a site. Subsequently, several levels (including headquarters) approved the proposals for new locations, thereby screening them. As to postinvestment screening, the procedure for the annual follow-up report on each service station helped to identify substandard outlets. Reports on sales volume were available more frequently for any investments that required scrutiny. If necessary, eventual corrective action might entail disinvestment. Thus, it can be seen that the screening activity actually permeates the entire development and useful life of all capital assets. To achieve the maximum usefulness of this activity, management must be willing to disinvest when continued development or operation of an asset appears to offer no reasonable hope of profitability.

Coordination

The marketing operation was the last step in the operational cycle. It was necessary to coordinate marketing investments, not only with the other operating functions of the company but also with the total objectives of the enterprise. For marketing activity, it was particularly desirable to achieve a balance of capital expenditures as to type and geographic location. Basic content coordination was the responsibility of line management, and the routine coordination of individual projects was handled at the district level, which was in direct contact with operations. The Controller's Department handled the overall coordination of procedures (e.g., budget preparation, the profitability analysis, A.F.E. processing, and the reports comparing the budget, A.F.E.'s, and actual expenditures). Of course, most of the actual detail preparation by

prescribed procedures was performed by each individual department, which, in this case, was the Marketing Department. The most important *procedural* coordination at the departmental level had to do with site-selection criteria and follow-up procedures. The coordination of both content and procedures for the overall capital-expenditure program, and within each segment down to the point of individual projects, was vital to all of the framework activities.

Formalization

The need to formalize activities throughout the development of a project was evident in this entire case study. Once a program was in operation, the development of individual projects might begin at any time and might proceed at varying rates of development, with a corresponding variation in the degrees of information available to management for inclusion in the budget. Thus, the degree of formalization accomplished for various projects by the time the annual budget was submitted also might vary considerably. This lack of consistency only made more obvious the need for routinized procedures covering the request for expenditure and for the evaluation and screening of projects as they continued to develop after their inclusion in the budget.

In this case, since the routine nature of service-station investments enabled the department to develop forms which called for a great deal of standardized information, the initial support for such a proposal was quite detailed.

In order to facilitate the implementation of the overall capital-expenditure program, the Controller's Department had prescribed certain format and procedural requirements. Most of this type of information for a service-station project was accumulated and formalized at the district level by the company's real estate representative (a Continental employee). He and the district operations manager were also quite active in coordinating and formalizing the overall plans for construction and initial operation.

Evaluation

Since several different ownership and financing arrangements were used in service-station investments, knowledge of the planned arrangements was essential to the analysis of the investment proposal. Consequently, a considerable amount of detail was included in support of the

A.F.E., in addition to data on the payback period and estimates of the D.C.F. rate of return. A station, although it indicated a favorable return, still was required to meet certain other analytical criteria, such as desirability, gallonage volume, and current traffic counts. Many felt that it was a serious handicap to compute the D.C.F. rate of return with the pricing for the predicted volume based on the average price in the area for the preceding three years. A headquarters manager felt that a criterion of a required annual sales volume in gallons per dollar invested might be a useful supplement to the D.C.F. rate. In the case of economic evaluation, although the consideration of only incremental cash flows in computing payback and D.C.F. was correct, the general overhead costs which had to be covered before profits could be available were considered in the total analysis of operations. It was also evident from the completeness of the forms and the detail in the instructions for their preparation that there was a high level of procedural formalization and coordination in evaluating this type of capital expenditure.

It was apparent that the evaluation activity did not end with the inclusion of a station in the budget and the approval of the request for expenditure; rather, it lasted throughout the construction and useful life of the asset.

Budgeting

The periodic budget, as described in this case study, was in accordance with the prescribed procedure set forth in company bulletins, with budget-related communication occurring throughout the year and not just at the time the annual budget was prepared. Whereas the budget was simply a record of the plans at a given point in time, the status of these plans was the result of the continuous process of planning. Although a budget was designed to cover only one year, it evidenced long-range marketing plans, since any plans for a constant rate of long-range growth called for a year-to-year balance in the amount and type of expenditures, not only for individual departments but also for the company as a whole. Budget detail was prepared at the level of origin (in this case, the marketing district), since the organizational segment which sponsored and administered a given project was in the best position to prepare the necessary supporting budget data.

The approved budget might necessitate the revision of that year's annual guidelines. For example, a budget that reduced original requests

materially might necessitate a more rigorous set of criteria in the selection of upkeep replacement expenditures for that year; and marketing headquarters, therefore, might have to request that only the very essential replacements be made. The technique of personally carrying the approved budget to the operating levels and explaining the thinking behind it appeared to achieve effective communication and to enhance personnel relations. In the interviews with Continental employees, there appeared to be a general awareness of the company's purpose in budgeting, and this appreciation of purpose was considered essential if the budget was to fulfill its role in an organization's overall capital-expenditure program.

Request for Expenditure

Very detailed data were prepared by the district personnel to support the Addicks service-station project, including a large number of evaluation criteria. While assistance from higher levels seldom was needed, headquarters offered "educational" assistance by conducting such instructional programs as periodic real estate clinics, which served as a vehicle for communication as well as a means for improving uniformity.

In the selection of new service-station locations, the use of detailed support and of a number of criteria was indicative of the high degree of procedural sophistication. Sometimes, portions of the supporting data were not available at the time of the budget. However, when the request for expenditure was made, it was required that all the data available be gathered and included. Whereas the budget was prepared at a prescribed time, the request for expenditure could be prepared at any time during the year, with approval requirements usually dependent on whether or not the project had been budgeted (either as allocated or unallocated funds). Approvals also were governed by whether designated evaluation criteria were met, a procedure which appeared to be a logical one for establishing approval requirements.[5]

In-Process Control

In this case study, the in-process control involved the cost, time, and

[5] Unless the use of these criteria in determining required approval are accompanied by a means of independently confirming the validity of the computations, inappropriate approval of projects could result from excessive optimism.

quality dimensions typical of projects having a construction period. The preliminary arrangements required in connection with market research, preparation of appraisal data, option to purchase land, and arrangements with a prospective lessee were controlled by the district marketing manager. Both the real estate representative and the district operations manager were involved directly in the preliminary arrangements and in the subsequent control of cost, time schedules, and construction quality. For continuity from project development to the use of the asset (and beyond), the exercise of control by these personnel appeared logical. In contrast, however, other types of projects of a more complex nature might require the use of staff groups, such as an engineering department, in performing the in-process control activity. Again, in this case, financial reports were kept primarily for historical purposes, with the most effective direct control being the on-the-scene observation of, and liaison with, the construction personnel. Since service-station costs could be predicted very accurately, excessive underexpenditures or overexpenditures in this type of project were infrequent.

Follow-Up

It was found that, for service stations and bulk plants, the Marketing Department employed a routine, annual follow-up reporting procedure using data-processing equipment. A pretax D.C.F. return on booked investment was computed, assuming that the annual cash flow for the succeeding twenty years would be the same as for the year of the report.[6] The D.C.F. rate, as well as an aftertax rate, was calculated as a part of the original A.F.E. profitability analysis. While the use of a pretax D.C.F. rate afforded a basis of comparability as between the A.F.E. estimates and the results for a given year, an additional computation, using the actual cash flow to date and the estimated cash flow for the remaining life, would have aided in appraising the station on something more than a one-year basis. The inclusion, in the follow-up report, of the ratio of gallons per dollar invested indicated the use of additional criteria in the evaluation of results.

A good follow-up procedure should include the appropriate use of the resulting information. In the course of this case study, it was found that the Marketing Department used its follow-up data to evaluate sta-

[6] This assumption, however, was cited as a criticism of the method.

tion performance. Those stations not meeting certain minimum standards as to pretax D.C.F. return on booked investment (after allowing for areas having depressed prices) were placed on a below-standard list. Marketing headquarters then asked that the operating management personnel make definite plans to rectify the performance of such stations. Another use of the follow-up data involved the explanation of variations in order to gain knowledge that would be useful in making future investments of a similar nature. In general, the uses for follow-up data described in this case study were consistent with the general patterns outlined in the literature.

CHAPTER V

CASE STUDY OF A PETROCHEMICAL PRODUCT NEW TO THE COMPANY: CYCLOHEXANE

BACKGROUND INFORMATION

Characteristics of the Case

The case study of a petrochemical product new to Continental Oil Company afforded the opportunity of analyzing the development of a unique, major capital expenditure within the company's overall capital-expenditure planning and control program.[1] The investment, which was of a nonroutine type, involved a rather large amount of funds in a relatively new segment of the company's activities. The nature of the investment necessitated a considerable amount of coordination of activity among groups within and outside of the company.

The administrative processes analyzed in this case included the decision to add the manufacturing and marketing of a new product, cyclohexane, which is a raw material used in the manufacture of nylon. The investment was the responsibility of Continental's Petrochemical Department, although the unit to manufacture this product was to be located at Continental's Ponca City (Oklahoma) refinery, with additional processing facilities at the Lake Charles (Louisiana) refinery. Basic aspects examined in the course of the case study included the following: (1) problems of coordination and participation, both intercompany and intracompany, inherent in a major project; (2) conditions associated with a nonroutine investment; (3) importance of departmental organization in a major project; (4) problems of developing a new product; and (5) specific activities involved in the development and approval of the A.F.E., the construction of the plant, and the post-completion process. One aspect which was presented as an auxiliary to this case was a detailed checklist for new projects, which was developed

[1] For the sake of anonymity, the names of individuals and companies and certain of the quantitative data have been disguised.

by the Petrochemical Department. This checklist enumerated all the different procedures to be followed in carrying out a project such as that described in this case study.

Organization of the Petrochemical Department

The Petrochemical Department of Continental Oil Company was almost a company within a company. The four petrochemical positions which reported directly to the general manager of this department were: (1) administrative assistant to the general manager, (2) coordinator of petrochemical affiliates, (3) manager of petrochemical operations, and (4) manager of petrochemical planning.

The operations function comprised activities in manufacturing, sales, and personnel relations. Manufacturing was broken down by plants, of which there were five. However, some of the manufacturing activities not attached to the petrochemical plants were directed from headquarters, and the product discussed in this case was of this latter type. The cyclohexane "plant" actually was composed of a manufacturing unit, with its activities located at the Ponca City and Lake Charles refineries. These manufacturing-installation investments were carried in the company's accounts as refinery assets, although, for the purpose of reports and profitability analyses, these cyclohexane investments were reclassified as Petrochemical Department assets.

The sales function included the following categories:

1. Sales divisions.
   a. Detergents sales.
   b. Oil field sales.
   c. Petroleum sulfonate sales.
   d. Plastic intermediates sales. [Cyclohexane was in this category.]
   e. Export sales.
2. Advertising and sales promotion.
3. Credit and administrative services.
4. Customer-service laboratory.

The two major sections of planning in the Petrochemical Department consisted of (1) the New Projects group and (2) the Market Research and Development section. The New Projects group, which concentrated on process design and economic studies, had a role similar to that of the New Projects division of the Coordinating and Planning Department

and to the Process Center of the Manufacturing and Engineering departments. Despite some overlap in the roles of these groups, the project sponsor and his superior in this case study tried to avoid duplication of effort. In the cyclohexane project, there was a close interrelationship, with much of the process design and evaluation study performed by the Process Center.[2]

In Market Research and Development, the research section surveyed market potentials with respect to new products, new market areas, and product upgrading. The development section searched for ideas for new products and/or distribution.[3] As will be developed presently, a representative of the Market Development section bore the major coordination responsibility for the cyclohexane project.

All of the Petrochemical Department had access to, and utilized as needed, the administrative and services departments of the entire company.

CHRONOLOGICAL DEVELOPMENT OF THE PROJECT

Activities Leading to Approval

Origin and Development of the Project. The two major facilities for new product lines described in the company's annual report for 1959 were a new type of alcohol plant and the cyclohexane unit, with the latter described as follows:[4]

> The second major facility will be located at Ponca City and will manufacture cyclohexane at the rate of 65,000 tons a year. The bulk of this output will be sold under long-term contracts as an intermediate for the manufacture of nylon. Completion of this new facility is scheduled for the fall of 1960.

The annual report for the following year announced the completion of the facility and the beginning of operation in the fall of 1960.[5] The fol-

[2] Throughout this case study, all references to the Process Center should be construed as meaning the joint efforts of the Process Center and the Petrochemical Department New Projects group.

[3] A "new" product might be either a material unique in the industry or one already on the market, as in the case of cyclohexane.

[4] Continental Oil Company, *Annual Report 1959* (Houston, 1960), p. 18.

[5] Continental Oil Company, *Annual Report 1960* (Houston, 1961), pp. 11–12.

lowing basic activities were involved in the approval of the project: (1) customer contacts, (2) raw materials and plant location, (3) transportation of finished product, (4) process design, (5) economic studies, (6) engineering department project development, and (7) management approval. Many of these activities overlapped chronologically, and all of them were in process almost continuously from the initial idea through project approval. As a matter of fact, all of the activities, with the exception of the management-approval process, even carried over into the construction and the postcompletion periods.

Within the company, the sponsorship and the coordination of projects generally were related to (1) the degree of importance and size of the investment and (2) the departments, groups, and individuals most interested in the project. Projects of a complex and significant nature needing more precise coordination usually were handled through the headquarters network rather than at a lower level. For some of the company's very large projects, a committee type of coordination arrangement was used.

A major coordinating agency for the development of new and/or large projects in the petrochemical area was the Market Development section of the Petrochemical Department. One of this section's representatives frequently would be assigned the major responsibility for a project, as was the case in the cyclohexane project. From the first customer contact that gave rise to the project, on through to its ultimate development, the same marketing representative carried the basic responsibility for the coordination of the entire project. This representative, of course, acted on the authority of his superiors and utilized extensively the talents of many groups and individuals. One of the Process Center engineers noted that "he [the representative] was the guy who went out and, when the thing seemed to die, got them moving again." Numerous status reports, prepared by the Marketing Development representative, both before and after the A.F.E. approval of the project, evidenced his considerable participation as the coordinator of the project.

Customer Contacts. A letter, written in December 1955 by one of Continental's Manufacturing Department Technical Services representatives to the New York Petrochemical Sales office, pointed out that, at a recent chemical exposition show, a representative of Southern Nylon Company had indicated an interest in the possibility of securing an additional supply of cyclohexane, one of the raw materials for nylon. During the previous year, although another company had contacted

Continental regarding the same material, the project had not been pursued because of what appeared to be expensive extraction costs and an unsatisfactory effect on the company's overall manufacturing balance. However, this more recent inquiry from Southern Nylon Company was passed through channels until ultimately it was assigned to the Market Development representative for further investigation.

There followed a long pattern of correspondence and conferences between the representatives of Continental and of the Southern Nylon Company. Southern Nylon's key negotiator was its purchasing director, although a number of individuals in the manufacturing and laboratory operations eventually were involved. While some contacts were made with other potential customers, Continental's major efforts were directed toward Southern Nylon, primarily because the economic evaluation of the project appeared sufficiently attractive even if it were based entirely on a contract with this one company. The many discussions among the representatives of Southern Nylon and Continental, most of which were arranged by Continental's Market Development representative, dealt with some or all of the following five considerations: (1) product quality, (2) competitive ability, (3) purchase-quantity negotiations, (4) price negotiations, and (5) duration of the contract. One process engineer noted that the precontract demand for a very high quality probably accounted for a more precise process design which led to a minimum of quality difficulty when actual production began.

Since the cyclohexane plant was to be located at Ponca City, Oklahoma, evidence was needed that Continental could compete with other manufacturers, especially those on the Gulf Coast. Since the final agreement called for Continental to furnish 30 percent of Southern Nylon's requirements and since Continental had to be able to deliver a minimum of 15 million gallons of cyclohexane annually, a unique transportation plan was devised in order to assure Continental's competitive position in the fulfillment of the contract.

The price negotiations resulted in a sales price of $0.50 per gallon, subject to the following price-escalation clauses:

> Price Escalation: The price of cyclohexane shall be increased or decreased penny for penny based upon the price of the highest grade regular gasoline Gulf Coast Bulk Cargo and 0.06 cents per gallon for each one point change over or under base of the final monthly index for "All Commodities Other Than Farm Products and Foods." The 1958–1959–1960 average of Platt's Low Quotations for the highest grade regular gasoline and the

Commodity Index for October 1960 will be used as the basis for determining the effect of the escalation clause on the price of cyclohexane.
Price Protection: The price protection clause requires that Continental shall reduce the price of cyclohexane to Southern Nylon to the lowest price level offered to anyone else. Also, in the event Southern Nylon has a bona fide offer of at least 5 million gallons of cyclohexane per year for the unexpired portion of the contract at a price lower than Continental's, Southern Nylon will have the option of purchasing such quantity from the other supplier and subtracting same from Continental's contract in the event Continental elects not to meet the lower price on that quantity.

The final contract was for five years, 1961 through 1965. Beyond 1965, the contract was to be renewed on a year-to-year basis until terminated by a six-months' notice by either party. The negotiations, which were consummated after an extended period of time, involved Continental personnel from Market Development, the Process Center, Engineering, Sales, Manufacturing, and Transportation and Supply. Throughout the entire negotiation period, it was necessary to reassure Southern Nylon of Continental's interest while, at the same time, making the many coordinating arrangements. The methods used by Continental's personnel illustrated the complexity of coordinating the many aspects of a major project. For example, a letter of intent was needed from Southern Nylon before the project could be submitted for official approval. This letter, originally anticipated in January 1959, actually was not obtained until seven months later, in August 1959.

Raw Materials and Plant Location. Two refinery by-products, hydrogen and benzene, were the only two raw materials required for the production of cyclohexane. Since the availability and price of the raw-material supply were primary considerations, these two aspects strongly affected the selection of the plant location. An additional factor in the the selection of a satisfactory site was transportation for the finished product.

Since Southern Nylon and a number of other potential customers were located along the Gulf Coast, the site selection was narrowed to either of two Continental refineries, the Ponca City (Oklahoma) refinery or the Lake Charles (Louisiana) refinery. Whereas hydrogen was available in adequate quantity at the Ponca City refinery, the supply at the Lake Charles refinery was committed already, which would have meant obtaining an additional supply at a time when there was some scarcity of hydrogen on the Gulf Coast and when transportation costs

precluded the movement of hydrogen from Ponca City to Lake Charles.

An annual production of 25 million gallons of cyclohexane (which ultimately was the capacity of the new plant) would require 21 million gallons of benzene. Either of the refineries was able to produce only about one-fourth of this amount. Here again, the price for available benzene delivered to Ponca City was much more favorable than that on the Gulf Coast. Demand for benzene in these two locations was, of course, a major factor in the price structure. It was management's opinion that availability and price would continue to be more favorable for the Ponca City location.

The projection of manufacturing costs indicated raw-material costs to be as much as 5 cents per gallon cheaper at Ponca City, which more than offset the additional transportation costs of moving the cyclohexane from Ponca City to the Gulf Coast markets. Thus, the factors associated with the raw-material supply and finished-product transportation led to the decision to locate the cyclohexane plant at Ponca City.

The arrangements for benzene procurement were handled for Continental through the Purchasing Department and were coordinated by the Marketing Development representative. After contacts with several potential suppliers, an option to purchase benzene was obtained from the Oklahoma Oil Company. A sixty-day extension was obtained in July and again in September 1959. The price-escalation clause summarized earlier was included in the final agreement, consummated in November 1959, following management approval of the project.

During this time, investigations were made regarding the possibility of expanding the benzene-manufacturing facilities at the Ponca City refinery. Although it was not feasible to expand the facilities, some improvements in existing facilities were made to improve quality and increase capacity slightly. Some of the Continental personnel were concerned about such a heavy reliance on an outside source of benzene, and, as circumstances developed, the scarcity of benzene did become a limiting factor in the cyclohexane production during the first year of operations.

The problem of coordinating the timing was discussed in a November 1958 memorandum from the Marketing Development representative to the director of Market Research and Development:

> Naturally, we are in no position to enter into any firm agreements that may result in our securing the required additional . . . benzene until we

secure a contractual agreement with Southern Nylon. Of course, we could sign no such agreement unless our sources of raw material were secure. Therefore, we have been attempting to time these two processes so that we shall have an option on our feed stocks prior to signing a contract with Southern Nylon.

Transportation of the Finished Product. Since excessive transportation costs precluded the movement of the finished-product cyclohexane to the major markets on the Gulf Coast by tank car, the Process Center, in cooperation with the Transportation and Supplies Department, developed a basic plan for the shipment of this product.

