A SUGGESTED MODEL FOR THE MANAGEMENT OF A SEA GRANT INSTITUTIONAL PROGRAM

Prepared by
DONALD EUGENE WALSH
Sea Grant Program Office
Texas A&M University

TAMU-SG-70-213

June 1970

A SUGGESTED MODEL FOR THE MANAGEMENT OF A SEA GRANT INSTITUTIONAL PROGRAM

by

Donald Eugene Walsh

Partially Supported by the National Science Foundation
Sea Grant Program
Institutional Grant GH-59 to
Texas A&M University

Sea Grant Publication No. TAMU-SG-70-213

June 1970

ABSTRACT

This study was based on the results of a fact-finding questionnaire survey and on management theories applicable to all-university type programs. One hundred percent of the Sea Grant Institutional Program directors responded to the questionnaire.

One of the purposes of the model was to provide program directors a suggested means to identify elements existing in a university on which the nucleus of a Sea Grant Program can be built. A second purpose was to suggest some possible techniques for setting objectives and evaluating their attainment. A written evaluation checklist was prepared, tested, modified as a result of the test, and presented as one of the results of the study. Another of the purposes of the study was to suggest some ways of encouraging faculty and student identification with the objectives of the program.

Means of administration control is a key element in program management. The study sought to identify the administrative problems and needs of the Sea Grant institutional program. The model offers a number of suggested techniques for control. Committee assignments to perform several control functions are recommended. Yet the model recognizes that many control functions are more appropriately conducted by an individual coordinator, and suggests ways of control by coordination. These coordinative functions are

based on a set of management propositions recently formulated by James D. Thompson which appeared to be especially applicable to this study. Then, based on the suggested control mechanisms, two administrative structures for the program office were formulated. This formulation began with the placing of the program directorate in what appeared to be the most appropriate location in the university hierarchy and worked downward through the two suggested administrative structures. The two structures were based on: (1) a subject matter formulation and (2) a functional formulation. The functional formulation was recommended for immediate implementation because universities had tended to cling to a departmentalized structure. Subsequent conversion to a subject matter formulation was recommended because of the interdisciplinary nature of the program.

ACKNOWLEDGEMENTS

This study was partially funded by the National Science Foundation Sea Grant Program institutional grant GH-59 made to Texas A&M University. This support is gratefully acknowledged. The writer also wishes to thank the program directors of the eight institutional grant and five coherent project grant institutions for the information they provided in response to the questionnaire used in the study. Without this information the study would have been much more difficult to do.

Dr. John C. Calhoun, Jr., Sea Grant Program Director at Texas A&M University was most generous in the contribution of his time and effort in support of this study. This guidance and counsel was sincerely appreciated and is gratefully acknowledged.

TABLE OF CONTENTS

Chapter | Page

CHAPTER I

INTRODUCTION

The purpose of this study was to define the major problems inherent in the management of Sea Grant Programs and to develop a model that would allow for the effective and efficient management of such programs within a departmentalized university structure. There are a number of other all-university programs for whose management this model might serve as a guide.

The Nature of the Problem

The Sea Grant Institutional Program is one example of the unusual new programs that have begun to appear on the academic horizon. The distinctive aspect of this program, as compared to most other university programs, is its broad multidisciplinary scope. In its fully developed extent, the Sea Grant Program encompasses activities in graduate and undergraduate education, technician training, research, information collection and dissemination, and extension and advisory service for marine resource development.

A few other university programs of a similar nature have come into existence in the last few years. Examples are Water Resources Institutes, Transportation Institutes, and Institutes of Urban Affairs. Each of these programs draws upon the expertise of a wide

---

The citations on the following pages follow the style of the Journal of Educational Research.

range of academic disciplines. Each program is faced with problems of coordination, control, and management of a magnitude not ordinarily encountered by university administrators. It is precisely the multidisciplinary nature of these programs that creates the problem for university administrators.

Researchers in the administration of higher education have thoroughly explored most of the problems inherent in the management of departments, of schools and colleges of the university, and of the university itself. A search of the literature failed, however, to uncover any report of investigations related to managing all-university programs that cut across the traditional structures of academic administration.

Each of the activities included in the Sea Grant Program--Education and Training, Extension and Advisory Services, and Research--has many common elements of management, but each has many that are unique to the particular activity. For example, the literature contains extensive coverage on the management of extension service programs and much has been written recently about the management of research programs.

This study identified the elements common to the management of all these activities, considered as separate entities. It then identified those elements that were unique to an all-university program which combined all the activities into a unified whole. Stated broadly, these were the objectives of this study.

The Nature of the Model

The development of any suggested management model, if it is to have credence, must be based on accepted management theory. There are a number of theories of management currently in vogue in the United States. Two of these theories represent the opposite poles of thought and were identified by Gouldner (15) as the rational model and the natural system model. The rational model was viewed by Gouldner as identifying the organization as an "instrument"--a means to the realization of group goals. Its structures are tools for the realization of group purposes. The structures are deliberately manipulated to match group purposes and to improve the level of efficiency of the organization. The rational system utilized codified procedures for decision-making. The rational model tended to ignore the environment in which the organization functions.

In contrast to the rational model pattern, the natural system model focused on the maintenance of organizational equilibrium or stability. The natural system model considered the environment surrounding the organization and the need for the organization to interact with and receive support from that environment. Most writers agreed that striving for equilibrium and survival may lead to goal distortion or neglect, and that changes in structure in the natural system view of organizations will be unplanned, adaptive responses to perceived threats to the equilibrium of the system. The parts of the

system were viewed as interdependent. Threats to the stability of one of the parts were viewed as a threat to the whole.

A recent model, developed by Thompson (49), successfully merged these two models, referred to by him as the closed and open system models respectively, into a unified system. Thompson's system had a number of elements pertinent to the model to be developed herein and will be explored in more detail in a later section.

His approach largely treated organizational structure without dealing in any detail with the problems of program loyalty, evaluation or administrative control. A structure for the management of an organization is important, but to design such a structure, one must first come to grips with such questions as loyalty, objectives, evaluation and control. Following this, the structure that will effectively and efficiently cope with these problems can be designed.

The Nature of the Research

The implementation of any research project should be preceded by a search of the literature to determine (1) the existing state of the art and (2) whether any previous research has been done on the same subject. A literature search regarding the present problem revealed that a significant body of knowledge existed to provide a sound theoretical base. From this base it was possible to build a workable model that would appear to have relevance in university administration.

The literature search failed to find a model that would serve the needs of the university administration in the management of all-university programs such as the Sea Grant Program. The model growing out of this research considered both the philosophy and the practicability of loyalty, evaluation, control, and other factors. To re-emphasize an earlier point, these factors were especially critical to an activity that cut across the traditional lines of administration among academic-discipline oriented units.

In addition to the theoretical framework for program management that has been designed and is reported herein, a number of practical application techniques and instruments were developed as a part of this research. The application of these was also tested and is reported here. Among these were an annual evaluation questionnaire, a program of small group seminars, some suggested techniques for encouraging loyalty to the objectives and goals of the program, and a position paper on program focus. These techniques and instruments were designed to get at the goal-oriented elements of program management.

Other elements of program management are organization-oriented and are most amenable to solution based upon that part of the theory dealing with organizational structure. These elements are control of a program superimposed upon discipline-oriented units, the program administration hierarchy, and the proper location of decision points within the hierarchy to assure effective operation of the program.

One other test instrument was designed and used in this research. This was a questionnaire (See Exhibit I of Appendix I, page105.) that was devised by the author and distributed to all Sea Grant institutional program directors, all Sea Grant coherent project directors*, and to the directors of two other all-university programs. The latter two were utilized as a test of the usefulness of the model to non-Sea Grant applications.

The questionnaire itself was designed to determine as much as possible about the techniques of management employed by other all-university program administrators. The purpose was to incorporate those which appear to be consistent with management theory into this model.

One cautionary note must be stated. The writer acknowledges that operational policies and philosophies vary among universities, and that a single management model will not necessarily fit every university. Accordingly, although the final result of this study is a single model, sufficient alternative strategies were examined and reported to allow some selection of alternatives.

The all-university program must also be designed and managed in a way that meets the goals and objectives of the sponsoring organization. Such sponsors may be federal, state, municipal, or private organizations. In the case of the Sea Grant Program, the

---

*The meanings of the terms institutional grant and coherent project grant are given in Chapter II.

sponsor is the National Science Foundation Office of Sea Grant Programs. Since the objectives of individual Sea Grant Programs must be consistent with the objectives of the Office of Sea Grant Programs, the next section will explore the philosophy and objectives of that Office in considerable detail.

CHAPTER II

BACKGROUND OF THE NATIONAL SEA GRANT PROGRAM

The National Sea Grant College and Programs Act of 1966, Public Law 89-688, October 16, 1966, amended the Marine Resources and Engineering Development Act of 1966 by adding at the end thereof the new title: "Title II - Sea Grant Colleges and Programs." This title was designed to encourage colleges and universities, among others, to "achieve the gainful use of marine resources," through the vehicle of support of research, education and extension and advisory services in marine resources. Operational responsibility for the Sea Grant Program was given to the National Science Foundation by the act. A copy of the act, Public Law 89-688 (51), as published by the Government Printing Office, is reproduced as Exhibit II in Appendix II, page 135.

Program Initiation

In the introduction section of the National Science Foundation pamphlet NSF Pub. 67-18, Suggestions for Submission of Proposals (32), it is stated that the Foundation shall exercise its authority under the act by:

> initiating and supporting programs ... for the education of participants in the ... development of marine resources;
>
> initiating and supporting necessary research programs ... applicable to the development of marine resources and,

> encouraging and developing programs consisting of instruction, practical demonstration, publication, [etc.], ... through marine advisory programs with the object of imparting useful information to persons currently employed or interested in the various fields related to the development of marine resources; the scientific community and the general public.

To implement the Sea Grant Program and carry out the provisions of the Act, the Foundation established the Office of Sea Grant Programs as a separate office within the Foundation and named Mr. Robert B. Abel as Program Director.

Program Implementation

For operational purposes the National Science Foundation originally established two separate elements, Sea Grant institutional support and Sea Grant project support. The former is placed with institutions engaged in comprehensive marine resources programs that include research, education and advisory services. Institutions selected for this form of support are to provide leadership and scientific and technological resources for marine activities within their regions.

Sea Grant Project support has the purpose of aiding individual projects in marine resource development. In general, these projects are single, well defined activities in one of the three areas of research, education, or advisory services. Subsequent to the original announcement of the program, an intermediate category, the coherent project grant, was initiated. In general, this form of grant is

reserved to those institutions engaged in depth in two or more of the project areas.

The National Science Foundation (32) is also authorized to designate Sea Grant Colleges. A Sea Grant College is "an institution of higher education ... which has major programs devoted to increasing our Nation's utilization of the world's marine resources." The Foundation may designate as Sea Grant Colleges "institutions which have demonstrated sustained excellent performance along a broad front and have received some support under the Act." The Foundation currently is reported to be working to establish criteria for Sea Grant College designation.

Within the two support divisions, the three areas of activity are research, training, and extension services. Research may be of two kinds. The first of these is research designed to obtain knowledge essential to reach the practical goals of the program. The second kind of research seeks to establish the feasibility of techniques for marine resources utilization. The emphasis in both forms of research is on applied projects.

Marine advisory programs have the objective of collecting, assimilating, and transmitting useful information to users. This information is to be made available to persons employed in fields related to marine resources development.

Training programs may be of four kinds. The first of these is technical training. This is a program of training extending one or two years beyond the high school level. Second, there is an

element of the program to provide for four-year college training beyond the high school level. The third form is vocational continuing education. Finally, there is an element for graduate scientific and engineering training in related fields.

In carrying out the provisions of the Sea Grant Act, the National Science Foundation encourages industrial-academic research cooperation. To quote Mr. Abel (1): "This gives industry an opportunity to triple the funds it has available" to develop a given device, product, or process. Industrial participation serves two other purposes. It helps to assure a commercially valuable end-product and it helps the institution to meet the one-third matching obligation.

The National Science Foundation encourages cooperative programs between institutions and state and local agencies. This helps to assure the responsiveness of the institution to the needs of the state and local area.

Selection Criteria

The Foundation established some broad criteria for a university seeking an institutional grant in NSF Pub. 67-18. According to that booklet (32):

> Any suitable institution may apply for Sea Grant Institutional support. Criteria on which awards will be based include the following:

> A history of significant marine-related activities in research and education, and demonstrable success of those activities.
>
> Availability of the necessary facilities for conduct of the Sea Grant Program, including laboratories, ships, docks, etc.
>
> A capacity and an intention to adopt the Sea Grant Program as a major goal, as demonstrated among other things, by the full commitment of the responsible senior officials to the program.
>
> A staff recognized in the marine community for leadership and scholarship.
>
> Ability to match the Federal contribution by providing at least one-third of the cost of Sea Grant activities.
>
> Capacity for growth and the ability to plan and execute a complex program of high quality.

In addition to these, the standard National Science Foundation and federal regulations, as criteria, also apply.

In making application for a project grant the institution, institute, laboratory, public or private agency must also meet certain criteria (32), including the following:

> The merit of the project and its potential for contributing to objectives of the National Sea Grant Program.
>
> The proposing institution's demonstrable competence and experience in the project field, or in a closely related field requiring approximately the same competence and experience.
>
> The full commitment of responsible officials of the institution to a <u>well managed</u> project [emphasis added].
>
> The qualifications of the Principal Investigator (in the case of a research project) or of the Program Manager (in the case of an education or advisory project).

Availability of the necessary facilities for conduct of the project.

Ability to provide at least one-third of the project cost.

It is apparent from both these sets of criteria that the purpose is not to build new programs at universities with no marine science background, but to build upon and strengthen existing programs. The responsibility to show a commitment to the objectives of Sea Grant falls to the university. This commitment is stated in the institutional proposal and is backed up by a "show of strength" at the time of the visit of the site selection committee. The university is encouraged to show in its proposal that it has invited the participation of industry, other universities and state and local agencies both in planning and participation.

It is because of this careful screening of proposals in advance of grant award that the National Science Foundation can state, in the case of institutional grants, that the intent of the Foundation is continued and continuing support of each such grant. This sustained support is conditional only upon continued evidence that the university strongly supports the objectives of the Sea Grant program, that the program is efficiently managed and operationally effective, and upon congressional appropriations.

It is imperative, then, that the university not only be committed to the development of marine resources, but that it effectively and efficiently manage the personnel and other input resources that it

commits to the program. It is to the ways and means of efficient and effective management of these resources that this study is directed.

Implications for University Programs

The preceding overview indicated something of the flavor of the Sea Grant program as established by the National Science Foundation. Out of this review can be seen certain broad implications of the program to a university interested in qualifying for an institutional grant. Some of these implications were specifically stated in the criteria established by the Office of Sea Grant Programs. Others can come only from a closer acquaintance with the program.

The requirement of a federal/university matching ratio of 2:1 was mentioned. This is a total program requirement. The matching is not on an item by item basis, or even a subject by subject basis. Accordingly in reviewing both proposals and programs, the staff of the Office of Sea Grant Programs reviews not just the expenditures of the federal funds, but also the university matching. The review is not solely budgetary, but also programatic.

The interdisciplinary nature of the Sea Grant program has been mentioned, as has the tripartite form; research, education and extension, of the institutional program. The latter of these is clearly parallel to the land grant university concept. The organizational and operational form of such programs is well established at the university level. Two of the chief complications in managing

the program are its interdisciplinary nature, and the management of the land grant aspects of the program.

The institutional grant initiated by the office of Sea Grant Programs was the factor that gave rise to the whole question of program management. The project type grants could readily be integrated into existing university management. The institutional grant was too large from the funding and personnel points of view, and too complex because of its interdisciplinary format to be integrated into the existing departmentalized structure of a university. The prospect of designation of Sea Grant Colleges was likewise a factor in the need for a sound management model for this all-university program.

Other factors that were important in the design of the model were the institutional project funding level (about $500,000, average), the span of activities covered, and the involvement of other universities in joint projects. Sea Grant institutions may be engaged in studies in fisheries and aquaculture, marine commerce, law, recreation and tourism, sediment analysis, pollution abatement, coastal engineering, port and harbor problems, and many other areas of problem definition, research, education and advisory services.

CHAPTER III

THEORETICAL CONSIDERATIONS

For simplicity of presentation, the theoretical framework of the model as developed herein has been divided into two parts. In the first part after a brief review of the history of the development of modern organizations theory consideration was given to the theoretical foundations of the concepts of organizational goals and objectives, the setting of objectives and evaluation of their attainment, and the encouraging of loyalty of participants to program goals. Following this, part two considered the design of a structure to manage the organization effectively and efficiently.

It is recognized that this separation is somewhat arbitrary since the organization should function as a unified whole. It is the belief of this researcher, however, that the managers of an organization should have a sound conception of what the organization is to accomplish before setting out to design a structure to manage it.

Theoretical Framework for the Model - Part 1

Because of the complex nature of an all-university program such as the Sea Grant Program, the works of writers from a number of fields of endeavor had to be reviewed for background, scope, and conceptualization. These writers tended to report the results of their research in a wide selection of journals ranging through, but

not restricted to, such publications as The Education Administration Quarterly, The Administrative Science Quarterly, the Journal of Cooperative Extension and the Journal of the American Society for Engineering Education. Writers from the areas of specialization represented by these journals have some interest in management theory. That management theory had become of interest to a broad spectrum of disciplines was apparent from the large number of new books on the subject then present on library shelves.

One of the more recent books on management theory is James D. Thompson's (49) Organizations in Action. The elements of organization theory presented in this section borrowed from this work, although the writings of many other researchers on organizations were integrated into the model.

