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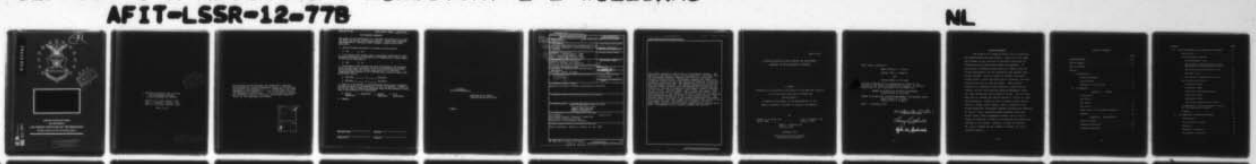

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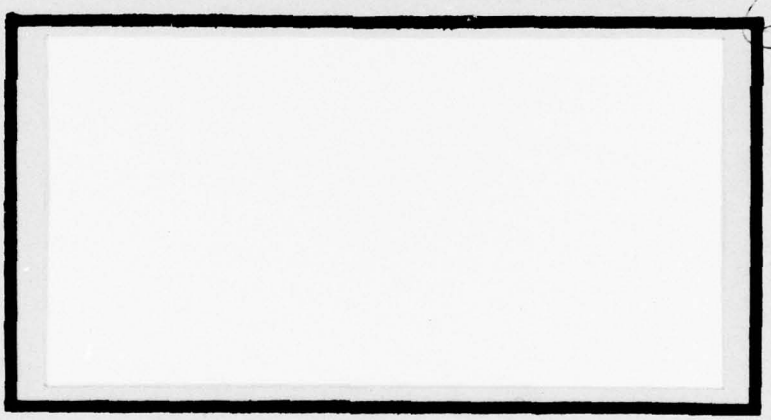

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A PROPOSED DEFINITION AND TAXONOMY FOR PROCUREMENT RESEARCH IN THE DEPARTMENT OF DEFENSE

Gerald R. J. Heuer, Major, USAF
John C. Kingston, Captain, USAF
Eddie L. Williams, Captain, USAF

LSSR 12-77B

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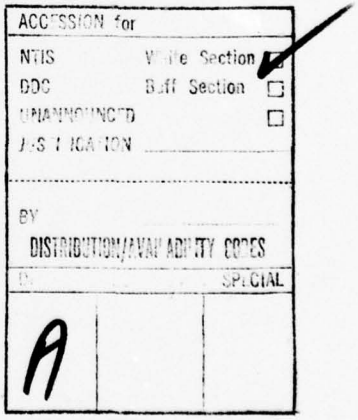

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This report presents a definition of procurement research. The definition was derived from a content analysis of the first five DOD Procurement Research Symposia (1972-76) for procurement research characteristics. Procurement research was found to be an applied social science using abstract/mathematical techniques, relying on historical data, and emphasizing both the acquisition and procurement processes. The general characteristics derived from the content analysis were supplemented with interviews and literature reviews to construct a procurement research taxonomy of five levels: process, phase, cycle, event, and issue. Four levels are discussed in detail. The taxonomy was combined with characteristics of the scientific method to construct an algorithm for determining whether an effort is procurement research. The taxonomy should be helpful to procurement researchers and operators to provide them with a means of focusing on key events of the procurement process. The report also contains a history of procurement research and procurement organizational changes since 1950. Recommendations for further research are offered.

LSSR 12-77B

A PROPOSED DEFINITION AND TAXONOMY FOR PROCUREMENT RESEARCH IN THE DEPARTMENT OF DEFENSE

A Thesis

Presented to the Faculty of the School of Systems and Logistics

of the Air Force Institute of Technology

Air University

In Partial Fulfillment of the Requirements for the

Degree of Master of Science in Logistics Management

By

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September 1977

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MASTER OF SCIENCE IN LOGISTICS MANAGEMENT (PROCUREMENT MAJOR)
Major Gerald R. J. Heuer
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CHAPTER I

INTRODUCTION

Problem Statement

Extensive research has been accomplished in the name of procurement over the past few years but no definitive, delimited concept has evolved as to what constitutes procurement research (59). A Review of early Department of Defense (DOD) Procurement Symposia "Proceedings" indicated that professionals in the field of procurement called for a definition of "Procurement Research" as well as the classification of its characteristics into a model to provide for more efficient use of resources (30,36). In a recent interview with Robert F. Trimble, Assistant Administrator, Office of Federal Procurement Policy (OFPP) for Contract Administration, the need for a definition of procurement research was raised again (59). The need exists to clearly define procurement research and to classify its characteristics into a usable conceptual model.

Justification

The Federal Government spends billions of dollars each year for the procurement of weapons, weapon systems, equipment, services, and supplies, required for the operation

of the DOD. In fiscal year 1978, the proposed budget amount is $35.1 billion (68). As a consequence of the magnitude of these outlays, repeated cost, schedule, and performance problems, and increased general public awareness, the DOD procurement (acquisition) process has come under serious criticism in recent years (24:2-4).

Research has been viewed by many in the field as a key to alleviating both existing and future procurement problems (6:1). Senator Stennis, Chairman of the Senate Committee on Armed Services, and Congressman Price, Chairman of the House Committee on Armed Services, reiterated this widely held belief in a joint letter to Defense Secretary Schlesinger:

> We recognize the value and importance of procurement research as a means of improving the procurement process -- one of the most crucial tasks in Government [51].

Even though there is a general consensus as to the importance and possible impact of research on the procurement process, procurement research as a discipline has not been clearly defined in existing literature and practice. Also, there is little agreement among the agencies performing this research as to what constitutes research (4:2). There have been several indications as to a possible scope for procurement research; for example, J. M. Malloy, then

Deputy Assistant Secretary of Defense for Procurement, described procurement research as essentially "a systematic approach" that follows the scientific method (36:215). However, there has not been a concerted effort to adequately describe what should be included. The result has been that research efforts are categorized as both tentative and diffuse (53:4). Robert Judson, then Deputy Director of Commission Studies, Commission on Government Procurement (COGP), stated that procurement research's

> . . . first order of priority . . . is to construct . . . a model so that we can share a consensus on procurement problems, . . . a comprehensive studious critical conceptual model for the acquisition process that will give us insights we do not now possess that will help us identify what we don't know [30:93].

The importance of procurement research and the necessity of defining its role in Government acquisition was reaffirmed in an interview with Robert F. Trimble, Assistant Administrator, OFPP for Contract Administration. He discussed procurement research as follows:

> I've long had an interest in procurement research. I think that it [an attempt to define and classify procurement research] is one that is particularly important because I have seen a considerable amount of confusion regarding what constitutes procurement research. I believe that this matter needs to be clarified so that we can more efficiently utilize the manpower resources that we have in this particular area [59].