Primarily, the transportation process was worked out as follows: The cyclohexane was shipped from Ponca City to Wood River, Illinois, via the Cherokee Pipe Line Company, in which Continental held a 50 percent interest. Since the freezing point of cyclohexane is 40°F, it was necessary, prior to shipping during the winter months, to mix the product with another Ponca City refinery product called dodecene, which served as an antifreeze. At Wood River, the mixture was accumulated in storage tanks at Continental's products terminal, and it was then barged down the Mississippi to Lake Charles. An administrative assistant in petrochemical headquarters described the barge movement, and the subsequent handling at Lake Charles, as follows:

> We have a scheme on barging whereby this is a return haul for the barge line company. We have been operating on a twenty-two day turnaround schedule. In other words, these barges come down to Lake Charles, drop off our product, go over to New Orleans and pick up a solvent, and take it all the way back up the river to Chicago. Then they vent their tanks from Chicago back down to Wood River and they are ready to accept our cargo.
>
> Once we get into Lake Charles, we put this material through a splitter tower. [The splitter tower investment was made to handle this particular product separation activity and involved a part of the total "new facility" investment.] The cyclohexane and dodecene are thus separated and placed in storage tanks to await shipment to the customer. Most cyclohexane shipments were by barge.

In the event of an emergency, cyclohexane could be shipped by tank car from Ponca City to Lake Charles. Also, some of the product was marketed direct from Ponca City, although this type of sale was on a very small scale.

Process Design. The major work in process design was performed by the Process Center, a unit of the Manufacturing and Engineering departments. This work, of course, had to be coordinated closely with the Ponca City refinery operating personnel and with personnel in the areas of manufacturing, new projects, and market development within the Petrochemical Department.

The two basic processes by which the product could be produced commercially included (1) catalytic hydrogenation of benzene and (2) extractive distillation of benzene from refinery napthas and natural gasoline. Continental's decision to use the first of these processes was the result of the following two major factors: (1) the raw materials needed to manufacture cyclohexane of the desired purity in commercial quantities were available only if the hydrogenation process were used, and (2) the capital investment for the distillation process would be approximately 60 percent greater than that for the hydrogenation process.

Several engineering contracting firms had developed the hydrogenation process selected by Continental, and they were prepared to guarantee performance, protection from patent litigation, and construction costs. Contacts with the potential contractors came through the Process Center, with the Engineering Department handling the subsequent bid receipts, the awarding of the bid, and the supervision of construction.

Economic Studies. The possible changes in, and the combinations of assumptions for, the preparation of economic studies were numerous. After the process design and plant location were determined, among the many variables still to be resolved were the following:

1. Construction costs.
2. Benzene price.
3. Cyclohexane price.
4. Volume.
   a. Plant capacity.
   b. Utilized capacity.
5. Economic life.

The first formal economic study was completed in December 1957. This study and others developed subsequently (through to the point of A.F.E. approval) were made by the Process Center. This group, in developing the economic analysis, utilized in varying combinations a number of the following basic assumptions: (1) plant capacities of 3

million to 5 million gallons per year and of 15 million to 25 million gallons per year, (2) economic lives of five years and of ten years, (3) a benzene price range of four cents, and (4) a cyclohexane price range of seven cents. The results of these projections were plotted on graphs. For example, in a combination which assumed an economic life of five years, the production of 5 million gallons per year, and an investment of $600 thousand, the computations indicated a payback period ranging from 1.85 years upward and a D.C.F. rate of return of from 55 percent downward, depending on the variations in the assumptions concerning the sales prices for benzene and cyclohexane.

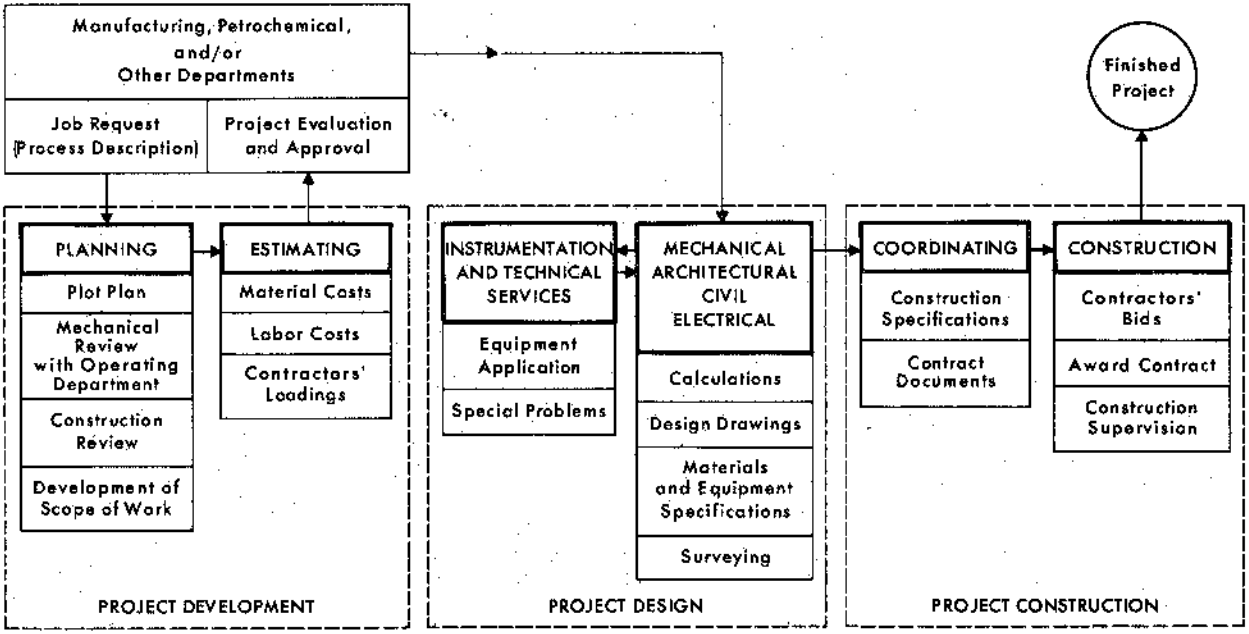
This study was but the beginning of a continuing pattern of revisions and updating to include additional variations of assumptions and to incorporate more precise data as they became available. The report that presented the final proposal to top management in August 1959 included six assumptions, with two variations each as to plant capacity, sales volume, and economic life. However, the assumptions were restricted to the existing price of benzene and cyclohexane. If a range of price variables for these two materials had been included, the number of alternatives would have been increased appreciably. Payout years and the D.C.F. return were computed for each assumption, with the subsequent A.F.E. economic appraisal then being based on one of these assumptions. However, when the A.F.E. economic appraisal was prepared, the updated cash-inflow data modified somewhat the payout years and the D.C.F. return.

Engineering Department Project Development. The Engineering Department was of major assistance in the manufacturing and engineering phases of activity. The process charted in Exhibit 17 generally was applicable for manufacturing and petrochemical projects and sometimes for the terminal and bulk-plant construction projects. However, all of these steps, except the awarding of the contract and construction supervision, usually occurred prior to the approval of the A.F.E.

The project-development pattern was divided into the three phases of (1) project development, (2) project design, and (3) project construction. The extent of the work performed in the areas of planning and estimating depended on the two key factors of time pressure and the degree of certainty as to whether a project was desirable enough to merit approval. Management recognized the waste of a great deal of effort on projects that were marginal at best. Conversely, there was the problem of doing a study in enough depth to make an intelligent de-

Exhibit 17

DIAGRAM OF A TYPICAL PROJECT DEVELOPMENT, ENGINEERING DEPARTMENT, CONTINENTAL OIL COMPANY



Source: Adapted from Continental Oil Company, Houston.

cision. The preliminary data, including estimating, were prepared for such groups as the Process Center, which then developed the economic studies.

Project design and the request for, and receipt of, bids were carried out by the Engineering Department (see Exhibit 17) based on informal indications from management that a project would be approved. The planning, estimating, and project design were carried out on the basis of job requests and process descriptions supplied by such groups as the Process Center. Depending on the circumstances, the degree of development of these requests and descriptions had varied considerably, ranging from sketchy notes to very detailed supporting data.

Since quite often the successful bidder was known at the time the A.F.E. was prepared, the bid figures could form the support for the amount of funds requested. However, the actual awarding of the contract normally would be withheld until the A.F.E. had been given final approval. In the construction of the cyclohexane facilities, some of the bids had been determined at the time the A.F.E. was submitted, but not all of the construction was to be performed by outside contractors; certain portions were to be constructed by Continental's maintenance employees.

Management Approval. As has been noted previously, the letter of intent (dated August 17, 1959, and valid for thirty days) received from the Southern Nylon Company set in motion a number of administrative processes. A 19-page report, entitled "Cyclohexane—A Petrochemical Investment Opportunity," was prepared and presented to all members of the Domestic Operating and Coordinating Committee under the signature of the general manager of the Petrochemical Department. Since the project had been shown as a memorandum item (unbudgeted) on the 1959 budget, it required handling as an amendment to the budget, and the proposal had to be channeled through management levels to the point of approval by the Board of Directors. However, because management at the level of the Operating and Coordinating Committee and at higher levels had been informed of the status of the project from time to time, the process of final approval had the advantage of prior exposure to, and reactions regarding the merits of, the proposal.

In the process of securing approval, a memorandum dated August 25, 1959, was sent from the chairman of the Domestic Operating and Coordinating Committee to the Management Executive Committee, indicating consideration of the project:

> At its August 25th meeting, the Coordination Committee reviewed the cyclohexane project. Although certain risks were recognized, the estimated rate of return on an investment of 2.43 million dollars was considered sufficiently attractive to outweigh the major risks involved in the venture.

Some of the major risks which were noted in the committee memorandum were:

> Under present circumstances, Continental would have to purchase between 64 percent and 74 percent of the benzene required to manufacture the cyclohexane.
>
> The right of Southern Nylon to take advantage of any bona fide lower price offers is a disadvantage.
>
> Continental's transportation cost is higher than [that of] its Gulf Coast competitors.

The approval of the Management Executive Committee was given on August 28, 1959. At that time, the director of the Market Research and Development section of the Petrochemical Department telephoned the director of purchasing for Southern Nylon, informing him that the necessary top-management approval had been received. This notice was confirmed by letter on August 31, 1959. After a memorandum signed by the president and dated September 9, 1959, was sent to the Board of Directors requesting approval of the amendment to the 1959 capital budget, consent was received immediately from the board.

In late September 1959, then, specifications for bid purposes were sent to potential contractors with whom the manager of the Engineering Department and his staff already had been involved in extensive correspondence. At the same time, the Marketing Development representative and the Transportation and Supplies Department were involved in the pursuit of making final arrangements for barge movements down the Mississippi and from Lake Charles to the customer. Finally, in November 1959, a benzene agreement was entered into with the Oklahoma Oil Company.

In early November 1959, authorization was given by the executive vice-president to expend approximately $200 thousand for tankage and piping prior to the formal approval of the A.F.E. While the executive vice-president felt that he should not sign the A.F.E. until the contractor was selected, he felt that there was no reason to delay this offsite work.

On November 16, 1959, the A.F.E. and supporting economic calculations were prepared in the amount of $2.43 million. The signatures of the general manager of the Petrochemical Department and of the executive vice-president were obtained on December 1, and the president's signature on December 9. After the approval of the A.F.E., the contract was awarded immediately to the successful bidder, who had been selected in mid-November 1959. The agreement was on a cost-plus, fixed-fee basis, with a guaranteed maximum price.

With the arrangements made and work begun, it was estimated that the plant would be in production by the beginning of the fourth quarter of 1960, with delivery to Southern Nylon beginning on or about January 1, 1961. During this period, the Marketing Development representative continued to correspond with other potential customers, and he had, at this point, the additional advantage of being able to give the approximate date that the production of cyclohexane was scheduled to begin.

Plant Construction

The contracted phases of the project were begun in January 1960. The major portion of the A.F.E. that was contracted was the cyclohexane plant at Ponca City, although the splitter tower constructed at Lake Charles also was contracted. However, not all of the construction was assigned to outside personnel, because it was possible for several minor phases of construction at both locations to be handled by Continental's maintenance forces.

Responsibilities of the Engineering Department. The construction phase was coordinated centrally by the Engineering Department. The phases involving Continental work forces at the Ponca City and Lake Charles refineries were handled through the plants' mechanical superintendents. They conferred with each other and with the Engineering Department regarding timing and detailed specifications. The liaison with the contractor, however, was handled directly by the Engineering Department. As can be seen in Exhibit 17, this responsibility was considered as "construction supervision," for which the Engineering Department assigned a project engineer to each of the two geographic locations to manage the on-the-scene coordination.

As implied above, the authorized A.F.E. was divided further into subordinate portions, in order to break down the tasks and provide for

cost accumulation. Ten subordinate A.F.E.'s were assigned for the Ponca City expenditures and two for the Lake Charles expenses.

As construction progressed, the Engineering Department had frequent contacts with the Process Center regarding process and plant design. As the time of completion drew nearer, the Engineering Department worked closely with the staffs of the Ponca City refinery operating management, the manager in the area of petrochemical manufacturing, and the Process Center personnel as they laid plans to begin production. The Engineering Department was responsible until the plant actually was in operation according to specifications, to the point that the contractor could be given a final release.

Construction Audit. Since the cyclohexane construction contract was of the cost-plus, fixed-fee type, an audit by the General Auditing Division of the Controller's Department was required. When an A.F.E. involving a contract subject to audit was authorized, the general auditor, who was the director of the General Auditing Division, was informed by the affected accounting division, and it was his responsibility to administer the audit through his staff and other designated accounting representatives. The General Auditing Division had prescribed the broad audit procedures which covered an examination of the contract and of billings and the related support. This division also provided on-the-scene liaison with engineering and operating personnel.

Accounting Records and Reports. The cyclohexane project, although it was located at the Ponca City and Lake Charles refineries, was a Petrochemical Department proposal and A.F.E. authorization. The profit responsibility also belonged to the Petrochemical Department and was reported as such. However, since the plants were attached physically to the two refineries as operating units, the accounting records for the investment and its subsequent operations were developed as a part of the records kept for the respective refineries, and all of these refinery records were maintained centrally by the Manufacturing Accounting Division of the Controller's Department at Ponca City.

During the construction period, the investment costs were accumulated in detail. Each month, an "Open Authorizations Report" was prepared, showing the total figures for the amount authorized, expended, and underexpended or overexpended for each A.F.E. The Engineering Department also prepared an "Authorization Progress Report" each month, which, in addition to the dollar information showed the percentage of completion and a status description for each active A.F.E.

On special request by the Engineering Department, the Manufacturing Accounting Division would prepare a detailed "Semimonthly Expended and Committed Report" on major projects. The term "committed" applied only to those expenditures of which the Engineering Department had knowledge, but which had not yet been recorded as expended items. Notices of these items were sent by the engineering group to the accounting personnel, with the net effect of placing the report on an accrual rather than a cash basis.

A representative of the Manufacturing Accounting Division worked with the Petrochemical Department and the Transportation and Supplies Department, as well as with personnel at the Ponca City and Lake Charles refineries, in taking care of interdepartmental transfer costs for hydrogen and benzene, the use of facilities, and certain overhead charges. Also, arrangements were developed with the Petrochemical Department regarding the format to be used in reporting operating data.

The cyclohexane facilities were put into operation in the beginning of the fourth quarter of 1960; because of minor plant revisions and late charges, however, the A.F.E. was not closed fully until December 31, 1962. Nevertheless, depreciation was recorded from the time that production began. The capitalized expenditures were supported by a asset-record, data-processing card for each piece of equipment. Such items as piping and electrical costs were set up in the aggregate for each A.F.E., with a code designating location, type of equipment, and an identification number for each piece of equipment. These cards, which also showed acquisition date and cost of material and labor, were used in the periodic inventory of assets and for depreciation and retirement purposes, with maintenance costs being accumulated by means of the equipment code.

Continuing Arrangements. During the construction period, further arrangements were made regarding raw-materials sources and the transportation of the finished product. Also, liaison was continued with Southern Nylon and with other companies which might be potential customers. The groups and individuals involved in the liaison activities were essentially the same as those pointed out in the description of the preconstruction period. In addition, personnel in the areas of petrochemical manufacturing and sales, in the Process Center, and in the refinery-operations groups were being involved more and more in the details of the plans for the start-up and operation of the new facilities.

Postcompletion Activities

Production. Production was begun in early October 1960, with the first deliveries being made to Southern Nylon Company in January 1961, some five years after the first serious consideration of the project. In the course of the project's development, very few process problems had occurred, and one engineer in the Process Center had commented as follows:

> I followed the [cyclohexane] project steadily beginning with early economic studies and process design through the time that we built the plant and had it on stream and the quality problems were solved. We stay up with process problems if and when they arise. This was one of those that had practically none.

The major responsibility for the production and marketing of the product was assigned to the operations segment of the Petrochemical Department. The Market Development section, again mainly through its representative, continued to make contact with potential customers, particularly in connection with market potential for three products that could be made using cyclohexane as the primary raw material. Although the possibility of the construction of facilities to manufacture these additional products had been considered and investigated by Process Center personnel, no action had been taken on this proposal.

Operating Problems. Three significant operating problems occurred during the first two and one-half years during which Continental produced cyclohexane.

The first problem developed during the first year of production, when a short supply of benzene caused a production level below that desired by the Petrochemical Department sales group. The second occurred in the winter of 1961–1962, and again in the winter of 1962–1963, when the northern portion of the Mississippi River barge route was frozen for the first time in nearly fifty years. In both years, it was necessary to move the product by tank car as an emergency supply measure. In the first year, the unsually severe winter at Lake Charles caused the line from the splitter tower to the cyclohexane product storage tanks to freeze, which necessitated a change to the use of a line that was largely underground and the insulation of the sections of the line that were above ground. The third problem was one of logistics, stemming from the fact that the product was manufactured at a refinery rather than at a petrochemical installation. During the first year, this problem was

handled by a group in the company that had responsibility for refinery production levels and shipments to distribution points. However, since their operation was not geared to handle a product involving direct contact (through the sales group) with individual commercial customers, situations occurred involving inventory shortages and overages and delays in answering customer inquiries regarding delivery of anticipated purchases. In order to ease this problem, the logistics responsibility was assumed in January 1962 by an administrative assistant in the Petrochemical Department headquarters, with all activities of production, transportation, storage, and sales of cyclohexane being coordinated through him. This alteration in administrative procedures facilitated the handling of the product and permitted the maintenance of more desirable inventory levels. As an added assistance, a computer program dealing with the logistics problem was developed during 1962, through the cooperation of the Central Computer Department and the Petrochemical Department's administrative assistant. The following is an excerpt from a memorandum, dated February 25, 1963, from the administrative assistant to the manager of the Manufacturing Accounting Division, summarizing the program and suggesting an additional step which could help in determining the profitability of the operation:

> Over the past several months, we have developed a computer program involving the logistics of the cyclohexane-dodecene movements. This program is now complete and we are to the point where we are running a case once a week. The program as it is set up now takes into consideration the cyclohexane operation in Ponca City, schedules pipeline tenders to Wood River, details the Wood River inventory, schedules barge movements to Lake Charles, gives a detailed inventory on cyclohexane-dodecene at Lake Charles, processes these products through the cyclohexane splitter tower, maintains an inventory on finished cyclohexane, and makes shipments of cyclohexane.
>
> With all this basic information available, it has occurred to me that perhaps without too much additional effort we could plug in our cost of cyclohexane and our selling price and therefore determine the profitability of this operation on every run that we make.

Other Production Studies. The Process Center was called on to make three studies in connection with the cyclohexane project during the first two and one-half years of production. However, as of early 1963, no firm plans had been made to set in motion any of the possibilities investigated. The three aspects investigated included: (1) expansion of

the cyclohexane plant, (2) construction of facilities to manufacture three products made from cyclohexane, and (3) relocation of the cyclohexane plant.

Follow-Up Studies. For the first six months of 1961, and later for the full year 1961, a D.C.F. rate and payback period were computed by the same method as that used in the service-station case discussed in an earlier chapter. For the first six months, the net profit after tax (plus tax depreciation) was computed, with the figure being doubled to place it on an annual basis. The result was divided into the gross investment, the quotient being the payback period in years, assuming a continuation of a uniform annual cash flow. On the basis of the cumulative-discount-factor table (see Appendix D) a D.C.F. return of ..... percent on a ten-year life was indicated. A similar calculation for the full year 1961 indicated the payback period of ..... years and a D.C.F. percentage rate. The cost and revenue data were accumulated and reported by the Manufacturing Accounting Division, with follow-up computations being prepared by the administrative assistant in the Petrochemical Department.