Modern Organization Theory

Modern theory of organization can be thought of as beginning with Max Weber's treatise on Bureaucracy (56) and Frederick Taylor's scientific management theory (47). Weber's writings have more relevance to public administration and Taylor's to assembly line manufacturing than either has to university management.

After the development of these theories, a period of time followed during which a number of theories began to come into existence. The majority of these theories was aimed at the management of specific kinds of organizations. During this period emphasis was placed on educational administration, industrial management,

research management, hospital administration, hotel management, and others. More recently management theorists have begun to realize that all these management theories have too much in common to be kept separate. This attitude is exemplified by Halpin (18:66) who has written, "despite certain content differences, such areas as educational administration, business administration, public administration and hospital administration ... share a significant common core." It was this philosophical assumption that determined the approach taken in this study, i.e., the review of literature from a number of journals representing diverse points of view.

The Establishment of Goals and Objectives

The existence of any organization assumes the pre-existence of a set of organizational goals. It is almost axiomatic that at least a generalized goal or set of goals will exist, which leads to the creation of an organization to attain these goals.

It is a fairly common occurrence for the broad goals of an organization to be established for the organization by a higher authority. In the case of the Sea Grant Program there were two major superordinate goal setting organizations, the NSF Office of Sea Grant Programs and the university administration. The goals of each of these should be considered by the Sea Grant program director in setting program objectives. There were other groups who must sanction the established objectives. These included the university faculty and the clientele to be served.

In order to establish workable short- and long-term objectives, the program director needs to formulate a focus for the program. This focus should generally delimit the action areas and the groups involved in the accomplishment of the objectives to be attained. A staff paper on the focus of the Texas A&M University Sea Grant Program, prepared by this author, is reproduced as Exhibit I of the Appendix II, page 117.

This study concentrated on the setting of specific objectives rather than the broad institutional goals of the superordinate organizations. Further, since modification of objectives and relative intangibility of objectives are fairly common phenomena, these subjects also are discussed.

A Definition of Organizational Goal

Herbert A. Simon (40), defined organizational goals as "constraint sets that define roles at the upper levels of the administrative hierarchy." The definition assumed a whole set of constraints that must be satisfied by the goal seeking action.

Simon also made a distinction between goals and motives. To Simon, motives were "the causes, whatever they are, that lead individuals to select some goals rather than other as premises for their decisions." He related goal setting and goal attainment to the decision-making process.

Simon shows both how goals could be used to synthesize proposed solutions, and how they could be used to test the suitability of a

proposed solution. Generally the process continued until one, or at most a very few, alternatives remained as final goals.

Thompson and McEwan (50) discussed organizational goals in relation to the environment in which the organization operates. They viewed the setting of goals as a dynamic situation in which the goals may periodically have to be changed to meet the needs of the society served (the environment), or at least the goals which society is willing to support.

A Definition of Organizational Objectives

Many writers have tended to view the terms "goal" and "objectives" as interchangeable. The purposes of this study were best served by making a distinction between these two. The program focus will grow out of the goals of the National Science Foundation. Goals are more long-term in nature. Objectives, on the other hand, are shorter-term.

Objectives, then, are defined as the short-term (one to two years) aims of a particular activity. So defined, objectives become a part of the long-term (five or more years) goals of the program plan.

Modification of Objectives and Goals

A reference was made earlier to the tendency for organizational objectives to be modified over time. Etzioni (12) treated this phenomenon in one chapter of his recent book Modern Organizations.

He discussed a number of ways in which goals come to be modified. The first of these modifications was displacement, defined as the substitution of a goal for which the organization was not orginally created. This included the organization in which the perpetuation of the organization itself becomes the central goal. The second form of goal modification was goal succession. This modification would occur when original goals had been attained and the organization sought new goals to justify its continued existence. The final modifications discussed were multiplication and expansion. These modifications would occur when an organization found its original goals to be unattainable and decided to set new goals or expand the scope of old ones.

The first of the modifications cited above is clearly a goal modification. The second might be applied to either goals or objectives. The last two, multiplication and expansion, would most likely occur in regard to the modification of objectives.

Some modification of objectives is certain to occur, and such modification is usually acceptable. Goal modification is more often harmful to the organization, especially in the form of displacement.

Intangibility of Objectives

One of the best recent studies of the intangibility of organizational objectives is that of Warner and Havens (55). These authors titled their publication "Goal Displacement and the Intangibility of Organizational Goals." Much of their discussion referred, however, to what has been defined for purposes of this study, as objectives.

Warner and Havens defined displacement as the neglect of major goals (goals) in favor of goals (objectives) associated with building or maintaining the organization. They cited intangibility of goals as the primary reason for such displacement, or means-ends inversion.

Intangible goals would allow the accomodation of diverse objectives and facilitate flexibility and adaptation in pursuing new objectives. They implied that the chief difficulty appeared to arise in developing tangible objectives. The adoption of tangible objectives within more intangible goals would allow the evaluation of the attainment of objectives, and the application of appropriate sanctions, either positive or negative.

Setting Organizational Objectives

At least two lists of steps in alternative selection existed in the literature. William M. Fox in The Management Process gave a series of eight steps in setting objectives. He described these steps as the organic subfunctions of planning (14:33ff.):

> Determine key environmental factors and the interrelationships among them.
>
> Search for and identify relevant alternative objectives and determine all of the relevant possible consequences of each alternative.
>
> Determine objectives (to be subject to correction based on the results of steps 5-8).
>
> Search for and identify relevant alternatives for the achievement of objectives and determination of the relevant possible consequences for each alternative.

Assign numerical value to the consequences of each alternative.

Assign probabilities to independent consequences and order dependent consequences in a natural sequence and assign conditional probabilities to them.

Determine the expected value for each alternative (This value is the product of the numbers assigned in steps 5 & 6.).

Determine the optimal alternatives or set of alternatives in view of the objectives and risks involved.

Fox acknowledged that all of these steps frequently will not be followed in the process of setting simple objectives.

Daniel Griffiths treated the problem of steps in the decision-making process in his book Administrative Theory. While he was not specifically addressing himself to the problems of setting objectives, the steps in the process were certainly amenable to modification to that form. Griffiths' six step process (16:94) was:

Recognize, define and limit the problem.

Analyze and evaluate the problem.

Establish criteria or standards by which the solution will be evaluated or judged.

Collect relevant data.

Formulate and select the preferred solution or solutions. Test them in advance.

Put into effect the preferred solution.
a) Program the solution.
b) Control the activities in the program.
c) Evaluate the results and the process.

Evaluating the Attainment of Objectives

Once the objectives of an organization have been set, it is necessary to establish a means of evaluating the attainment of the objectives. Fox's model, discussed in the preceding section, dealt with evaluating anticipated outcomes, and the last part of Griffiths' sixth step stated (paraphrased) that the evaluation of objectives attainment is an essential step in the process of setting objectives. Neither of these, however, offered any definitive evaluation process.

According to Thompson (49:83), evaluation of objective attainment may be divided into four different categories, depending upon the degree to which the organization knows (a) what it wants to do and (b) how to go about doing it. If the evaluator has a well crystallized understanding of the standards of desirability for the objective (what to do), and believes he has complete knowledge of how it should be done, an efficiency test is in order. If what needs to be done is known, but the way to do it is not clear, effectiveness is the appropriate criterion (Have the desired outcomes been attained.). Finally, if what needs to be done is not explicitly understood, but the organization believes that it knows how to attack the problem, the evaluation of attainment of the objective is judgmental, and the criterion is a comparison of the outcome to the results attained by similar organizations. In the last case, where the task is not clear and the means of accomplishment is unknown, attainment is not subject

to logical measurement. Thompson declined in his book to even deal with this case.

Evaluating the attainment of the objectives of a program is a direct function of the organization. Few evaluation schemes have broad applicability; and although a number of evaluation checklists exist in the literature, these were not explored in this study. An evaluation checklist developed by this author for the Texas A&M University Sea Grant Program is discussed in Chapter V, and is reproduced as Exhibit II of Appendix I, page 113.

Faculty and Student Loyalty to the Program Mission

Loyalty is not a unitary concept; it is made up of many elements. Unless defined in the context in which it is to be used, it can easily be misunderstood. For the purposes of this study, loyalty will be defined as a sense of identification with the goals and/or objectives of the program through its mission orientation. Throughout this paper the terms "loyalty to" and "identification with" the objectives of the program mission have been used synonymously and interchangeably to refer to the same phenomenon.

The elements of loyalty come out of the past experiences of an individual, out of his perception of the present situation, and out of anticipated future events. Inevitably, the individual sees some value accruing to himself as a result of his loyalty. An early, rather simplistic view of loyalty indicated that man "traded" his services and his loyalty to his employer for his salary. In the view

of most modern writers, however, monetary reward is of secondary importance as long as salary is adequate for the service performed (35).

In research from an industrial setting, Rensis Likert (24) found that high-loyalty groups differed from low-loyalty groups in ways that formed a consistent pattern. He reported that high-loyalty groups had greater identification with their group and a greater feeling of belonging to it; had more friends in the group than outside it; had better interpersonal relations among the members of the work group; had a more favorable attitude toward their job; and not only had higher production goals, but produced more with less sense of strain or pressure. Likert indicated that group leaders created a climate in which loyalty to the goals of the organization was developed. The employee-centered leader tends to stay sufficiently close psychologically to workers to be able to see problems through the eyes of the workers. Such leaders are better able to develop good group loyalty. Open communication permits activity leaders to understand problems as employees see them and to interpret for program management the operations-level point of view.

The examination and proposal review process in the Sea Grant program is one mechanism whereby activity leaders are involved in decisions which openly show the functions and responsibilities of their total work group. At this point in the decision-making process, (where hope, disappointment, and compromise often merge) it is critical that the activity leader understand how a particular research, education, or extension segment fits into the complete proposal

package for that year. It is important for supervisors to accept the goals of the over-all organization and to have a clear understanding of the function of their activity group in achieving goals through immediate objectives.

Since high group loyalty and a good team spirit seem to result in more productive work and greater job satisfaction, it is important to ask, "How can group loyalty be developed?" Scattered research in industry and elsewhere indicated that the commonly recognized methods of group leadership yielded good group loyalty. Berelson and Steiner in Human Behavior, An Inventory of Scientific Findings (5:363-81), developed a compilation of research findings and related generalizations. Their work on organizations and leadership is a benchmark effort but only a portion of it relates specifically to identification of organization members to organization goals. They suggested, however, that the efficiency of a large formal organization is enhanced when its chain of communication is tied into the informal network of groups within the organization so that the network can be used to support the organization's goals. The individual's feeling that he is a part of a respected group which is in effective contact with an agent of the organization and which has his views taken into account--that feeling is highly desirable from the standpoint of the organization as well as the individual's own morale.

An early industry experiment by Coch and French (8) indicated that group involvement and participation were usually beneficial at all levels in an organization and such participation tended to have

a positive effect on morale and productivity. Their research strongly suggested the necessity for involving group participation in decisions affecting the group. Most subsequent research tended to support that view.

Likert (24:236) suggested that as research results are looked at in an over-all manner, an important conclusion on the nature of human motivation can be made. He suggested that every individual earnestly seeks a secure, friendly, and supportive relationship and one that gives him a sense of personal worth in the face-to-face groups most important to him. Usually the most important face-to-face groups are the individual's immediate family group and his work group. Individuals seem to seek recognition and a sense of importance in terms of the values and goals with which they identify and which their most important face-to-face groups also cherish. People seek to achieve a sense of importance from doing difficult but important tasks which help to implement goals which they and their close associates seek. Thus, loyalty deals with an intangible attitudinal component which bears upon a more tangible working productivity.

The inducements/contributions theory of March and Simon (28) while not addressed specifically to loyalty, had some interesting elements which have application to the subject. According to those authors, the inducements/contributions contract prescribed some of the behavior of the individual in the organization. The contract also specified the reward for the contribution. Yet the agreement was more than a one for one exchange; it had long-term as well as

short-term implications. The association of an individual with an organization affords the individual an opportunity to learn and an opportunity for visibility. These clearly can function as rewards for loyalty, or as inducements to loyalty.

Theoretical Framework for the Model - Part 2

In the initial part of this chapter, attention was focused on what might be described as the non-structural elements of management theory. In this part, the focus is more on the structural elements that must be incorporated into the model for management of the program.

Administrative Control of the Program

Many managers think of control of organizations largely in terms of fiscal control. This form is relatively easy to exercise, and more importantly, is relatively easy to assess for effectiveness and efficiency. It is not, however, the only element of organizational control, and perhaps not even the central element.

Management control has been defined by Mockler (29) as "a systematic effort to compare performance to predetermined standards, plans or objectives ... to determine whether performance is in line with these standards ... and to take any remedial action required to see that ... resources are being used in the most effective and efficient way ... ." Hence by this definition, any organizational resource is subject to control. The problem then, for this study,

was to examine those resources of a university that provided inputs into a Sea Grant Program and delimit the form and content of the necessary and sufficient control. The definition also emphasized the importance of evaluation, planning, and decision-making in the control process. Evaluation and decision-making theory were considered important enough to be treated separately in an earlier section. The planning and fiscal aspects of control were best explained in terms of the recently developed Planning-Program-Budgeting System.

Planning and Fiscal Control

The Planning-Programming-Budgeting System (PPBS) was developed to its present degree of sophistication in the United Stated Department of Defense. The techniques of PPBS go back further into history than the time of their adoption by the Defense Department but the adoption of PPBS by that department has done much to popularize the system.

The conceptual framework for the system has been described by Smithies (45) as follows [The framework as stated in the original was in terms of government, and has been paraphrased to describe a university program]:

> Appraisals and comparisons of various program activities in terms of their contributions to program activities.
>
> Determination of how given objectives can be attained with minimum expenditures of resources.

> Projections of program activities over an adequate time horizon.
>
> Comparison of the relative contributions of individual project or departmental activities to program objectives.
>
> Revision of objectives, programs and budgets in the light of experience and changing circumstances.

Further the PPBS technique provides:

> A mission-oriented program structure which carries out continuing in-depth analyses by permanent specialized staffs of the program's objectives and its activities to meet these objectives.
>
> The existence of a multiyear planning and programming process ... in meaningful categories for [decision-making].
>
> The existence of a budgeting process which can take broad program decisions, translate them into ... decisions in a budget context and present appropriate program and financial data for program director action.

Again according to Smithies (paraphrased), the overall system is designed to enable each program to:

> Make available to top management more concrete and specific data relevant to broad decisions.
>
> Spell out more concretely the objectives of programs.
>
> Analyze systematically and present for review and decision possible alternative objectives and alternative programs to meet those objectives.
>
> Evaluate thoroughly and compare benefits and costs of programs.

> Produce total rather than partial cost estimates or programs.
>
> Present on a multiyear basis the prospective costs and accomplishments of programs.
>
> Review objectives and conduct program analyses on a continuing, year-round, basis instead of on a crowded schedule to meet budget deadlines.

In a recent article in Datamation, Hitch (19) gave the following explanation of PPBS elements:

> Programming ... is organized by programs rather than by objects of expenditure as traditional budgets are. Or ... by outputs which are objective-oriented rather than by inputs. ... But there is a second characteristic of programming, namely, that the program extends far enough into the future to show ... the full resource requirements and financial implications of the program outputs.
>
> The second [technique] ... systems analysis ... is explicit, quantitative analysis, which is designed to maximize or at least increase the value of the objectives achieved by an organization, minus the value of the resources it uses.

The PPBS technique has been broadly adopted by the federal government but not so broadly adopted by state governments or universities. The NSF Office of Sea Grant Programs required a modified form of program budget presentation in Sea Grant proposals. The Planning-Programming-Budgeting System appeared to be very useful in allowing for program office control of those aspects of program operation.

Administrative Structure for the Program

The last remaining theoretical factor for the model was the problem of an administrative structure for the management of the program. The Sea Grant Institutional Program was an integrated program, established to deal with a very complex problem. As pointed out in Chapter II, the program encompassed educational, extension, and research activities. These covered the fields of marine biology, geochemistry, marine engineering, economics and business, marine law, aquaculture, and a host of other fields. Project leaders and program office staff dealt with educators, industrialists, fellow scientists, laymen, school children, government agencies, municipal groups, and, perhaps most importantly, with each other in a multi-disciplinary format. Further, the organization had to be structured to allow it to carry out all the functions described in this study.

Thompson, in the work cited earlier, described a system such as the Sea Grant Program as a mixed open and closed system, having elements of each type contained within it. He seemed to have successfully brought the two systems together into a unified whole. Accordingly, his system, parts of which are described in the following pages, formed the theoretical basis of the organizational structure to be proposed.

A Generalized Organizational Form

Thompson began his description of the organization by recalling Parson's suggestion (49:11ff.) that organizations had three distinct levels of responsibility and control--technical, managerial and institutional. The managerial level administered the technical level by deciding such matters as the broad technical task which was to be performed, the scale of operations, and employment policy. It also serviced the technical suborganization by mediating between the technical suborganization and the users of the product and by procuring the necessary resources for the technical suborganization. The institutional level acted to legitimize the organization to society [the environment]. The technical suborganization had to be as free as possible from the need to interact with and be dependent on the environment surrounding the organization. This purpose was served by the managerial and institutional level but had to be augmented by a boundary spanning component. This boundary spanning component could be thought of as operational specialists such as purchasing agents and salespeople, to use two simple examples. One of these is clearly on the input side while the other is on the output side of the organization. A Sea Grant institutional program had all three of these levels, as did nearly all organizations.

Types of Technology

A number of writers have recognized three basic types of technology; long-linked, mediating, and intensive. Long-linked technology is most clearly depicted by the automobile assembly line. An example of a mediating technology given by Thompson was the commercial bank which links depositors and borrowers. Intensive technology was illustrated by the general hospital. A client of this organization may simultaneously need the services of the pharmacist, radiologist, dietician, physician, the laboratory technician and a number of others.