Approach to the Problem

This study defines procurement research and its characteristics and establishes where procurement research fits into the scientific field. In Chapter II, the history of procurement research is discussed to establish a starting point and background for the effort. In the rest of the second chapter, the scope of the study is addressed, and the specific research objectives and questions are specified.

The theoretical concepts necessary as a base for relating the procurement and acquisition processes to research and science are discussed in the next two chapters. In Chapter III, the procurement process and the acquisition process are briefly reviewed, then the role of the procurement process in acquisition is presented. Next, in Chapter IV, the scientific method, research, and science are briefly addressed and then related to the procurement and acquisition processes.

In Chapter V, the methodology of content analysis is outlined briefly, and the research structure is established to provide a means for analyzing the "Proceedings" of the DOD Procurement Research Symposia for characteristics of procurement research. The results of the content analysis are summarized in Chapter VI, and a definition of procurement research is proposed.

The results of the content analysis are then combined with additional literature reviews and interviews to provide a suggested research taxonomy* of the procurement process; this taxonomy is presented in Chapter VII. Additionally, an algorithm** is suggested for deciding if a research effort is procurement research. Finally, in Chapter VIII, the findings are summarized; corollary observations are made; suggestions for what procurement research should be are presented; and recommendations for further research are given.

---

*Taxonomy: A classification according to characteristics.

**Algorithm: A sequential decision-making process or model.

CHAPTER II

BACKGROUND

SECTION A: HISTORY

Introduction

In the past, specific areas in procurement research have not been clearly delimited; therefore, a historical background must concentrate on the Federal procurement organizations that have developed to do the research. During the past twenty-five years, the evolution of procurement research has been characterized by changes in organization and procedures. Research, per se, has not been emphasized; rather, the changes in organization which resulted from the need for better procurement methods have been emphasized. The lack of a clear definition of just what procurement research included has necessitated this approach. The historical perspective of this paper has been deliberately limited to the DOD organization with special emphasis on Air Force procurement research organizations.

This review of procurement research starts with the Second Hoover Commission in 1953 and continues up to the present time. Key events in procurement reorganization in the 1960's included the reorganization of Air Force Commands

for procurement, the Hershey Procurement Pricing Conference, the establishment of the Army Procurement Research Office (APRO), and the Commission on Government Procurement. The significant events (thus far) during the 1970's have included the six DOD Procurement Symposia, the establishment of the Air Force Business Research Management Center (AFBRMC), the addition of Procurement Majors to the Air Force Institute of Technology (AFIT), School of Systems and Logistics, and a Systems Acquisition Management curriculum to the Naval Post-graduate School (NPS), the establishment of the Office of Federal Procurement Policy and the founding of the Federal Procurement Institute (FPI). Also, three models to concept-ualize the management aspects of procurement research have been offered. This brief history will trace the course of these important milestones in the evolution of procurement research organization.

The 1950's

The 1950's were characterized by little progress toward procurement reorganization. The Hoover Commission's procurement studies, however, did emphasize a need for centralized procurement planning. The Secretary of Defense (SECDEF) was recognized as the key man for guidance in effective materiel planning. Secondly, the Commission recommended the creation of a new post in the Office of the Secretary of Defense (OSD) to allow the OSD or SECDEF to be more effective in the National Security Council and in

the Joint Chiefs of Staff when coordinating guidance for a materiel program (26:317-19).

The Hoover Commission also recommended that a single Defense Supply and Services Agency be established to handle common items among the services. Instead, a "Single Manager Plan" evolved wherein one military department was designated by SECDEF to be responsible for the wholesale supply of a category of common-use items or services. Charges of preferred treatment resulted in interservice disputes, but a follow-up government study disclosed that the operation was very effective despite these accusations (52:129).

In 1958, Congress passed the Defense Reorganization Act. This law required that any supply or service activity that was common to two or more services must be provided through SECDEF by a single agency. The Secretary delegated this responsibility to the Assistant Secretary of Defense, Supply and Logistics, and created, under his management, the Armed Forces Supply Support Center. The "Single Manager Plan" was maintained through this agency (52:130).

The last significant procurement event of the decade occurred in 1959 when Al D. Keen finally gained enough support to found the National Contract Management Association (NCMA). This association was not a DOD organization but rather a professional association for both government and private contract administrators. Since its inception, the NCMA has provided a forum for the interchange of ideas

among procurement people. Contract administrators in different fields began to learn the same "language;" new, improved procurement ideas were being shared. The publications of NCMA kept members abreast of the latest developments in both public and private sectors (42). More recently, NCMA has completed a study for the FPI to identify areas for procurement research (55:17). The high ethics and standards of the NCMA have made its founding truly significant as a respected source of procurement information and research.

The 1960's

In April of 1961, the Air Force created two new commands -- the Air Force Systems Command (AFSC) and the Air Force Logistics Command (AFLC). These two commands, still the Air Force's primary procurement agencies, evolved to deal with special procurement areas.

> The current Air Force procurement organization is characterized by decentralization down to the lowest level commensurate with the nature of the material and services being procured and the availability of the market from which they are obtained. This decentralization is reflected in two broad categories of procurement--central and base. In essence, central procurement embraces weapon systems, ancillary equipment, and bulk (wholesale) logistics support. Conversely, base procurement covers supplies and services required to operate the bases. Base procurement supplements central procurement; it does not duplicate it [5:55].

AFSC and AFLC both have several subordinate buying organizations; moreover, the buying responsibilities are different for each command. AFSC handles the central procurement

for major weapon systems and for research and development. AFLC is responsible for the central procurement of operational logistic support equipment. This reorganization of the Air Force greatly facilitated the overall procurement function but had little effect upon structural procurement research.

The implementation of the project management approach to acquisition management was also initiated in the early 1960's. In contrast to the traditional functional management, project management placed the development, evaluation, procurement, and deployment for a weapon system under one program manager. Under this system, specialists were assigned for short periods of time to the program manager's staff. The advantage of this type of organization was that the procurement efforts were centralized and under the same manager throughout the duration of the acquisition. This unified effort allowed the identification of high risk areas, exploration of schedule, cost, and technical performance trade-off decisions, flexibility in alternative selection, and better estimation of realistic costs (24:169-80).