When cyclohexane and benzene prices dropped sharply in 1962, it was found that the larger of the reductions was in the cyclohexane price, which then resulted in a lower profit margin than had been anticipated. This drop in the cyclohexane price was largely a result of the lower-price-offer clause included in Continental's contract with Southern Nylon. Data indicating the 1962 results were not available at the time of this case study; the Petrochemical Department had commented that it was waiting for the cyclohexane market price to stabilize before recomputing the rate of return.

In April 1963, a formal annual follow-up procedure was added to the Petrochemical Department's procedures guide (see Exhibit 18). Prior to that time, the follow-up had been handled on a special-study basis only. The new procedure, however, called for the computation of a return on investment using the method of annual return on original investment. That is, net profit after tax was divided by the investment and inventory. It should be noted that inventory (working capital) was included as a part of the investment. Although a D.C.F. rate as such was not required, the cash-flow information was to be included on the form.[6]

[6] It is important to observe that the computed rate of return should not be compared blindly with the D.C.F. rate computed for A.F.E. purposes. The follow-up rates of return were computed by means of a different method. However, even if a

New-Projects Checklist

On April 17, 1963, the Petrochemical Department added to its procedures guide a section on new projects. This section, part of which has been reproduced as Exhibit 19, summarized the multiple tasks involved in major capital investments, and also it described procedures for smaller projects that were handled by the operations arm of the department.[7] Compliance, however, was cited as the responsibility of the manager of the operation involved and of the subordinates to whom he might redelegate authority.

CASE ANALYSIS OF THE ADMINISTRATIVE PROCESSES

The analysis of the administrative processes involved in the cyclohexane capital-expenditure proposal can be divided into three major parts. The first part covers activities prior to, and including, approval. Also developed in this part of the case were the implementation activity of the search and the events leading to an addition to the budget and approval of the A.F.E. The second part, comprising material on plant construction, includes the in-process control activity. The third part, which reviews postcompletion activities, reports on the follow-up activity. Throughout the development of this project, over the five-year period from the embryonic stage to early 1963, there were repeated instances of nonsequential activities involving the processes of screening, coordinating, formalizing, and evaluating.

Awareness of Company Objectives and the Development of Strategic Planning

The manufacturing and marketing of petrochemical products can be classed as being well-established, normal activities of an integrated oil

D.C.F. rate were to be computed, such a blind comparison would be dangerous. For example, the D.C.F. rate for 1961, as computed above, assumed that annual flows for each year were the same as for 1961. A preferable alternative would be the computation of a payback period and D.C.F. rate using actual cash flow to date and a reestimation of cash flow for the remaining economic life.

[7] Both checklists shown in Exhibit 19 are applicable to department-wide projects. Appropriate groups who might be responsible, either from the department or from other company administrative and services departments, have been suggested.

company such as Continental Oil Company. However, the location of the manufacture of the product at a refinery rather than at a chemical plant and the unique aspects of the marketing channels created numerous problems of logistics. Even though a project has been made consistent with basic company objectives, it also must be blended into, and coordinated with, the company's diverse daily operations.

The petrochemical activity was relatively new, with many of the investments also involving new products or processes. This growing activity at Continental affected a number of the functions within the department and the company. Hence, the formulation of objectives and guidelines was centralized more in the departmental headquarters than might have been the case for a more mature, stabilized, and relatively larger operation.

Framework Structuring

Because of its somewhat unique nature, a description of the organization of the Petrochemical Department was included as background information necessary for the study of this case. The concentration of centralized authority and procedures in the Petrochemical Department was considered to be evidence that the department operated virtually as a company within a company. Nevertheless, Continental's overall capital-expenditure framework encompassed the petrochemical function, and the organization of the department and the department's tie to the company organization consequently affected the development of projects which comprised the department's program. For example, the Petrochemical Department frequently made use of the Process Center and the Engineering Department; its accounting was performed by the Controller's Department; and there were cases in which a petrochemical product was produced on the premises of a Manufacturing Department plant. From an overall standpoint, the new follow-up procedure and the checklists for new projects were considered to be indications of continuing efforts throughout the company to improve its overall capital-expenditure program.

Objective Criteria

In some areas of Continental's organization, the fairly large volume of routine projects had afforded an opportunity for lower levels of management to develop specific, detailed criteria. Where such criteria were

EXHIBIT 18

ANNUAL FOLLOW-UP PROCEDURE FOR ANALYZING EXISTING INVESTMENTS, PROCEDURES GUIDE, PETROCHEMICAL DEPARTMENT, CONTINENTAL OIL COMPANY

Purpose

To evaluate past investments to insure that we will profit from our own experiences and upgrade our judgment on capital investments.

Policy

1. Petrochemical capital investments exceeding $10 thousand which have an expected payout will be reviewed annually according to this procedure.
2. The following past investments shall also be reviewed annually. [Thirteen past investments were specified.]
3. The review of investments covered by either No. 1 or No. 2, above, shall be continued for a period of five years or the conclusion of the payout period, whichever is greater.
4. Each of these economic analyses will be reviewed and evaluated.

Responsibility

For each of the operating plants, it shall be the responsibility of the plant superintendent to prepare the economic analysis reports for the investments under his jurisdiction. For all investments under the jurisdiction of the Petrochemical General Office, it shall be the responsibility of the manager of manufacturing to prepare these reports. These reports should be filed no later than March 1st for the previous year. It shall be the responsibility of the manager of manufacturing to review and appraise these reports and to counsel with the respective plant superintendents concerning any action which might be appropriate as a result of these reports. It shall also be the responsibility of the manager of manufacturing to deliver these reports to the appropriate headquarters, sales, or planning personnel who have any responsibility for these investments.

Procedure

1. The investments shall be reviewed according to "Petrochemical Investment Analysis, Form 2."
2. The following graphs shall be plotted under the heading, "operating ratios," on either semilog paper or linear-coordinate paper (for negative values), whichever is applicable.
   a. "Return on investment," including inventories (graph 1).
   b. "Profit margin" (graph 2).

EXHIBIT 18 (CONTINUED)

3. The following graphs shall be plotted under the heading, "sales, profits, and investment" on semilog paper.
   a. "Sales" (graph 3).
   b. "Net profit" (graph 4).
   c. "Investment," including inventories (graph 5).
4. An estimated income tax rate of 50 percent normally shall be used.
5. The financial depreciation as shown in the Blue Book normally shall be used. The tax depreciation shall be used only when it is substantially different from the financial depreciation and was a consideration in the planning and approval of the A. F. E.
6. An analysis of the investment should accompany the economic analysis form and graphs. It should contain:
   a. A comparison of the payout with that shown on the A. F. E.
   b. An analysis of the levels and trends for each of the five graphs and an explanation of those factors which are the responsibility of the Manufacturing Department.
   c. A discussion of the future for the investment.
   d. Any other appropriate comments.
7. A copy of the economic basis for the A. F. E. should be attached.

Petrochemical Investments
Economics Analysis--Form 2

Sales or Savings

_____

_____

_____

Total (graph 3)

Costs[a]

_____

_____

_____

Total

EXHIBIT 18 (CONTINUED)

Inventory Change

_____	(increase) decrease.
_____	(increase) decrease.
_____	(increase) decrease.
Total	(increase) decrease.

Gross profit before depreciation.
Financial depreciation.
Gross profit after depreciation.
Estimated income tax (_____ percent).
Net profit after tax (graph 4).
Add back depreciation.
Cash flow.
Gross investment, cumulative.
Inventories.
Total investment and inventories (graph 5).

Percent profit margin (4 divided by 3; graph 2).
Percent return on investment (4 divided by 5; graph 1).

[a] Columns were provided for five years.
Source: Continental Oil Company, *Petrochemical Department, Procedures Guide* ([mimeographed]; Houston, 1963), Sec. 9.

applicable, the supervision from higher management was less critical, and the actual decisions regarding proposals could be made at lower levels, subject to approval from higher echelons.

For unique projects such as the cyclohexane production, many of the routine procedures and forms and other detailed criteria were not usable. However, since such projects usually are developed and decided upon at higher levels of management, there is less need for this type of supporting data. Even so, it was possible to use the more general criteria, such as D.C.F. and payback, in the cyclohexane project, because such criteria would be applicable to almost any type of capital expenditure, regardless of size or complexity.

Search

In the cyclohexane case, the alertness of a member of the Petrochemical Department to a possible investment opportunity for the company set in motion the events that resulted in the manufacturing and marketing of cyclohexane by Continental. This sensitivity on the part of the company's personnel indicated that the search for worthwhile ideas, which should be present in any effective capital-expenditure program, was an active process at Continental. However, personnel must have the background necessary to recognize an opportunity and be in a work assignment that affords the chance to be exposed to proposal ideas. The systematic consideration by the company of several alternatives also revealed further aspects of the search activity as an integral part of the company's capital-expenditure planning and control program.

Screening

Screening at an early stage was indicated by a decision, prior to the contact with Southern Nylon, not to consider the manufacture of cyclohexane, although some marketing opportunity had developed.

At the time that the agreement with Southern Nylon was under consideration and negotiation, several plant capacities, two plant locations, and two manufacturing processes were evaluated. This consideration of several alternatives would suggest that, even when an investment idea has been developed extensively, there may be a necessity to examine and screen out less-desirable alternatives.

EXHIBIT 19

NEW-PROJECTS CHECKLISTS A AND B, PROCEDURES GUIDE, PETROCHEMICAL DEPARTMENT, CONTINENTAL OIL COMPANY

The procedures to be followed in carrying out a project are divided into two categories: (1) those which fall principally within the operations group of the department, and (2) those which are department-wide and involve more than one of the operations, new projects, market research, or market development groups. Responsibility for compliance is set out herein.

Examples of coverage and assignment of responsibility are:

Checklist A

These are normally the smaller projects, such as plant expansions and modifications. The responsibility for compliance falls to the superintendent of the affected operation. Examples of such projects are:

Multistage alkylation--Baltimore.
Second manufacturing unit--Chicago.
M-300 manufacture--Trainer.
Hot well modification--Lake Charles.

Checklist B

Responsibility for compliance on these more major projects are designated on the checklist. Examples of such projects are:

"ALFOL" alcohol plant--Lake Charles.
N. A. B. plant--Baltimore.
M. C. plant--Lake Charles.
ALFENE plant--Lake Charles.

The checklists follow:

Petrochemical Operations, New Projects,
Checklist A

Preliminary to Design

1. Product specifications established.
2. Product volumes and prices estimated (short and long term).
3. Packaging requirements determined.
4. Potential hazards of raw materials, intermediate, and finished products determined. (Include fire, safety, and toxicity.)
5. Wherever possible, assign a project coordinator.

EXHIBIT 19 (CONTINUED)

Design (Preliminary)

1. Preliminary design prepared and issued with operating instructions.
2. Preliminary design reviewed by the Research and Development Department (if applicable).
3. Preliminary design reviewed by operating plant personnel.
4. Preliminary design reviewed by headquarters manufacturing personnel.
5. Preliminary design reviewed by the Safety Department.
6. Preliminary design reviewed by the Engineering Department.
7. Preliminary design reviewed by the Maintenance Engineering Department.

Design (Final)

1. Final design issued and letters of approval obtained from the Research and Development Department (if applicable), operating plant, Safety Department, headquarters manufacturing, and Maintenance Engineering Department.
2. Cost estimate determined (to include a thorough review of used and surplus equipment).
3. Freight classifications and rates developed.
4. Economics of project determined.
5. A. F. E. prepared and letter of concurrence obtained from the Sales Department if a new product, expansion, or change of product is involved.
6. A. F. E. approved.

Construction

1. Determine construction basis (contract or plant labor).
2. Establish equipment purchase specifications (Engineering Department).
3. Arrange for plant construction (assign construction engineer).
4. In conjunction with the Engineering and Purchasing departments:
   a. Review vendors' bids and specifications.
   b. Purchase equipment and materials.
   c. Follow up on delivery.
   d. Assist in contract negotiation for raw materials and supplies.
5. Select and train operating and maintenance personnel.

EXHIBIT 19 (CONTINUED)

Start-Up

1. Set up accounting start-up expense.
2. Prepare operating standards.
3. Develop training program.
4. Purchase raw materials and supplies.
5. Organize supporting activities, including control testing, receiving and shipping, billing, etc.
6. Have representative of the Research and Development Department (if applicable), Process Center, and Engineering Department on hand for start-up.
7. Make acceptance run.
8. Clear charges and close A. F. E.

Petrochemical Department, New Projects,
Checklist B

I. Research

A. Compare alternate processing schemes.
B. Establish optimum reaction conditions.
C. Establish material balance, showing yields of product, by-products, waste materials, and losses.
D. Develop process scheme by which established product quality can be met.
E. Take corrosion factors into consideration.
F. Investigate and report potential hazards in the areas of toxicity and fire.

II. Patent and Legal Considerations

A. Determine if any legal or patent considerations would preclude proposed designs, operating plans, or sale of products.
B. Establish patentability features of the project.

III. Marketing Research

A. Establish product demand-supply situation, existing and potential.
B. Check location of market.
C. Recommend size of plant.

EXHIBIT 19 (CONTINUED)

IV. Market Development

A. Determine product specifications.
B. Develop demand for product by potential customers.
C. Recommend product and by-product pricing policy.
D. Determine how product and by-product sales should be handled in terms of organization.
E. Establish how product should be packaged and distributed.
F. Recommend advertising and promotion program.
G. Assist in training salesmen in selling the new product.

V. Process Engineering

A. Work closely with the Research and Development Department to establish basis for design and economics.
B. Prepare preliminary and final economics.
C. Prepare process design.
D. Consult with the operating group with regard to proposed design.
E. Review proposed process design with the Engineering Department.
F. Assist in plant start-up.

VI. Insurance

Review project with the Insurance Division.

VII. Safety and Medical

A. Review proposed operation with the Safety Department.
B. Establish a specific medical program with the Health Division.

VIII. Engineering

A. Prepare plant layout and elevation of equipment and buildings.
B. Prepare mechanical design of buildings and equipment.
C. Estimate complete cost of installation.
D. Establish equipment purchase specifications.
E. Arrange for construction of plant.

IX. Financial

Review financing schemes with the Treasury Department.

EXHIBIT 19 (CONTINUED)

X. Purchasing

A. Review vendor bids and specifications with the Engineering Department.
B. Purchase equipment and material.
C. Follow up on delivery of equipment and keep team informed of changes in schedule.
D. Assist in contract negotiation for raw materials and processing supplies.

XI. Accounting

A. Account for expenditure during construction.
B. Establish accounting procedure to be followed during operation.
C. Set up customer-billing procedure.

XII. Plant Operation

A. Designate operating staff.
B. Prepare operating manuals.
C. Train operating staff.
D. Organize supporting activities including clerical, control testing, maintenance, receiving, and shipping.
E. Purchase raw materials and supplies.
F. Clean, test, and break in equipment.
G. Make acceptance run.
H. Clear charges and close A. F. E.

XIII. Public Relations

Check with the Public Relations Department concerning press releases and publicity.

XIV. Review of Performance of Operation

Check plant performance and project economics as compared to original forecast.

Source: Adapted from Continental Oil Company, *Petrochemical Department, Procedures Guide* ([mimeographed]; Houston, 1963), Sec. 10.

Lower levels of management can screen out alternatives that are obviously undesirable, while higher levels may do the selecting from among the more desirable ones. Hence, where several possibilities for the accomplishment of a project exist, screening will have two dimensions (i.e., the screening out of all but the most desirable alternatives, and the decision as to whether or not to pass a proposal upward and continue to develop the project).

Coordination

In this case study, there were numerous examples of the types of complex relationships and the coordination required in carrying out a major project as it is developed within the broad framework of the capital-expenditure control program and the organizational structure of a company. Of the many phases described in the cyclohexane case, coordination was the most involved. An examination of the multitude of interrelationships and of the lengthy checklist for new projects prepared by the Petrochemical Department (see Exhibit 19) should convey some feeling for the enormous task involved in major-investment projects.

Central coordination in major-investment projects is quite important. In this case, the coordination was accomplished largely by a single person, the Marketing Development representative. In other situations, a committee might assume responsibility for this activity, as major projects, because of their scope and complexity, usually were coordinated through the headquarters group.

Both vertical and horizontal coordination was in evidence within Continental's organizational structure. The vertical coordination correlated relationships with other organizational levels, whereas the horizontal coordination covered the direct relationships with personnel on the same level, but in other segments of the company. In addition, the coordination with individuals and organizations outside the company was often essential.

Sequentially, coordination was found to be vitally related to the entire development and eventual utilization of the capital expenditure. The process of gaining approval of the proposal, the period of construction, and the eventual operation all were involved. However, arrangements for construction and operation had to be coordinated to some extent during the period prior to their occurrence. For example, the

cyclohexane case revealed the numerous contacts and arrangements with contractors, raw-materials sources, potential customers, and company engineering, manufacturing, transportation, sales, and accounting personnel. Many of these contacts and arrangements had been initiated in the early stages of the project, and, since the coordination of content in this case also required that the project be related to the capital-expenditure program of the department and of the company, this activity was centralized in the departmental headquarters.

As was indicated earlier, the procedural coordination for the cyclohexane case involved compliance with company and departmental procedures for such matters as budget and A.F.E. approvals, the use of certain basic forms, and the overall follow-up process.

Formalization

In the cyclohexane case, the size and complexity of the project formalization underscored the need for many groups having special skills. For example, the services of the Process Center and Engineering Department were employed for many of the framework activities. For a major project of this nature, formalization by the originator and/or sponsor alone was not feasible, and the checklists for new projects indicated the numerous tasks that had to be coordinated and formalized during such a project's span of evolution. However, the timing and extent of formalization in this case depended largely on continued favorable reactions on the part of the Petrochemical Department and higher management levels.

While the forms and procedures were not as detailed as was the case for proposals of a more routine type, the cyclohexane project, nevertheless, was required to follow certain basic procedural patterns, including economic evaluation, budget inclusion, and A.F.E. approval.

Evaluation

Several economic-evaluation studies were made during the development of the cyclohexane project, primarily because of changing circumstances, alternative solutions, and varying assumptions as to the amount and time pattern of cash flows. In the analysis of the investment, the costs of all fixed assets were considered. However, a more realistic appraisal would have resulted if additional working capital requirements for inventories of raw materials and finished goods had

been added to the estimated investment outflow and end-of-life inflow of cash. As a supplementary analysis, the administrative cost of developing the project also might have been considered.

The economic evaluation employed in the cyclohexane project involved the efforts of the Process Center in detailing a description of the facilities, in making estimates of cash inflows through liaison with sales personnel, and in making the evaluation computations. The investment costs were estimated by the Engineering Department, based on the description furnished by the Process Center. As in the case of the other activities in the program, the size and complexity of this major project necessitated the coordinated help of many other sections of the company, in addition to assistance from many groups having special talents.

In any investment proposal of this size, the use of economic evaluation by top management should include an effort to relate the estimated rate of return and the risks that seem pertinent. In this case, management had listed the risks in detail, thereby indicating an effort to consider these aspects carefully.

Budgeting

In order to invest in the unit to produce cyclohexane, it was necessary to amend the annual budget. It was interesting to note that the inclusion of the project in the budget as a memorandum item reflected long-range planning for items which might not materialize during the budget year. Obviously, the formal processing of a budget amendment or an A.F.E. would not reveal all the planning processes which had occurred. For example, the fact that "management . . . had been informed of the status of the project from time to time" and that "an environment of prior exposure and reactions had existed" facilitated the rapid approval granted for the budget amendment and the A.F.E.

Request for Expenditure

The preparations leading to the decision to construct the plant were costly. These expenses, however, were essential to the project's success. Since the approval of the budget amendment to include the cyclohexane proposal was tantamount to A.F.E. approval, this assurance that the project would be carried out made it possible to complete the basic arrangements for a raw-materials supply, a sales agreement, transpor-

tation, the receipt of construction bids, and the authorization to proceed with certain offsite tankage and piping work. However, as was customary with all of Continental's capital-expenditure projects, the construction contract was not awarded formally until after the A.F.E. was approved, even though, in this case, it was little more than a formality.

The two major reasons already indicated for the secondary role of the A.F.E. in the cyclohexane case were: (1) the budget approval date was very near the date of the A.F.E., thus minimizing the chance of the development of circumstances that would alter the decision, and (2) informal assurance was given by top management that the project would be pursued. Unless such conditions exist, however, the A.F.E. should serve to control the initiation of projects. It cannot afford *control* over administrative costs either before or after approval. The administrative approach covering this problem has been discussed under the following section on in-process control.