An organization may have more than one form of technology operating. The Sea Grant Program for example was composed of at least mediating and intensive technologies. The technical core was only an incomplete representation of what the organization had to do to accomplish the organization's objectives. The boundary spanning components, and the managerial and institutional levels had to be present to mediate between the technical core and the environment. These groups functioned to manage the dependencies of the technical core on the environment.

Organizational Design

Many organizations wish to incorporate into themselves other activities which could function independently, although perhaps not as well. Sometimes these functions could be omitted from the

organization without damage to its major mission. For example, a number of different research activities might be excluded depending on what is viewed as the major mission.

Thompson also made two other points relevant to this discussion. The first was that organizations with capacity in excess of what the task environment supports would seek to enlarge their domain of activity. The second was that the decision to incorporate certain activities into an organization required a commitment to a host of supporting facilities and services which may be costly. The first point illustrates why the cooperative extension service and community colleges are interested in the Sea Grant Program. The second point illustrates why universities with a Sea Grant Program are interested in cooperative extension and community college cooperation.

Structures for interdependencies

A number of interdependencies exist and/or should be encouraged in a program like Sea Grant. The need to integrate research discoveries into classroom lectures, and to transmit research discoveries to marine users by way of extension specialists are examples of such interdependencies. In the latter case, of course, the extension specialist is a boundary spanner. These interdependencies might be classed as what Thompson called a pooled interdependence, although they have elements of sequential interdependence.

Thompson identified three types of interdependence. The most complex of these was reciprocal interdependence. This refers to the

situation in which the outputs of each activity become inputs for the others. The activities of an airline are illustrative of this interdependence. The operations unit takes aircraft and uses them. This creates a product for the maintenance unit, which services the aircraft and returns it to the operations group. There are pooled and sequential aspects to this as well.

Sequential interdependence was the next simplest form. Here, activity B takes the product of activity A, performs some operation on it and passes it along to C, and so on. Pooled interdependence is in a sense the capstone of the interdependencies. In this case, each unit or activity was interdependent on all other activities for both outputs and ultimate existence. Failure of any one unit could jeopardize the total organization.

Coordination of interdependencies

The interdependencies that exist in an organization must be coordinated. For this discussion of coordination, Thompson borrowed from March and Simon although the terminology was modified somewhat (28). The first form of coordination described was standardization. This is the establishment of routines or rules for consistent action. These rules are assumed to be internally consistent, requiring stable and repetitive situations. In the Sea Grant Program this would apply to such activities as procurement, fiscal affairs, personnel actions, proposal preparation, documentation, and publications.

The second form of coordination was by plan. This is a form of scheduling and is important for more dynamic situations such as project evaluation, integration of research results into course material, preparation of class notes for new course offerings, and similar activities. Research results themselves cannot, of course, be scheduled. This fact, and others, leads to the final form of coordination--mutual adjustment.

Coordination by mutual adjustment involved the transmission of new information during the process of action. The more variable and unpredictable the situation, the greater is the need for this form of coordination. Mutual adjustment is required for communication of research results to users, and for the communication of user needs to researchers and to classroom teachers.

These three forms of coordination may be tied directly to the three forms of interdependency. Standardization may be associated with pooled interdependence, plan with sequential, and mutual adjustment with reciprocal interdependence. Standardization required less frequent decision and less communication, according to Thompson, while planning called for more of both and mutual adjustment required the highest levels of both decision-making and communication. Although Thompson does not make note of it, coordination by trade-off might exist. Trade-off is explained most simply as "I'll help you if you'll help me." This would be a reciprocal interdependency in a sense, but appeared not to be covered by mutual adjustment.

Departmentalization and Hierarchy

Again according to Thompson, organizations would seek to group activities in a way to reduce costs of coordination and since coordination by mutual adjustment was the most costly, organizations tried to minimize the need for such coordination. He proposed that organizations attempted first to place reciprocally interdependent activities tangent to each other. In other words, when technology required action by crews or teams, the team should be as small as possible. Such teams, if reciprocally interdependent with another team, should be organized into local units, autonomous within the constraints of plans and standardization, or as Thompson says, conditionally autonomous.

If sequential interdependence existed in an absence of reciprocal, then the sequentially interdependent groups were the groups that should be placed intangential to each other, localized, and conditionally autonomous. Finally, in the absence of reciprocal and sequential interdependence, organizations should arrange homogeneous grouping of activities for coordination by standardization. In the Sea Grant program, homogeneity might be considered as homogeneity of function or as homogeneity of activity type. For the encouraging of interdisciplinary activities in the Sea Grant Program, the latter form of grouping would probably be most viable. However, some provision for homogeneity by function would likely be required if activity grouping was used.

The precise form of the hierarchy for coordination would be to a large extent determined by which form of homogeneity of grouping is given precedence. According to Thompson, reciprocal interdependencies must be grouped for coordination first. Such reciprocally interdependent groupings were then arranged sequentially according to their resulting sequential interdependence. Finally, the pooled interdependencies were grouped.

Following the format of Thompson's book (presentation of major concepts by a series of propositions), three final points which have pertinence to this study, should be stated. These three ideas (49:61) were:

> Proposition 5.4b: When organizations employ standardization which cuts across multiple grouping, they should develop liaison positions linking the several groups and the rule making agency.
>
> Proposition 5.4c: Organizations with sequential interdependence not contained by departmentalization rely on committees to accomplish the remaining coordination.
>
> Proposition 5.4d: Organizations with reciprocal interdependence not contained by departmentalization rely on task force of project groupings to accomplish the remaining coordination.

Each of these last points had special relevance to the management of Sea Grant Programs. This is seen in the questionnaire responses discussed in the following chapter and relied upon extensively in developing the management model.

CHAPTER IV

A SURVEY OF SELECTED MANAGEMENT PRACTICES AT SEA GRANT INSTITUTIONS AND SIMILAR ALL-UNIVERSITY PROGRAMS

The best means of determining the management practices used at Sea Grant institutions and other all-university programs appeared to be a survey of such programs. Because of the small number of institutional Sea Grant awards, the directors of all such programs in existence at the time of the study were asked to respond to the survey.

A much larger number of similar all-university programs existed. A small selected sample of directors of these programs was also asked to respond to the survey for the purpose of comparison of the responses. The survey was conducted by a written questionnaire.

The Survey Instrument

In order to provide a means of determining the management methods used by the administrators of Sea Grant Institutional Programs, a questionnaire was devised. The questionnaire, which is reproduced as Exhibit I of Appendix I, was designed to obtain factual information concerning selected elements of management practice. Out of the universe of possible questions that could have been asked, only a limited number was selected. There were several criteria for the selection of questions for inclusion in the questionnaire.

The first was whether the question had relevance to an all-university program. The second, was whether it really shed new light on a question not already answered in the literature, and the third was whether it provided appropriate response choices.

It was recognized that the questionnaire could conceivably fail to cover some aspect of management that a university administrator might view as critical. Consequently, the cover letter that accompanied the questionnaire specifically requested additional information on such topics. No specific comments were received from any of the respondents to indicate that the instrument failed to adequately cover their management philosophy, although a number of respondents did add amplifying statements on some of the questions posed.

The first part of the questionnaire was composed of eighteen forced-choice items. The questions may be categorized according to the specific element of management to which each was addressed. The categories were:

> Techniques for identifying appropriate proposals and judging the degree to which proposals fit the objectives of the program.
>
> Techniques for evaluating the progress and final results of projects.
>
> Allocation of funds and other elements of program control.
>
> Techniques for encouraging loyalty to the objectives of the program.
>
> Techniques for the articulation of special elements of the program, e.g., extension activities and technician training programs.

The instructions accompanying the questionnaire allowed for the selection of one or more of the choices on each question.

The second part consisted of a set of essay-type questions in which the respondents were invited to discuss, to any degree they might choose, four broad areas of management. The forced-choice questions did not provide an opportunity for in-depth comments indicative of the philosophy of the university or the program. These essay questions thus provided an opportunity for respondents to make additional comments on four of the more critical areas of Sea Grant management. The elements covered were: (1) program control of staff who are basically members of discipline-oriented academic units, (2) program focus, (3) program objectives and evaluation, and (4) the structure of the program office staff, in terms of organization charts and/or job descriptions. The first question, on program control, was as open-ended as possible in order to give the respondent maximum latitude in his response. The question on program focus was accompanied by a shortened version of a staff paper prepared by this author for use within Texas A&M University. The purpose of providing this paper was to clarify the meaning of the term "focus." A copy is included as Exhibit I of Appendix II, page 117.

An ancillary purpose of the questionnaire was to identify those institutional programs whose program management techniques might be classed "exceptionally good" or highly innovative." As might have been anticipated, the responses indicated that virtually every program included some element that was innovative. Many of these

elements were worthy of consideration for incorporation into the program management model and are considered in detail in a later section.

The Survey Population

There were a large number of multi-disciplinary, mission-oriented, all-university programs that might have been invited to respond to the questionnaire. Very few of these other programs were as complex as the Sea Grant Program, which combined research, extension, advisory and information transfer, and multi-level educational programs. Hence, initially, the population was envisioned as being restricted to the eight extant Sea Grant Institutional Program grantees: Texas A&M University, the Universities of Miami, Rhode Island, Michigan, Wisconsin, Washington, and Hawaii, and Oregon State University.

Subsequently, two other groups were added to the sample population, for reasons somewhat different than the original selection criterion. At the suggestion of Mr. Robert B. Abel of the NSF Office of Sea Grant Programs, the five coherent project grantees were added. These programs were similar to the institutional programs, and it was anticipated that many of these would eventually qualify for institutional grants. The five coherent project grantees were Louisiana State University and Agricultural and Mechanical College, the University of Delaware, Humboldt State College, the

Scripps Institution of Oceanography, and the Virginia Institute of Marine Science.

Finally, to test the usefulness of the survey instrument for programs widely divergent from the Sea Grant program, directors of two other programs were invited to respond. These were the Water Resources Institute and the Texas Transportation Institute of Texas A&M University. For the purposes of this study, the coherent project and the non-Sea Grant program responses were tabulated together.

Survey Responses

The degree of response to the questionnaire was very gratifying. Because of the small sample size, a total response was essential if the results of the survey were to be meaningful. The response from the institutional grantees was one-hundred percent.

Responses from Institutional Grantees

The questionnaire included as Exhibit I in Appendix I, page 106, gives a tabulation of the responses received on all eighteen forced-choice questions. The last question required respondents to rank-order research, education, and extension activities according to their perceptions of the long-term importance of these activities. Such a rank-ordering was not amenable to tabulation directly on the questionnaire, but was tabulated immediately below the question. One respondent declined to answer this question, two rated all three

as having equal long-term importance, and the remainder split about evenly on their opinions of the importance of the three.

It was difficult to draw any firm conclusions as a result of the responses to this question although there seemed to be some tendency toward ranking education as most important followed by research and extension. It was interesting to note, however, that an informal, unpublished grant tabulation prepared by NSF and distributed to all grantees contained just under seventy percent of Sea Grant funds assigned to research projects, just less than twenty-five percent to educational programs including technician training, and something over six percent to extension and advisory activities. These figures were for institutional, coherent project, and project grants. Only one of the non-institutional grantees had any extension activities. Almost all project and coherent project grants were in either education or research with the majority being in the latter category. After removing the project and coherent project grants from consideration, the percentages were more closely balanced but more funds were clearly allocated to research. So, in spite of the reluctance of institutional grant directors to draw conclusions regarding long-term importance, the short-term trend clearly favored research. This observation must be tempered with the knowledge that research and education programs were more amenable to rapid initiation than were extention and advisory service programs.

Responses to the Forced-Choice Questions

Some interesting patterns developed in the replies to the seventeen forced-choice questions, as indicated in the responses tabulated on the questionnaire in Appendix I, Exhibit I, page 106. The responses have been considered in groups under the categories listed on page 42.

Identification of appropriate proposals

Four questions from the questionnaire related to this subject. These were the first four questions. Paraphrased, they were:

> How are individuals whom you wish to have involved in the program identified?
>
> How are individual proposals selected for inclusion in the institutional proposal?
>
> What is the membership composition of advisory committees for either program definition or proposal evaluation?
>
> How is technical evaluation of proposals handled?

In answer to the first question the majority issued open invitations to university faculty to submit a proposal for consideration. Some, however, retained the prerogative of asking specific persons or groups to do work in specific areas.

The answers to question two indicated that most directors utilized an academic advisory committee, composed mostly of deans and department heads, in selecting proposals for inclusion in the

institutional proposal. Of those who did not indicate selection by an academic advisory committee, some interesting techniques were cited. One cited an advisory committee composed of industrial and academic members acting as a single group. Another utilized a group of anonymous reviewers, while a third utilized a committee of peers. In the latter system, each person who submitted a proposal ranked the proposals of all faculty who had presented proposals in mission areas the same as his own.

This technique plus that of anonymous review appeared to be the most time consuming. One other problem might exist with these techniques, if applied without some reservations. Many research problems and educational projects can be expected to require more than one year to complete. If the anonymous or peer rating techniques were used to rank on-going projects along with new projects, the on-going project might be dropped prior to completion in favor of a new proposal if the on-going projects were not identified. Other rating techniques would be less likely to experience this problem provided the review group had some member or members familiar with the program from the preceding year.

It was anticipated that most of the Sea Grant directors would have academic advisory committees with whom they worked to define program goals or evaluate proposals, or both. The third question was designed to determine the membership of such committees at the eight universities. The survey indicated that, in general, such committees were a mix of deans, department chairmen, and senior faculty. One

university reported an advisory committee composed of both industrial and academic members, a second reported two committees, one for program decisions and one for policy decisions. The policy committee of the latter was composed of higher administration officials, while the program committee was composed of faculty involved in the program.

The advisory committees were responsible, as well, for technical evaluation of proposals, as revealed by reponses to the fourth question. Somewhat surprisingly, only one university utilized a written checklist of objectives and other criteria in making proposal evaluations.

Evaluation of interim progress and final results

Within this category, all or parts of three questions were relevant. The questions were five, six and one aspect of question fifteen. Restated, these questions referred to

> Technical evaluation of project progress and final results,
>
> Obtaining feedback for interim information, and
>
> Recall of funds for inadequate performance.

Questions five and six dealt with essentially the same question, except that five was concerned with annual evaluation of project results and six focused on interim progress reporting and evaluation. The responses received indicated periodic (quarterly or other)

reports from principal investigators was a common form of interim progress evaluation. The majority of the respondents also indicated a strong reliance on informal visits with principal investigators by program office staff for this purpose. Indeed, three of the program directors utilized a staff member on a part to full-time basis to perform this function. Mission-area and program-wide seminars were common means for evaluating progress. These mission-area and program-wide seminars were judged by respondents to be useful in another context (encouraging faculty and student indentification with program objectives), which will be explored in a later section.

One element of question fifteen had some relevance to progress evaluation. That was the element dealing with the recall of budgeted funds in the case of inadequate performance. Virtually every program director indicated that he had that prerogative, but anticipated rarely having to invoke it. If interim evaluation indicated recall for that reason, it could be done.

Allocation of funds and program control

The largest portion of the questionnaire dealt with these topics. Questions addressed to fiscal affairs were twelve through seventeen inclusive. The topics covered were:

> Are funds handled through your university fiscal office or by some special arrangement?

What are the sources and percentages of your matching funds?

Can program funds be recalled and recommitted?

Under what circumstances may funds be recalled?

Do you employ program budgets or line item budgets in your program?

Do you employ program budgets or line item budgets in your proposal?

Question twelve, concerning the methods of handling Sea Grant funds, was apparently not sufficiently specific. Almost every respondent amplified his answer to this question either in this section or in response to the first essay question. It was apparent from the responses that some measure of fiscal control was exercised by the program office staff. Typically this took the form of a part to full-time employee in the program office who was responsible for preparing proposal budgets, maintaining a running account of expenditures for the information of the program director, and completing budget forms required for the initiation or modification of project budgets. A few program directors allocated only salary and wages funds to individual departments or divisions. Funds for other expenditures were retained in a single master account administered by the program office in these cases.

In accordance with federal statute, each university with a Sea Grant Program must supply matching funds at a federal to institutional ratio of 2 to 1. For the most part, program directors required this matching as a responsibility of each individual department that had

an active Sea Grant project. Three program directors reported special state appropriations for matching purposes, but all three attempted to hold these funds in abeyance for special projects rather than distributing them to individual projects. This technique allowed program flexibility that would be difficult to achieve otherwise. Four program directors reported industrial matching funds.

The especially appropriated state matching funds ranged in percentage from zero to seventy, while industrial matching was reported as ranging from zero to ten percent. The majority of the respondents indicated that matching was largely the repsonsibility of the academic departments.

Seven of the eight program directors reported that they retained the prerogative of reallocation of project funds. The circumstances under which reallocations could be made were largely confined to such factors as illness of the principal investigator or unanticipated over-budgeting. One or two directors apparently consciously over-budgeted to provide flexibility. Most respondents agreed that inadequate performance would be sufficient grounds for recall of funds, yet most directors seemed to feel that such an eventuality would be rather remote. Two directors cited other reallocation reasons, i.e., a changing of program emphasis, and the inability of a project leader to hire the man appropriate for a new position that had been budgeted.

Program budgeting had come to be widely used in the federal government in recent years. Although many state governments

continued to use line item budgets, a number of universities had begun to utilize program budgeting. This was largely because of federal reliance on this form. In presenting proposals, six of the universities utilized program budgets, one used line item budgets, and one used a combination budget. However, for intra-university use, there was an even division, with half using program and half using line item budgets.