In 1967, the first step toward a systematic effort in procurement research was taken at the Defense Procurement Pricing Conference held in Hershey, Pennsylvania. The idea of a Procurement Research Laboratory was conceived from the deliberations of Panel Three. The Conference recommended establishment of a research center with a staff

of approximately 40 people. This center would have conducted some training to establish a communication link between the policy makers and field operations; moreover, it would have conducted studies as a centralized procurement research agency (36:208).

The top executives in the DOD reviewed this idea very favorably. The Secretary of Defense, Clark Clifford, proposed the establishment of a procurement research laboratory in his next statement on the budget. Chairman of the Committee on Government Operations, Chet Holifield, submitted a House of Representatives report in December, 1970, in which he stated:

> . . . a procurement research laboratory would identify and exploit new and significant business methods; develop, test and innovate procurement methods on a systematic and centralized basis; test or simulate the impact of major new policies and procedures on government activities and industry prior to their issuance; and provide an in-house consulting and training capability to hasten the exploitation of significant developments [36:208-09].

Unfortunately, the idea was not well received by the rest of the Department of Defense. The services agreed that the idea was good, but no service would make the sacrifices in time or personnel to get the organization started. None of the services was interested in becoming the executive agent for the DOD in the new organization. The Army and Navy objected to the establishment of a new organization, while the Air Force concurred with the concept and suggested the establishment of an advisory council and working group. The procurement manpower

shortages, the decrease in funding for the Logistics Management Institute (set up in the early 1960's as a problem-solving research organization), and the lack of military department support caused the procurement research center idea to stagnate (36:209-15).

The disagreement among the services led Mr. Shillito, the Assistant Secretary of Defense, Installations and Logistics (ASD/I&L), in October 1971, to advise the military services to continue procurement research within their departments for the time being. And as an alternative to a centralized procurement research organization,

> . . . he established the DOD Procurement Research Coordination Committee . . . to provide the capability for sharing information across departmental lines [36:214].

In 1969, the Army initiated action to establish the Army Procurement Research Office whose primary mission was procurement research. Two years later the Navy decided to expand the Naval Postgraduate School to include a procurement research type of capability, while the Air Force continued with existing facilities and did not set up a formal organization (36:213-14). These attempts at organizing procurement research were basically parochial in view; moreover, they resulted in much duplication of effort (53:4-5).

In 1969, the COGP was established to "promote the economy, efficiency, and effectiveness" of procurement in the Executive Branch of the Federal Government. This

Commission was legislatively created and consisted of twelve members selected from the Legislative Branch, the Executive Branch, and private industry. Some people were concerned about the magnitude and complexity of the undertaking; but opposition faded; and both public and private sectors made valuable contributions to the study effort (15:184).

The Commission examined procurement in the Federal Government from an overall viewpoint rather than concentrating on specific activities. The study focused on three general areas: the procurement environment, the procurement cycle, and the various procurement types. The complexity of the project resulted in a one-year extension for the study (5:166-70).

The Report of the Commission on Government Procurement made 149 recommendations for improving the procurement process. Some of those recommendations proposed major changes in methods and organizations being employed; some more clearly defined areas of responsibility; and some repeated previous ideas which had not yet come into being. Some of the important recommendations for change were: the establishment by law of a central Office of Federal Procurement Policy to assume leadership in procurement, the authorization for all executive agencies to enter into multi-year contracts, the establishment of a means for timely funding of procurement activities, and the establishment of a program to examine

social and economic influences that are applied to the procurement process (15:185-89).

Other areas covered by the recommendations prescribed changes in the acquisition of major systems, research and development, commercial products, and construction and architect-engineer services. The last portion of the report addressed legal and administrative remedies, issues of liability, and other statutory considerations (15:190-99).

The Commission recognized the complexity of the procurement process and suggested that the government benefit from previous mistakes. The timely implementation of the recommendations was suggested to provide improved methods. No estimate was made of cost benefits, but opportunity for savings was clearly evident. Congress has addressed these recommendations, and the General Accounting Office (GAO) has been appointed to monitor the status of implementation (5:180-81).

The period of the Commission's study actually transitioned from the 1960's to the 1970's; however, one change that occurred in the procurement process in 1969 requires further discussion. Previously, the entire acquisition process had been oriented to a single controlling decision point; this process tended to de-emphasize the need for continuing review after initial approval. In 1969, the Defense System Acquisition Review Council (DSARC) was established to review major development programs at three

critical points: prior to initiating development, prior to contracting for development, and again prior to production. This increased emphasis on complete-cycle development with three decision points required an increased effort on procurement research so that the best information was available for each decision. Better contract conditions could also be adapted to each of the three different phases in the acquisition process (12:72). A recent adaptation in the acquisition process has added an additional decision point (Milestone 0) prior to beginning the conceptual effort (70:3).

The 1970's

During the period from 1970 to the present, significant changes occurred in the area of procurement within the Federal Government. Congress has continued to implement recommendations of the COGP and different agencies in the DOD have sought to combine efforts in procurement research.

The government, in its attempt to focus on procurement problems, made attempts in the early part of the 1970's to establish an informational data base. The COGP published a Preliminary Bibliography of Materials Relating to Government Procurement in October 1970, followed by supplements in December 1970 and April 1971. These documents were compiled as source documents for the working groups of the COGP and covered as much material as possible on

procurement (published since 1955) (16:I). These were followed by monthly updates ". . . distributed . . . through the Study Operations Information . . . issued by the Commission Studies Control Office [17:I]."

The COGP, recognizing the need for follow-on data bases of procurement and procurement research information, charged the proposed Office of Federal Procurement Policy to: " . . . promote government wide exchange of information that highlights successful ways to improve the procurement process [5:174]."

J. Mendolia, former ASD/I&L, emphasized the need for a procurement research data base and for the effective communications between procurement managers and researchers (63:1). Two documents, Resources for Performing Procurement Research and Sources of Information for Procurement Research, were compiled and developed by the APRO in August 1975 to enhance the procurement research data base (63:i). The documents were developed through the use of the descriptor system of the Defense Logistics Studies Information Exchange (DLSIE) (63:2). These documents were reviewed by the DOD Procurement Research Coordinating Committee and recommended for publication as DOD procurement research guides. The APRO was designated Executive Agent " . . . for publication, distribution, coordination and updating of these guides [61:i]." Prior to the publication of the APRO research sources, the NPS had published a compilation of procurement

research theses written between June 1972 and March 1975 at the NPS (45:i) for distribution to fleet and material commands to inform them " . . . about . . . fundamental studies in the important area of defense acquisition management [45:2]." These compilations of procurement research information, along with the "Working Paper" of the COGP, represent the first efforts to establish a documented information base for procurement research.