In-Process Control

Since in-process control at Continental related primarily to commitments against the A.F.E., it was classified as a sequential activity. However, in the case of major projects, the administrative costs of developing the proposal may become significant. In this case study, most of these administrative costs were in terms of employee time and involved both technical and nontechnical personnel. Since many of these costs were incurred prior to the approval of the A.F.E., they were nonsequential in nature. Furthermore, since these expenses would not be charged against the A.F.E., and, since they were not the major factor in this activity, they should not be stressed out of proportion. However, since there should be some control of these costs, it would be reasonable to prepare periodic reports which would summarize the time and associated cost of various groups in the development of a particular project.

In the cyclohexane project, the Engineering Department served as the key coordinator in the control of commitments against the A.F.E. As was common with major projects, specialized help was secured. For example, the Engineering Department already had assisted in preparing investment estimates, in handling the receipt of bids for the construction contract, and in scheduling the construction. This department's role during the construction period then became one of in-process con-

trol of time, cost, and quality through on-the-scene efforts of the assigned project engineers.

Coordination by the departmental engineers with the contractor, the Process Center, Manufacturing personnel, and the Controller's Department was necessary in performing the control activity. During the construction period, these efforts were intensified to coordinate and formalize the transition arrangements which would move the project into the completion and operation stages. Also, during this period, since the contract was of the cost-plus, fixed-fee type, additional control was exercised through a construction audit by the General Auditing Division, and a fairly current indication of costs was provided by the "Semimonthly Expended and Committed Report" prepared by the Controller's Department.

Follow-Up

Once the petrochemical project had been completed, it became a part of the company's assets. When the project had reached this stage, it was incorporated into the operations of the company. The postcompletion evaluation, or follow-up activity, which was applied during this period was affected by the nonsequential activities of screening, coordination, formalization, and evaluation.

Since the ultimate disposition of any operating asset depends on continued favorable follow-up evaluation, the problems and results of the operating phase are quite important. In the postcompletion evaluation, the actual operating data were compared with the projected economic evaluation of the investment. In the cyclohexane case, several of the operating problems were described in the postcompletion section of the case, in order to show the activities and events which affected the investment as the product moved into the operative stage. These activities had included studies of alternatives for future operations.

Until a formal departmental follow-up procedure was adopted early in 1963, analyses of project results for Continental's petrochemical investments, as compared to the A.F.E. predictions, had been made only on a special-study basis. Since both the old and the new follow-up analyses offered problems with respect to the comparability of the estimated D.C.F. rate of return and the computed follow-up rate of return, it was considered especially important for management to be aware of the nature of the data and how the computations were made in order

to avoid making invalid comparisons. In this utilization of a follow-up procedure, graphs appeared to be desirable for detailing the results of follow-up analyses.

CHAPTER VI

CASE STUDY OF COMPANY PIPELINE AND REFINERY CONSTRUCTION: EXPANSION IN THE COMPANY'S ROCKY MOUNTAIN REGION

BACKGROUND INFORMATION

Characteristics of the Case

The project described in this case study, which involved the building of a pipeline and the expansion of a refinery, was a major nonroutine expenditure which was strategic both in importance and in amount. A significant project of this type can place heavy demands on the administrative processes of a company's capital-expenditure planning and control program, and this case afforded an opportunity of analyzing a complex project, involving many of Continental's functions, within the company's overall capital-expenditure program.[1] The project was an excellent example of the well-planned and well-coordinated development of a major investment decision.

On the basis of a well-developed depth study by Continental personnel, the company had decided to construct a petroleum-products pipeline, at an estimated cost of $8 million, and to expand the capacity of one of its petroleum refineries, at an estimated cost of $7 million. At the time the project was examined through the field-research interviews in May 1963, the A.F.E.'s had been approved and the refinery-expansion contract had been let.

The basic description of the case covered eight aspects: (1) the committee investigation of a major investment decision, (2) the problems of coordination and participation, (3) the conditions associated with a

[1] For purposes of anonymity, the names of individuals and companies and certain of the descriptive and quantitative data have been disguised.

nonroutine investment, (4) a comparison of alternatives, (5) the quality of source data for mathematical calculations, (6) the presentation to top management, (7) the budget (and its amendment) and the A.F.E., and (8) a method used in scheduling a major construction project.

Description of the Project

The two major segments of the total investment were announced in the company's 1962 annual report, with the pipeline investment being described as follows:[2]

> In November 1962, Continental announced plans for the construction of a products pipeline to extend 330 miles from Billings, Montana, to Sinclair, Wyoming, where it will connect with the Pioneer pipeline. This new line will provide the Company with low cost transportation for products shipped from its Billings refinery to Salt Lake City and other markets served by the connected pipeline systems. Construction will begin early this spring, with completion scheduled for September.

The refinery investment, which was to be the first major expansion of the company's refining capacity since 1952, was reviewed as follows:[3]

> In November 1962, Continental announced plans to increase the capacity of its refinery at Billings, Montana, from 15,300 to approximately 32,000 barrels daily. In conjunction with the projected new products pipeline between Billings and Sinclair, Wyoming, this refinery expansion will permit Continental to supply the growing product requirements of its Rocky Mountain Region. This area is short of refining capacity and cannot be supplied economically from other areas in the country which have surplus capacity. Increased refining capacity at Billings will also compensate for the expiration in 1964 of an arrangement with another company through which Continental has obtained an average of 6,800 barrels daily in the Rocky Mountain states. Construction will begin in mid-1963; and the new facilities, including crude fractionating, catalytic reforming, and alkylation equipment, are scheduled to go "on-stream" by mid-1964.

As the preceding quotation would indicate, the basis for the investment "package" was the need to fill existing and future finished-product requirements for the Rocky Mountain states.

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[2] Continental Oil Company, *Annual Report 1962* (Houston, 1963), p. 9.
[3] *Ibid.*, p. 10.

CHRONOLOGICAL DEVELOPMENT OF THE PROJECT

Appointment of a Study Group

The studies leading to the expansion decision necessitated coordination of the thinking of many segments of the company, including the Rocky Mountain Region and the departments of Transportation and Supplies, Manufacturing, Engineering, Marketing, and Coordinating and Planning. Since a number of these Continental personnel were aware not only of the forecasted shortages in the supply of products in the Rocky Mountain area but also of certain instabilities in the existing arrangements for the supply of products, much informal discussion of the problem had been taking place at various levels for a number of months.

Since the problem was related primarily to Rocky Mountain Region operations, a meeting in Denver, Colorado, was called for July 31, 1957, by the vice-president and regional general manager of the Rocky Mountain Region. During this meeting, in which the nature and scope of the problem were discussed, it was determined that a complete study of the situation would necessitate considerable full-time effort on the part of several persons, especially if the study were to be completed within a reasonable length of time. As a result, the vice-president and regional general manager of the Rocky Mountain Region appointed the following committee:

Chairman—Vice-president and regional general manager, Rocky Mountain Region.

Vice-chairman—Vice-president, Planning and Engineering (Continental Pipe Line Company).

Members—Manager, Product Supply and Distribution Department; Director, Process Center.

A subcommittee, appointed to give full-time effort to the actual work of the committee, had representatives from Continental Pipe Line Company, the Process Center, the Rocky Mountain Marketing Region, and the Product Supply and Distribution Department.

The vice-chairman of the main committee was to coordinate the actual work of the subcommittee and to keep other committee members informed as to the study's progress. Each of the major committee's members was charged with keeping both regional and headquarters

department managers informed and also with coordinating the work of the subcommittee with appropriate staff and operating departments.[4]

Periodic meetings, in which the work of the subcommittee was reviewed and decisions were made concerning continued work on the study, often were attended by other interested persons who had made contributions to the subcommittee's work.

Summary of the Study Group's Basic Report

The chairman of the study committee, assisted by other members, presented the final recommendations to the Domestic Operating and Coordinating Committee and to the Management Executive Committee. In this basic report, a documentary of the committee's findings,[5] the study group had evaluated the various alternative solutions from a general, company-wide viewpoint rather than from an individual departmental approach.

Assumptions. In evaluating the alternatives, the study group had made several basic assumptions. It was the consensus that a supply method could be obtained which would be more economical than the existing exchange arrangement with another company. This existing contract for a significant portion of the current requirements was to expire in early 1964 unless it was renegotiated.

While the area served by the Billings (Montana) and Denver (Colorado) refineries was expected to exceed the refining capacity of the two plants in early 1964, a comparatively low-cost, long-term crude oil supply was expected to be available through existing pipeline facilities. A further assumption was made regarding the quantities and prices of the crude oil supplies for the long-range study period of twenty years.

The last of the basic assumptions was that the company would continue to market in the Rocky Mountain Region and that sufficient investment would be made in the marketing outlets to retain the company's existing share of the market. The rate of growth of the total market for petroleum products in the area involved was estimated for the succeeding twenty years, the growth rate being determined as a

[4] For example, the Process Center representative provided the communication, liaison, and coordination with the vice-president of the Manufacturing Department and the regional manager of manufacturing activities.

[5] Continental Oil Company, *Long-Range Products Supply Study: Rocky Mountain Region* ([mimeographed]; Houston, March 5, 1962).

result of a 1958 study of thirty selected states made by the Marketing Department. The gross revenue, which was assumed to be the same for every alternative, was based on the estimated average terminal wholesale price. The boundaries of the marketing area were eastern Washington, eastern Oregon, Idaho, Utah, Montana, Wyoming, Colorado, western North Dakota, western South Dakota, western Nebraska, and northwestern Kansas. The two basic product classifications were designated as (1) gasoline and (2) other products.

Study Approach and Results. Each of the alternate supply methods could be placed in one of the following three basic groups:

> *Group One.* Supply methods resulting from new exchanges[6] or modification of existing exchanges without additional transportation facilities.
> *Group Two.* Supply methods resulting from additional transportation facilities together with the modification of existing exchanges or the development of new exchanges to effect a reduction in transportation and product costs and to place the supply of the marketing area on a more permanent basis.
> *Group Three.* Supply methods which would provide a permanent supply source and which would not be dependent upon exchanges.

Various alternates were considered under each of these three groups, but a preliminary study eliminated approximately one-half of the alternatives as being either less attractive than the existing method or as being too improbable for further consideration. Of the twenty alternate supply methods which remained, the first (the "base case") was simply a continuation of the existing method of supply. In Group One, there were 3 additional alternatives included; 7 in Group Two; and 9 in Group Three. Within each group, supply alternates then were evaluated to determine the most realistic method.

The selection of the best alternative within each group resulted from discounting the incremental investments and cash flows after tax for

[6] These exchanges referred to arrangements whereby Oil Company A's manufacturing facilities located in area X would supply a part of Oil Company B's product needs in Area X where Company B had inadequate refinery capacity. In exchange, Oil Company B's manufacturing facilities located in Area Y would supply a part of Oil Company A's product needs in Area Y where Company A had inadequate refinery capacity. Any balances were settled periodically, in cash. These exchange arrangements of products meeting quality specifications thus enabled companies to reduce transportation costs.

each year for each alternative versus every other alternative within the group. In the first group, the alternative calling for a modification of the existing exchange agreement, based upon a proposal made by the other company involved in the exchange agreement, was found to be the most attractive. In the second group, the alternative which called for acceptance of a portion of the proposed revision in the exchange agreement, coupled with a products-pipeline extension was the most attractive. As for the third group, the construction of a pipeline from Billings, Montana (via Casper, Wyoming), to Sinclair, Wyoming, with the expansion of the refinery at Billings was considered a better alternative to additional capacity at the Denver refinery.

In the selection of the best from among the three groups, the cases for the second and third groups were each compared, by incremental investment and revenue, against the case for the first group. According to the committee's report, the case of the second group could be eliminated. However, the report indicated that the case for the third group not only would provide a permanent source of supply for the entire marketing area, but also it would yield a number of "intangible benefits" not reflected in the study. These intangible benefits would include an alleviation of dependence upon exchanges, a stronger competitive position, a greater flexibility in balancing refinery capacities, and the availability of refinery facilities designed to process additional lower-priced refinery feedstocks which might become available in the future. When a further analysis was made comparing all alternatives versus the "base case" cited earlier, the alternative selected from the above analysis again was the most desirable, feasible alternative.

Collection of Information. The analyses described in the preceding paragraphs were quite important in this case. However, the validity of any such analyses will be dependent largely on the accuracy of the data used, and much of the effort in any well-implemented study will be devoted to the gathering of data that are as accurate as practicable. The following data for the committee's study report indicate the magnitude of the forecasting and estimating task for this project, since the items on this list were needed for each of the twenty cases (where applicable) for the twenty-year period from 1964 through 1983.

1. Refinery-capacity forecast for product requirements within the Rocky Mountain Marketing Region, by refinery, for the years 1964, 1968, and 1973.

2. Annual product-manufacturing cost statement, by refinery, for the period 1964 through 1983.
3. Assessment of proven and prospective reserves of the crude oil supply to be available for consumption at the Billings refinery, assuming that the expansion necessary to handle this type of material, for the period from 1964 through 1986, would be made.
4. Pipeline and terminal-throughput summary, in barrels per day, for 16 terminal points, for the years 1964, 1968, and 1973.
5. Product-cost basis used to determine the optimum distribution and refinery requirements.
6. Refinery-requirement summary, by refinery, for the years 1964, 1968, and 1973.
7. Gross-exchange-revenue summary, for the years 1964, 1968, and 1973.
8. Exchange-differential-cost summary, for the years 1964, 1968, and 1973.
9. Investment requirements for the period 1964 through 1973.
10. Total cash-basis income-and-expense statement, for the period 1964 through 1983.

Where estimates were made only for the years 1964, 1968, and 1973, the values for the years between 1964 and 1968 and between 1968 and 1973 were determined by interpolation. However, values for the years between 1974 and 1983 were assumed to be the same as for 1973. In the compilation of these data, certain subcommittee members and other individuals and groups within the company were involved in varying degrees. The subcommittee members, in particular, provided liaison with their respective departments.

The Marketing Department, which was asked to project the needs for gasoline and other petroleum products for each terminal point in the area under study, made estimates based on the 1958 market study cited earlier, as well as on subsequent market developments.

The Process Center, assuming various alternatives, not only projected product availability from the refineries but also did the preliminary process-design work on a refinery unit capable of processing the additional crude oil. With the Engineering Department assisting in the preparation of refinery-investment estimates, the Process Center prepared annual manufacturing-investment and manufacturing-cost statements based on the various assumptions selected. The final decision

was to make one initial investment to handle the growth requirements estimated for a ten-year period.[7]

The Transportation and Supplies Department prepared estimates of the pipeline investment and of the unit operating costs for the pipeline and other transportation.

Using the quantity needs at terminals, the product availability at refineries and through exchange agreements, and the costs of the product and for transportation, the Product Supply and Distribution Department (a unit of the Transportation and Supplies Department) determined optimum supply patterns, using a computer program for the evaluation of alternatives.

Conclusions. As a result of its findings up to the date of its basic report, the committee recommended the adoption of the case in the third group (i.e., refinery expansion and pipeline construction). The report, which was distributed to interested parties in the headquarters group and in the Rocky Mountain Region, was presented as a summary of the study to that time, although the committee did point out that it planned to continue the investigations.

Subsequent Studies

New Base Case. After the issuance of the report in March 1962, a new question, described below, was posed within the committee:

> We had compared alternatives against a base case that assumed continuing exchange agreements. As growth occurred, these agreements would require that we expand the capacity of our Ponca City Refinery to fulfill our part of the contract. We had looked at the incremental investment and net revenue of this versus other alternatives. But, we had not considered the return that we could expect on the additional investment required in the base case. So, we established a new base case which assumed that we would purchase all additional product needs. This new base case became case A. The old base case became B. The group three case became C, and then there was an alternate D which assumed a delay

[7] In the course of this work, one of the many problems to be solved was described as follows by a subcommittee member from the Process Center:

> We had to say to ourselves: "Is there such a tremendous increase in refinery capacity needs that we can make all of the expansion in one year without unduly penalizing the project? Or, should we do this in steps?" In other words, to expand in pieces is more expensive in dollar outlay than to do all the expansion at one time.

of the Billings Refinery expansion and an interim processing arrangement.

The Product Supply and Distribution Department was called upon to project purchase prices and volumes of product that would be available in specific areas. Based upon the new assumptions and on the sharpening of some of the previous data, an evaluation was made of these four cases. The results of this evaluation and the committee's next steps were summarized by a subcommittee member as follows:

> The D.C.F. rate of return for case C [Billings expansion and pipeline construction] versus A [purchase products] was still attractive enough that we felt that we wanted to present this case as opposed to going out and buying the product for the next twenty years. So, we had reached the point where we thought we wanted to go to management, and we prepared ourselves to do just this. About July 1962, we distributed our findings in booklet form to the various people whom we felt would be making the decision [the Domestic Operating and Coordinating Committee and the Management Executive Committee], with the exception of the president. We had not bothered him at this point with trying to read our volumes of material. This would come later, of course.

Marketing Investment Needs. In reviewing the committee's study, the New Projects group of the Coordinating and Planning Department suggested that the marketing investment needs be brought into the analysis, together with the revenue spread between the terminal wholesale product price and the retail price (depending on commission arrangements and less operating costs). Previous analyses had not included these factors but had assumed a projected annual sales-volume growth rate.

With the assistance of the Marketing Department, assumptions were made regarding profit margins and service-station investment requirements considering retirements, growth, and volume and cost per service station. This marketing information then was added to the previously-mentioned cases A and C. For both cases, the same growth rate was assumed, and each was compared to a base case, assuming no growth and the continuation of existing supply sources. A committee member commented that the new set of calculations showed that the proposal still was justified even when the marketing factors were included. He also indicated that, in such a program of expansion, it was not the committee's job to make the ultimate decisions but only to "provide management with all the tools with which to make their decisions."

Presentation of Recommendations to Top Management. In August 1962, the committee's updated findings were presented first to the members of the Domestic Operating and Coordinating Committee and then to the Management Executive Committee. The project was looked upon favorably by the Management Executive Committee, with approval granted for inclusion of the project in the 1963 budget. This approval was made assuming that 70 percent of the pipeline would be owned by Continental and the remaining 30 percent by another company.

Upon management approval for budget inclusion of the project, the Process Center and the Engineering Department proceeded with work on the process design and the preparation of the "basis for bids" forms to be sent to the potential contractors for the refinery expansion. The preliminary pipeline arrangements also were accelerated.

Study Group's November Memorandum. By mid-November, the study committee needed to consider several developments which had occurred after the August presentation, including firmer arrangements for a long-term contract for the purchase of additional crude oil, several minor activities by competition in the region, an alteration of the process design requiring an additional $400 thousand, and the possibility of 100 percent ownership of the pipeline. The committee's evaluation of these new aspects was reflected in the following excerpt from its memorandum dated November 14, 1962:

> This memorandum is to update the Long-Range Product Supply Study for the Rocky Mountain Region presented to the Management Executive Committee on August 9, 1962. There have been a number of developments subsequent to the study; and, after consideration of all of these, we feel the recommendations as set out in the original study are still valid and that we should proceed with the Billings Refinery expansion and the Billings-Sinclair Pipeline at the earliest possible date.

Bids. In January 1963, the Management Executive Committee gave permission to request bids for the refinery expansion. The successful bid was based on a firm-price contract, with certain offsite work to be performed by Continental's own personnel. The pipeline construction was to be accomplished by Continental Pipe Line Company, and, in early 1963, the Board of Directors gave permission to amend the 1963 budget in order to provide for 100 percent pipeline ownership by Continental.

A.F.E.'s. As soon as the refinery contractor had been determined, but

prior to the awarding of the contract, the A.F.E.'s were processed. The final approval of the Billings refinery expansion A.F.E., dated April 5, 1963, was approved by the Rocky Mountain Region regional manager of manufacturing, the Manufacturing Department vice-president, and the president; and the final approval of the pipeline A.F.E., dated April 10, 1963, was signed by the president of Continental Pipe Line Company. Both of these A.F.E.'s included a brief description, justification, and economic appraisal. The D.C.F. rate of return was included for pipeline, manufacturing, and a combination of the two, all of which were compared to a continuation of existing supply methods.