Question number seven attempted to determine where in the university hierarchy the authority and responsibility rested for decisions affecting the future of the program. The consensus was that program office staff have such responsibility, with the advice and consent of advisory committees. It should be recognized, parenthetically, that the levels of funding and commitments of other resources of the university of the magnitude required by the Sea Grant Program were relatively large. Such commitments required the approval, at least tacitly, of the highest level administrators of the individual university.

Question nine, the location of the program directorship in the university administrative hierarchy, was another pivotal question in the design of a management model. Certainly the location may have a bearing on the degree of the university's commitment to the program. It will probably affect the management philosophy, and perhaps the management style, of the director.

In four of the institutions, the program director reported to a vice president, in three to a dean (although in each case to a

dean of research or of graduate studies, not a dean of an academic college). In one case, the director reported directly to the university president. This director happened to also hold the position of vice president in addition to his duties as Sea Grant Program director. Thus it was apparent that the administrations of these eight universities clearly recognized the complexity of the Sea Grant Program and the necessity to place responsibility for the program at the highest practical university level.

The four essay questions also dealt largely with program control. The cooperation of the eight institutional grant program directors was most clearly exemplified by the degree to which they responded to the four. One of the program directors sent a copy of his initial Sea Grant proposal, another sent the introductory chapter of the proposal being prepared for submission to the office of Sea Grant Programs for the third year of support, a third sent a copy of a policy statement prepared for use within his university, and most of the remainder supplied rather lengthy comments in response to the questions. The four questions dealt with (1) the administrative control of members of discipline oriented academic units, (2) the defining of a program focus, (3) establishing and evaluating the attainment of program objectives, and (4) the administrative structure within the program office.

From the responses, it appeared that most of the directors tended to view control as exercised largely through budgetary means. Some respondents mentioned various committees but these were

ordinarily cited in terms of the committees' control of decisions to fund project A rather than project B. Every respondent cited the necessity of keeping deans and department heads informed. About half of the directors indicated that they attempted to identify project leaders within each mission area. These leaders were then relied upon to channel the efforts of the principal investigators into activities that were in line with the objectives of the particular mission area of the group. In a few cases program directors and their staff members played an active role only when project leaders were not readily identifiable, or when gaps in existing administrative structure existed. This attitude did not appear to be generalized; many of the directors took a very active role in program formulation and decision-making processes that controlled the content and development of the overall program.

With regard to the questions of program focus and the evaluation of objective attainment, very few directors utilized written guidelines. Statements on program focus varied from the fourteen page suggested program focus document prepared by this author (see Exhibit I of Appendix II, page117), to a statement made by one program director on the questionnaire: "The understanding, utilization, and management of the marine environment; everything and anything under this heading falls into Sea Grant."

This does not imply that no program focus existed. Such a statement of focus or goals was required by the Office of Sea Grant

Programs, as noted in a number of statements in NSF Publication 67-18 (32).

On page 4 of that document, the following requirement is stated: "A five year plan ... should be given in sufficient detail to permit evaluation of the total projected program and its major elements." In a subsequent paragraph it is stated that: "For each project or related group of projects a ... statement of objectives should be given ..."

The vehicle used by most program directors as a means of establishing program objectives was the program advisory committee. Two of the directors indicated that identified leaders from the pertinent mission areas worked with interested faculty to develop objectives for the mission area. Individual project proposals were then developed and integrated into the institutional proposal within the funding framework. Those program directors who responded to the part of this question dealing with evaluation indicated that the evaluation was subjective in nature. Evaluation was covered by question five of the forced-choice part of the questionnaire and has been discussed earlier in this chapter. It will be recalled that in reply to that question most directors indicated a reliance on written annual project reports. The only university which utilized a written evaluation checklist was Texas A&M University. This checklist was developed as a part of the present study and is reproduced as Exhibit II in Appendix I, page 113. A discussion of

the rationale for this checklist, and its use and effectiveness is included in the following chapter.

The fourth and final question requested information on the hierarchical structure within the program office. The purpose of the question was to determine whether and to what degree the administrative duties within the program offices had been divided among management specialists or technical specialists. The degree of division of labor evidenced by the program office hierarchial arrangement was indicative of a number of factors pertinent to the management model under development. These factors will be reviewed in a later section of this report.

Encouraging loyalty to program objectives

Only one question on the questionnaire was directly concerned with loyalty. With regard to this question, a wider spread of responses occurred than on any other question. This may have been symptomatic of a new dimension beginning to emerge. This dimension had two parts: (1) the perceived need to examine the social, economic, and ecological aspects of a problem concurrently with the engineering or scientific aspects and (2) the channeling of faculty and student loyalties toward program missions rather than, or in addition to, the traditional loyalty to an academic discipline.

The means of encouraging identification with the program mission that were suggested ranged through such possibilities as funding provisions, total freedom for the conduct of project

activities, frequent personal contact with investigators, total program seminars, and sub-group seminars.

The first of these possible responses had some value in the encouragement of mission loyalty in that it tied monetary reward directly to mission loyalty. Yet monetary reward may play only a small part in the encouragement of identification with the program mission.

The second possible response, encouraging mission loyalty by allowing total freedom for conduct of project activities, was open to two possible interpretations. Total freedom could contribute to identification with an academic discipline or it could be viewed as freedom to expend effort in innovative and interdisciplinary projects. Academic freedom is widely accepted and diligently guarded in universities. Six out of eight respondents indicated a reliance on total freedom for conduct of project activities (in association with other techniques) to encourage mission loyalty. Yet this assessment must be tempered by the observation that the next most frequently employed technique (checked on five of eight questionnaires) for encouraging identification with program mission was frequent meetings with principal investigators on an individual basis. This may be considered, in a way, the opposite of total freedom. Yet many respondents checked both responses.

The multi-disciplinary nature of the Sea Grant institutional program almost demands program-wide seminars and/or sub-group (e.g., fisheries) seminars, yet only half the program directors utilized

this technique. Three respondents indicated that they utilized other techniques for developing group interaction. These were (1) "discussions with coordinating committee who have immediate contact [with] and/or supervision of activity leaders," (2) "by development of a coherent program within which the work of each participant has more meaning than if carried out in isolation" and (3) "by including faculty from the start in building the overall program as well as funding their own projects."

This was one of the key questions in the design of a model for program management. A more detailed consideration of this question, and the responses, will be developed in a later section.

Articulation of special program elements

The last questions to be considered were ten and eleven on the questionnaire. They were concerning:

> How is your technician training program administered?
>
> Is your Sea Grant extension program separate from Agricultural or Engineering extension?

These two elements of the institutional program contributed most to differentiating the Sea Grant Program from the typical federal program. It must be emphasized that a technician training program was not essential as a qualification for an institutional grant, nor was an extension program, in the classical land grant college sense. The latter point was exemplified by the fact that

only one program director indicated that all extension functions of the program at his university are handled by the local cooperative extension service. One program director indicated that his marine advisory services director was an assistant director of the local cooperative extension service. Virtually every program director indicated an intention to develop a Sea Grant extension and advisory activity whose staff would be directly responsible to the program director. This fact added some complexity to the management of the program.

As was mentioned above, technician training programs were not required as a part of the Sea Grant institutional program. However, six of the eight institutional grantee program directors indicated that technician training was included in their programs. Only one of the six operated a technician training activity through one of its university academic departments. The remainder of the program directors relied on cooperative arrangements with community colleges or technical institutes. This situation added another dimension to the management model to be developed; coordination and control of an activity that resided totally outside the structure of the recipient institution.

Survey Responses from Other Programs

The responses from these program directors were markedly similar to those supplied by directors of Sea Grant institutional program offices. The primary points of divergence, not surprisingly, were

in the lack of technician training programs and extension activities within this group. The responses received, and especially those from the coherent project group, indicated that the model to be developed would prove useful to most programs. Because of the similarity of the responses from this group to those of the institutional program directors, a question-by-question discussion will not be given here.

The response from this group was not as complete as that of the institutional grantees. Of the eight who were asked to complete and return the questionnaire, only four did so. The directors who did respond to the questionnaire generally did not supply narrative responses to the essay questions. Two of the directors did so, however. These two sets of responses were very helpful in solidifying the view of this author that a study such as the present one would be useful to directors of programs other than Sea Grant institutional programs.

Some Cbservations Regarding the Questicnnaire

A questionnaire was selected as the technique through which the relevant information could be obtained and highlighted. A well developed, written questionnaire is generally preferable to the direct interview technique because of the psychological resistance that most individuals feel toward putting an untrue statement in writing. A direct oral interview often produces responses which are superficial, socially acceptable, and show the respondent in the best possible light. Although the questionnaire is not a perfect

instrument, social science researchers use it extensively and consider it a valid information gathering technique. The purpose of the questionnaire was not to get information upon which the model would solely rely for management direction. The questionnaire information was obtained to highlight current Sea Grant management practices and to serve as a backdrop from which a model integration of realistic management and useable theory could be developed. The management techniques in use in organizations are not necessarily the most effective ones and some depart markedly from currently accepted techniques.

Not every aspect of management was covered in the questionnaire. Some general management activities were found to be adequately covered in existing theory. For example, written communication and information dissemination which are the life lines of any organization are well documented. The management of communications with the external environment may be thought of as a boundary spanning function, and that with the internal membership, largely coordinative. The importance of documentation and information dissemination is underscored by the fact that most program directors indicated that a member of their staff was responsible for these activities on a full time basis.

CHAPTER V

THE SUGGESTED MODEL FOR SEA GRANT PROGRAM MANAGEMENT

A model is only an approximation of reality. No model for an organization can hope to provide answers to all of the problems that may arise in the operating organization. Furthermore, since organizations established in different environments to serve different clientele will have different problems and objectives, the design of a single all-purpose model would be a hopeless task. Nevertheless, many aspects of organizations, especially those with similar goals and objectives, are sufficiently alike that a small number of suggested solutions to these problems will suffice. Under these circumstances a model becomes a useful approximation to reality. The development of such a model was the purpose of this study.

Most management theorists would view a model of an organization as incomplete if it considered only structure. It was the belief of the writer that this model would be incomplete if it did not include suggested means of setting objectives, evaluating progress, encouraging loyalty, establishing seminar groupings, providing sanctions, and decision making patterns, in addition to describing an administrative structure for the program office, indicating means of coordinating off-campus activities, and integrating the program into the university structure. All of these functions were viewed as having importance and relevance to the model.

The framework of organization theory presented in Chapter III and the responses to the questionnaire discussed in Chapter IV form the basis of the model. The format of its development differed from the order of the development in that the model began with a consideration of the structure of the program office for direction, coordination, and control and proceeded outward from that point. Some elements of management theory that were adequately treated in the literature were not treated in the model. There were a few instances where the theory had relevance at more than one place in the model. Examples and illustrations of a number of points were drawn from questionnaire responses and from the personal experience of the author in a functioning Sea Grant program.

As was indicated in the discussion of administrative structure, in the theoretical framework for the study, there was a heavy reliance on the theories advanced by Thompson (49). Of all the literature reviewed in preparation for this study, his work seemed to have the greatest relevance to the design of an effective administrative structure for a complex program such as Sea Grant. Thompson's discussion (49) of coordination of interdependencies and overarching coordination were important in the design of the program office staff model. His discussion of the third, or institutional, level of an organization was relevant to the appropriate level of the program directorate in the university administrative hierarchy.

A Brief Description of a University Administrative Structure

An understanding of a typical university structure was helpful in attempting to place the directorate of a Sea Grant program in the most effective location within a university. This structure was relevant to the understanding of the reasons for suggested placement of the Sea Grant program within the structure.

At the institutional level the university typically was administered by a board of regents, the president, and an academic vice president. Many presidents were aided by additional vice presidents for activities such as research, program development, and student affairs. These vice presidents and other specialized assistants then acted to control and coordinate the work of others within their areas of activity.

At the second (managerial) level were the academic deans and some others. For academic matters, such deans were responsible to the academic vice president; to the research vice president for matters of research planning and funding, and so on. Immediately below the dean were such staff positions as directors of agricultural extension and engineering experiment stations. The occupants of these staff positions had responsibility for certain specific functions, and were directly responsible to their dean but slightly superior in authority to the group next in line in organizational position, the academic department head. The deans were responsible

primarily for academic and research matters in the academic departments under their supervision. There were frequently assistant deans for research or student affairs whose responsibilities were somewhat analogous to those of the cooresponding vice president, but at the managerial rather than the institutional level.

The final occupant at the managerial level was the department head. He functioned at the technical level as well, in that he often conducted research and taught classes, which would be technical functions. Yet he had many managerial duties and was called on to represent his department to deans, directors and higher university officials. In general, within this structure, loyalties were to individual departments, objectives were set within departments and colleges, and the overall focus and goals were set at the university level. Overarching coordination of activities usually occurred at the vice presidential level, though often not in a programatic sense.

An illustration might be useful at this point. Consider a faculty member who wanted to initiated a specific research project. His first consideration probably had to be whether the student load in the department allowed him enough free time to pursue the research, so he would first obtain permission from his department head for space and time to conduct the research. He would then clear the project with the dean of his college. Following this his proposed research would be reviewed by the vice president for research, who

would authorize the project if it had been approved by the department head and dean. Educational and extension projects would follow similar paths. The example is a simplified model and does not consider such factors as funding from an external agency. It is illustrative of the controls and coordination that existed in universities. The coordination of planning was shown to occur primarily at the vice presidential level. This process seemed to be one of individual consideration for each proposal, without attention to an overall program.

It was necessary, then, to determine the optimum location, within the existing university structure, for the Sea Grant program directorate. The aim of the National Science Foundation, in establishing the program, was to encourage a unified program conducted by interdisciplinary groups or teams. These teams needed to have a broad focus, and needed to have sufficent expertise to find workable solutions to marine resource problems. Hence it became necessary to develop not only a viable program, but a viable organization to develop and manage the necessary loyalties, coordination, and environmental interdependencies (in the management sense).

The Sea Grant program was, to a degree, a university in microcosm. It brought together extension, research, and educational activities--perhaps in an even more programatic, unified sense than for the typical university activity. The administrative structure of the university as it existed at the time of initiation of the

Sea Grant Program seemed to indicate the appropriate level of program management for the university.

The need for a programatic overview seemed to dictate a need for the director of the Sea Grant Program to be placed slightly above the academic deans, in terms of authority over the marine activities of the university. This would place the program director in a position more or less analogous to the dean of the graduate college whose responsibility was for all graduate programs at the university.

The logical location, organizationally, for the Sea Grant directorate seemed to be either as a separate office reporting directly to the president or to the president through an appropriate vice president. It appeared that only in this manner could the university be assured that all aspects of the program would receive equal consideration and equal opportunity for development. This arrangement would help to insure that inter-departmental cooperation would exist, and that important porgrams could be carried out even if it should become necessary to create new departments or to arrange inter-university cooperative agreements.

Some Observations Regarding the Model

The theoretical and experimental results of this study seemed to this researcher to suggest that there possibly was one best model for the management of a Sea Grant institutional program. The reader, because of personal philosophy or an awareness of the unique character of his own university, may find himself at odds with this

model. Should this occur, there should be sufficient alternative approaches, suggested by the model itself to allow the reader to design a theoretically sound model that would fit better into his own university.

The Program Office Hierarchy

The first problem to which the model was addressed was the problem of the efficient division of labor in the program office. This could to a degree be a matter of the personal preference of the director and the staffing policy and operational philosophy of the university.

Two separate schemes might be proposed. The first calls for organization by subject matter, while the second calls for organization by program function. The former is clearly aligned with the PPBS format, while the latter corresponds to the program breakdowns utilized by the Office of Sea Grant Programs, and to the classical university structure. Both structures may be viewed as conforming to the categories of coordination according to interdependency through overarching control proposed by Thompson (49).

Program Director

The director of a program with objectives and environmental interrelationships (in the management sense), as complex as those of the Sea Grant program should devote full time to his duties. The

responsibilities of the director involve many managerial and institutional duties. At the managerial level he should coordinate the duties of his assistants and the responsibilities of various committees. He should be the leader in the effort to encourage identification, on the part of faculty and students, with program objectives.

At the institutional level, the director is the person best qualified to maintain contact with the NSF Office of Sea Grant Programs. He should be responsible for initiating contacts with clientele external to the university although he may delegate the duty of maintaining such contacts to his assistants. Such contacts would be with industrialists, state officials, state agencies, and professional associations of a variety of forms. Also at the institutional level is the matter of intra and inter-university relations. The interdisciplinary nature of the program could introduce a whole spectrum of interdependencies with which the director and his staff would have to cope. Among these would be inter-departmental relationships and the meshing of the objectives of the program with those of the university and the proliferating number of other institutes appearing at universities. Much of this problem will hinge upon the question of interpersonal relations and lies outside the scope of this study. Some means of improving intra and inter-university relationships were developed as a part of this study and are discussed under subsequent headings.

The program director personally, through his staff, and through his advisory committee should make every effort to keep deans, department heads, institute directors and the university administration informed about the program. He should report to a vice president, or directly to the president in a university that has no vice presidents.

Professional Office Staff

If it is assumed that the director is responsible for the program on a full time basis, only the assistants described below should be included in the program office staff. If the director is not full time, an assistant director would be almost mandatory. The assistant director should be responsible for managerial level functions, with institutional level functions remaining as the responsibility of the director. The number of staff assistants with direct program management responsibility is probably best set at four. This is in accord with present theory on span of control and seems to fit the needs of the program. Other specialized staff assistants may be added as necessary. The four key assistants should be a fiscal assistant, a research assistant, an educational assistant and an extension assistant.