The Air Force, also, had been active in establishing new programs to improve the procurement research knowledge base. In February 1972, the first annual DOD Procurement Symposium was held at AFIT; since then, procurement people have met each year to exchange ideas on procurement research. The Air Force, Navy, and Army have rotated as host for the annual event, but the attendance has not been limited to the military. Each year representatives from the Military Departments, other Federal agencies, Business, Academia, and Congress have met to discuss current problem areas in procurement methods, research and regulations.

The First Symposium was held to get an inter-service exchange of information on procurement methods. This symposium was characterized by an experimental attitude: just what would be the response of the various participants? Several papers were presented with subsequent question-and-answer periods, and time was allowed for the participants to get acquainted and to exchange information. Some of the

presentations had a historical perspective, but current techniques and new ideas were emphasized also. "Probability of Incurring Estimated Cost [PIECOST]," "Return on Invested Capital," "New Concepts in Pricing," and "Unified Logistics" were some of the specific areas covered. A summary of current research was given by each military service and the DOD near the end of the event (2).

Due to the favorable reaction to the First Symposium, the NPS held the Second Procurement Research Symposium in 1973. At this symposium, the subject of procurement research was recognized as critically important to achieving improvement in procurement methods. Two papers were presented; then seven panel discussions were held. Finally, a summary of current work was made. Topics addressed included: "Defining Procurement Research," "Risk Analysis," "Cost Estimating," "Pricing," "Automatic Ordering, Processing System," "Source Selection and Proposal Evaluation" and "Procurement Methodology" (44).

The Third DOD Procurement Research Symposium was held at the Army Logistics Management Center at Fort Lee, Virginia. This symposium emphasized new organization for procurement research and specific problems that had general application to all of the Services. Major topics were the presentations on the Research Coordinating Committee (OSD), the AFBRMC report, and the Armed Services Procurement Regulation (ASPR) Committee report. Other topics discussed

included "Risk Analysis," "Use of Price Breaks in Computation of Economic Order Quantity [EOQ]," "Developing Design to Cost Policy," "Cost Escalation," "Use of Warranties," and "Contracting for Management and Services" (64).

The Fourth Annual DOD Procurement Research Symposium was held at the Air Force Academy. This symposium was somewhat different because for the first time all material to be covered was distributed to the participants in advance. This technique allowed an even greater opportunity for productive exchange because each person could study any unfamiliar topic that would be discussed. Nine major areas were covered during this symposium: "Quantitative Approaches in Procurement Management," "Procurement Management Prior to Award," "Buying for Inventory," "Pricing and Estimating," "Foreign Military Business," "Program Management," "Current Issues in Procurement," "Information Systems," and "Current Procurement Research Programs" (61).

The Fifth Symposium was held in 1976 again at the NPS. This symposium was unique because for the first time members of several Federal procuring agencies outside the DOD were invited. The symposium theme was that of reflections on past lessons learned and applications to future needs in procurement. The general sessions covered the following areas: "Evaluating Research Candidates and Validating Research Results," "Reconciling Organizational Interest in Procurement Research," and "Acquisition Strategy

Planning." The working groups discussed grants, competition, commercial products, technology incentives, reliability and maintainability issues, socio-economic impacts on procurement, and major shipbuilding systems (46).

The most recent symposium was held at West Point during June 1977. The theme of this symposium was "Translating Procurement Research into Action." Though the "Proceedings" were not yet available, the general session topics were known to include "DOD Profit Policy-Implementing Procurement Research Results," "Industrial Procurement Research: Uses and Expectations," and "Dimensions and Modes of Procurement" (62).

The annual DOD procurement research symposia have provided opportunities for disseminating information among procurement people. Besides sharing current techniques, participants were able to make personal acquaintances in other Departments and to obtain additional background for procurement research projects.

The Air Force has recognized the need for coordination of procurement research efforts and the requirement for quality procurement personnel; it was for these reasons that the Air Force sponsored the First Symposium. The need for Air Force procurement personnel with a solid quantitative and management background was specifically addressed in 1972 when Headquarters USAF asked the Air University to expand the AFIT Graduate Logistics Management Program (1).

Air University's proposal was to introduce additional course material on Air Force procurement for students with a directed duty in procurement on completion of the graduate program. Additionally, the number of procurement majors needed to be expanded. Only George Washington University and Florida Institute of Technology offered programs in Procurement/Contract Management; at that time the Air Force was sending approximately twenty students per year to the former program. With the continued Congressional emphasis on procurement, the existence of a single logistics general graduate level course did not meet the needs of the Air Force procurement functional career development (1).

Two programs were considered: either to modify the existing Graduate Logistics Management Program, or to accredit the short courses of the Continuing Education Division for graduate requirements. AFIT suggested adoption of the former program with specialized courses required for procurement majors and a required procurement-related thesis topic. In August 1973, the first class of procurement majors entered AFIT; annual input was set at twenty students (ten in each class). The educational objective was to provide broadly educated procurement personnel who understood the management process and who were able to bring modern quantitative managerial tools to bear upon the weapons acquisition process (1).

Along with an increase in the number of qualified procurement personnel, the Air Force sought a better method for coordinating and disseminating procurement research information. In 1973, the Air Force Business Research Management Center was established

> To harness the talents of government, industry, and the academic community in a comprehensive and coordinated program design to develop new approaches to defense procurement that will keep pace with rapid advances in technology and with the accompanying changes in economic conditions [65:5].

The AFBRMC has become the source of topics for continued research as well as a supplier of information on related study areas. Collocated at Wright-Patterson AFB with AFIT, Headquarters AFLC and major divisions of AFSC, the AFBRMC has close contact with current procurement research problems and many of the people who are doing research in these areas. Valuable assistance is provided both to students and to operational managers through a coordinated approach.

The AFBRMC was chartered to:

> . . . combine these unstructured and frequently irrelevant efforts into productive and useful research projects. To accomplish this mission the center works in three distinct ways. First, it acts as a coordinating center by providing research with reviewed and approved topic areas relevant to the needs of specific Air Force organizations. The goal here is to develop independent but closely related studies which can be integrated as part of larger and more useful research projects. The center thus becomes a communications focal point, putting researchers and organizations with real, researchable problems in contact with one another. Second, the center provides valuable services to researchers by identifying and helping the researcher gain access to the data needed for his study, either from Air Force organizations or related civilian contractors. The center also collects,

> integrates, and disseminates research results, a service which further aids in coordinating and integrating research efforts. Third, the center is charged with developing field trials of the research results, providing both a final test to determine if the results should be implemented on a broad scale, and an opportunity for the researcher to see that his contribution was not wasted. Together, these three tasks can serve to combine independent student research efforts into comprehensive and useful solutions to Air Force management problems [14:220].