Construction Work Plans. In May 1963, the basic administrative processes for capital-expenditure approval were completed with the letting of the refinery contract. As a means of assisting in planning, coordinating, and controlling the refinery expansion, the Engineering Department prepared an estimated completion schedule (see Exhibit 20). The completion of the pipeline was projected for late 1963, and the plant start-up was planned for January 1964.

CASE ANALYSIS OF THE ADMINISTRATIVE PROCESSES

The management of Continental Oil Company, in arriving at the decision presented in this case, adopted a viewpoint which was oriented toward the overall interests of the company rather than those of individual departments. While this philosophy is useful in any project, it was found to be essential in the case analyzed here.

Awareness of Company Objectives and the Development of Strategic Planning

Continental's decision to invest in refinery expansion and pipeline construction affected the marketing region in which the company was established best, and, consequently, the one in which the company had the most to gain or lose as a result of such a decision. The project involved the commitment of a significant amount of funds for current outlays in both the manufacturing and the pipeline areas. In addition, these activities carried both short- and long-range implications for all the operating functions of the firm.

The scope and potential effect of these commitments underscored the

Exhibit 20

ESTIMATED COMPLETION SCHEDULE FOR THE BILLINGS (MONTANA) PLANT EXPANSION, ENGINEERING DEPARTMENT, CONTINENTAL OIL COMPANY

(Sample Copy)

EXHIBIT 20 (CONTINUED)

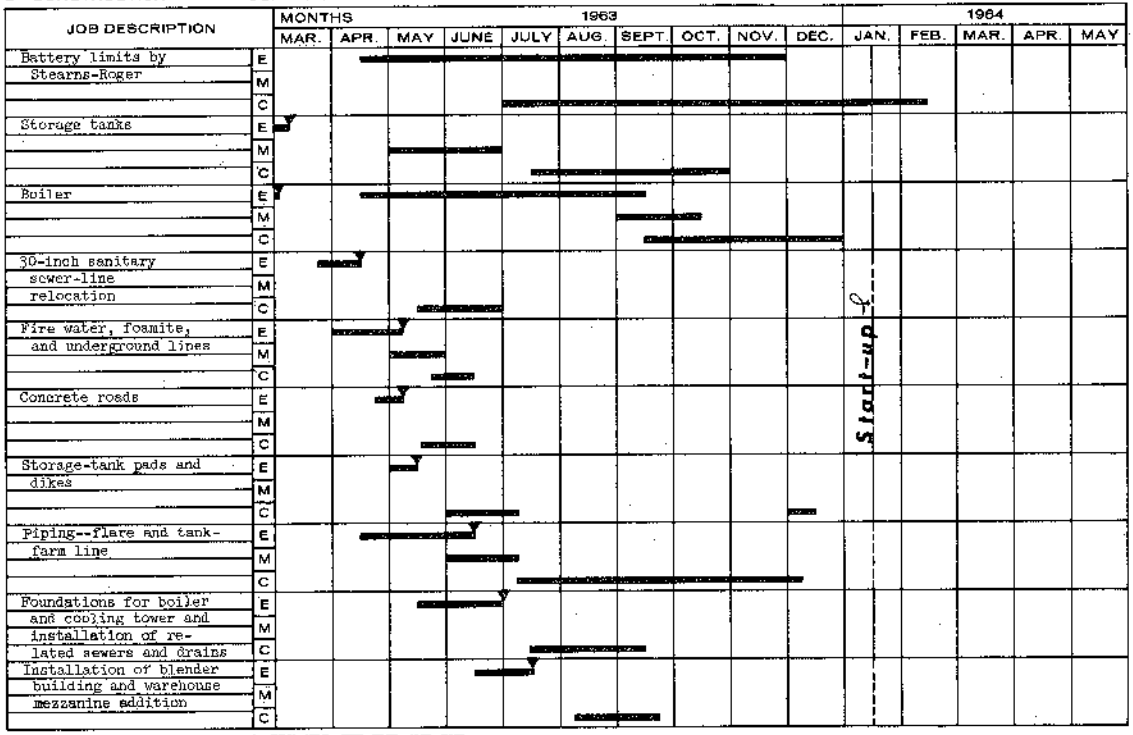
BASIS OF BIDS ISSUE ▼

E - ENGINEERING
M - MATERIALS
C - CONSTRUCTION

—— CONOCO
– – – CONTRACT

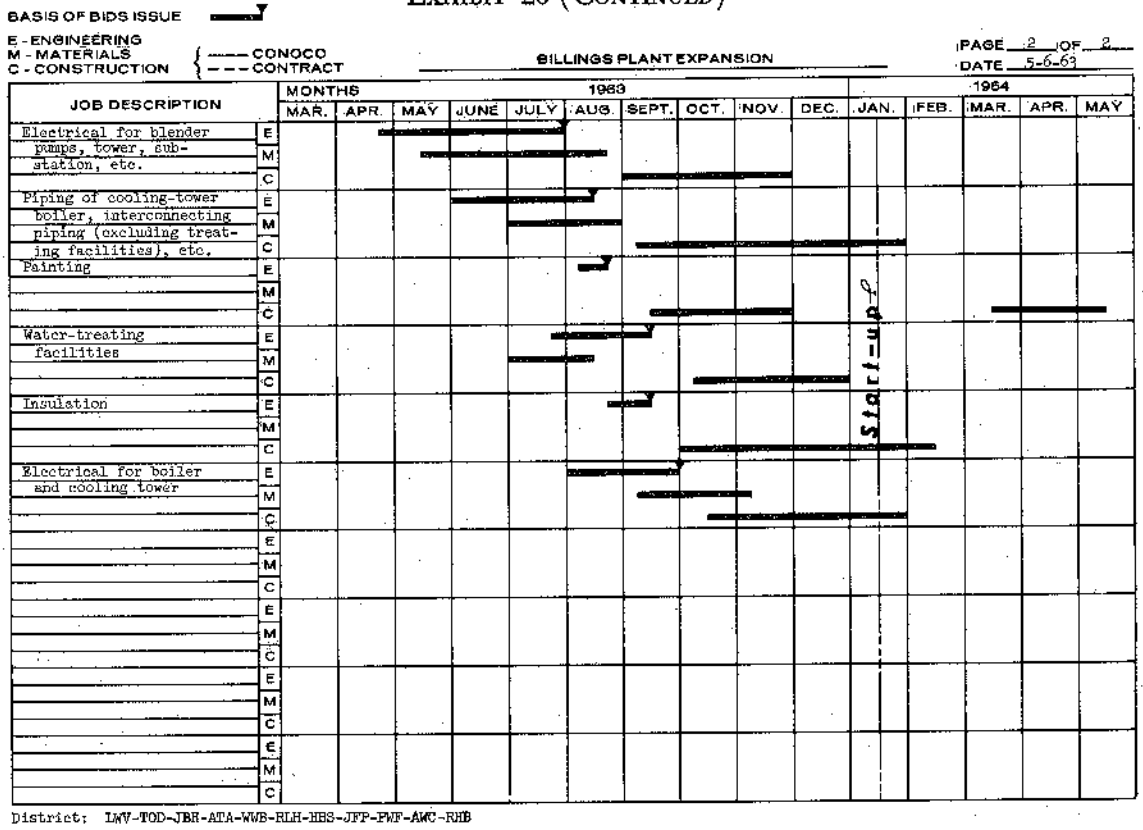
BILLINGS PLANT EXPANSION

PAGE 1 OF 2
DATE 5-6-63



District: LWV-TOD-JBH-ATA-WWB-RLH-HBS-JFF-FWF-AWC-RHB

Exhibit 20 (Continued)



Source: Adapted from Continental Oil Company, Houston.

need for a crystallized picture of both immediate and long-range objectives. There was the immediate problem of finding the most desirable source of finished products. In addition, the company's plans had to be reconciled to certain long-range objectives, such as continued plans to stress the development of the Rocky Mountain Marketing Region and an assumed rate of growth in the region. Hence, the immediate problems needed to be resolved in the light of these future implications.

Framework Structuring

The capital-expenditure framework of a company should be sufficiently broad and flexible to cover the development of both routine and unique projects. Within this framework, however, a company's organizational structure and principles will influence the way in which a project is guided. The enormous group effort, including the study reports, which was involved in Continental's decision to invest $15 million in a refinery expansion and in the construction of a pipeline was illustrated in this case. The study, the decision, and the ensuing events were oriented to the environment of the company's total organizational structure and, more specifically, were set within the framework of its capital-expenditure planning and control program. While the study portion utilized whatever routine capital-expenditure framework facilities were applicable, the project was a unique one which required some administrative approaches which were designed specifically for it.

While many facets of company operations were involved, with both lower echelons and staff groups being included, the focal point of the decision process was at a high level in the organization. Consequently, a project of these proportions tests the link between a company's organizational structure and its overall policies.

Objective Criteria

In a broad context, objective criteria pertain to any activity in which a standard for comparison and guidance can be useful. The criteria used in the capital-expenditure context were drawn from technical areas (e.g., engineering) and from economic fields (e.g., economics, accounting, and finance).

The application of basic criteria in the performance of capital-expenditure activities was demonstrated effectively in this case. Since the project was of a major, nonrecurring type, the supervision and

approval were at a high level. However, even though the customary detailed forms and procedural instructions were not designed for this kind of project, the basic criteria governing these activities were quite applicable. The criteria which could be used included: (1) D.C.F. rate of return, (2) numerous quality and process standards and specifications, (3) A.F.E.'s, and (4) plans for the control of time, cost, and quality of the project.

Search

In this case history, it was noted that a number of Continental's personnel were aware of forecasted shortages and instabilities in existing arrangements for supply of product. This awareness indicated that the search for the basic idea or need had resulted from a close tie between headquarters and regional personnel. Once the need had been established, however, the major search problem was the location and consideration of all possible alternatives. In all, the study groups considered some 42 alternatives. Although 20 of these proposals were eliminated after a preliminary evaluation, 22 were analyzed in detail. While it was a voluminous task to make the extensive comparative analyses, it was considered most important that all reasonable possibilities be brought into the framework for screening and evaluation, since the overlooking of valid alternatives could have resulted in an erroneous decision.

Screening

In this case, the screening task consisted of the selection of new action to be taken. Since shortages in product supply had been forecasted, ultimately some proposal was going to be necessary if the current growth pattern were to continue. Once this aspect had been recognized, the screening consisted of selecting the most desirable alternative. As was noted in the earlier description of the case, the committee was able to eliminate from top management's consideration about half of the alternatives to be examined. Although all of the remaining alternatives were presented to top management, the most desirable one from each of three groups was identified, with a single proposal being designated as the most desirable of all.

In the course of the screening process, however, the committee acted only in an advisory capacity. Since the project under consideration involved long-range objectives calling for action other than the con-

tinuance of existing arrangements, it was top management's responsibility to make the final decision by selecting from among the alternatives presented by the study committee.

Coordination

Coordination has a basic relationship to all framework activities, and, in a large project which involves virtually an entire organization, a high degree is required. In this case, the coordination problem was sufficiently complex that investigation at top levels in the company was necessary. Therefore, a high-level committee study was used to assure an overall company viewpoint rather than a preference for any particular department.

Although, from its inception, the study was supervised by the top management in the affected regions and by the headquarters management, the coordination responsibility was concentrated in the hands of those most vitally concerned. In this case, that person was the vice-president and regional general manager of the Rocky Mountain Region.

The case description of the activities of the study groups has indicated the type of content coordination essential for a major project. Another portion of the content coordination for this project involved the relationship of the proposal to long-range objectives as a part of the company's total capital-expenditure program. Although the basic coordination of procedures connected with the study was assumed to be the responsibility of the study committee, this procedural coordination in its broader sense also encompassed routine procedures for the budget, the A.F.E., and the awarding of contract bids.

The continuing nature of the coordination problem can be seen on the bar chart (see Exhibit 20) prepared by the Engineering Department, on which have been outlined the plans pertaining to various parts of the refinery-expansion activities effort.

Formalization

In the development of the proposal for this project, the investigation and its many ramifications stretched over a considerable time. The formalization was directed by the study committee, with a prolonged full-time effort on the part of the subcommittee. However, formalization was evident throughout the development of the proposal, although the study committee was well aware that preinvestment formalization

was costly and should not be allowed to exceed reasonable bounds.

The extent and timing of the formalization activity was controlled directly by the study committee, with periodic review by the Management Executive Committee. In addition to the study committee, the specialized knowledge and skills of many individuals and groups were needed, both in conducting the study and in the subsequent formalization of arrangements for the refinery expansion and the construction of the pipeline. For example, estimates of various quantitative and technical data were furnished by several groups, such as the Marketing Department, Process Center, and Transportation and Supplies Department. Where applicable, special skills also were used, such as the application of a computer program in determining the best supply patterns. The company's accepted evaluation techniques were used in the development of this project. Although the only standard forms which could be used were those for the budget and request-for-expenditure activities, the remaining format for analysis and for presentation of results had to be tailor-made, as could be seen in the 114-page report presented in March 1962 and in the subsequent reports.

Evaluation

The evaluation process continued throughout the project. In the beginning, the need to consider all relevant possibilities and to weigh them against each other in a logical manner was demonstrated by the consideration of 40 alternatives, the careful selection and analysis of 20, and the subsequent analysis of 2 additional ones.

The necessity to estimate investments, product quantities, prices, production costs, and transportation costs for an extended period pointed up the importance and limitations of those assumptions which govern the raw data and, hence, the quantitative "answers." Consequently, as a part of the reports to management, the committee was careful to state clearly such assumptions and the sources of the supporting data.

The necessity of adding marketing data to the evaluation supported the importance of making a total analysis. Also, it would have been useful for a supplementary analysis to include working-capital requirements and an estimate of the administrative cost of developing the proposal.

The D.C.F. rate of return proved to be the key evaluation criterion. However, several less-tangible benefits also were spelled out in the

reports as having an influence on the evaluation process. These intangibles included: (1) alleviation of dependence upon exchanges, (2) stronger competitive position, (3) greater flexibility in balancing refinery capacities, and (4) the availability of refinery facilities designed to process possible future increases in the availability of lower-priced refinery feedstocks. The memorandum issued in November was evidence of the importance of a continuing reevaluation to utilize intervening developments and to improve the precision of the data in use.

Budgeting

Since the inclusion of this project in the budget was related closely to the long-range planning for a major geographic area in the company's organization, the decision was indicative of the relationship that should exist between a company's current investment program and its long-range plans. Once top management had reacted favorably to the study committee's recommendations, the process of including the project in the budget was a routine one. Since both the annual budget and the budget amendment required approval by the Board of Directors, it was possible for the Board to review the total budget program. Detailed reports, beginning with the one in March 1962, together with informal contacts, laid the foundation for budget approval. These reports were not withheld until the time of the budget but were presented at appropriate intervals as soon as findings and recommendations could be crystallized.

A budgeting procedure, if it is to operate realistically and effectively, must be flexible. In this case, the adaptability of Continental's budgeting approach was indicated by the amendment of the original budget to allow for a revised pipeline-ownership arrangement.

Request for Expenditure

Prior to official approval of the request for expenditure, considerable work had been performed in process design, in the preparation of the "basis for bids," and in the receipt of bids. All of this activity was carried out on the informal assurance that the project would be pursued. In addition to this informal support, however, the Management Executive Committee had given formal sanction to receive bids, although this action was withheld until the timing of the investment had been determined.

The foundation work had been prepared carefully, including the November 1962 memorandum, which updated previous analyses by considering new developments. Such an analysis afforded an important "second look" for all personnel concerned. The two segments of the proposal, which were presented as separate A.F.E.'s for the products pipeline and for the refinery expansion, involved relatively large sums and thus required approval at rather high levels in the organization. However, the Board of Directors' approval of the proposal as a part of the 1963 budget and a subsequent continued favorable reaction from the Management Executive Committee made even the A.F.E. approvals a routine matter.

The A.F.E. support had been prepared in great detail on the basis of the original study group report and its amendments and on the basis of numerous meetings and informal contacts. Thus, it was possible to reduce the A.F.E. process to basic paperwork, and only a decision regarding when the project was to begin was necessary in order for the A.F.E. to be finalized.

In-Process Control

The control of costs of administering the project, described in this case, both before and after A.F.E. approval, was exercised primarily by the study committee in terms of an analysis of the staff time which was devoted to various aspects of the project's development. At the time of this study, the A.F.E.'s for the project had been approved and the refinery-expansion contract had been let. Commitments and expenditures chargeable to the A.F.E.'s were about to commence, and the machinery for control had been established. For example, the Process Center had prepared the process design and was to be available for consultation. The Manufacturing Department was to become involved more and more as the construction neared completion, since it would be making arrangements for going "on-stream."

The Engineering Department was to play the major role in the planning, coordinating, and controlling of the refinery expansion. This department previously had estimated the necessary investment figures, had drafted the "basis for bids," and had prepared a detailed estimated completion schedule (see Exhibit 20). This planned timetable for the engineering, materials, and construction responsibilities which were to be assumed by Continental personnel was indicative of the complexity

of the in-process control of the time schedule. Although the contracted construction was not shown on this timetable, it was the control responsibility of the Engineering Department, and this work was considered in determining the timing of the tasks shown on the schedule.

The control of costs and quality also was the major responsibility of this department. Direct observation, as well as reports prepared by field personnel, the contractor, and the Controller's Department, were the key control devices used.

Follow-Up

Although the investigation for this case study did not extend into the project's actual follow-up time period, the analysis of the other activities pointed up a probable difficulty in the performance of follow-up. Although the aftertax cash inflows from the pipeline could be measured in a relatively straightforward manner, the measurement of the incremental aftertax cash inflows attributable to the *increased plant capacity* would be very difficult to determine, primarily because of the intermingling of cash flows resulting from past and increased capacities. It would prove still more difficult to measure the cash-flow increment resulting from the new supply method versus the estimated cash flow, assuming the base-case supply method had continued. Thus, the identification of cash flows attributable to the expansion would have to be arbitrary at best. In this project, the lack of realistic data pointed up one of the major drawbacks in the performance of the follow-up activity.

In any project involving a major portion of a company, the responsibilities for performing the follow-up activity are sometimes difficult to assign. Basically, Continental's follow-up procedures were set up on a departmental basis, yet this project was one which cut across departmental lines. This situation would seem to support the argument for the performance of at least a part of the follow-up activity by a centralized group (e.g. the Controller's Department or the Economics Division of the Coordinating and Planning Department).

Regardless, however, of the methods or assignment of responsibility for the follow-up activity, its inclusion in any capital-expenditure framework is essential, because follow-up is a tool for the direct measurement and evaluation of the effectiveness of an entire program in operation.

CHAPTER VII

SUMMARY AND CONCLUSION

SUMMARY OF THE RESEARCH

Purpose and Approach

The central purpose of this study was to define the total requirements of an effective planning and control program for capital expenditures. In the building of the generalized framework, the desirable characteristics found in the literature were supplemented by, and blended with, supporting material from the field research.[1]

While much of the available literature covered numerous individual aspects of the framework, there appeared to be no coordinated body of literature in the area of capital-expenditure planning and control programs. The material examined tended to center more or less on specific activities (especially the economic evaluation of capital-investment proposals) and on sequential activities with a procedural emphasis.

The generalized framework for the implementation of a capital-expenditure planning and control program was composed of twelve major segments divided into two basic groups: (1) foundation components and (2) implementation activities. The three foundation components included: (1) awareness of company objectives and the development of strategic planning, (2) framework structuring, and (3) objective criteria. On the broad base formed by these foundation components, the nine implementation criteria were built. Of these nine, five were of a sequential nature (i.e., search, budgeting, request for expenditure, in-process control, and follow-up), whereas the other four (i.e., coordination, formalization, screening, and evaluation) were nonsequential, because they tended to permeate the other implementation

[1] The recommendations for further research on the framework developed in this study have been included as Appendix A.

activities. Of these four, coordination and formalization were considered to affect *all* of the implementation activities, whereas screening and evaluation were identified as affecting only those sequential activities subsequent to the search aspect.

In this study, special attention was given in the field investigation to those aspects of the framework which, based on the literature review, did not appear to have been developed adequately. This field research included the following four case studies of specific capital expenditures of varying types: (1) a producing well, (2) a company-owned service station, (3) the development of a new petrochemical product, and (4) a pipeline and refinery expansion project. These four case studies afforded concrete opportunities to analyze the framework and to strengthen the analysis of the administrative process of implementing the capital-expenditure planning and control program within the selected company.