This recommendation may appear to be at variance with the overall tone of earlier sections where subject matter categorizations were stressed. The reason for this is simple. Most universities continue

to cling to the classical academic structures, and may yet do so for a number of years. As long as this is the case, the program office staff should be organized accordingly. One of the objectives of the director and his staff should be, however, the eventual realignment of responsibilities along subject matter lines. This planned reorganization would also serve to keep the program objectives in focus and should keep pace with, or assume a leadership role in, the awakening of the university faculty to the need for interdisciplinary activity. The functional structuring would tend to increase the coordinative responsibilities of the director and his staff. The program assistants should be responsible for the activities described in their respective titles, but more importantly, should work together in close cooperation to insure interdisciplinary solutions to educational, extension, and research problems.

The size of the office staff and the distribution of labor is directly dependent on the funding level and number of faculty involved. The model for program office staffing assumed a program approximating those extant in the 1969-70 academic year, funding at the level of $500,000 to $600,000 and an involvement of between seventy-five and one hundred faculty and students.

If organization by subject matter categories was chosen, the staff should consist of a fiscal and personnel assistant; an assistant for environment and resources, responsible for programs in environmental quality and living and non-living resources; an assistant for engineering, responsible for engineering, ports and

harbors, instrument and equipment development; and an assistant for recreation and commerce, responsible for tourism, recreation, commerce and business. Each of these individuals would then be responsible for seminars, proposals, interim evaluations, extension and advisory activities, and other activities, in particular subject matter areas of investigation.

The three subject area categorizations described above; environment and resources, engineering, and recreation and commerce, were somewhat arbitrary selections but should prove to be a workable grouping. With the introduction of the coastal zone laboratory into Sea Grant, or the designation of Sea Grant Colleges, an assistant for coastal zone affairs might prove necessary in either structuring. Note also that some potential overlapping of responsibility occurs. In either system the primary intra-office responsibility of the director would be the coordination of the activities of his four assistants, the resolution of the conflicts among them, and the resolution of conflicts brought to them by others which they cannot resolve themselves.

Whether the assistants' duties are organized along function or subject matter lines, it should be recognized that their duties are largely related to the coordination of interdependencies. This generally takes the form of overarching coordination, for example, the coordination of groups of related seminar steering committees or related proposal evaluation committees.

There are other positions that an individual program director might wish to add to the sets specified above, and indeed the coordination of certain specialized functions may require the establishment of these positions. Examples of such positions are: information systems coordinator, program editor, coastal zone program coordinator or coastal zone laboratory coordinator.

The publication and information transfer services that should be performed by the Sea Grant office would provide a tangible product which would serve several functions. First there might be the direct publication of a research technical report, an educational curriculum guide or textbook, or an extension publication. These are all parts of the communication outreach of the organization. Second, there may be internally prepared reports and memoranda that should be published and circulated to activity leaders and other faculty to help to keep them informed of the progress of projects related to their own. Third, the information and publication center could act as a central clearinghouse to receive, circulate, and keep on file reports from other Sea Grant or marine related programs. Finally, the publication center should play an active role in the preparation and publication of annual proposals to the Office of Sea Grant Programs. Thus, the publication center could become the focal point at which program planning decisions are reduced to writing.

It appears important that the director have a fiscal assistant on his staff. The fiscal assistant should have primary responsibility

for fiscal and presonnel control. This would involve the processing of personnel action forms and procurement documents, and the keeping of a running account of expenditures. This running account should be reviewed periodically with the director. If it appears that a project is not properly funded (either over or underfunded) adjustments should be made in the account, with the approval of the activity leader.

Planning-Programming-Budgeting techniques are very important to the program. Although PPBS is not really a fiscal tool, the fiscal assistant should be conversant with the system in order for the program staff to make efficient use of it.

Coordination

Coordination of program activities may possibly be more vital to success than control or direction in the program. This importance has been stressed throughout this study. Several elements of coordination have already been discussed in describing the duties and responsibilities of the director and his staff.

Coordination of Environmental Interdependencies

One of the major features of the open or natural system model was its consideration of the interactions between an organization and its environment. In Thompson's model (49) this was managed by the boundary spanning component. Such boundary spanning components were required at both the technical and managerial levels. Several

boundary spanning sets may be identified, for example, extension agents and the inter-university branch campus coordinators. The latter are not truly boundary spanners in the sense used by Thompson yet they serve a similar function and could be so considered. This is true because they represent the organization (Sea Grant) to, but within, a branch campus.

Another useful extrapolation of the boundary spanning concept exists within the Sea Grant institution. This might be called intra-university boundary spanning, and is occasioned by the inter-dependencies between the program and other divisions of the university. The interdependencies are made more complex by the interdisciplinary cooperation that is one of the goals of the program. Universities have only recently begun to be aware of the desire on the part of some of their publics to have these institutions engage in inter-disciplinary pursuits. The classical pattern of departmentalization makes this difficult, but engineering departments appear to be in the forefront of the interdisciplinary movement (20, 30, 34).

The coordination of intra-university interdisciplinary inter-dependencies is properly the function of the institutional level of the organization, hence of the Sea Grant program director. He should be aided in this by the different committee chairmen within the program, but the center of this coordination is the director. The division of responsibility in the program office referred to earlier as the subject matter category is probably very important to

this coordination if the director is only part-time. In this case each assistant should be responsible for the coordination of a broad spectrum of interdisciplinary cooperation of extension, education, and research responsibilities.

In addition to his responsibility for the coordination of the activities of his assistants; the program director, who along with the program advisory committee, forms the institutional level of the organization identified in Thompson's writings, should perform other functions. These are legitimization functions. He must represent the program to the university administration, to state governmental agencies, and to the NSF Office of Sea Grant Programs.

Committees for Coordination

At least five appropriate committees can be identified in a Sea Grant program. These are the proposal evaluation committees, subject area seminar committees, seminar steering committees, program advisory committees, and industrial advisory committees. Each of these can have some coordinative, control, or boundary spanning functions in the program.

Proposal evaluation committees

The proposal evaluation committees should be composed of faculty who participate actively in the program. There should be a small (5-7 individuals) committee for each research category in the program, i.e., fisheries and aquaculture, mineral resources, engineering and

technology, marine law, marine socio-economics and/or others. The committees should evaluate and rank order every extension, education, and research proposal within their subject area. The committees would meet two to four times a year and consider both interim and annual proposals. The program office should have representation on the committees since the office staff is in more direct contact with the Office of Sea Grant Programs and other elements of the program environment, and thereby should be cognizant of the priorities of those groups. Provision would need be made for the identification of renewal proposals in the review process.

Seminar committees

The seminar committee should be composed of academic faculty with the broadest possible interest in marine affairs. The chairman as well as members of the committee should be chosen by the seminar group. This committee should be responsible for the regularly scheduled seminars, for encouraging speakers to discuss Sea Grant related topics, and for securing specialists from off campus to speak frequently. These seminars could play a very important role in identifying problems in need of solution, in keeping the efforts of activity leaders focused on the program objectives, and in encouraging group loyalty.

Seminar steering committees

The chairman of each of the steering committees should be a senior faculty member, department head, or dean who is conversant with program objectives and who has a broad interest in marine affairs. The committees should be composed of the chairmen of appropriate seminar groups and perhaps one member from the group, although this committee should be kept deliberately small. These committees are of the kind that Thompson (49) identified as useful for coordinating of pooled interdependency by overarching coordination. The committee could assist in obtaining the services of off-campus speakers and calling joint meetings when topics of mutual interest to several seminar groups can be arranged.

It should be stressed that meetings of the steering committees and the seminar committees would not have to be formalized. Their primary usefulness would be in service to the seminar groups as outlined above, and in resolving inter-group conflicts that might occur.

At Texas A&M University eight seminar groups were either operating or in the process of development. These eight covered the following broad areas:

Fisheries and Marine Biology

Acoustics

Economics, Resource Management and Tourism

Ports, Harbors and Transportation

Environmental Quality

Geosciences and Mineral Recovery

Equipment Design and Instrumentation

Marine Education and Training

No attempt was made to encourage any given faculty member to join a specific group. Rather, when he found a group with interests similar to his, he was encouraged to meet with them.

In Thompson's terminology (49) such committees may have a form of reciprocal interdependency. The coordination of this interdependence is accomplished by the ad hoc steering committee chairman. If several such seminar committees exist, with steering committee chairmen responsible for interlocking sets, a pooled interdependence has been created. A liaison with the program office is needed, the form of which is dependent on the number of such seminar groups and the concomitant number of steering committees. This liaison should be through one of the office staff. Again using Thompson's terminology (49) this brings interdependent groups into tangency.
This is an excellent means of identifying program clientele, as well as user needs. Arrangements such as these would effectively coordinate research, education, and extension activities.

Program advisory committee

The chairman of this committee would be the program director. The committee should be composed of interested deans, department

heads, senior faculty, and higher administration officers. If the program should happen not to have an industrial advisory committee, key industries should be represented on this committee. Representatives of appropriate state agencies might be among the membership, although some industrial and state agency representatives might prefer instead to cooperate through the seminar groups. This committee would be consulted in major decisions concerning program development, including final decisions regarding the individual proposals to be included in the annual proposal.

Industrial advisory committee

The suggested composition of this committee should be clear from its name. The members should be carefully chosen from the leadership of key marine industries from the region to be served. The group should be kept small enough to work closely together and closely with the program office and activity leaders.

Direction of the program would reside, in the final analysis, in the program office. The program director would be the final arbiter, but the committees and other management elements should provide adequate opportunity for input both from within and outside the organization.

Special Programs Coordination

The Sea Grant program might incorporate several activities not normally associated with interdisciplinary programs. Among these

could be technician training, extension and advisory services, and inter-university arrangements. The model, to be complete, had to provide means for these coordinations.

Technician Training

Most of the institutional grantees report the incorporation of technician training activities into their programs. Of those that include such activities, most have either contracts or letters of agreement with more than one junior college, community college, or technical institute. Such arrangements require coordination to eliminate unnecessary duplication and assure continuity. These programs fit Thompson's category of pooled interdependence (49) in a sense, and would require coordination at the program office level, although periodic meetings of the activity leaders from the individual institutions would be useful for the coordination of pooled and reciprocal interdependencies. For example, a single training vessel or other facilities might be shared by two or more of the institutions.

Many universities have departments of engineering technology which would have an interest in encouraging the abler graduates of the technician training programs to continue their education. Thus an engineering technology department would have a sequentially interdependent interest in technician training programs. In such a case, the head of the department would probably be willing to assume the responsibility of coordinating the technician training programs for the Sea Grant office. If there is no engineering technology

department, coordination should revert to the assistant for education in the program office.

Extension and Advisory Service

Extension and advisory service activity is an intergral part of every land grant university system. The major difficulty with the exclusive reliance upon the cooperative extension service to perform all the extension functions of the Sea Grant Program is the agricultural orientation of the service. This in no way implies a condemnation of the group. They are in large measure responsible for the improvements in rural life over the last hundred years, and the improvements have been enormous. Nevertheless, because of this concentration upon agricultural problems and rural populations, their degree of acquaintance with marine industrialists and marine problems may be small. Many other individuals and groups at a university may be better equipped to deal with most marine problems in a shorter time frame. As would be the case in education and research activities, the need for a broad program objective viewpoint argues for an extension program broader than the agricultural focus.

Most program directors supported this view by indicating an intention to augment or substitute for a reliance on cooperative extension for extension and advisory activities. This necessitates the coordination by the program office of off-campus and on-campus elements of this activity. The extension activity at each Sea Grant institution either presently had, or was planning field agents on

location at key coastal locations. In the suggested model the chief function of the extension agent would be to act as liaison between the reciprocally interdependent coastal user and the on-campus expert. The coordination of these interdependencies probably would be best handled through an assistant for extension located in the program office. This assistant should have access to an expertise file from which he can locate an expert in the needed specialty, or a publication file through which he could refer the user to the appropriate written information, journal article, or technical report.

Other Off-campus Activities

A few other off-campus activities may be found in some Sea Grant programs. Some questionnaire respondents indicated that they had branch campuses where a significant level of Sea Grant activity was in progress. These institutions had a Sea Grant coordinator at each location who was responsible to the program office on the main campus.

According to the survey, some universities did not have certain specialized programs such as law or medicine, but had cooperative arrangements with such schools in another university. These off-campus (to the Sea Grant institution) programs were managed by on-location coordinators responsible to the program office.

These forms of coordination would be essential to the program management. The coordinators would be responsible to the appropriate program office assistant, either educational or research.

In still other cases, an individual research scientist at another university or in industry, had some expertise that was important to the solution of a marine resource problem. In such a case, he would usually want to work with a researcher on the faculty of the Sea Grant institution. This should present no problem as long as the administrations of both universities agree to such an arrangement. Such agreements are ordinarily fiscal in nature. To assure that no misunderstandings occur between universities, a written inter-university agreement, prepared at the department head level but approved by deans, is recommended. The agreement should specify the period of time and personnel involvement, and stated monetary contributions from both parties to the total effort. The same technique should be beneficial to intra-institutional inter-departmental cooperative agreements, and is recommended for these situations as well.

Useful Management Tools for the Model

To this point, the model has dealt with descriptions of jobs to be done by status occupants, with little attention to such factors as a program focus, loyalty, sanctions, or setting objectives and evaluating their attainment. The study indicated that a number of tools relating to the above factors might be suggested as aids to management.

A Focus for the Sea Grant Program

As has already been described, a university must have a firm conception of what its Sea Grant focus should be. This focus should

be written in explicit form, so that participants can clearly understand the relationship of the program to the national need and the national program, the regional or state needs and programs, and the way in which the program interacts with the programs and objectives of the parent university. The program director and office staff that has a clearly and concisely stated focus would be better able to communicate the goals and objectives to principal investigators. Principal investigators and university administrators would benefit from a better understanding of the program. The publics to be served could also understand better the scope and nature of the program. The focus should serve as a continuing benchmark, a basis for comparison of the actual to the optimum. The focus should be viewed as a statement of operational philosophy and should be so carefully reasoned as to not require up-dating for a period of several years. The focus would be set down in writing by the director, but he should be counseled by the university administration and senior faculty interested in marine programs.

The Objectives and Goals of a Sea Grant Program

The literature survey for this study and the theoretical framework pointed out the importance of well stated objectives to the management of the program. In the discussion of the literature Simon's definition of organizational goal was stated (40). Although

Simon did not discuss this point, the experience of many managers indicated that goals tend to be modified to some extent by the status occupants in an organization. This might come about, for example, as the individual exercised or failed to exercise some element of his authority, or filled a vacuum where one of his associates failed to exercise legitimate authority.

Furthermore, university programs, such as the one being considered, are most often charged by the superordinate organization with several (or many) goals. Within such multi-objective organizations it is easy to stress ways and means instead of objectives. This was one of the problems that Etzioni (12) considered in his discussion of goal modification.

Any organization must be legitimized by the segment of society it seeks to serve. Thus, it must have objectives which society and superordinate organizations will accept. But the objectives which society approves often change over time. Under these circumstances the organization's objectives must be amenable to change. A means of rational modification of objectives found not to be appropriate to the organization, is required. This can usually be most readily accomplished by a process of goal expansion, or building upon existing objectives. Ordinarily, an established objective will not be so foreign to an organization's purpose as to make it impossible to expand it rationally.

Another problem faced by university programs is the intangibility of goals. The more intangible the goals, the more easily they are

displaced. However, under intangibility, goal attainment may be maximized by establishing tangible objectives and keeping them directed toward the intangible goals. One of the primary tasks of the program director and his staff would then be to keep the goals and objectives of the program aligned with those of the university and the NSF Office of Sea Grant Programs.

Setting Organizational Objectives

The stepwise method of establishment given by Fox (14) is very useful for objectives that are easily quantifiable (see Chapter III). For less quantifiable objectives, Griffiths' six steps (16) appears useful. Sometimes the objective is more difficult to attain than was anticipated. When this happens, the director must decide among the acceptance of a lowered objective, increasing the effort, or abandoning the project.

The responses from program directors indicated that the majority utilized advisory committees to aid them in setting program objectives. Most committees were composed of university faculty and staff having a direct involvement in the program. If these committee members have wide enough contact with the clientele to be served, such a committee arrangement would be adequate, but the director should not lose sight of the fact that clientele input into the program objectives may be a very important element.

Evaluating the Attainment of Objectives

Thompson's discussion (49) of the essential elements that must be recognized in setting up an evaluation scheme was quite important to this study. Two of the categories appeared to fit the activities of the Sea Grant Program explicitly. The activities encompassed by the educational and extension segments would fit into the following category: What needs to be done may not be explicitly understood, but (from long experience) it is believed that the correct way to get the job done is clear. In this case, evaluation is largely a matter of judgment, and the criterion for judgment is a comparison of the outcome to results obtained by similar organizations.

Research, on the other hand, fits into the category wherein the investigator believes he has complete knowledge of what needs to be done to solve a problem, but may not know clearly the best way to do it. In this case effectiveness tests must be applied and the criterion is the attainment of the desired outcome.

Following from Griffiths' model, one may develop a scheme for evaluating attainment of objectives. This scheme follows six partially sequential steps:

Develop a clear statement of the objective

Develop a list of necessary evaluative information

Develop a means of recording the necessary evaluative information

develop a means of quantifying (analyzing) the information received

Check the validity of the quantifying instruments

Make an objective evaluation of attainment.

The means of evaluation favored by the author is the written checklist. Theoretically, this seems to be the most reliable approach to the problem in the final analysis. If the proper list is developed, and is equally applicable to all programs, the evaluator can be certain that each activity leader receives a fair and equal evaluation. A sample checklist has been developed and tested by this author at Texas A&M University. In the interest of brevity, it has undergone some modification as a result of the first trial. This second form of the checklist is reproduced in Exhibit II, Appendix I, page . Evaluations should be conducted jointly by the program office and either the appropriate proposal evaluation committee or the program advisory committee.