Thus, the AFBRMC serves as a "bridge" between the researchers with their newly-gained knowledge and the operational managers who can best use the knowledge to improve the acquisition and procurement processes.

The Federal Government as a whole did not actively get into the "game" of procurement research until, acting upon the primary recommendation of the COGP, it established the OFPP in 1975. One of OFPP's six tasks is to "promote and conduct research in procurement policies" and " . . . to act as an information and coordination catalyst between the major agencies to assure consistency and uniformity on future policies [13:20]."

In an attempt to satisfy the above task and based upon another recommendation of the COGP, Mr Hugh Witt, then Administrator of the OFPP, formally established the FPI on 14 July 1976. According to the Federal Procurement Institute Plan, among other things,

> The FPI is committed to the objective of developing the skills, knowledge, and abilities of federal personnel engaged in procurement, production, system acquisition, and grants management through the establishment and operation of progressive and practical programs in procurement research . . . [21:1].

Just newly established, the FPI has a plan to improve the quality, efficiency, and performance of procurement personnel. The current program plans are divided among four directorates, one of which is particularly important to procurement research, i.e., the Research Directorate. To measure the progress of the FPI, a milestone chart of procurement planning was formulated through 1980. The FPI seeks to solve many of the problems in current procurement through: (1) a systems perspective in the definition of each part of the process, (2) a careful analysis of existing methods, (3) a wide dissemination of procurement research findings, and (4) a comprehensive program of research and education (21).

Directed by the OFPP, the FPI will act as the coordinator on procurement matters and as a repository for procurement information for the Federal Government (21:2). This organization is similar to what was envisioned for a DOD Procurement Research Laboratory by Mr. Herbert Roback (then Staff Member, Committee on Armed Services, U.S. House of Representatives) in his article "Toward More and Better Procurement," published in Defense Management Journal, July 1975 (53:4-5). The FPI can direct its attention to procurement problems with government-wide applications, while the individual department could, upon coordination and approval of FPI, concentrate on research peculiar to its procurement activities:

> . . . this means maintaining open communication channels from one department to another, and within each service between researchers and those confronted by procurement operating problems. The departments must ensure that scarce procurement research talent is not wasted [4:3].

Three Views of Procurement Research

Few attempts have been made to describe models of procurement research; discussion of three such efforts follows.

In 1973, Lieutenant Colonel Leland A. Osburn completed an AFIT thesis on "A Procurement View of the Systems Acquisition Process: An Effort to Provide Procurement Research Objectives". This work builds a model through synthesizing the systems acquisition processes and the generic procurement activities of the procurement process into a procurement framework. The model is then used as a guide to identify problems at the operational level -- specifically during a field study at the Aeronautical Systems Division of the Air Force Systems Command (48).

In 1976, two other models were suggested; one originated through the Procurement Research Coordinating Committee (PRCC), while the other was presented at the Fifth Annual DOD Procurement Research Symposium by Lieutenant Colonel Daniel E. Strayer and Major Lyle W. Lockwood, both from the AFBRMC. The PRCC model is a systematic approach designed to correct and improve the procurement process through research. It emphasizes the

coordination and communication required during the research process (11;72).* The AFBRMC model emphasizes a level of effort classification composed of application, objectivity, and outcome with an applied rigor index. The amount of rigor applied can be traded off in the forms of different levels of effort so that the necessary responsiveness can be achieved (57).

These three models are all management applications of the procurement research process, but none defines procurement research per se. The Osburn model is used to identify problem areas; the PRCC model is used to coordinate the total system's efforts; and the AFBRMC model is used to apply a level of effort to obtain the necessary responsiveness. What is needed is a conceptual framework for procurement research itself; this must include a definition, a classification, and a working conceptual model.

Summary

The history of procurement research has been characterized by changes in organization and procedures. Research, per se, has not been emphasized; rather, the emphasis has been on the changes in DOD and Air Force procurement organization that resulted from the need for

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*Original information on this model came from a draft copy obtained from D. Burchfield, Secretary to the PRCC. This draft has been subsequently published in DOD Directive 4105.68 (see reference 72).

better procurement methods. The lack of a clear definition of just what procurement research included had made this approach necessary.

The historical path of procurement has emphasized the need for a centralized Federal Procurement Institute. In the 1950's, various attempts were made to save money through reorganizing and centralizing purchases on common items. The inertia of old techniques was slow to yield to change; moreover, each military service was "isolated" from the others as far as procurement methods. In the 1960's, some efforts were made to exchange procurement information and to evaluate decision-making during the acquisition process. New approaches were being utilized to improve the management information flow and to seek better bargaining positions. Many recommendations of the COGP have become or are in the process of becoming part of the formalized acquisition process; moreover, attempts to conceptualize the management aspects of procurement research have finally begun. Finally, after many long years of inefficiency and redundancy, the national procurement policy, education, and research are becoming centralized and coordinated under the FPI.

Mr. Robert Judson (a member of the COGP) in an address to the Second DOD Procurement Symposium in 1973 made a challenge to the procurement profession. He said:

> You, gentlemen, have a golden opportunity to redirect procurement research to achieve new goals of excellence. First let's do our research on the problems of research before we lose the chance to make procurement what we want it to be [30:99].

This challenge was re-emphasized by Dr. John J. Bennett, former Acting ASD/I&L, in the Defense Management Journal, July 1975:

> Procurement research is not yet a household phrase in the Department of Defense (DOD). . . . It needs a great deal of attention from management and those people actually engaged in procurement projects [6:1].

SECTION B. DELIMITATION

Scope of Study

The scope of this research effort was to define procurement research in terms applicable to its role in the DOD acquisition process. Secondly, procurement research was classified into various areas; this classification or taxonomy separates procurement research from peripheral, closely-related areas in the behavioral and physical sciences. Finally, a model of procurement research was designed at the conceptual level and an algorithm was developed to determine whether an effort is procurement research. This study was confined to the procurement process used in the Department of Defense.

Research Objectives

The following objectives were pursued in this study:

1. To classify procurement research efforts and functions into various areas. To identify those areas that are most frequently investigated.
2. To define procurement research so that a common foundation can be used when discussing this subject.
3. From these classifications, to suggest a detailed algorithm which can be used for deciding if an effort is procurement research.

Research Questions

These specific questions were addressed during the study:

1. Which areas of procurement research are most frequently investigated?
2. What is procurement research?
3. Does procurement research possess definable characteristics which can be collected into a taxonomic form?