Areas of Deficiency

The general areas of deficiency noted in the literature survey and the treatment of them are as follows:

1. The interrelationships of the many aspects of the framework were emphasized in this study. Particular stress was placed on the permeating nature of the evaluation, screening, coordination, and formalization activities, as related to the sequential activities of search, budgeting, request for expenditure, in-process control, and follow-up.
2. The essential relationship of a capital-expenditure program to the larger universe of the organization of the company was stressed. The framework-structuring component and those conditions having applicability to the total framework and to specific components and activities were particularly relevant as a basis for improvement.
3. The problems of implementation of the total requirements of the program were examined in detail in the field research. The case studies examined the following aspects: (1) the contrast of routine versus nonroutine capital projects; (2) the consideration of the significance and complexity of projects, with particular emphasis on the coordination and formalization activities and the need to consider all feasible and relevant alternatives; and (3) the tie of capital

expenditures to long-range plans, as well as the design and use of an accounting-information system in connection with such activities as in-process control and follow-up.

GENERAL FOUNDATION CONDITIONS

There are certain conditions which have a vital effect on capital-expenditure programs, but the extent of that influence will depend on their application in the context of a particular program. The correct utilization of these conditions forms the foundation upon which the framework for the implementation of a capital-expenditure program should be built. While many of these conditions have been referred to either explicitly or implicitly throughout this study, especially in respect to their relationships to the particular components and activities which comprise the framework for a capital-expenditure program, these conditions are applicable, in a broader sense, to the total framework since they form the supporting foundation.

The support of a program by management at all levels is essential. Since the attitudes of superiors have much to do with the attitudes of their subordinates, support must be much more than mere "lip service." Management action through participation should help to convey management's support in a convincing manner and should generate support and participation by others, and this approach should permeate the organization within the frame of reference of authority and guideline limitations.

Even the best-designed program may be a poorly-used machine unless those who use it in a technical, nontechnical, and/or management capacity understand the basic concepts and procedures that are involved. This need calls for a careful indoctrination process that is reviewed and updated continuously.

Communication, both downward and upward, is the very lifeblood of a program. Poor communication can cause even an excellent program to operate ineffectively. Provided the necessary education is present, clear and concise communication (both oral and written) should facilitate the transmission of information throughout an organization. Formal channels, as well as the informal feedback sources, should be recognized and utilized appropriately.

The vehicle that takes a program from the drawing board into a

state of effective implementation can be summarized in one word—personnel. The principles of human relations point up the importance of the recognition of personnel interactions and an awareness of the part that the sentiments of both individuals and groups can play in their responses and actions. Ignoring the sentiments of the persons involved can doom a program to failure, whereas the recognition of the importance of human relations and action based on this recognition can make a sagging program taut.

Flexibility in adjusting quickly to changing needs is a desirable characteristic. At the same time, basic long-range objectives and guidelines must not be thrown aside lightly. In a mature program, the change tends to be evolutionary rather than spontaneous. However, rapidly changing conditions (such as an economic recession) might call for a more rapid rate of change, not in the structure of the program, but in the type of action taken through the structure.

A capital-expenditure program should be constructed and implemented (1) so that its influence is spread throughout a firm; (2) so that it gives direction to individual capital-expenditure development; and (3) so that it is generally useful as a means of control of *all* capital investments of an enterprise. A program should not control, but it should be, instead, a tool for planning and controlling. A manager still must exercise judgment and make the final decisions, no matter how elaborate a program may be. While this point does *not* speak for the acceptability of deficient capital-expenditure programs, it does underline the need for intelligent, practical implementation.

There are integral relationships among the components and activities of the framework. A recognition of these relationships implies that structural segments cannot be viewed in an environmental vacuum. Changes in one aspect of the program will affect other segments. This same fact concerning interrelationships is true for individual investment projects. That is, there are components, activities, and general characteristics of the total program. As individual projects are developed, they should demonstrate these components and activities and take on these characteristics, because the whole is simply the sum of the parts. Thus, the entire capital-expenditure program is the summation of all investment decisions, at varying stages of development, as they exist in the administrative framework of policies and procedures.

Finally, a capital-expenditure program is related to, and is affected by, the organizational climate of an enterprise and by the economic

surroundings in which a firm operates. In the implementation of a program for a given firm, all relevant factors, even though technically they may be external to a firm's capital-expenditure program, must be given careful consideration.

SUMMARY OF THE FRAMEWORK COMPONENTS

Awareness of Company Objectives and the Development of Strategic Planning

All of the objectives of an organization, whether broad or detailed, should be formulated carefully. While economic objectives are needed specifically for use in formulating capital-investment decisions in an economic area, all policies should consider both economic and non-economic factors.

The various organizational levels play different roles in connection with this component, but all of the levels of an organization need to be conscious of the firm's objectives insofar as a given level is affected, with objectives being attained through the successful execution of plans. Thus, top management should set the broad objectives, while operating management should carry out the approved specific policies and programs formulated to govern functional activities.

In accordance with this fundamental pattern of organization, the action through capital expenditures should be consistent with, and should support, a firm's objectives and the resulting short- and long-range strategic plans.

Framework Structuring

It should be recognized that the capital-expenditure program is an integral part of the total organization of a firm; and the established capital-expenditure framework, updated to meet changing circumstances, forms the basis for implementing such a program. The goal should be a framework that is tailored to fit an organization and one that will contain the essential requirements of a sound program; that is, the framework ought to be consistent with the form of an enterprise's organization and should utilize sound principles of organization. In this study, the applicability of the principles of sound organization appeared to be particularly significant.

Objective Criteria

Criteria are in use wherever facts and circumstances are related to standards, norms, tolerance limits, and acceptable practices. The need for the correct and appropriate use of such objective criteria is vital to the entire capital-expenditure framework.

The criteria used by a firm may vary among different framework activities, among different operating functions, and among different classifications of proposals, and they may be influenced further by the significance of an investment proposal. Moreover, the appropriateness of criteria which are developed to analyze these phases of activity may change over time.

Valid criteria are particularly important for preinvestment economic evaluation. However, they are also quite important for other evaluation guides and for searching out proposals, screening alternatives, coordinating and formalizing the total program and specific projects, preparing the budget, approving expenditures, and in carrying out in-process control of expenditures and follow-up analysis of capital-investment results.

Search

Search is a continuous process that involves striving to bring into an evaluation system all proposals and alternatives which merit consideration. Well-communicated guidelines, tempered by judgment, should assist all elements of an organization in the effort to feed projects of merit into a capital-expenditure program. It is particularly important to maintain a genuine feeling that a worthy proposal will be reviewed through channels in a fair and objective manner.

Screening

Screening may be defined as the activity of passing proposals to the next higher level in the chain of approval so that only those proposals that merit inclusion and subsequent use in a company's capital-expenditure program will be selected and approved.

The screening process is applicable throughout the development and useful life of a capital expenditure. Unnecessary duplication of the screening effort should be avoided because of the administrative cost involved; ideally, every effort should be made to screen out undesirable projects before excessive costs have been incurred, but a firm should be

sensitized to the possibility of screening out a project after construction has been initiated or even after the project has been completed and is in use. It should be recognized that, if the continued development of a project would have a greater detrimental effect than its immediate termination, the latter action should be taken.

However, careful use of the screening activity will help to retain projects that are worthwhile, and guidelines for investment decisions and properly used techniques should contribute to intelligent screening.

Coordination

The need for coordination of the overall capital-expenditure program is of particular importance for all except rather small firms. In large firms, the problem is especially acute.

Coordination is the process of relating activities with respect to objectives and guidelines. This activity, which pervades, and is essential to, all of the other implementation activities, involves the total investment program and specific project development, although the problem is more difficult for nonroutine projects than for routine ones.

The procedures for the implementation of activities must be coordinated, and, in this process, centralization helps to assure uniformity. The content of a capital-expenditure program also must be coordinated. This type of coordination, which should involve planned and existing proposals (both individually and collectively) at varying stages of development, is the direct responsibility of the management hierarchy. Necessary authority and the responsibility for coordination need to be designated clearly.

Formalization

The process of formalization pervades all other implementation activities in a capital-expenditure program, and, in this process, there are two key ideas involved.

First, the total capital-expenditure program and individual projects should be accomplished through a formalized system of procedures and forms, with the details prepared at the level at which a project is to be developed. However, if needed, specialized technical staff assistance from other levels or departments should be made available.

In order for a system to be uniform, efficient, economical, and practical, the design of the procedures and forms should be centralized.

Such centralization not only should facilitate uniformity but also should reduce administrative costs through the routine treatment of similar tasks.

Second, the formalization activity involves the crystallization of plans during the entire development of a project. Thus, the degree of formalization of a project at any point in time will be a function of the cost of formalization, the nature of the project, the availability of data, the limitations of time, and the assurance by the appropriate authority that the project will be approved.

Evaluation

Evaluation covers the basic theory, techniques, and procedures for the consideration and reevaluation of projects through the course of a project's development, and it affects the sequential activities subsequent to search, although evaluation after project completion is covered under the follow-up activity. A number of evaluations of a single proposal may be necessary because of (1) changing circumstances during project development, (2) alternative solutions, and/or (3) varying assumptions as to the amount and time pattern of cash flows.

Evaluation includes a consideration of both economic and noneconomic factors, since, in actual practice, evaluation criteria other than economic-evaluation techniques may have a significant bearing on a capital-expenditure decision. The best available tools should be used appropriately, and the circumstances of each situation should be considered in passing judgment on the criteria used. Even then, there may be justifiable differences of opinion with respect to which criteria should govern. In the final decision, however, it is important to recognize that there may be a danger in an overreliance on quantitative answers that have been based on numerous assumptions and estimates.

Budgeting

The requirement that an annual capital budget should be only the first segment of formal long-range planning appears to be essential for continuity in a capital-expenditure program. It is recognized generally that a formal budget-preparation procedure is needed by all but the smallest firms, and even the small firm should plan for future capital-investment needs, although the procedures used might not be as formalized.

The capital budget should be coordinated with the total planning of a company, covering both short- and long-range aspects; and inordinate budget fluctuations from year to year, within functional classifications and in total, should be avoided, because company staffs and facilities normally will not be geared to handle effectively annual budgets which fluctuate widely.

A formal periodic capital budget provides a plan for the centralized coordination and control of capital expenditures. The capital budget is not generally an authorization to commit funds. Rather, it is an opportunity to consolidate plans by looking at projects for an organization as a whole, side by side. Projects under examination will be at varying stages of development. Some projects may never materialize, while others may be added during the budget year. Thus, while a sound capital-expenditure program should aim for a carefully planned budget, it should also be adaptable to changing circumstances and needs within the limits of prescribed authority and responsibility designations.

Request for Expenditure

Authority to commit funds and commence work ought to come by means of a request-for-expenditure procedure. This procedure should provide for an up-to-date set of documents justifying and describing the expenditure. The level of origin of the request should prepare the request, with necessary technical assistance, if needed. Approval should be delegated to the lowest feasible level that is consistent with the company's overall policy as to authority delegations. Technically, approval ought to be given prior to the incurring of commitments or expenditures, but, as a practical necessity in the coordination and formalization of a project, a reasonable amount of engineering work, the receipt of bids, and various tentative arrangements with contractors, suppliers, and customers must be made prior to the approval of the request for expenditure. As a control measure, during the development of a project, periodic reports should be prepared, comparing approved expenditures and the budget.

In-Process Control

In-process control involves the procedure for the control of costs, time, and quality, both before and after the approval of the request for expenditure. While control relates primarily to commitments against

the approval expenditure, administrative costs of developing capital-expenditure projects should be controlled also. Progress reports to higher levels, indicating the status and extent of efforts devoted to individual projects, may be a useful control device.

Control presupposes a plan that is to be controlled. The coordination and formalization of a project should provide for a plan for construction or other form of asset acquisition. While the accumulation of historical records on such projects is important, it should not be confused with effective and timely cost control which can provide for desirable corrective action. As a project develops, the results should be related to the criteria included in the plan. As a project moves toward the completion stage, a high degree of coordination and formalization is required. To achieve this, management should assign direct control responsibilities, recognizing that assistance from, and coordination with, many groups (both within and external to the company) will be necessary in order to complete the approved expenditure project successfully.

Follow-Up

Follow-up is the process of comparing and reporting (1) projections made when an investment project was evaluated and justified, as related to (2) measured actual results. The follow-up process should aid in the evaluation of results and in the improvement of future investment decisions.

There should be formal follow-up policies and procedures. This does not mean that follow-up of all projects for extended time periods is either necessary or desirable. Rather, the follow-up activity should be spelled out, and the justification of the extent of the activity should be based on the value received as related to the cost of obtaining the follow-up information. Although practices vary widely from company to company, a formal procedure for comparing results and expectations and reporting the findings seems fundamental so long as the benefits exceed the cost of the procedure.

There are many criteria for judging the effectiveness of an investment decision, just as there are numerous ones for the evaluation of proposed investments. In addition to the return on investment, there are other yardsticks, such as quantitative measures, competition, balance of investments, and various legal, strategic, and social considerations. In the utilization of the follow-up process as a control device, the results should be reported to those levels of management which exercise the

control function, and adequate auditing should be performed to be sure that the results are reported correctly.

CONCLUSION

The ideas developed in this study represent an effort to define the essential requirements of a capital-expenditure planning and control program. The significance of this study rests upon the utility of a generalized framework of individual activities as a feasible approach to the subject of capital-expenditure programs. There are several indications that such a framework not only is useful but also is essential.

Much of the research and writing on this subject has been devoted to specific aspects of the capital-expenditure program. For example, while techniques and procedural aspects have been reported in the literature in detail, the lack of a comprehensive framework has resulted in difficulties in correlating the reported subject matter. It is of considerable importance, however, that the subject matter be related in proper perspective to a total capital-expenditure planning and control program.

As a guide for an enterprise, the framework should serve in several ways. It should afford a basis for analyzing a company's existing program. It should be useful in the design or improvement of a firm's capital-expenditure program, and it should serve as a guide in the implementation of a company's structured program.

While the individual characteristics and needs of each firm will call for a certain amount of tailor-made adaptation, the best program, even when implemented correctly, does not guarantee success, since conditions beyond a firm's control could precipitate results which fall short of objectives. However, a carefully structured and effectively implemented program which is consistent with the requirements as developed in this study will aid an enterprise in doing the most effective job possible of planning and controlling its capital expenditures.

The real value of any capital-expenditure program lies in its successful implementation and the resulting accomplishment of an organization's objectives. While there is no easy route to carrying out organizational programs and policies, the firm having at its disposal and utilizing a sound capital-expenditure planning and control program should have a better opportunity of reaching its desired goals.

APPENDIXES

Appendix A

RECOMMENDATIONS FOR FURTHER RESEARCH

During the course of this study, several areas for further research were noted. These included the following possibilities:[1]

1. Testing of the total generalized framework via *depth studies* in selected companies. The companies should be selected on the basis of size, type of organizational structure, and type of industry, depending on the specific objectives of the research.
2. Preparation of a number of case studies emphasizing the administrative process and problems of implementing a capital-expenditure program. These case studies should afford a basis for analysis of the programs from which the cases were extracted and should be especially useful for teaching purposes.
3. Study in depth of the individual components and activities of the framework. Those in particular need of further study are coordination, formalization, in-process control, and follow-up.
4. Examination of the relationships of the capital-expenditure program to long-range planning.
5. Study of the utilization of the accounting-information system in the improvement of the implementation of a capital-expenditure planning and control program.
6. Exploration of the human-relations aspects of the implementation of a program for capital expenditures.
7. Further examination of the gaps which exist between theory and practice with respect to economic-evaluation techniques and related topics. The link between preinvestment and postinvestment economic evaluation should be emphasized.

[1] In pursuing the following suggested aspects, the researcher should avoid the danger of superficial field research which might result from inadequate interviewing, the use of poorly designed questionnaires, or deficiencies in the application of statistical sampling theory.

8. Study of the extent and nature of the training offered in collegiate schools of business and in professional development programs with respect to the essential requirements of a capital-expenditure program.
9. Further study to modify and adapt the framework to the needs of small firms.

APPENDIX B

TECHNIQUES FOR THE EVALUATION OF CAPITAL EXPENDITURES AND RELATED TOPICS

The following list of topics covers techniques for the evaluation of capital expenditures and related aspects. Each topic has been referenced to sources which contain more detailed discussions of the various points indicated below:

Classification of capital expenditures.[1]
Requisites of a good evaluation tool.[2]
Cost of capital.[3]
Allowance for risk and uncertainty.[4]
Cash flow.[5]
Economic-evaluation techniques.[6]
  Payback.
  Average return on investment.

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[1] For a discussion of several possible classifications of capital expenditures, see Joel Dean, *Capital Budgeting* (New York: Columbia University Press, 1951), pp. 82–88; see also John A. Beckett, "The Background for Making Effective Capital Commitment Decisions," *The Controller*, XXVI, No. 7 (July 1958), p. 317.

[2] Herbert W. Johnson, "Measuring the Earning Power of Investments—A Comparison of Methods," *N.A.A. Bulletin*, XLIII, No. 5 (January 1962), pp. 37–38.

[3] Charles T. Horngren, *Cost Accounting: A Managerial Emphasis* (Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1962), pp. 612–17.

[4] Harold Bierman, Jr., and Seymour Smidt, *The Capital Budgeting Decision* (New York: The Macmillan Co., 1960), pp. 128–29, 132; Robert N. Anthony (ed.), *Papers on Return on Investment* (Boston: Graduate School of Business Administration, Harvard University, 1959), p. 1; C. Jackson Grayson, Jr., *Decision under Uncertainty—Drilling Decisions by Oil and Gas Operators* (Boston: Graduate School of Business Administration, Harvard University, 1960); and Irwin D. J. Bross, *Design for Decision* (New York: The Macmillan Co., 1953).

[5] Bierman and Smidt, pp. 176–81.

[6] National Association of Accountants, *Return on Capital as a Guide to Managerial Decisions* (Research Report No. 35; New York, December 1, 1959); Horngren, pp. 403–31, 594–618; Gordon Shillinglaw, *Cost Accounting Analysis and*

Economic-evaluation techniques (continued).
Present value.
Discounted cash flow.

In the above list of topics, the first five items cover significant background information related to the subject of economic-evaluation techniques. The final topic includes four representative techniques currently in use. While the selected references indicated in the footnotes cover the various topics, additional references have been included in the bibliography for this study.

Control (Homewood, Ill.: Richard D. Irwin, Inc., 1961), pp. 493–521, 529–54; see the tables in Jerome Bracken and Charles Christenson, *Tables for the Analysis of Capital Expenditures* (Note ICH 7C13, EA-C 561; Cambridge, Mass.: Harvard University, 1961), and compare with the discount factors used by Continental Oil Company (see Appendix D of the current study); Charles Christenson, "Construction of Present Value Tables for Use in Evaluating Capital Investment Opportunities," *The Accounting Review,* XXX, No. 4 (October 1955), pp. 666–72; Ezra Solomon, "The Arithmetic of Capital-Budgeting Decisions," in *Administrative Control and Executive Action,* ed. B. C. Lemke and James Don Edwards (Columbus, O.: Charles E. Merrill Books, Inc., 1961), pp. 458–62; and Bruce F. Young, "Overcoming Obstacles to Use of Discounted Cash Flow for Investment Choices," *N.A.A. Bulletin,* XLIV, No. 7 (March 1963), pp. 15–26.

APPENDIX C

CONTINENTAL OIL COMPANY PROCEDURES FOR APPRAISAL OF NEW CAPITAL INVESTMENTS

In the two major parts of this appendix are discussed (1) Continental's adoption of the discounted-cash-flow (D.C.F.) evaluation method and (2) two appraisal (evaluation) techniques (i.e., payback and D.C.F.) in use by the company in 1963, at the time of this study. The second part has been subdivided into two sections: Section one is a synthesis of the content of Bulletin Nos. 15, 16, 17, and 22 used by the Continental Pipe Line Company, Production Department, Manufacturing Department, and Petrochemical Department, respectively. Section two is a discussion of Bulletin No. 8, which was used by the Marketing Department. All of the bulletins discussed were prepared as instructions for use in the appraisal of capital-investment proposals.