Faculty and Student Loyalty to the Program Mission

The concept of loyalty to, or identification with, the program mission is one of the most difficult with which a program director must deal. Yet it is important to the development of a viable multi-disciplinary or interdisciplinary program. The responses of the program directors appeared to convey some uncertainty as to the mechanisms for encouraging such loyalty. It could be argued that the fact that the program provides funds to carry out a favored research project would encourage loyalty. It may be significant to many

individuals that their association with the Sea Grant Program provided them the opportunity to gain professional recognition. The assistance provided by the program in getting the individual's first nationally funded grant may be especially important to the younger faculty member. The opportunity for national funding through local filing may be appealing. Some have no knowledge of the practical procedures required in requesting a government grant. Some have never considered their expertise in relation to broader problem areas. These factors present a definite opportunity for the program director to channel the efforts of the faculty into interdisciplinary investigations, or into already identified areas of need, and should be relied upon by the director to encourage a sense of loyalty among participants.

A common response to the question concerning loyalty was frequent personal contact. This technique, too, should have the additional value of indicating to the principal investigator that the program office staff in interested in his project problems and results.

One other frequently checked response to the question concerning identification with the program objectives deserves mention: the establishment of regularly scheduled small group seminars concentrating on specific areas of interest. The value of these seminars could be enhanced by providing financial support to bring distinguished speakers in the disciplines of interest to the campus to conduct seminars.

These seminars should serve to generate continued interest in the objectives of the program, encourage the exchange of information, and lead to the initiation of multidepartmental group effort in the solution of problems that are identified. Such groups should be useful to the program director in identifying new objectives or modifying existing objectives for the more effective attainment of program goals.

Since the program is very broad in scope it would be difficult to expect individual principal investigators with widely diverse research and educational interests to identify with broad program goals. Small group seminars would foster group solidarity and allow individual loyalties to be directed toward group objectives which mesh with, or are consistent with, broader program objectives.

Sanctions

The need for sanctions was mentioned in Chapter III. Negative sanctions were implied in Chapter IV in discussing the program director's responsibility for, and authority to withdraw funding support when principal investigators do not perform adequately. Inadequate performance would lead to an even stronger negative sanctioning by the peers of the principal investigator. A number of positive sanctions have been mentioned, e.g., funding for research of interest to the principal investigator, the opportunity to publish, and the opportunity for recognition among peers.

The program office could do some other things to sanction loyalty to the program objectives. These things are small but could come to have real significance. First, the program director might, at the end of each grant year, send a brief letter of acknowledgment and thanks to each faculty member associated with the program. In addition, at the end of the second year of a faculty member's association with the program, an engraved award similar to a faculty achievement award could be presented.

The final suggested positive sanction is also very simple, but precedents for it exist. When a researcher travels to the Antartic for research purposes, he is presented a lapel pin shaped in the form of a penguin. This immediately identifies him as a member of a select group. Such a symbol could be adopted for, say, the fifth year of association with a Sea Grant Program. As indicated, these things are simple, yet potentially effective.

Implications of the Model to Sea Grant College Management

While no definitive plans for Sea Grant colleges had been announced by the funding agency it seemed interesting to speculate on the form that Sea Grant College implementation might take, and the degree to which the model might fit the management of such a college. Some assumptions regarding the college must be made in order to speculate on its management.

First, it may be assumed that the college will continue to emphasize extension and advisory services, information transfer,

educational programs including technician training and continuing vocational education, and research. Second, it might be assumed that the emphasis on research will continue to be on applied aspects, but that the overall emphasis on research will decline with respect to other functions. Third, it might be assumed that funds for buildings and facilities will be made available, but that the emphasis of the funding agency will continue to be focused on the improvement of existing programs rather than the initiation of programs at universities with little or no existing expertise in marine activities; and fourth, that coastal zone laboratories would be included. Such assumptions might have no basis in fact, but appeared valid at the time of the study.

The assumptions largely served to establish that the Sea Grant College program would not be materially different from the institutional program, except for allowing building and facilities funds and including coastal zone laboratories. These exceptions would be important ones, however.

With the assumption that Sea Grant Colleges would be established at existing universities, it may be assumed that for the most part college designation would be given preferentially to existing institutional grantees, with a concomitant expansion of programs. In that case the existing management structure would probably not need to be disturbed materially. The exception to this would be the need to designate an assistant for coastal zone coordination responsible

for the coordination of activities at the coastal zone laboratory (ies).

It would appear to be best to leave the directorate at the same level as was recommended in the institutional grant model. To designate a dean of the Sea Grant college would place the program in the same potential jeopardy as was cited for placing the institutional grant under an academic dean. This jeopardy, it may be remembered, was the possibility of lessening the degree of encouragement of interdisciplinary activities that was cited as one of the goals of the program. This would arise out of the possible tendency to establish a classically departmentalized structure. Such a departmental structure could reduce the effort required to encourage loyalty to the program mission, but would probably reduce interdisciplinary cooperation.

It would appear that the remaining elements of structure, control, and coordination, should be directly transferable from the institutional to the college program, and that the loyalty, sanctioning, objective setting, and evaluation models, too, would be useful. Realistic evaluation of the usefulness of the model to the Sea Grant College program would not be possible until the criteria for establishment had been set. It would appear though that the model should be directly transferable, and that the location of the directorate in the university hierarchy would remain appropriate. It would seem inappropriate to create new institutions to assume

responsibility for marine resource development. This is partly a function of the expense of creation of duplicate facilities that would appear certain to occur. This expense of duplication would likely be a factor in the acceptance and acknowledgment of a Sea Grant College by a state legislature. Most coastal states have fairly large investments in marine laboratories and both "green water" and "blue water" research facilities. Most legislatures would probably prefer to expand these facilities rather than create new colleges. A new college would require both new facilities and new faculties.

The Sea Grant institutional program may be a program in transition. It appears to be a program that rests parallel to existing university colleges. It may eventually become merged into the existing structure. If it does, perhaps the dean of the Sea Grant College should have status equivalent to the Graduate College dean, with coordinative responsibilities over some of the activities of academic colleges. The curricula would still remain basically the responsibility of the academic deans.

CHAPTER VI

SUMMARY AND CONCLUSIONS

At the outset of the study a literature search was conducted. The search indicated that no similar study had been conducted, and that sufficient theoretical background existed to form the foundation of the study. Following the literature search, a fact-finding questionnaire was constructed. The survey population selected was the program directors of the eight Sea Grant institutional programs in existence at the time, and the directors of seven other similar programs. The response from institutional program directors was one-hundred percent. Only fifty-seven percent of the other directors responded to the questionnaire.

This study had several purposes. The first purpose was to provide a suggested means for a Sea Grant program director to identify appropriate elements of an existing university on which the nucleus of a Sea Grant Program could be built. A second purpose was to suggest some possible techniques for setting objectives and evaluating their attainment. Another purpose was to suggest some ways of encouraging faculty and student identification with the objectives of the program, and some means of rewarding faculty and students for their association with the program.

Means of administrative control is another key element in program management. The model offered a number of suggested techniques for control. Committee assignments to perform several control

functions were recommended. Yet the model recognized that many control functions are more appropriately conducted by an individual coordinator, and suggested ways of control by coordination. These coordinative functions were based on a set of management propositions recently formulated by James D. Thompson, which appeared to be especially applicable to this study. Then, based on the suggested control mechanisms, two administrative structures for the program office were formulated. This formulation began with the placing of the program directorate in what appeared to be the most appropriate location in the university hierarchy, and worked downward through the two suggested administrative structures. The two structures were based on (1) a subject matter formulation, and (2) a functional formulation. The latter form was recommended for early implementation, followed at a suitable time by the former.

In conclusion it should be noted that the study was limited to a consideration of the objectives of a non-profit organization. Literature references cited in this paper and used to design the framework of theory were those pertinent to university programs. Many other references, dealing with organizations of different kinds, could have been cited but did not appear appropriate to such an organization.

This paper did not attempt to consider the question of personal goals in relation to organizational goals. This question is adequately covered in most text books on organizations and is not

greatly variable among various types of organizations. The scheme presented herein seems to be theoretically sound and to be useful in managing a university multi-disciplinary program.

Two of the techniques that were specifically suggested--a written focus and a written evaluation checklist--appear to be especially valuable as guides to program management. The proposed control mechanisms may be more extensive than the present magnitude of the program justifies. However, the management model was conceived with the idea in mind that it would be sufficiently flexible to grow as the program expands.

If the Sea Grant College retains its programatic focus it would appear to be best to retain the subject matter categorization in the program office. If, on the other hand, the college is ultimately molded into more nearly the classical college form and becomes departmentalized, the dean of the college (for such would the program director become) should be assisted by assistant deans with function oriented duties, i.e., research, academic and extension.

As is true of any investigation, there are fruitful lines of inquiry yet to be explored. In the years to come, other inter-disciplinary programs similar to Sea Grant may emerge. As the number of these programs increases, management adaptations will follow. The inquiry into the comprehensive management of multi-disciplinary programs is just beginning.

BIBLIOGRAPHY

1. Abel, Robert B. Director, Office of Sea Grant Programs, National Science Foundation, Washington, D.C., personal communication, 1969.

2. Barnard, Chester I. The Functions of the Executive, Twelfth Printing, (Cambridge, Massachusetts, Harvard University Press, 1956).

3. Beatty, H. Russell "Engineering Technology Specializations," J. Am. Soc. for Engineering Education, LX (Dec. 1969), pp. 295-297.

4. Benton, J. B. and Itenzer, A. J. Program Budgeting and Executive Commitment, (Microfilm), (Santa Monica, California, Rand Corporation, July 1969).

5. Berelsen, Bernard and Steiner, Gary A. Human Behavior, An Inventory of Scientific Findings, (New York, N.Y., Harcourt, Brace and World, Inc., 1964).

6. Burr, Arthur A., Mortenson, Kenneth E. and Yerazunis, Stephen "A Two Dimensional Plan for Engineering Education" J. Am. Soc. for Engineering Education, LX (Dec. 1969), pp. 289-92.

7. Chambers, George A. "The Concepts and Problems of Planning-Programming-Budgeting System," State School Systems Development, (Winter, 1968), pp. 223-35.

8. Coch, Lester and French, John R. P., Jr. "Overcoming Resistance to Change," Human Relations, I (1948), reprinted in D. Cartwright and A. Zander (Eds.) Group Dynamics (Evanston, Illinois, Row-Peterson Co. 1953), pp. 257-79.

9. Corson, John J. Governance of Colleges and Universities, (New York, N.Y., McGraw-Hill Book Co., Inc., 1960).

10. Cyert, Richard M. and March, James G. A Behavioral Theory of the Firm, (Englewood Cliffs, N.J., Prentice-Hall, Inc., 1963).

11. Dror, Yehezkel Educational Planning-Programming-Budgeting--etc. (Microfilm), (Santa Monica, California, Rand Corporation, Sep. 1969).

12. Etzioni, Amitai Modern Organizations, (Englewood Cliffs, New Jersey, Prentice-Hall, Inc., 1964).

13. Etzioni, Amitai "Authority Structure and Organizational Effectiveness," Administrative Science Quarterly IV (1959), pp. 43-67.

14. Fox, William Mc N. The Management Process, (Homewood, Illinois, Richard D. Irwin, Inc. 1963).

15. Gouldner, Alvin W. "Organizational Analysis," in R. K. Merton, L. Broom, and L. Cottrell, Jr. (Eds.), Sociology Today, (New York, N.Y., Basic Books, Inc., Publishers, 1959).

16. Griffiths, Daniel E. Administrative Theory, (New York, N.Y., Meredith Corporation, Appleton-Century-Crofts Educational Division, 1959).

17. Haire, Mason (Ed.) Modern Organization Theory, (New York, N.Y., John Wiley and Sons, 1959).

18. Halpin, Andrew W. Administrative Theory in Education, (Danville, Illinois, Interstate Printers and Publishers, Inc., 1958).

19. Hitch, Charles J. "Program Budgeting," Datamation (Sep. 1967), pp. 37-40.

20. Koenig, Herman E. "A Systems Model for Management, Planning, and Resource Allocation in Institutions of Higher Education," J. Am. Soc. for Engineering Education, LIX (Apr. 1969), pp. 963-966.

21. Lazarus, Harold and Warren, E. Kirby The Progress of Management, (Englewood Cliffs, New Jersey, Prentice-Hall, Inc. 1968).

22. Lederer, David A. Personnel Policies - 1980, (Microfilm), (Santa Monica, California, Rand Corporation, May 1969).

23. Levinson, Harry "Whatever Happened to Loyalty," Public Management, (June 1966), pp. 160-165.

24. Likert, Rensis "Motivation: The Core of Management," in Management and the Behavioral Sciences by Maneck S. Wadia, (Boston, Massachusetts, Allyn & Bacon Inc., 1968), pp. 224-40.

25. Little, Arthur D., Inc. Port Management Problem Study, (Microfilm), (Cambridge, Massachusetts, Arthur D. Little, Inc., July 1969).

26. McGraw, James L. "The Engineering Bachelor of Technology Degree," J. Am. Soc. of Engineering Education, LX (Dec. 1969), pp. 298-300.

27. McKetta, John J. "Measuring Teaching Effectiveness," J. Am. Soc. for Engineering Education, LX (Dec. 1969), p. 325.

28. March, James G. and Simon, Herbert A. Organizations, (New York, John Wiley and Sons, Inc., 1958).

29. Mockler, Robert J. "Developing the Science of Management Control," Financial Executive, (Dec. 1967), pp. 80, 85-90.

30. Moore, Richard A. "A Freshman Curriculum for Informed Career Choices," J. Am. Soc. for Engineering Education, LX (Dec. 1969), pp. 293-94.

31. National Academy of Science - National Academy of Engineering "Institutions for Effective Management of the Environment," A report from the Environmental Studies Group to the Environment Studies Board of the NAS-NAE, (Washington, D.C., Jan. 1970).

32. National Science Foundation Suggestions for Submission of Proposals, NSF Pub. 67-18, (Washington, D.C., Sep. 1967).

33. Novick, David W. (Ed.) Program Budgeting, (Cambridge, Massachusetts, Harvard University Press, 1965).

34. Palladino, N. J. and Weidhaas, E. R. "Engineering Education in a Multicampus University," J. Am. Soc. for Engineering Education, LX (Dec. 1969), pp. 309-12.

35. Peck, Daniel "Company Loyalty: Nine Executives Present Their Views," Administrative Management, XXVII (Sep. 1966), pp. 26-29.

36. Pfiffner, John M. and Sherwood, Frank P. Administrative Organization, (Englewood Cliffs, New Jersey, Prentice-Hall, Inc. 1960).

37. Potter, V. R., et al "Purpose and Function of the University," Science, CLXVII (Mar. 20, 1970), pp. 1590-93.

38. Rubin, Irwin M. Research Program on the Management of Science and Technology, (Microfilm), (Cambridge, Massachusetts, Massachusetts Institute of Technology, Oct. 1966).

39. Selznik, Phillip Leadership in Administration, (Evanston, Illinois, Row-Peterson, Inc., 1957).

40. Simon, Herbert A. Administrative Behavior, Second Edition, (New York, N.Y., The Macmillan Company, 1957).

41. _____ The New Science of Management Decision, (New York, N.Y., Harper & Row, Publishers, Inc., 1960).

42. _____ "On the Concept of Organizational Goal," Administrative Science Quarterly, IX (June, 1964), pp. 1-22.

43. Smith, W. V. "Research Management," Science, CLXVII (Feb 13, 1970), pp. 957-59.

44. Smith, Herbert E. "Undergraduate Engineering as Preparation for Management," J. Am. Soc. for Engineering Education, LIX (Apr. 1969), pp. 949-52.

45. Smithies, Arthur "Conceptual Framework for the Program Budget," Program Budgeting, (Ed. by David Novick), Cambridge, Massachusetts, Harvard University Press, 1965), pp. 26-27.

46. Taft, Martin I. "A Systematic Method for Evaluating Teachers," J. Am. Soc. for Engineering Education, LIX (Mar. 1969), pp. 852-57.

47. Taylor, Frederick W. Scientific Management, (New York, N.Y., Harper & Row, Publishers, Inc., 1911).

48. Tead, Ordway Art of Administration, (New York, N.Y., McGraw-Hill Book Co., 1951).

49. Thompson, James D. Organizations in Action, (New York, N.Y., 1967).

50. Thompson, James D. and McEwan, W. J. "Organizational Goals and the Environment," American Sociological Review, XXIII (Jan. 1958), pp. 23-31.

51. The United States 89th Congress, Public Law 89-688, National Sea Grant College and Program Act of 1966, Washington, D.C., October 15, 1966.

52. Voich, Dan, Jr. and Wren, Daniel A. Principles of Management, (New York, N.Y., The Ronald Press Company, 1968).

53. Volmer, Howard M., et al Organizational Design, Process, and Concepts, (Microfilm), (Menlo Park, California, Stanford Research Institute, Dec. 1968).

54. Waida, Maneck S. Management and the Behavioral Sciences, (Boston, Massachusetts, Allyn and Bacon, Inc. 1968).

55. Warner, W. Keith and Havens, A. Eugene "Goal Displacement and the Intangibility of Organizational Goals," Administrative Science Quarterly, XII (Mar. 1968), pp. 539-55.

56. Weber, Max Essays in Sociology, Edited and translated by H. H. Gerth and C. W. Mills, (Cambridge, England, Oxford University Press, Inc., 1946), pp. 196-224.

57. Whistler, Thomas L., et al "Centralization of Organizational Control: A Empirical Study of its Meaning and Measurement," Journal of Business, XL (Jan. 1969), pp. 10-26.

APPENDIX I

QUESTIONNAIRE WITH TABULATED RESPONSES

EVALUATION CHECKLIST

QUESTIONNAIRE AND RESPONSES FROM INSTITUTIONAL DIRECTORS FOR PROGRAM MANAGEMENT MODEL

The original instructions asked for respondents to check one or more responses. The numbers appearing beside the response choices indicate the number of institutional program directors who chose that response.