CHAPTER III

THE PROCUREMENT AND ACQUISITION PROCESSES

Introduction

In this chapter, the procurement process and the acquisition process are briefly reviewed; moreover, the interrelationships between the two processes are discussed. A review of the general characteristics of both processes, when combined with the theoretical concepts of science and research discussed in Chapter IV, provides the foundation for describing the characteristics of procurement research.

The Procurement Process

The Armed Services Procurement Regulation (ASPR) defines procurement as follows:

> Procurement includes purchasing, renting, leasing or otherwise obtaining supplies or services. It also includes all functions that pertain to the obtaining (but not determination) of requirements, selection, solicitation of sources, preparation and award of contract, and all phases of administration [68:1:16].

Procurement is one function of military logistics, i.e., the service function which obtains needed goods and services. Viewed broadly, procurement ". . . describes the whole process whereby classes of resources . . . required by the Armed Forces are obtained [5:1]."

The procurement process includes all the actions necessary to obtain goods and services required by the Military Services. The key steps or cycles of the

procurement process are conceptualized in Figure 3-1 and are discussed below. The cycles are shown as being definitive, beginning and ending with a particular action (dotted lines), but in practice this sequence may not occur. Each cycle contains several possible events; however, no particular pattern of events must be completed in any cycle or procurement.*

> Variables, such as the urgency of the requirement, the type of goods and services required, the size, type, and complexity of the procurement, and the laws and regulations applicable, impact upon the actions taken in each step and the sequencing of the steps [5:2].

A brief discussion of the individual cycles follows.

The Requirement Cycle

From outside the area of responsibility of the procurement office, a need for supplies and/or services is generated; this externally generated need starts the procurement process. The initiating agency, in conjunction with the procurement personnel, determines the method by which the identified need will be satisfied (Requirement Determination) and issues a purchase request (PR) to the procurement activity. Prior to actual issuance of the PR, the procurement personnel assist the requestor in formalizing requirements; this coordination facilitates the movement of the PR through the procurement process.

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*These possible events were developed as part of this research effort and are discussed in Chapter VI.

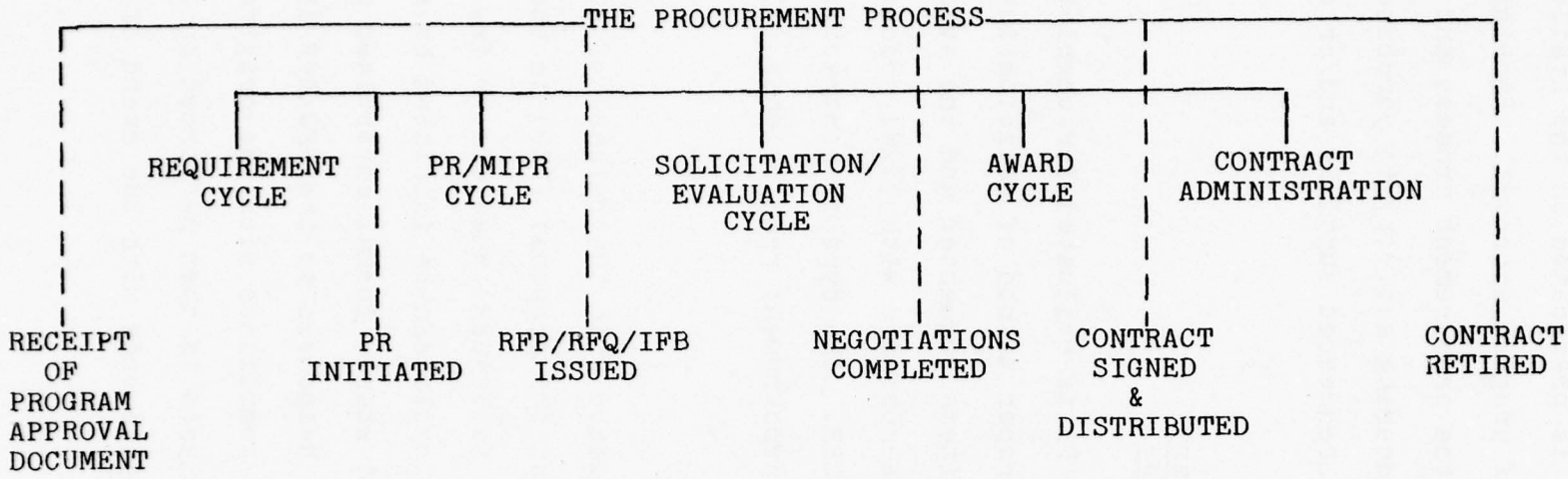

Fig. 3-1: The Procurement Process (Cycles)(37)

Issuing of the PR is predicated on the availability of funds and the receipt of program approval. Receipt of the PR formally activates the procurement process and serves as authorization to the procuring activity to purchase, rent, lease, or otherwise obtain requested supplies and/or services (37;54).

The Purchase Request/Military Interdepartmental Purchase Request Cycle (PR/MIPR)

In this cycle, the PR is evaluated for completeness and accuracy. Also, the proper method of solicitation is determined based upon the items requested and the availability of a supplier, in accordance with (IAW) procurement directives, law, and the ASPR. The type of contract required depends upon the specific procurement requirements (37;54).

The Solicitation/ Evaluation Cycle

This cycle is initiated with the release of a request for quote (RFQ) or a request for proposal (RFP) in the case of negotiated procurements (IAW ASPR) when one or few suppliers are available. Also, this cycle can be initiated by releasing an invitation for bid (IFB) when a formal advertised procurement is required by ASPR. Responses to the RFQ/RFP/IFB are reviewed and evaluated for compliance with the original request. A price/cost analysis is then performed on the contractor's offer. The cycle ends with the award of the contract (37;54).

The Award Cycle

This cycle encompasses the final contract writing function of the procurement process. It involves such activities as legal review (Judge Advocate General [JAG]) and final approval. The cycle ends with the distribution of the contract (37;54).

The Contract Administration Cycle

After award, management of the contract is assigned to an administrative contracting officer (ACO) until the contract is completed or closed out. Upon completion of the terms of the contract or termination, the contract files for this particular procurement are retired. Any unused funds are returned to the financial system (37;54).