CONTINENTAL OIL COMPANY'S ADOPTION OF THE DISCOUNTED-CASH-FLOW EVALUATION METHOD

The concept of the present value of money is not new—it has been used in banking for centuries. However, its use in evaluating capital-investment proposals has been publicized more noticeably since 1950. Continental apparently was one of the earlier users of this more sophisticated mathematical method in evaluating capital-expenditure proposals, and, even today, the D.C.F. method is not in general use. The virtual pioneering nature of Continental's decision to use the discounted-cash-flow method led to several published discussions on the topic.[1] In the review of the literature, it was observed also that an

[1] One such study was Harvard University, *Continental Oil Company—Appraisal of Capital Investments* (ICH C12, Admin. Acctg. 117; Cambridge, Mass., 1955).

article by McLean appeared frequently as a source in subsequent articles and also was found included in suggested reading bibliographies.[2] In the summer of 1954, a group comprised of McLean and Continental's controller and its financial vice-president were asked to review the procedures being used in the company's various departments for the appraisal of new capital investments.[3]

The recommendations arising from this review were reported to the president in early 1955. The essence of this report appears below:[4]

1. Beginning July 1, 1955, we should use *return-on-investment figures* as the primary yardstick for evaluating new capital investments in place of the *years-to-pay-out figures* which have been our primary guide in the past. Years-to-pay-out figures should also be calculated but should be used only as measures of capital turnover.
2. Seven percent per annum after taxes should be regarded as the rate of return necessary to cover our average, long-term cost of capital and to maintain our earnings per share at about their present level.
3. Our stockholders expect continual improvements in their financial returns, and we should therefore seek to invest the majority of our capital funds in situations where it will earn substantially more than 7 percent after taxes, Moreover, in accordance with universal financial practices, we should require higher rates of return on our money when the risks are high than when the risks are low.

   It is recommended, therefore, that the *normally expected* level of return for the general run of investments in marketing and pipeline facilities should be about 10 percent or better; for refining facilities, 14 percent or better; and for development wells and petrochemical facilities, 18 percent or better. Projects showing lower rates of re-

[2] See John G. McLean, "How to Evaluate New Capital Investments," *Harvard Business Review*, XXXVI, No. 6 (November-December 1958), pp. 59–70.

[3] At that time, Dr. McLean was a member of the Harvard faculty, but he joined Continental in 1956; and, at the time of this study in 1963, he was vice-president in charge of international operations.

[4] Continental Oil Company, *Appraisal of New Capital Investments* ([mimeographed]; Houston, February 9, 1955), p. 1; the full text of the report, with the exception of sections F, G, and H, was reproduced in Harvard University, *Continental Oil Company–Appraisal of Capital Investments* (ICH C12, Admin. Acctg. 117; Cambridge, Mass., 1955), pp. 6–14.

turn should be undertaken only when there are very sound, non-financial justifications for them.

4. Beginning July 1, 1955, all return-on-investment figures should be calculated by the *financial method*; that is, on the basis of the investment actually outstanding from time to time over the life of the project rather than on the basis of the *original* or *average* investments[5] which we are now using.

   The chief advantage of the financial method is that it differentiates between investments which generate their income early and investments which generate their income late. In addition, adoption of the financial method would serve to place procedures for calculating returns on a uniform basis in all departments of the company.

The report of the study committee was divided into three parts. Part I contained the recommendations and supporting reasons for them. The sources given in Appendix B cover the advantages and disadvantages of the various methods, including all of the supporting reasons contained in this report. Part I was broken into sections A through J, as follows:[6]

A. Use of Return on Investment as Primary Yardstick.
B. Rate of Return Necessary to Cover Cost of Capital.
C. Normally Expected Level of Return on New Investments.
D. Need for Uniform Procedures in All Departments.

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[5] These methods are synonymous with certain of the methods indicated in Appendix B. Since the latter terminology appears to have wider acceptance, it has been used throughout this study. The following tabulation collates the two sets of terms:

Continental's terminology	*General terminology*
Financial method	Discounted-cash-flow method
Return calculated on original investment	Average annual return on original investment
Return calculated on average investment	Average annual return on average investment

Prior to the 1955 change to the method of discounted cash flow, the return on original investment method had been used by the Production, Manufacturing, Petrochemical, and Pipe Line departments, and the average-investment method had been used by the Marketing Department.

[6] The content of sections F through H is developed in detail in the case studies examined in Chapters III through VI of this study.

E. Use of Financial Method to Calculate Returns.
F. Application of Financial Method to Service Stations.
G. Application of Financial Method to Development Wells.
H. Application of Financial Method to Other Investments.
I. Follow-Up Procedures.
J. Working Committee on Investment Analysis.

The comments with respect to follow-up did nothing more than recognize the need. The Working Committee referred to under Section J was a suggested vehicle for implementation.

A series of exhibits supporting points developed in Part I comprised Part II of the report; in Part III were developed the procedures for calculating returns by the discounted-cash-flow method (as discussed in sections F, G, and H of Part I). These procedures then became the foundation for the ensuing preparation by the Controller's Department of bulletins of instructions for the operating departments.

The recommendations submitted in the report received top-management approval in mid-1955. Although there was some opposition to the recommended change, most of the resistance soon disappeared, and a smooth changeover was accomplished. The following three prime factors accounted for the success in the implementation of the new method:

1. The recommendations were approved and supported by top management.
2. Company personnel skilled in the use of these techniques made personal visits to the offices throughout the company and gave instructions in the use of the new tool.
3. The Controller's Department prepared and issued detailed written instructions, well supported by examples.

An assistant to one of the headquarters vice-presidents commented:

> The groundwork was already laid. It was not a crash program. It was carefully explained and there were numerous meetings and sessions held on explaining it, and quite detailed instructions came out that made it go well—examples, etc.

However, it should be remembered that this approach was an alteration of an existing capital-expenditure program rather than the installation of an entirely new one.

APPRAISAL TECHNIQUES USED BY CONTINENTAL OIL COMPANY[7]

Synthesis of Bulletin Nos. 15, 16, 17, and 22

The topical headings for Bulletin Nos. 15, 16, 17, and 22 were:

1. Appraisal Statements.
2. Form and Content of Statements.
3. Retention of Statements.
4. Procedure for Preparing Statements.
   a. Total Investment.
   b. Economic Life.
   c. Net Income before Depreciation (Tax Deductions) and Income Taxes.
   d. Tax Depreciation (Deduction).
   e. Taxable Net Income.
   f. Income Taxes.
   g. Cash Income after Income Taxes.
   h. Discount Factors.
   i. Present Values.
   j. Years to Pay Out.
5. Example(s).
6. Cumulative Discount Factors for General Use.

The following paragraphs synthesize the content of these bulletins:

1. *Appraisal Statements.* An appraisal was normally required if cost reduction and/or revenue increase was anticipated. Illustrative exceptions were noted.
2. *Form and Content of Statements.* For format, reference was made to the examples that accompanied each bulletin. Both the return on investment, using the discounted-cash-flow method (D.C.F.), and

[7] Adapted from Continental Oil Company, *Procedure for Appraisal of New Capital Investments* (Controller's Department General Office Bull. Nos. 8, 15, 16, 17, 22; [mimeographed]; Houston, 1955, 1959). The bulletins were identified as follows:

Bulletin number	*Department*	*Date*
8	Marketing	September 1, 1959
15	Pipe Line Company	September 1, 1955
16	Production	September 1, 1955
17	Manufacturing	September 1, 1955
22	Petrochemical	September 1, 1955

the payback period were shown, and the discounted-cash-flow method was defined. The principal evaluation yardstick was to be D.C.F., with payout viewed only as a measure of capital turnover; and it was stressed that a high-risk investment should require a relatively high rate of return.

3. *Retention of Statements.* Appraisal statements supporting A.F.E.'d projects were to be kept on permanent file by the sponsoring department.
4. *Procedure for Preparing Statements.* The major goal in the preparation of statements was uniformity, and the instructions applied to proposals that involved 100 percent company (i.e., not affiliated company) funds:

   a. *Total Investment.* The total investment was described as including the following:

      (1) Capitalized outlay.
         (a) Cost of the current investment.
         (b) Present value of the deferred investment.
      (2) Aftertax expensed outlay.
      (3) Aftertax (capital-gain) appraisal market value of the existing investment. (The tax adjustment was not to be made if the appraised market value was less than the residual tax base.)

   b. *Economic Life.* The economic life was to be considered as the shortest of the estimated years resulting from considering each of the following:

      (1) Physical wear and tear.
      (2) Obsolescence.
      (3) Permanence of source of revenue.

   c. *Net Income before Depreciation (Tax Deductions) and Income Taxes.* The Production Department bulletin used the heading "tax deductions," while the other three used the term "depreciation." The concept of incremental income was stressed. However, in the case of the reuse of an existing investment, such income was to be total income estimated to result from both the new and existing investment.

With respect to the pattern of future cash flow, the bulletins gave the following instructions:

> If the annual net income before depreciation and income taxes is expected to be reasonably uniform throughout the economic life of the proposed investment, a single estimate thereof should be made. If, however, it is anticipated that significant changes will occur in the annual net income before depreciation and income taxes, the economic life of the investment should be divided into two or more periods and an estimate made of the average annual net income before depreciation and income taxes for each period.

An easily expressed idea, but one difficult to implement, was included in the following statement regarding source data and their accuracy:

> The net income before depreciation and income taxes estimate should be based on the best available projections of volume, tariffs, wage rates, property taxes, and other costs and expenses that are likely to prevail during the entire economic life of the investment.

One of the most difficult elements to estimate was future sales prices. It was suggested that, when available, the price history for recent months or years was to be considered. If the expenditure were a major one, or if a price history did not exist, consultation with other departments (unspecified) was suggested.

d. *Tax Depreciation (Deduction).* The section on tax depreciation specified the annual rates to be used in computing depreciation and depletion and prescribed the treatment of intangible development costs, other items expensed for tax purposes, and tax write-offs permitted under Certificates of Necessity. Salvage values generally were assumed to be 5 percent. Included was a reminder that depreciation on reused investment should be based on original cost rather than on current value. If suggested rates appeared inapplicable and if "major expenditures" were involved, the Tax Division was to be consulted.
e. *Taxable Net Income.* The figure for the taxable net income was simply item c minus item d (i.e., net income before depreciation [tax deductions] and income taxes minus tax depreciation [deduction]).
f. *Income Taxes.* All income taxes (federal, state, and municipal) were to be estimated at 50 percent of the taxable net income.
g. *Cash Income after Income Taxes.* The figure for cash income after income taxes was described as net income before depreci-

ation (tax deductions) and income taxes minus income taxes. The value of land and the salvage value of other assets (not to exceed the undepreciated basis) were to be shown as cash inflow in the year of disposition.

h. *Discount Factors.* The discount factors used by Continental are shown in Appendix D. These factors assume an end-of-period cash flow, and compounding is at the end of each period. Specific instructions for the determination of the desired factors were spelled out as follows:

> Select a trial rate of return and obtain the appropriate discount factors from the cumulative table [see Appendix D]. The discount factor for the first period may be read directly from the table. The discount factor for the second period may be obtained by subtracting the factor for the first period from the factor for the last year of the second period. The discount factor for the third period may be obtained by subtracting the sum of the factors for the first and second periods from the factor for the last year of the third period, etc. The discount factor for the land value and the 5 per cent tax basis salvage value of building and other plant and equipment may be obtained by subtracting the factor for the next to last year of economic life from the factor for the last year of economic life.

i. *Present Values.* The use of the discount factors was covered under the discussion of present values. Typical instructions have been given below (the operations are the same as those cited in the references in Appendix B under "discounted cash flow"):

> Multiply the average annual cash income after income taxes for each period, the land value and the 5 per cent tax basis salvage value of buildings and other plant and equipment by the appropriate discount factors for the trial rate of return and add the resulting present values.
>
> If the total present value comes out higher than the total investment, the trial rate of return is *too low.* In this case, select a higher rate of return and repeat the calculations.
>
> If the total present value comes out lower than the total investment, the trial rate of return is *too high.* In this case, select a lower rate of return and repeat the calculations.
>
> Continue the trial calculations until a rate of return is found which

will give a total present value roughly equal to the total investment. Return on investment should be calculated only to the *nearest full per cent.*

Instructions in the Pipe Line Company bulletin noted that a return in excess of 50 percent should be reported as such, without further refinement.

j. *Years to Pay Out.* The method employing the number of years to pay out was the same as that cited in Appendix B. The calculation was to be carried to the nearest one-tenth year.

5. *Example(s).* In the various bulletins, detailed examples were given of typical situations, and components of the examples were keyed to the various sections of the narrative instructions.
6. *Cumulative Discount Factors for General Use.* The set of factors used by Continental has been included as Appendix D.

Discussion of the Content of Bulletin No. 8

Bulletin No. 8, for use by the Marketing Department, was designed to accomplish the same purpose as were the bulletins just described. Detailed instructions for preparation were given, and examples and a table of discount factors were included.

The following three forms of profitability analysis were prescribed in Bulletin No. 8:

1. *Profitability Analysis of a Proposed New Investment (Retail Outlet—Company Service Station).* The following three types of service-station proposals were illustrated:[8]
   a. Construction of new service station on a company-owned site.
   b. Construction of new service station on a leased site.
   c. New three-party-lease service station.
2. *Profitability Analysis of a Proposed New Investment (Retail Outlet—Financial Assistance).* The profitability analysis was to be used for both direct and indirect loans to jobbers, agents, or dealers. An indirect loan to a jobber was illustrated.
3. *Profitability Analysis of a Proposed Retail Outlet—Financial Assistance [from jobber, agent, or dealer viewpoint].* An indirect loan to a jobber was illustrated.

[8] Bulk-plant investments were to follow the same format.

Instructions for all three forms were detailed, line by line, and the discussion covered the same basic points as in the appraisal bulletins for the other departments. However, the instructions in this bulletin were much more specific and detailed than were those in the other bulletins.

For the Marketing Department, a procedure was described for investments in which a uniform cash inflow was assumed for each period. This approach simplified the computation of the aftertax D.C.F. rate of return. The payback period was computed, and the D.C.F. rate was determined by finding the cumulative discount factor in Appendix D for the twentieth year (or the lease period including options, not to exceed twenty years) nearest to the computed payback period. The form also called for the computation of a pretax D.C.F. return on the booked investment.

The analysis from the jobber, agent, or dealer viewpoint was provided to enable these individuals and the company to project (1) annual cash surplus or deficiency from the proposal and (2) average annual increase in net worth. Both of these computations were from the viewpoint of Continental's "partner" and enabled both parties to anticipate the probability of continued success on the part of the "partner."

At the time of this study, the forms for the Marketing Department were being revised to include additional appraisal criteria. One example of these new criteria was the requirement that new service-station locations have a stated minimum daily current traffic count.

Appendix D

CUMULATIVE DISCOUNT FACTORS FOR GENERAL USE

Year or period of years	Percent																								
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
1 year	0.99	0.98	0.97	0.96	0.95	0.94	0.93	0.93	0.92	0.91	0.90	0.89	0.88	0.88	0.87	0.86	0.85	0.85	0.84	0.83	0.83	0.82	0.81	0.81	0.80
2	1.97	1.94	1.91	1.89	1.86	1.83	1.81	1.78	1.76	1.74	1.71	1.69	1.67	1.65	1.63	1.61	1.59	1.57	1.55	1.53	1.51	1.49	1.47	1.46	1.44
3	2.94	2.88	2.83	2.78	2.72	2.67	2.62	2.58	2.53	2.49	2.44	2.40	2.36	2.32	2.28	2.25	2.21	2.17	2.14	2.11	2.07	2.04	2.01	1.98	1.95
4	3.90	3.81	3.72	3.63	3.55	3.47	3.39	3.31	3.24	3.17	3.10	3.04	2.97	2.91	2.85	2.80	2.74	2.69	2.64	2.59	2.54	2.49	2.45	2.40	2.36
5	4.85	4.71	4.58	4.45	4.33	4.21	4.10	3.99	3.89	3.79	3.70	3.60	3.52	3.43	3.35	3.27	3.20	3.13	3.06	2.99	2.93	2.86	2.80	2.75	2.69
6	5.80	5.60	5.42	5.24	5.08	4.92	4.77	4.62	4.49	4.36	4.23	4.11	4.00	3.89	3.78	3.68	3.59	3.50	3.41	3.33	3.24	3.17	3.09	3.02	2.95
7	6.73	6.47	6.23	6.00	5.79	5.58	5.39	5.21	5.03	4.87	4.71	4.56	4.42	4.29	4.16	4.04	3.92	3.81	3.71	3.60	3.51	3.42	3.33	3.24	3.16
8	7.65	7.33	7.02	6.73	6.46	6.21	5.97	5.75	5.53	5.33	5.15	4.97	4.80	4.64	4.49	4.34	4.21	4.08	3.95	3.84	3.73	3.62	3.52	3.42	3.33
9	8.57	8.16	7.79	7.44	7.11	6.80	6.52	6.25	6.00	5.76	5.54	5.33	5.13	4.95	4.77	4.61	4.45	4.30	4.16	4.03	3.91	3.79	3.67	3.57	3.46
10	9.47	8.98	8.53	8.11	7.72	7.36	7.02	6.71	6.42	6.14	5.89	5.65	5.43	5.22	5.02	4.83	4.66	4.49	4.34	4.19	4.05	3.92	3.80	3.68	3.57
11	10.37	9.79	9.25	8.76	8.31	7.89	7.50	7.14	6.81	6.50	6.21	5.94	5.69	5.45	5.23	5.03	4.84	4.66	4.49	4.33	4.18	4.04	3.90	3.78	3.66
12	11.26	10.58	9.95	9.39	8.86	8.38	7.94	7.54	7.16	6.81	6.49	6.19	5.92	5.66	5.42	5.20	4.99	4.79	4.61	4.44	4.28	4.13	3.99	3.85	3.73
13	12.13	11.35	10.63	9.99	9.39	8.85	8.36	7.90	7.49	7.10	6.75	6.42	6.12	5.84	5.58	5.34	5.12	4.91	4.71	4.53	4.36	4.20	4.05	3.91	3.78
14	13.00	12.11	11.30	10.56	9.90	9.29	8.75	8.24	7.79	7.37	6.98	6.63	6.30	6.00	5.72	5.47	5.23	5.01	4.80	4.61	4.43	4.26	4.11	3.96	3.82
15	13.87	12.85	11.94	11.12	10.38	9.71	9.11	8.56	8.06	7.61	7.19	6.81	6.46	6.14	5.85	5.58	5.32	5.09	4.88	4.68	4.49	4.32	4.15	4.00	3.86
16	14.72	13.58	12.56	11.65	10.84	10.11	9.45	8.85	8.31	7.82	7.38	6.97	6.60	6.27	5.95	5.67	5.41	5.16	4.94	4.73	4.54	4.36	4.19	4.03	3.89
17	15.56	14.29	13.17	12.17	11.27	10.48	9.76	9.12	8.54	8.02	7.55	7.12	6.73	6.37	6.05	5.75	5.47	5.22	4.99	4.77	4.58	4.39	4.22	4.06	3.91
18	16.40	14.99	13.75	12.66	11.69	10.83	10.06	9.37	8.76	8.20	7.70	7.25	6.84	6.47	6.13	5.82	5.53	5.27	5.03	4.81	4.61	4.42	4.24	4.08	3.93
19	17.23	15.68	14.32	13.13	12.09	11.16	10.34	9.60	8.95	8.36	7.84	7.37	6.94	6.55	6.20	5.88	5.58	5.32	5.07	4.84	4.63	4.44	4.26	4.10	3.94
20	18.05	16.35	14.88	13.59	12.46	11.47	10.59	9.82	9.13	8.51	7.96	7.47	7.02	6.62	6.26	5.93	5.63	5.35	5.10	4.87	4.66	4.46	4.28	4.11	3.95
21	18.86	17.01	15.42	14.03	12.82	11.76	10.84	10.02	9.29	8.65	8.08	7.56	7.10	6.69	6.31	5.97	5.66	5.38	5.13	4.89	4.67	4.48	4.29	4.12	3.96
22	19.66	17.66	15.94	14.45	13.16	12.04	11.06	10.20	9.44	8.77	8.18	7.64	7.17	6.74	6.36	6.01	5.70	5.41	5.15	4.91	4.69	4.49	4.30	4.13	3.97
23	20.46	18.29	16.44	14.86	13.49	12.30	11.27	10.37	9.58	8.88	8.27	7.72	7.23	6.79	6.40	6.04	5.72	5.43	5.17	4.92	4.70	4.50	4.31	4.14	3.98
24	21.24	18.91	16.94	15.29	13.80	12.55	11.47	10.53	9.71	8.98	8.35	7.78	7.28	6.84	6.43	6.07	5.75	5.45	5.18	4.94	4.71	4.51	4.32	4.14	3.98
25	22.02	19.52	17.41	15.62	14.09	12.78	11.65	10.67	9.82	9.08	8.42	7.84	7.33	6.87	6.46	6.10	5.77	5.47	5.20	4.95	4.72	4.51	4.32	4.15	3.98
2d 5 years	4.62	4.27	3.95	3.66	3.39	3.15	2.92	2.72	2.53	2.35	2.19	2.05	1.91	1.78	1.67	1.56	1.46	1.37	1.28	1.20	1.13	1.06	1.00	0.94	0.88
3d 5	4.39	3.87	3.41	3.01	2.66	2.35	2.08	1.85	1.64	1.46	1.30	1.16	1.04	0.93	0.83	0.74	0.67	0.60	0.54	0.48	0.43	0.39	0.35	0.32	0.29
4th 5	4.18	3.50	2.94	2.47	2.08	1.76	1.49	1.26	1.07	0.91	0.77	0.66	0.56	0.48	0.41	0.35	0.30	0.26	0.23	0.19	0.17	0.15	0.13	0.11	0.09
5th 5	3.98	3.17	2.54	2.03	1.63	1.31	1.06	0.86	0.69	0.56	0.46	0.37	0.31	0.25	0.20	0.17	0.14	0.11	0.09	0.08	0.06	0.05	0.04	0.04	0.03
6-15th year	9.01	8.14	7.36	6.67	6.05	5.50	5.01	4.57	4.17	3.82	3.49	3.21	2.95	2.71	2.50	2.30	2.12	1.96	1.82	1.68	1.56	1.45	1.35	1.26	1.17
6-20th	13.19	11.64	10.30	9.14	8.13	7.26	6.49	5.83	5.24	4.72	4.27	3.86	3.51	3.19	2.91	2.65	2.43	2.23	2.04	1.88	1.73	1.60	1.48	1.36	1.26
6-25th	17.17	14.81	12.83	11.17	9.76	8.57	7.55	6.68	5.93	5.29	4.73	4.24	3.81	3.44	3.11	2.82	2.57	2.34	2.14	1.96	1.80	1.65	1.52	1.40	1.30
11-20th	8.57	7.37	6.35	5.48	4.74	4.11	3.57	3.11	2.71	2.37	2.07	1.82	1.60	1.41	1.24	1.10	0.97	0.86	0.76	0.68	0.60	0.54	0.48	0.43	0.38
11-25th	12.55	10.54	8.68	7.51	6.37	5.42	4.63	3.96	3.40	2.93	2.53	2.19	1.90	1.66	1.45	1.26	1.11	0.97	0.86	0.76	0.67	0.59	0.52	0.47	0.41
10th	0.91	0.82	0.74	0.68	0.61	0.56	0.51	0.46	0.42	0.39	0.35	0.32	0.29	0.27	0.25	0.23	0.21	0.19	0.18	0.16	0.15	0.14	0.13	0.12	0.11
20th	0.82	0.67	0.55	0.46	0.38	0.31	0.26	0.21	0.18	0.15	0.12	0.10	0.09	0.07	0.06	0.05	0.04	0.04	0.03	0.03	0.02	0.02	0.02	0.01	0.01
25th	0.78	0.61	0.48	0.38	0.30	0.23	0.18	0.15	0.12	0.09	0.07	0.06	0.05	0.04	0.03	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.00	0.00