1. How do you identify the individuals or groups which you wish to have make contributions to your program?

6	A.	Open invitation to all faculty to submit proposal for review and possible inclusion.
3	B.	Personal invitation by office staff.
0	C.	Suggestions from clientele (via industrial advisory committees, for example.)
0	D.	Selection by Academic Advisory Committee
2	E.	Other (specify)_____

2. How do you select individual proposals for inclusion in the final draft of the program proposal?

2	A.	Personal review by office staff
1	B.	Selection by industrial advisory committee
5	C.	Selection by academic advisory committee
5	D.	Other (specify)_____

3. If you have an academic advisory committee for the purpose of either program goal definition or proposal evaluation, what is its make-up?

   0 A. Higher Administration Officials

   2 B. Deans and Department Chairmen

   3 C. Senior Faculty Members

   0 D. Junior Faculty Members

   5 E. A mix of the above (Please describe)_____

4. How do you handle technical evaluation of proposals to ascertain whether they are scientifically sound, and whether they fit University Sea Grant goals and NSF Sea Grant goals?

   2 A. Review and discussion by office staff

   5 B. Review and discussion by advisory committee

   2 C. Degree to which proposed activity meets objectives on a written check list.

   3 D. Other (please explain)_____

5. How do you handle technical evaluation of progress of a project, and final results?

   4 A. Review and discussion with principal investigator; for example, on a quarterly basis.

   2 B. Annual project review utilizing a written checklist

   5 C. Other (please explain)_____

6. How do you obtain adequate feedback from project leaders for interim information?

2	A.	Regular report (i.e., quarterly)
0	B.	Oral presentations on an individual basis
4	C.	Seminar presentations on a group basis
5	D.	Formal or informal visits to research labs
4	E.	Full time program staff member to perform liaison function
2	F.	Other_____

7. Where do the decision points rest for determining the future course of the program?

7	A.	In the program office
4	B.	In academic advisory committees
1	C.	In industrial advisory committees
0	D.	In individual activity leaders
3	E.	In the university administration
0	F.	Other (please specify)_____

8. How do you develop faculty and student loyalties to the program mission?

3	A.	By supplying both NSF and matching funds to activity leaders
6	B.	By allowing total freedom to principal investigators in the conduct of their program activities

5 C. By frequent meetings with individual principal investigators

2 D. By total program seminars

4 E. By sub-group (i.e., all Fisheries Principal Investigators) seminars

3 F. Other techniques (please explain)_____

9 In the hierarchy of the university administration, what position does the directorship of the program occupy?

1 A. Report to the President or Chancellor

4 B. Report to a Vice-President or Vice-Chancellor

3 C. Report to a Dean

0 D. Other (Please specify)_____

10. How is your technician training program administered?

1 A. Entirely by Sea Grant

4 B. Cooperatively with a community college

1 C. Cooperatively with another educational entity (please specify)_____

2 Not applicable

11. Is your Sea Grant Extension and Advisory Program separate from your Agricultural and Engineering Extension Service?

5 Yes

4 No

12. Do you have special arrangements for handling Sea Grant funds, or is this accomplished by your university fiscal office?

    3 A. Special arrangements

    5 B. Handled by university fiscal office

13. What are the sources of your matching funds (please also indicate approximate percentages)?

    3 A. Specially appropriated matching funds _____%

    7 B. Matching is an academic departmental responsibility_____%

    4 C. Industrial matching_____%

14. Do you have flexibility in allocating program funds; i.e., can they be recalled and recommitted?

    7 Yes

    1 No

15. If your answer to (14) was yes, under what circumstances can funds be recalled?

    3 A. Illness of principal investigator

    4 B. Inadequate performance

    5 C. Overbudgeting

    3 D. Other (explain)_____

    1 No response

16. Do you employ program budgets or line item budgets in your program?

6 A. Program budgets

6 B. Line item budgets

17. Do you employ program budgets or line item budgets in your proposal?

7 A. Program budgets

2 B. Line item budgets

18. Which elements of your program do you envision as having the greatest long-range importance? Please rank order (1,2,3) your response.

A. Research 1._____

B. Education 2._____ (See Table below)

C. Extension 3._____

Ranking, by Directors, of importance of Sea Grant Activities

Activity	Ranking*	Trend
Education	1,1,1,3,3	1
Research	1,1,2,3,3	2
Extension	2,2,2,2,3	3

*The rankings include only five of the eight responses since two directors ranked all three activities as equal in importance, while one director did not reply to the question.

Please provide a short answer to each of the following questions.

1. How do you handle the administrative control of the total program when utilizing the services of members of discipline-oriented academic units, or do you attempt to do so?

2. How have you defined the focus of your program?

3. Having established the program focus, how do you establish program objectives and evaluate their attainment?

4. How many assistants have you, and what are their titles? (If you have written job descriptions for the non-clerical management positions, I would like to have a copy. No financial information, please.)

SEA GRANT PROGRAM OFFICE

ANNUAL PROJECT EVALUATION SHEET

1. Project Title:
2. NSF Funds:
3. Amount $_____ and Source of Matching Funds expended to date: (To be verified by Activity Leader)
4. Project Summary from Original Proposal: (Activity Leader should review this summary and advise the Sea Grant Program Office whether it is accurate and sufficient.)

A. Personnel and Staffing

   1. Number of Professional Staff working on project _____. Consultants _____.
   2. Number of Graduate Students working on project _____.
   3. Number of Laboratory Technicians, etc., employed (exclude clerical) _____.
   4. Number of Undergraduate Students working on project, if any _____.
   5. Was any difficulty experienced in obtaining adequate quantity or quality of personnel to staff the project?
   6. If yes, explain:

B. Cooperation (Degree and Kind)

   Have you:

a. conferred or consulted with professional staff from your own or other academic departments in carrying on your activity?

b. conferred with other groups internal to, or outside of the university?

c. established industry contacts in either a working or advisory capacity?

d. established any contacts for either information exchange or work sharing, in other universities?

e. conferred with any state or federal agencies?

C. Attainment of Objectives

1. What is the application (end product) of your research as you conceive it?

2. Of the objectives you outlined in your proposal to the Sea Grant Program Office are there any which, as of this time you have been unable or partially unable to meet? What are the causes?

3. Was your original proposal conceived as a multi-year project? Yes_____ No_____

4. a. Have any of the original objectives been altered as a result of the present year's activity?

   b. If so, how?

D. Publications or other Tangible End-Products

1. If any graduate students were involved in your activity, has any thesis_____ dissertation_____ material resulted

from their research? Give title(s) of thesis or dissertation, and name(s) of student(s) (If you have not already done so, please supply three copies, one unbound, to the Sea Grant Program Office at your earliest convenience).

2. Have any journal articles been published or submitted for publication by professional staff as a result of your research or activity? List:
3. Is there any other tangible evidence of the utility of the results of your activity, such as new devices, new processes, new techniques or other things pertinent to marine resources development? (If photos, drawings or word descriptions exist or can be developed, please provide two copies to the Sea Grant Program Office for documentation.)
4. Do you anticipate that any of the results of your activity can or will be integrated into a formal academic course?
5. Have any news releases, brochures or other forms of publicity or publication resulted from your activity? (Please attach 3 copies.)

APPENDIX II

PROGRAM FOCUS PAPER

PUBLIC LAW 89-688, NATIONAL SEA GRANT COLLEGE AND PROGRAM ACT OF 1966, EIGHTY-NINTH CONGRESS, WASHINGTON, D.C., OCT. 15, 1966

A SUGGESTED FOCUS FOR THE TEXAS A&M UNIVERSITY SEA GRANT INSTITUTIONAL PROGRAM

Introduction

A number of recent events at the local, state and national level, and some few events that may be anticipated to come to pass, lend impetus to the need for a well defined focus and set of goals for the Sea Grant Institutional Program at Texas A&M.

What are these events?

At the base of the whole question is the establishment of the Sea Grant Program itself, within the National Science Foundation. Without this, there would be no institutional program. Concomitant with this is the refusal (wisely made) of the National Sea Grant Office, to consider "shopping list" type proposals for Sea Grant funding. This refusal naturally leads each institution to establish a firm focus and set of goals at some point in the existence of its program.

The deliberations, and resultant report of the Committee on Marine Science, Engineering and Resources, suggests some very far ranging programs. Assuming that at least some of these suggestions will be acted upon by Congress, it is well to consider provision for these suggestions to be included as possible focal points in the institutional plan. Two of the more important of these, to a university, are the University-National Laboratory and the Coastal Zone Laboratory. Both of these plans would doubtless include funds for facilities.

Another anticipated event is the designation, by the NSF, of Sea Grant Colleges. Much has been written about the similarities between the Sea Grant concept and the Land Grant concept. In reality the two concepts are probably more dissimilar than alike. Yet the potential for designation as a Sea Grant College must be considered by an institution in defining its focus and goals.

Closer to home, an institution should be aware of activities in marine resources within its own state. This includes an awareness of state agency activity, educational activity, industrial activity, and to some extent, the opinions of laymen, although the latter are difficult to assess because of the volubility of pressure groups and the diffuseness of power centers.

In Texas, the recently established Interagency Council on Natural Resources has begun to focus on the overall question of natural resource development. It will, at some point in time, identify a variety of problems for which solutions must be found. The desires of the Council, and of the Legislative Branch of the State Government will certainly need to be considered in defining a focus for marine resource development programs.

Finally, and perhaps most important, it is necessary for a university to assess its own marine activities goals, in relation to its total goals, and to assess its own perception of the needs of industry, the state and the nation. In relation to these points, several questions arise. Among these are:

1) In relation to the total goals of the university, how can the administration assess the degree of support it is willing to give to marine activities?
2) Having assessed this, how can the university administration best go about making industry, state agencies and federal agencies aware of this commitment, in the best light?
3) How can the university encourage staff and students to do work in areas suitable to these goals, or indeed can the university expect its staff and students to follow the desires of the marine affairs planners?
4) Can a university really identify a set of regional needs that will help it to establish a realistic set of program goals?

In summary, then, as a natural extension of this need to develop a focus for the Sea Grant Program, an institution must examine national goals as elucidated by the federal administration, federal agencies and national study panels; regional and/or state goals as elucidated by the analogous state administration, agencies and study panels; and, finally, the overall goals of the institutional administration and faculty. Secondly, it is clear that a focus for the Program needs to encompass both long-and short-range goals.

Some Elements Requiring Consideration in Determining a Texas A&M University Sea Grant Focus

Even a cursory examination of the foregoing discussion indicates the complexity of the factors that must be considered in defining a Sea Grant Program focus at Texas A&M, or because of the interrelationship of all the programs cited, a marine resource program focus. To establish this focus it is necessary to consider the needs and recommendations of such programs and groups as

A. On the National Level:
   1) The Committee on Marine Science, Engineering and Resources
   2) The NSF Sea Grant Institutional Award Program
   3) The NSF Sea Grant College Award Program
   4) The Navy Oceanographic Office
   5) The Office of Naval Research
   6) The Department of the Interior (several Bureaus)
   7) National Academy of Science Committee on Oceanography
   8) Numerous other committees and agencies

B. On the State-Regional Level:
   1) The Governor's Planning Office
   2) The Interagency Natural Resources Council
   3) Texas Parks & Wildlife Commission
   4) Other state agencies
   5) Coastal industry and trade associations
   6) Other state universities and research laboratories
   7) Gulf Universities Research Corporation
   8) Other Gulf Coast Sea Grant Programs, both institutional and project type.

C. On the Local Level:
   1) The overall educational focus of the University and individual departments, especially Oceanography and Civil Engineering
   2) The research interests of faculty and staff
   3) The University's conception of its role in marine resource development.

4) Inter-University and University-Junior College Cooperative Agreements
5) The Galveston operations of the University

This listing is indicative, and certainly not exhaustive. Any reader conversant with Texas marine activities could not doubt add many more special interest groups to the list. There are probably several other groups not listed whom the reader out of his own experience would consider to be of major importance.

A Definition of Focus

Before proceeding further it becomes necessary to define what is meant by the term "focus." The dictionary definition is "a center of activity or attention." This is a very neat package of words, but in terms of the Sea Grant Program, it tells us exactly nothing. The term "focus" in regard to the Program must be broader in every sense. There must of necessity be several centers of activity, and these centers must have the capability to shift with time, and be subject to phasing-in and -out as necessitated by these shifts. In other words, there must be long-term as well as short-term goals, and while the Sea Grant Program cannot be all things to all people, it must attack problems in marine resource development on several fronts, in a variety of areas of need. Further, kinds of activity and arenas of activity must both be considered (i.e., research, technician training and education vs. Oceanography Department, Coastal Engineering Department and Extension Service).

In summary, it is clear that both external factors and internal factors, each on a broad scale, must be considered in developing foci (if we accept the premise that more than one kind and degree of focus is essential) for the program.

External Factors Concerning Focus Development

The Sea Grant Program Office at Texas A&M is dedicated to playing a major regional role in marine resource development activities. It faces the question of identifying the regional needs in marine resources development, and of attempting to establish some kind of priority listing among these needs.

Some possible ways of approaching this problem are:

1) Inquiries to federal and state agencies concerned with marine resources, asking them to give their assessment of regional needs and appropriate areas of activity under the Sea Grant Program.
2) Similar letters and visits to industrial organizations, trade associations and selected company leaders to gather the same kind of information.
3) A series of conferences at selected coastal locations to involve local leaders and marine resource users.

4) Assignment of the specific job, to an individual, to survey all available national reports and studies on marine resources to identify regional needs.

5) Conferences of selected university people from throughout the state to consider the question.

Another immediate goal to be accomplished by the Sea Grant Program is to develop an identity for itself among leaders of the State, and to provide stature for the Program among leaders of the State. One means of providing this identity is through the establishment of an Advisory Board. Such an Advisory Board could also help in establishing a regional program. In setting up such an Advisory Board, certain questions arise, among them being, "Should the Board include persons from outside the State of Texas?" "To what extent should the Board include people from other universities?" "To what degree should State legislators be involved?"

Another key aspect of the question of an identity for the Program is the necessity of keeping the Executive and Legislative branches of the State government aware of the activities of the Program. Governor Smith, Lieutenant Governor Barnes, House Speaker Mutscher and key members of the Legislature should be contacted and kept aware of Program activities. The Sea Grant Program must, of necessity, play a key role in establishing the University's image as a dominant force

in marine affairs in the minds of the people of the State, and of their representatives in State government.

Internal Factors Concerning Focus Development

Having in a sense wandered somewhat far afield from some of the previously posed questions of focus, let us return now to a few of these. Earlier it was stated that a need existed for the identification of regional marine resource development problems, and the encouragement of faculty and student effort devoted to solving the problems. A means of identifying need has been set forth, which should be workable. The question might be raised whether it will be possible, once these problems are identified, to locate people willing to work on the problems in an academic atmosphere. This appears to be begging the question. The first step in solving any problem is to recognize that the problem exists. Having recognized the problem, if no problem-solver appears on the university campus, the Sea Grant Program Office is allowed by statute to negotiate agreements with outside organizations and/or industrial groups who would be willing to work for solutions to problems of which they are aware. Another approach would be to cast the Sea Grant Program into a mission-oriented or problem-oriented format, wherein problem areas are identified and selected faculty are invited to solve the problem after it is identified. This approach would doubtless require a much larger volume of "unallocated" funds than are now available from NSF. Another disadvantage to this approach is the tendency for projects,

once established, to go on forever, examining side issues and/or delving deeper into already exhausted topics. This latter difficulty can be circumvented by a thorough evaluation of projects on a regular basis.

It does not suffice to say merely that the Sea Grant Program consists of research, applied research, education, technician training, extension, advisory services, etc. Each of these components needs to be characterized and identified. For example, what is the nature of the extension and advisory service program under the Sea Grant? It cannot be all things, particularly in the beginning. What can it be, and to what can it build? To a degree, questions of this nature can only be answered by the people for whom the advisory effort is to be expended, i.e., the coastal resident who wants the advice. Yet the program also needs to have a long-range picture of the goals to be reached and the individual steps by which these goals will be attained. These must be established by extension personnel and the Sea Grant Program Office. The same can be said for each of the other component parts of the program.

Another critical factor in establishing a focus was alluded to earlier. This is the question of functional (research, extension) vs. subject matter (fisheries, mineral resources) organizational format. Realistically, to avoid the temptation to re-package each year, and to encourage interdepartmental cooperation, the latter approach would probably be more viable. Some of the operations within the Sea Grant Program either had a pre-existing subject matter orientation, or have

evolved in that direction. Among these are the Galveston Marine Laboratory, The Galveston Community College Technician Training activity, the Extension Service (to a degree) and the Fisheries and Marine Biology seminar group (to a degree). This is not to say that these groups have reached the pinnacle of success, but they at least seem to be moving in the subject matter direction.

Some Suggested Foci

What forms should the subject matter foci of the various Program activities take? This question to a degree must await the results of the survey of federal and state agencies and coastal industry mentioned earlier. A few broad general areas of focus, and some specific areas are fairly apparent, however.

One major focus for the Program should be on biological organisms and biochemical interactions in the sea. This would include food-from-the-sea, fisheries and aquaculture, demonstration ponds, pollution abatement and perhaps some other areas. Another area of focus is one that might be called coastal zone processes, dealing with near-onshore and near-offshore phenomena and occurrences. Covered within this category could be man-in-the-sea, man-on-the-sea, offshore platforms, marine transportation, dock and harbor facilities, dredging, coastal engineering, wave forecasting and others.

A third area of endeavor might be classified as geoscience processes, and would include such activities as mineral recovery,

petroleum prospecting and production problems, water and sediment analysis, desalination processes and other activities of a similar nature.