For this study, the five procurement process cycles have been grouped into three broader categories: pre-award phase, award phase, and post-award phase (Figure 3-2). The pre-award phase begins upon receipt of the program approval document (identification of need and allocation of funds to satisfy that need) and ends at completion of negotiation or evaluation of the bid/proposal. This phase includes the Requirement, PR/MIPR, and Solicitation/Evaluation cycles. The award phase includes the award cycle only and includes those events necessary for the final approval of the contract terms. This phase begins after source selection and terminates with contract distribution. The post-award

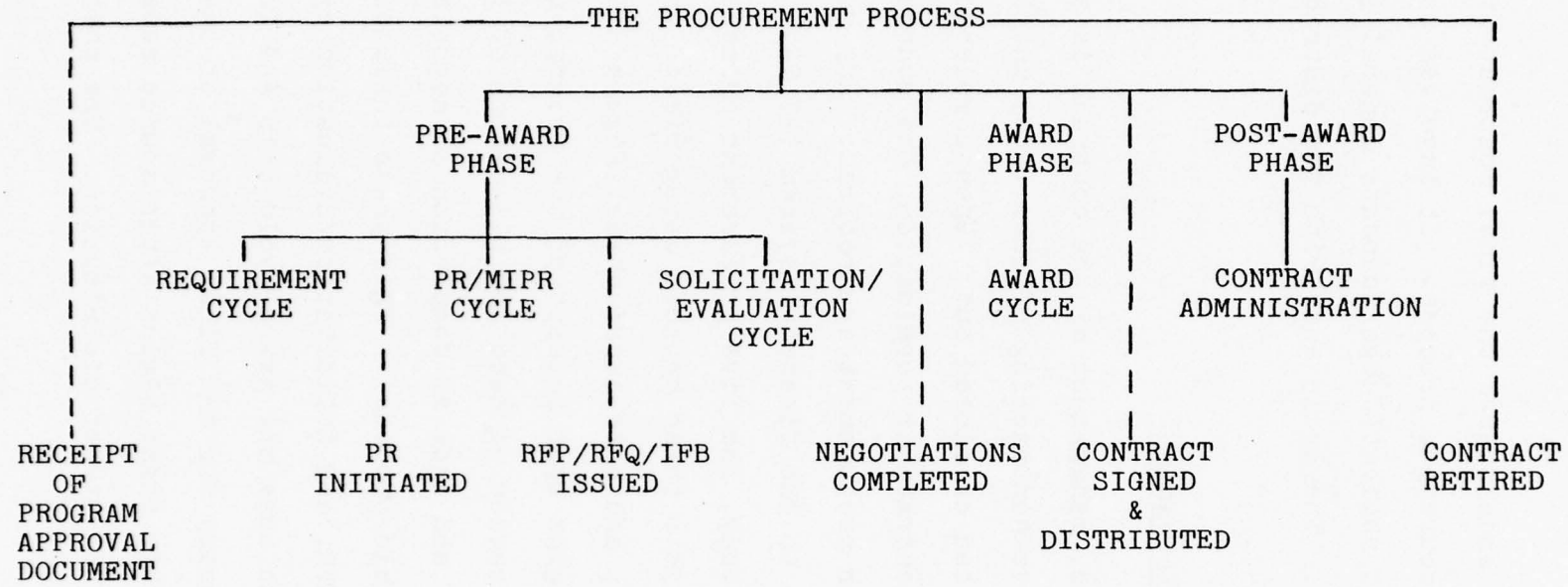

Fig. 3-2: The Procurement Process (Phases)(37)

phase includes only the Contract Administration cycle. It begins after the contract has been distributed and terminates with the retirement of the contract and the recovery of any unused funds (37;54).

The Acquisition Process

The acquisition process includes those necessary activities from determining the need for a major military weapon system to using the system. A military weapon system is designated "major" by the SECDEF upon recommendation of the DOD component heads and OSD officials. Prime candidates for major systems acquisition designation are those systems anticipated to exceed $75 million in research, development, test and evaluation costs, or $300 million in production costs (70:2).

Department of Defense Directive (DODD) 5000.1 defines the acquisition process of a major weapon system as:

> . . . a sequence of specified decision events and phases of activity directed to achievement of established program objectives in the acquisition of defense systems extending from approval of a mission need through successful deployment [use and disposition] of the defense system or termination of the program [70: enclosure 1:3].

The decision events in the acquisition process are termed milestones. At these milestones, the DSARC's and more recently the (S)SARC's ([Service] System Acquisition Review Councils), recommend to the SECDEF one of the following courses of action: (1) to continue the acquisition process

by proceeding to the next phase of activity, (2) to continue actions in the current phase of the process, or (3) to terminate the process (48:16).

The acquisition activities are those actions required to ". . . conceive, design, develop, produce, deploy, and support the system [48:16]".* The actual phases of activity in the acquisition process have been conceptualized in DOD and DOD component literature in terms of the acquisition life cycle of a "typical" military system. The acquisition life cycle has been described as consisting of five phases: conceptual, validation, full-scale development, production, and deployment (66:1). The General Accounting Office (GAO) report of October 23, 1974, expanded the process to a sixth phase: reutilization and disposition (73:2). (Figure 3-3 is a graphical representation of these phases of activity and the necessary decision events in the acquisition process.) The acquisition process described below was used because this study was undertaken prior to the advent of the current concept and used research data that was predicated on the system acquisition process that is presented here.

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*The discussion that follows differs from the current concept of the system acquisition process as contained in the Office of Management and Budget (OMB) Circular A-109 (19), a discussion of A-109 (20), DODD 5000.1(70), and DODD 5000.2 (71). These documents were issued during the development of this study. The main effect is the addition of the DSARC Zero decision point.