(continued)

Year or period of years	Percent																								
	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
1 year	0.79	0.79	0.78	0.78	0.77	0.76	0.76	0.75	0.75	0.74	0.74	0.73	0.72	0.72	0.71	0.71	0.70	0.70	0.69	0.69	0.68	0.68	0.68	0.67	0.67
2	1.42	1.41	1.39	1.38	1.36	1.35	1.33	1.32	1.30	1.29	1.28	1.26	1.25	1.24	1.22	1.21	1.20	1.19	1.18	1.17	1.15	1.14	1.13	1.12	1.11
3	1.92	1.90	1.87	1.84	1.82	1.79	1.77	1.74	1.72	1.70	1.67	1.65	1.63	1.61	1.59	1.57	1.55	1.53	1.51	1.49	1.48	1.46	1.44	1.42	1.41
4	2.32	2.28	2.24	2.20	2.17	2.13	2.10	2.06	2.03	2.00	1.97	1.94	1.91	1.88	1.85	1.82	1.80	1.77	1.74	1.72	1.70	1.67	1.65	1.63	1.60
5	2.64	2.58	2.53	2.48	2.44	2.39	2.35	2.30	2.26	2.22	2.18	2.14	2.11	2.07	2.04	2.00	1.97	1.94	1.91	1.88	1.85	1.82	1.79	1.76	1.74
6	2.88	2.82	2.76	2.70	2.64	2.59	2.53	2.48	2.43	2.39	2.34	2.29	2.25	2.21	2.17	2.13	2.09	2.05	2.02	1.98	1.95	1.92	1.89	1.85	1.82
7	3.08	3.01	2.94	2.87	2.80	2.74	2.68	2.62	2.56	2.51	2.45	2.40	2.36	2.31	2.26	2.22	2.18	2.14	2.10	2.06	2.02	1.98	1.95	1.92	1.88
8	3.24	3.16	3.08	3.00	2.92	2.85	2.79	2.72	2.66	2.60	2.54	2.48	2.43	2.38	2.33	2.28	2.24	2.19	2.15	2.11	2.07	2.03	1.99	1.96	1.92
9	3.37	3.27	3.18	3.10	3.02	2.94	2.87	2.80	2.73	2.67	2.60	2.54	2.49	2.43	2.38	2.33	2.28	2.23	2.19	2.14	2.10	2.06	2.02	1.98	1.95
10	3.46	3.36	3.27	3.18	3.09	3.01	2.93	2.86	2.78	2.72	2.65	2.59	2.53	2.47	2.41	2.36	2.31	2.26	2.21	2.17	2.12	2.08	2.04	2.00	1.97
11	3.54	3.44	3.34	3.24	3.15	3.06	2.98	2.90	2.82	2.75	2.68	2.62	2.56	2.50	2.44	2.38	2.33	2.28	2.23	2.18	2.14	2.10	2.06	2.02	1.98
12	3.61	3.49	3.39	3.29	3.19	3.10	3.01	2.93	2.85	2.78	2.71	2.64	2.58	2.51	2.46	2.40	2.35	2.29	2.24	2.20	2.15	2.11	2.06	2.02	1.98
13	3.66	3.54	3.43	3.32	3.22	3.13	3.04	2.96	2.88	2.80	2.73	2.66	2.59	2.53	2.47	2.41	2.36	2.30	2.25	2.20	2.16	2.11	2.07	2.03	1.99
14	3.69	3.57	3.46	3.35	3.25	3.15	3.06	2.97	2.89	2.81	2.74	2.67	2.60	2.54	2.48	2.42	2.36	2.31	2.26	2.21	2.16	2.12	2.07	2.03	1.99
15	3.73	3.60	3.48	3.37	3.27	3.17	3.08	2.99	2.90	2.83	2.75	2.68	2.61	2.55	2.48	2.42	2.37	2.31	2.26	2.21	2.17	2.12	2.08	2.04	2.00
16	3.75	3.62	3.50	3.39	3.28	3.18	3.09	3.00	2.91	2.83	2.76	2.69	2.62	2.55	2.49	2.43	2.37	2.32	2.27	2.22	2.17	2.12	2.08	2.04	2.00
17	3.77	3.64	3.52	3.40	3.29	3.19	3.10	3.01	2.92	2.84	2.76	2.69	2.62	2.55	2.49	2.43	2.37	2.32	2.27	2.22	2.17	2.12	2.08	2.04	2.00
18	3.79	3.65	3.53	3.41	3.30	3.20	3.10	3.01	2.93	2.84	2.77	2.69	2.62	2.56	2.49	2.43	2.38	2.32	2.27	2.22	2.17	2.13	2.08	2.04	2.00
19	3.80	3.66	3.54	3.42	3.31	3.21	3.11	3.02	2.93	2.85	2.77	2.70	2.63	2.56	2.50	2.44	2.38	2.32	2.27	2.22	2.17	2.13	2.08	2.04	2.00
20	3.81	3.67	3.55	3.43	3.32	3.21	3.11	3.02	2.93	2.85	2.77	2.70	2.63	2.56	2.50	2.44	2.38	2.32	2.27	2.22	2.17	2.13	2.08	2.04	2.00
21	3.82	3.68	3.55	3.43	3.32	3.21	3.12	3.02	2.93	2.85	2.77	2.70	2.63	2.56	2.50	2.44	2.38	2.32	2.27	2.22	2.17	2.13	2.08	2.04	2.00
22	3.82	3.68	3.56	3.44	3.32	3.22	3.12	3.02	2.94	2.85	2.77	2.70	2.63	2.56	2.50	2.44	2.38	2.32	2.27	2.22	2.17	2.13	2.08	2.04	2.00
23	3.83	3.69	3.56	3.44	3.33	3.22	3.12	3.03	2.94	2.85	2.78	2.70	2.63	2.56	2.50	2.44	2.38	2.32	2.27	2.22	2.17	2.13	2.08	2.04	2.00
24	3.83	3.69	3.56	3.44	3.33	3.22	3.12	3.03	2.94	2.86	2.78	2.70	2.63	2.56	2.50	2.44	2.38	2.33	2.27	2.22	2.17	2.13	2.08	2.04	2.00
25	3.83	3.69	3.56	3.44	3.33	3.22	3.12	3.03	2.94	2.86	2.78	2.70	2.63	2.56	2.50	2.44	2.38	2.33	2.27	2.22	2.17	2.13	2.08	2.04	2.00
2d 5 years	0.83	0.78	0.74	0.70	0.66	0.62	0.59	0.55	0.52	0.50	0.47	0.44	0.42	0.40	0.38	0.36	0.34	0.32	0.31	0.29	0.28	0.26	0.25	0.24	0.23
3d 5	0.26	0.24	0.21	0.19	0.18	0.16	0.15	0.13	0.12	0.11	0.10	0.09	0.08	0.08	0.07	0.06	0.06	0.05	0.05	0.05	0.04	0.04	0.04	0.03	0.03
4th 5	0.08	0.07	0.06	0.05	0.05	0.04	0.04	0.03	0.03	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00
5th 5	0.03	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6-15th year	1.09	1.02	0.95	0.89	0.83	0.78	0.73	0.69	0.64	0.61	0.57	0.54	0.50	0.48	0.45	0.42	0.40	0.38	0.36	0.34	0.32	0.30	0.29	0.27	0.26
6-20th	1.17	1.09	1.01	0.94	0.88	0.82	0.77	0.72	0.67	0.63	0.59	0.56	0.52	0.49	0.46	0.44	0.41	0.39	0.37	0.35	0.33	0.31	0.29	0.28	0.26
6-25th	1.20	1.11	1.03	0.96	0.89	0.83	0.78	0.73	0.68	0.64	0.60	0.56	0.52	0.49	0.46	0.44	0.41	0.39	0.37	0.35	0.33	0.31	0.29	0.28	0.26
11-20th	0.34	0.31	0.28	0.25	0.22	0.20	0.18	0.16	0.15	0.14	0.12	0.11	0.10	0.09	0.08	0.08	0.07	0.06	0.06	0.05	0.05	0.04	0.04	0.04	0.03
11-25th	0.37	0.33	0.30	0.26	0.24	0.21	0.19	0.17	0.16	0.14	0.13	0.12	0.10	0.09	0.09	0.08	0.07	0.06	0.06	0.05	0.05	0.05	0.04	0.04	0.03
10th	0.10	0.09	0.08	0.08	0.07	0.07	0.06	0.06	0.05	0.05	0.05	0.04	0.04	0.04	0.03	0.03	0.03	0.03	0.03	0.02	0.02	0.02	0.02	0.02	0.02
20th	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Source: Adapted from Continental Oil Company, Houston, September 1955.

Appendix E

CONTINENTAL OIL COMPANY GENERAL AUTHORITY LIMITATIONS, SUMMARY CHART

Bulletin number	Authority area	Chief executive officer	Executive vice-president	Senior vice-president	Headquarters department manager	Regional general manager
15	A.F.E.'s					
	Allocated, budgeted wells	--	--	--	--	x
	Unallocated, budgeted wells which meet requirements specified by headquarters department managers and when unallocated funds [have been] designated for use by headquarters department manager	--	--	--	--	x
	To be applied against contingency or unallocated portion of budgets when sufficient uncommitted funds remain	--	--	--	x	x
	Dryhole and bottom-hole contributions--in accordance with block book and made from funds allocated to region	--	--	--	--	x
	Nomination of lands for leasing					
	Up to $1,000,000	--	x	--	--	--
	Up to $500,000 (with concurrence of vice-president, Exploration)--from funds allocated for such purposes and when included in work program	--	--	--	--	x

(continued)

Bulletin number	Authority area	Chief executive officer	Executive vice-president	Senior vice-president	Headquarters department manager	Regional general manager
15	A.F.E.'s (continued)					
	Oil and gas leases-- in specific areas and program and from funds allocated by vice-president, Exploration	--	--	--	--	x
Revised 2-1-62						
	Marginal producing oil and gas leases for secondary recovery purposes					
	Up to $500,000	--	--	x	--	--
	Up to $350,000--from funds allocated to region	--	--	--	--	x
	Marketing transactions--from funds allocated to region and for projects meeting requirements specified by vice-president, Marketing	--	--	--	--	x
	Overcommitments of budgeted projects					
	Over 25 percent or $25,000	--	--	x	--	--
	Overcommitments not requiring headquarters approval[a]	--	--	--	--	x
	Overcommitments for projects approved in headquarters[a]	--	--	--	x	--

(continued)

Bulletin number	Authority area	Chief executive officer	Executive vice-president	Senior vice-president	Headquarters department manager	Regional general manager
15	A.F.E.'s (continued)					
	Supplemental A.F.E.'s					
	Over 25 percent or $25,000	--	--	x	--	--
	Total of original and supplemental A.F.E.'s exceeding $1,000,000	--	--	x	--	--
	Other supplemental A.F.E.'s[a]	--	--	--	--	x
	Approved, allocated, budgeted, capital items	--	--	--	x	x
Revised 7-17-62 (replaces 4-18-62)						
16	Cancellation of approved A.F.E.'s	--	--	--	x	x
17	Transfer of allocated budgeted funds to unallocated[b]	--	--	--	x	--
18	Original and supplemental maintenance A.F.E.'s	--	--	--	x	x
Revised 7-17-62 (replaces 4-18-62)						

[a]Authority may not be redelegated below assistant regional general manager or assistant headquarters department manager.

[b]Authority may not be redelegated.

Source: Adapted from Continental Oil Company, General Authority Limitations, Summary Chart ([mimeographed]; Houston, 1962-1963), pp. 1, 6-8.

Appendix F

CONTINENTAL OIL COMPANY LIMITATIONS ON AND AUTHORITY OF REGIONAL PERSONNEL IN THE SOUTHERN REGION[1]

Throughout Continental Oil Company's organization, the philosophy of delegation of authority to the lowest feasible level prevailed. Its manifestation at the regional level, as related to requests for capital expenditures (A.F.E.'s), is illustrated by the following excerpts from a company manual:

> For the purpose of this document, the term "regional department managers" refers to:
>
> Regional Manager of Marketing (or Assistant)
> Regional Manager of Exploration
> Regional Manager of Production (or Assistant)
> Regional Manager of Transportation
> Regional Manager of Personnel Relations
> Manager—Lake Charles Refinery
> General Attorney
> Regional Coordinator of Reserves and Production Acquisitions (or Assistant)
>
> Regional personnel may give final approval to any transaction affecting their respective departments, if such action is consistent with policies, plans, and procedures established by headquarters departments within their respective fields, by the regional general manager, or by their regional supervisors, and is not limited by the General Authority Limitations, this statement of authority limitations, or the Policy Guide.

General

> No matter requiring the joint approval of any headquarters office and the regional general manager shall be submitted to the headquarters office without prior approval of the regional general manager.

[1] Continental Oil Company, *Limitations on and Authority of Regional Personnel—Southern Region* ([mimeographed]; Houston, March 11, 1963), pp. 1, 5–9.

Redelegation

The assistant regional general manager may act as alternate to the regional general manager in approving various types of transactions in accordance with the General Authority Limitations.

Authorities delegated herein to regional department managers may be redelegated to appropriate levels within the respective departments except where specifically stated otherwise.

Delegations of authority by regional department managers to their subordinates must receive approval of the regional manager prior to publication.

Budgets

All budgets to be submitted to the headquarters office require prior approval of the regional general manager. This also applies to long-range forecasts or plans requested by the headquarters office.

Capital Items

All capital items must be covered by approved capital commitment budgets, either as specific budget items, by unallocated budgeted funds, or by contingency funds.

Authorization for Capital Items

Regional department managers may authorize and proceed with capital projects provided that:

1. An A.F.E. has been approved for that specific project.

or

2. The total amount of the project does not exceed $1,000 and a blanket A.F.E. has been approved for such miscellaneous projects costing less than $1,000 each except that Production Department projects are limited to $2,500 each.

Regional department managers may approve A.F.E.'s for capital items or projects as follows:

1. *Drilling Wells.*
   a. A.F.E.'s for allocated, unrestricted, budgeted (includes interim budget) wells may be approved by the regional department manager within whose field of responsibility the well falls. In the case of exploratory wells, it shall be the responsibility of the regional Production Department to furnish well cost estimates, casing programs, and plans for drilling procedures.

b. A.F.E.'s for unallocated, approved, budgeted wells may be approved by the regional department manager within whose field of responsibility the well falls provided that:
   (1) Continental Oil Company's share of the cost is not greater than $75,000.
   (2) Sufficient funds remain in the region's allotment of unallocated drilling budget.
   (3) Wells meet requirements specified by the appropriate headquarters vice-president and the regional general manager.
   (4) Copies of A.F.E.'s in this category are furnished the regional general manager.

2. *Dry Hole Contributions.*

The regional manager of Exploration may approve A.F.E.'s covering dry hole and bottom hole contributions provided they are in accordance with action specified in the block book review, are not in excess of $20,000, and are made from funds allocated to the region by the vice-president, Exploration.

3. *Acquisition of Oil and Gas Leases.*

The regional manager of Exploration may approve A.F.E.'s for acquisition of oil and gas leases provided that the leases are within specific geological areas, do not exceed $75,000, and are in accordance with the budget year program approved by the vice-president, Exploration. Commitments must be made from funds allocated to the region by the vice-president, Exploration.

4. *Marketing Facilities.*

The regional manager of Marketing is granted authority for approval of unrestricted allocated funds as follows:

a. *Plant Additions and Major Improvements Projects.*
   (1) Each project must provide an indicated aftertax rate of return of 8 percent for plant additions and for major improvements. [Based on Controller's Department Bulletin No. 8.]
   (2) Allocated bulk-plant relocation funds may be used only for the projects specified in support of the budget proposal.

b. *Miscellaneous Projects.*

Each retail outlet and bulk-plant improvement project approved must pertain to an outlet not on the current "Below Standard List" [issued by Marketing Economics], unless it is fully reported and documented that such improvement will immediately so enhance results that the outlet will be eligible for removal from the "Below Standard List."

5. *Unallocated Miscellaneous Investments.*

Regional department managers may approve A.F.E.'s for unallocated miscellaneous investments provided that there is sufficient uncommitted balance in the contingency or unallocated portion of the budget and that individual A.F.E.'s do not exceed the following amounts:

Production	$20,000
Other Departments	5,000

6. *Other Capital Investments.*

Regional department managers may approve all other A.F.E.'s for allocated, unrestricted, budgeted capital expenditures except for acquisition of marginal producing oil and gas leases for secondary-recovery purposes.

7. *A.F.E.'s in Excess of Amounts Specifically Budgeted.*

All A.F.E.'s in excess of amounts specifically budgeted require submission to the regional general manager.

8. *A.F.E.'s Which Are Overexpended.*

Expenditures which are anticipated will overcommit an A.F.E. require preparation and submission of a supplemental A.F.E. to the regional general manager when the amount of the overexpenditure exceeds the following:

a. For drilling wells—5 percent, but not less than $10,000.
b. For furniture and office equipment—10 percent, but not less than $500.
c. For all other projects—5 percent, but not less than $4,500.

9. *Cancellation of Approved A.F.E.'s.*

Regional department managers may authorize the cancellation of those A.F.E.'s to which they gave final approval. All other A.F.E. cancellations must be submitted to the regional general manager.

Written authority limitations also were passed downward by the regional department managers, based on the designated scope of their activities, and based on their authorizations to redelegate. However, redelegations by regional department managers required the approval of the regional general manager.

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