One other area, which in a sense is an umbrella for all the others, is the consideration of marine economics and resource management. Also falling under this umbrella is consideration of such facets of the total problem as sport fisheries and coastal recreation of all kinds.

Program Evaluation

No program can hope for long term success without periodic, objective, rational evaluation. The Sea Grant Program must be evaluated, just as must any other. It would be difficult to evaluate the program on a subject matter basis because of the diverse elements involved. It is better, though still not an easy matter, to establish criteria for evaluation on an activity basis, e.g., extension, information, research, technician training.

Research - As conceived by the NSF, the Sea Grant Program, especially in its research activities, is intended to function as an interest builder, or in a seed-money context. As such, one of its primary functions is to generate interest among industrial and other organizations in carrying forward projects having potential commercial or industrial applications. The National Sea Grant Office has chosen to concentrate on applied research, although not to the total exclusion of basic research. The Sea Grant concept largely excludes

research on fresh water inflows except in pollution studies, and also deep water exploration, except as both of these might affect estuarine and nearshore areas. Consequently the Sea Grant Program at this time is fairly narrowly confined as a practical matter to estuaries, shorelines and the nearshore waters, and our focus and evaluation criteria should develop accordingly.

It is suggested that each project of a "basic" character be reviewed carefully on at least an annual basis to determine its progress, its current applicability and its merit with regard to the primary thrust of the overall marine resource development program at A&M, and that programs of applied research be supported until the application has been proved or disproved, or until some other sponsor expresses an interest in supporting the research. Except in rare circumstances, we should avoid carrying a project in the program for an extended period of time. Applied research projects, too, should be reviewed at least annually for continued pertinence and for pregress. However, since applied research projects usually result in a visible end product, the evaluation might be less intensive.

Some of the research projects that are classed as basic, within the program, have a definite applied flavor. The economics research is centered on a theoretical model that has application potential. The pollution studies could yield vitally important results to applied problems. The geochemical research projects are important for mineral recovery although their economic impact is farther

downstream. The applied nature of the projects so classed in the institutional proposal can hardly be questioned.

If industry becomes interested in some project, we could contribute only a small amount of funds, and let industry carry as much as they will. We probably should reduce the research section of our future proposals at an even faster rate than we now have programmed. This is very hard to do considering the existing level of interest, however, and if we cut back too drastically, we may lose the cooperation and interest of our researchers.

Furthermore, at this stage, research is the stimulus--particularly applied research. Perhaps we also need to fund "state of the art" reviews in a few critical areas.

We cannot know what the relative economic values of possible research areas are until the Industrial Economics Research Division finishes its economic impact study, but most of these appear to be independent of evaluatable economic benefit (pollution, water extraction, food from the sea).

Education and Training - A definite program for educational development is difficult to perceive. Areas of non-involvement are easier to delineate. There is probably not much we can do to involve departments such as English, Mathematics, Language, Dairy Science, etc. Almost all the rest, however, could conceivably have some interest in course development.

Educational program development in a given academic department at this time should not be allowed specifically for the purpose of attracting new faculty, i.e., the faculty person should be on board to develop the course before development is begun. A definite focus and goal should exist within the department, and when the goal is reached, development of new courses should cease, unless newly identified student, industrial or other regional needs dictate additional new courses. There can, of course, be no fixed limit to the number of courses to be developed. Obviously, for example, Coastal Engineering, being a directly related discipline, and a new department, would have more need for course development than would Economics, which might need to develop only one or two courses.

The NSF Sea Grant Program Office has expressed an interest in the development of a masters degree program for coastal zone managers. Such a program could possibly be developed by the Management Department of the College of Business Administration.

Veterinary Medicine should be encouraged and aided in the development of courses in marine diseases. Since they provide many or the food inspectors for meat processing plants, a general course on the subject of marine disease and spoilage might be initiated, or made part of an existing course.

Some of the large shrimp fishing companies have expressed an interest in hiring college graduates as boat captains. How can courses be developed to meet these needs? Involved in such a preparation program would be such subjects as navigation, ship maintenance,

weather patterns, diesel engine fundamentals, marketing concepts, marine diseases and numerous others.

After an initially fairly high level of course development, the level of funding for this aspect of sea grant activities will probably decline exponentially, at least until we see what sort of facility and teaching assistance we can expect from designation as a Sea Grant College. We need to continue to give some thought to the form that such designation should take, so that our ideas can then be transmitted to the National Science Foundation for consideration.

Technician Training - At Galveston Community College they plan to use marine biology graduate students (available from the marine lab) to assist in lab instruction in that discipline. Perhaps when the marine lab is more fully developed, a physical oceanography or coastal engineering grad student who wants to work on thesis data gathering could be utilized in a similar capacity in physics. In short, employment by the technician training program in Galveston may be a way to support graduate students who need to live there.

The Texas coastline is long enough to support as many as four well-spaced technician training centers. These could make excellent locations for extension centers as well.

It appears that we have focused on the proper technician training programs for this region, in fisheries and oceanographic instrumentation. Later, we might want to establish other kinds of technician programs, including perhaps a bi-lingual program.

Review of technician training programs for progress and timeliness will probably need to be less frequent than research reviews. Advisory committees developed by each junior college will probably be effective in keeping these programs current and effective; although a single advisory committee for the total Technician Training program would probably be preferable.

Extension, Advisory and Information Services - Should the shrimp farming demonstration program operation be the primary focus of the extension program? Would it be more profitable to devote more effort in developing communications with coastal residents and leaders in marine resource utilization, and in the establishment of advisory programs?

The focus of this portion of the Sea Grant Program is information, both collection and dissemination. The on-campus and all off-campus information centers should remain associated with this portion of the program. The center of this activity should be in the Sea Grant Program Office to assure its responsiveness to all aspects of the Sea Grant Program.

The Information Center should also have responsibility for the compilation of reports, publication of conference proceedings and scholarly papers from Sea Grant research and other similar activities, in addition to its present activity of gathering, storing and disseminating information to users.

Some of the activities of the extension program will need to be reviewed more frequently than others. For example, the shrimp culturing program, being of an empirical nature, will need to be watched more closely than the advisory aspects of the program. The NSF Site Selection Committee expressed concern that the information system would be unable to integrate information rapidly enough to remain useful to ultimate users. We must be careful that this does not occur. Careful and fairly frequent review would help to accomplish this.

Summary - The methods for reviewing existing activities and the establishment of ground rules for estimating their value in regard to continuing support, is a much stickier problem than the preceding questions. The Sea Grant Program staff still must be responsible for periodic visits to activity sites to stay conversant with the nature and progress of the activities.

There are a few projects for which activity leaders prepared four and five year budgets in the second year proposal. In the future, researchers should be discouraged from such long term budgets. There are at least three dangers in long term projects:

(1) a tendency to be complacent and to expect several years of support regardless of output,

(2) a possibility that the program will not continue to be pertinent over the long time span, and

(3) a fuzziness about the goals of the project or its intended products.

Further, for the same reasons, and others, it is wise for certain of the non-research programs, such as information and technician training, to be tied directly to the administrative offices.

Public Law 89-688
89th Congress, H. R. 16559
October 15, 1966

An Act

To amend the Marine Resources and Engineering Development Act of 1966 to authorize the establishment and operation of sea grant colleges and programs by initiating and supporting programs of education and research in the various fields relating to the development of marine resources, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the Marine Resources and Engineering Development Act of 1966 is amended by adding at the end thereof the following new title:

National Sea Grant College and Program Act of 1966.

"TITLE II—SEA GRANT COLLEGES AND PROGRAMS

Ante, p. 203.

"SHORT TITLE

"SEC. 201. This title may be cited as the 'National Sea Grant College and Program Act of 1966'.

"DECLARATION OF PURPOSE

"SEC. 202. The Congress hereby finds and declares—

"(a) that marine resources, including animal and vegetable life and mineral wealth, constitute a far-reaching and largely untapped asset of immense potential significance to the United States; and

"(b) that it is in the national interest of the United States to develop the skilled manpower, including scientists, engineers, and technicians, and the facilities and equipment necessary for the exploitation of these resources; and

"(c) that aquaculture, as with agriculture on land, and the gainful use of marine resources can substantially benefit the United States, and ultimately the people of the world, by providing greater economic opportunities, including expanded employment and commerce; the enjoyment and use of our marine resources; new sources of food; and new means for the development of marine resources; and

"(d) that Federal support toward the establishment, development, and operation of programs by sea grant colleges and Federal support of other sea grant programs designed to achieve the gainful use of marine resources, offer the best means of promoting programs toward the goals set forth in clauses (a), (b), and (c), and should be undertaken by the Federal Government; and

80 STAT. 998

"(e) that in view of the importance of achieving the earliest possible institution of significant national activities related to the development of marine resources, it is the purpose of this title to provide for the establishment of a program of sea grant colleges and education, training, and research in the fields of marine science, engineering, and related disciplines.

80 STAT. 999

"GRANTS AND CONTRACTS FOR SEA GRANT COLLEGES AND PROGRAMS

"SEC. 203. (a) The provisions of this title shall be administered by the National Science Foundation (hereafter in this title referred to as the 'Foundation').

Administration by National Science Foundation.

"(b)(1) For the purpose of carrying out this title, there is authorized to be appropriated to the Foundation for the fiscal year ending June 30, 1967, not to exceed the sum of $5,000,000, for the fiscal year ending June 30, 1968, not to exceed the sum of $15,000,000, and for

each subsequent fiscal year only such sums as the Congress may hereafter specifically authorize by law.

"(2) Amounts appropriated under this title are authorized to remain available until expended.

"MARINE RESOURCES

"Sec. 204. (a) In carrying out the provisions of this title the Foundation shall (1) consult with those experts engaged in pursuits in the various fields related to the development of marine resources and with all departments and agencies of the Federal Government (including the United States Office of Education in all matters relating to education) interested in, or affected by, activities in any such fields, and (2) seek advice and counsel from the National Council on Marine Resources and Engineering Development as provided by section 205 of this title.

Research programs, etc.

"(b) The Foundation shall exercise its authority under this title by—

"(1) initiating and supporting programs at sea grant colleges and other suitable institutes, laboratories, and public or private agencies for the education of participants in the various fields relating to the development of marine resources;

"(2) initiating and supporting necessary research programs in the various fields relating to the development of marine resources, with preference given to research aimed at practices, techniques, and design of equipment applicable to the development of marine resources; and

"(3) encouraging and developing programs consisting of instruction, practical demonstrations, publications, and otherwise, by sea grant colleges and other suitable institutes, laboratories, and public or private agencies through marine advisory programs with the object of imparting useful information to persons currently employed or interested in the various fields related to the development of marine resources, the scientific community, and the general public.

Contracts or grants.

"(c) Programs to carry out the purposes of this title shall be accomplished through contracts with, or grants to, suitable public or private institutions of higher education, institutes, laboratories, and public or private agencies which are engaged in, or concerned with, activities in the various fields related to the development of marine resources, for the establishment and operation by them of such programs.

80 STAT. 999

80 STAT. 1000

"(d)(1) The total amount of payments in any fiscal year under any grant to or contract with any participant in any program to be carried out by such participant under this title shall not exceed 66⅔ per centum of the total cost of such program. For purposes of computing the amount of the total cost of any such program furnished by any participant in any fiscal year, the Foundation shall include in such computation an amount equal to the reasonable value of any buildings, facilities, equipment, supplies, or services provided by such participant with respect to such program (but not the cost or value of land or of Federal contributions).

Disposition of funds, restrictions.

"(2) No portion of any payment by the Foundation to any participant in any program to be carried out under this title shall be applied to the purchase or rental of any land or the rental, purchase, construction, preservation, or repair of any building, dock, or vessel.

"(3) The total amount of payments in any fiscal year by the Foundation to participants within any State shall not exceed 15 per centum of the total amount appropriated to the Foundation for the purposes of this title for such fiscal year.

"(e) In allocating funds appropriated in any fiscal year for the purposes of this title the Foundation shall endeavor to achieve maximum participation by sea grant colleges and other suitable institutes, laboratories, and public or private agencies throughout the United States, consistent with the purposes of this title.

"(f) In carrying out its functions under this title, the Foundation shall attempt to support programs in such a manner as to supplement and not duplicate or overlap any existing and related Government activities.

"(g) Except as otherwise provided in this title, the Foundation shall, in carrying out its functions under this title, have the same powers and authority it has under the National Science Foundation Act of 1950 to carry out its functions under that Act.

64 Stat. 149.
42 USC 1861 note.

"(h) The head of each department, agency, or instrumentality of the Federal Government is authorized, upon request of the Foundation, to make available to the Foundation, from time to time, on a reimbursable basis, such personnel, services, and facilities as may be necessary to assist the Foundation in carrying out its functions under this title.

Personnel, facilities, etc., availability.

"(i) For the purposes of this title—

Definitions.

"(1) the term 'development of marine resources' means scientific endeavors relating to the marine environment, including, but not limited to, the fields oriented toward the development, conservation, or economic utilization of the physical, chemical, geological, and biological resources of the marine environment; the fields of marine commerce and marine engineering; the fields relating to exploration or research in, the recovery of natural resources from, and the transmission of energy in, the marine environment; the fields of oceanography and oceanology; and the fields with respect to the study of the economic, legal, medical, or sociological problems arising out of the management, use, development, recovery, and control of the natural resources of the marine environment;

"(2) the term 'marine environment' means the oceans; the Continental Shelf of the United States; the Great Lakes; the seabed and subsoil of the submarine areas adjacent to the coasts of the United States to the depth of two hundred meters, or beyond that limit, to where the depths of the superjacent waters admit of the exploitation of the natural resources of the area; 80 STAT. 1606
the seabed and subsoil of similar submarine areas adjacent to the coasts of islands which comprise United States territory; and the natural resources thereof; 80 STAT. 1607

"(3) the term 'sea grant college' means any suitable public or private institution of higher education supported pursuant to the purposes of this title which has major programs devoted to increasing our Nation's utilization of the world's marine resources; and

"(4) the term 'sea grant program' means (A) any activities of education or research related to the development of marine resources supported by the Foundation by contracts with or grants to institutions of higher education either initiating, or developing existing, programs in fields related to the purposes of this title, (B) any activities of education or research related to the development of marine resources supported by the Foundation by contracts with or grants to suitable institutes, laboratories, and public or private agencies, and (C) any programs of advisory services oriented toward imparting information in fields related to the development of marine resources supported by the Foundation by contracts with or grants to suitable institutes, laboratories, and public or private agencies.

"ADVISORY FUNCTIONS

"SEC. 205. The National Council on Marine Resources and Engineering Development established by section 3 of title I of this Act shall, as the President may request—

Ante, p. 204.

"(1) advise the Foundation with respect to the policies, procedures, and operations of the Foundation in carrying out its functions under this title;

"(2) provide policy guidance to the Foundation with respect to contracts or grants in support of programs conducted pursuant to this title, and make such recommendations thereon to the Foundation as may be appropriate; and

Report to Congress.

"(3) submit an annual report on its activities and its recommendations under this section to the Speaker of the House of Representatives, the Committee on Merchant Marine and Fisheries of the House of Representatives, the President of the Senate, and the Committee on Labor and Public Welfare of the Senate."

SEC. 2. (a) The Marine Resources and Engineering Development Act of 1966 is amended by striking out the first section and inserting in lieu thereof the following:

Ante, p. 203.

"TITLE I—MARINE RESOURCES AND ENGINEERING DEVELOPMENT

"SHORT TITLE

Citation of title I.

"SECTION 1. This title may be cited as the 'Marine Resources and Engineering Development Act of 1966'."

(b) Such Act is further amended by striking out "this Act" the first place it appears in section 4(a), and also each place it appears in sections 5(a), 8, and 9, and inserting in lieu thereof in each such place "this title".

Approved October 15, 1966.

LEGISLATIVE HISTORY:

HOUSE REPORTS: No. 1795 (Comm. on Merchant Marine & Fisheries) and No. 2156 (Comm. of Conference).
SENATE REPORT No. 1307 accompanying S. 2439 (Comm. on Labor & Public Welfare).
CONGRESSIONAL RECORD, Vol. 112 (1966):
Sept. 13: Considered and passed House.
Sept. 14: Considered and passed Senate, amended, in lieu of S. 2439.
Sept. 30: Senate agreed to conference report.
Oct. 4: House agreed to conference report.

GPO 65-139

VITA

NAME AND ADDRESS	Donald Eugene Walsh 1203 Winding Road College Station, Texas
DATE AND PLACE OF BIRTH	September 25, 1933 Kilgore, Texas
EDUCATION	Kilgore High School - 1950 Kilgore Junior College Associate of Arts - 1953 A&M College of Texas Bachelor of Science, Physics - 1959 A&M College of Texas Master of Science, Oceanography - 1962
FIELD OF SPECIALIZATION	Educational Curriculum and Instruction
RESEARCH EXPERIENCE	Wave Refraction and Wave Energy on Cayo Arenas, Campeche Bank, M.S. Thesis 1962. Sponsored by Office of Naval Research Contract Nonr2119(4) and National Science Foundation Grant G9447. Analysis of sugar content in Texas sugar beets by specific gravity and index of refraction of extracted juices. Unpublished.
EMPLOYMENT	Instructor of Mathematics and Physics, Allen Military Academy Junior College Division, September 1961 - May 1965. Technical Procurement Officer, Texas A&M University Purchasing Department, September 1965 - November 1968. Program Associate, Sea Grant Program Office, December 1968 -
MARITAL STATUS	Married to the former Jennie Marie Russell, November, 1955, Number of children--2.
NAME AND ADDRESS OF PARENTS	Mr. and Mrs. Raymond L. Walsh Rt. 3, Box 281 L Kilgore, Texas
TYPIST	(Mrs.) Quin Wright