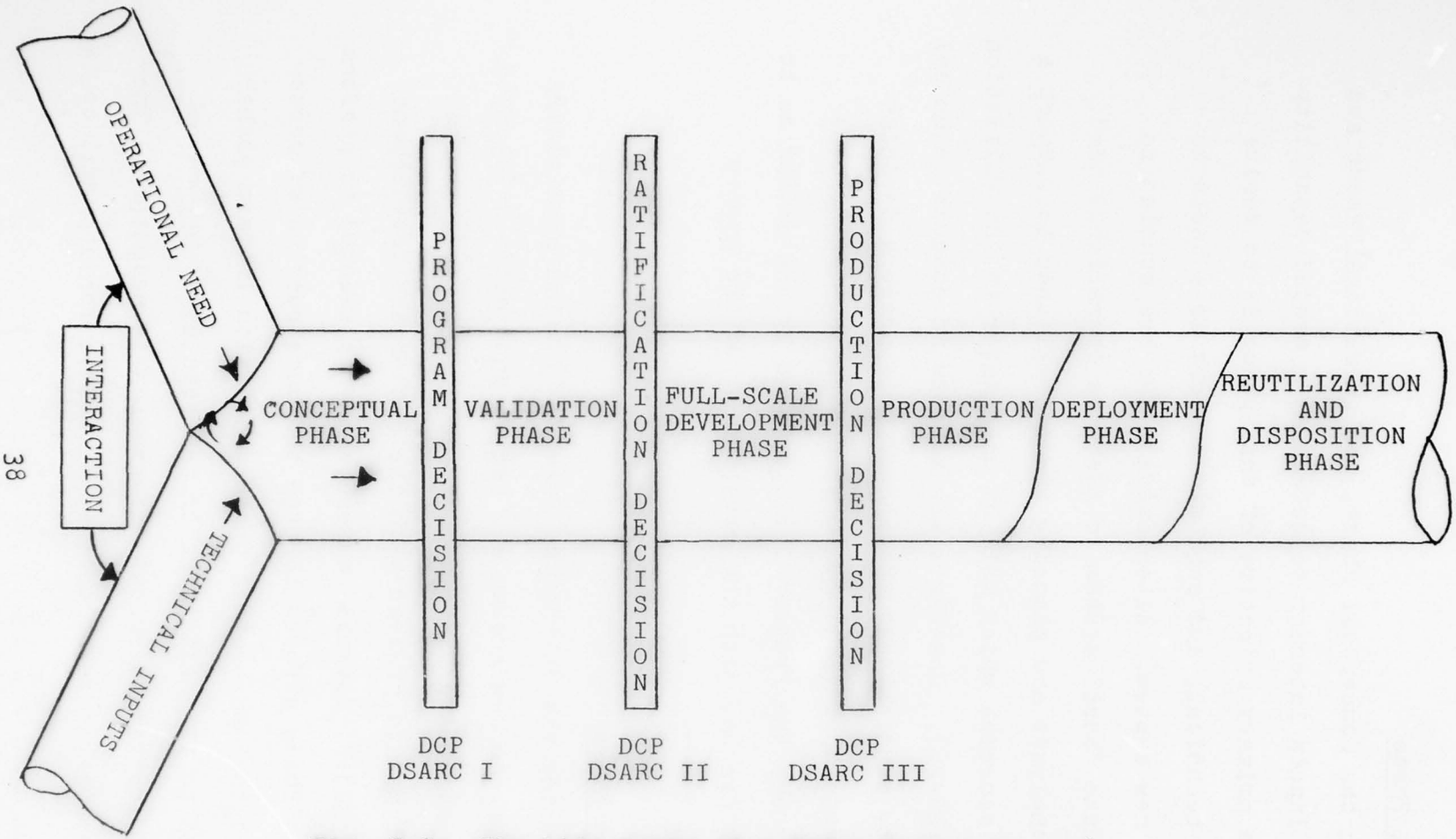

Fig. 3-3: The Life Cycle of a Major Weapon System*

*Adapted from GAO Report dated October 23, 1974 (73:2-2).

Conceptual Phase

In the Conceptual Phase, the operational needs and technical inputs interact to determine a needed capability (54). The primary objective of this phase is to derive military, technical, and economic support as a basis to acquire a new system. Alternative plans are studied to determine the "best" system to meet the operational need. Detailed analysis and planning are accomplished to support a preferred approach which will be used later in the Validation Phase (39:27-28). Contracts are awarded to conduct technical feasibility studies. At the end of this phase a decision coordinating paper (DCP) is forwarded to the DSARC. The DCP influences the Program Decision made by the SECDEF as to whether to proceed with the development of the system (48:30-31).

Validation Phase

During the Validation Phase ". . . the preliminary designs for the new system are tested and verified [23:106]." The prime objective of this phase is ". . . to determine whether or not to proceed with the Full-Scale Development Phase [48:30]." Several contracts may be awarded to perform Validation Phase efforts through the construction of prototypes. At the end of this phase a decision is made either to proceed to the next phase or to reevaluate the weapon system if further technical information is necessary. The optimal system is selected then submitted for approval to the

SECDEF (48:30-31). This decision point is called DSARC II, or the Ratification Decision (54). The DCP is updated to reflect the current status of the system prior to the SECDEF's approving/disapproving its progression to the Full-Scale Development Phase.

Full-Scale Development Phase

During this phase, the system is refined through the use of further technical studies and evaluations. The design of the system is solidified. Planning for production, logistical, and training support is accomplished also (48:32-34).

Prior to entering the Production Phase, DSARC III (Production Decision) occurs (54). Again the system is evaluated and the DCP is updated to reflect any changes. Authorization for production must be obtained from the SECDEF before production can commence. Requirements for future production beyond initial production quotas are also determined at this point (48:34).

Production Phase

In the Production Phase, the system is manufactured for operational use. This phase includes the production of spares, support equipment, facilities, and training equipment. Also, any training or logistical plans delayed from the Full-Scale Development Phase are completed (48:35-36).

Deployment Phase

This phase begins when a unit receives the first operational systems; however, this does not mark the end of the Production Phase. The Production Phase continues concurrently with the Deployment Phase until all systems under a contract are produced (54).

Reutilization/Disposition Phase

In this final phase of the acquisition process, contracts are issued for major modifications of existing weapon systems. These modifications meet new requirements that were not originally imposed upon the weapon system during the Conceptual Phase. The disposition of the weapon system completes the acquisition process (34;54).

Relationship of the Procurement Process to the Acquisition Process

The procurement and acquisition processes are conceptualized above as two separate and distinct processes. In fact, these two processes have a definite interrelationship. Although the procurement process is exercised whenever goods and services are obtained for military use, it may be operated independent of the acquisition process. The converse, however, is not true because the acquisition process cannot occur without the procurement process. Interwoven in the acquisition process is a series of procurement processes that

support the major phases of the acquisition process. (This concept is depicted in Figure 3-4.) The series of procurement processes is carried out to provide those " . . . goods and services at the proper times to be used in accomplishing the objectives of the overall acquisition process [48:38]." The degree of complexity of these different procurement processes varies according to the type of purchases made and depends upon the phase of the acquisition process in which the procurement is initiated. In the early phases, the procurements are directed toward research and development contracts; while in later phases, procurements may emphasize the delivery and supply of the major end items, spare parts, or major system modifications.

Summary

This section has simplistically described the framework in which the research objectives were accomplished. Procurement Research necessarily is concerned with the procurement process and the procurement process as an integral part of the acquisition process. This research effort characterizes and defines procurement research in terms of the various phases and interrelationships involved in both the acquisition and procurement processes.

In the next chapter, further discussion of the framework necessary to accomplish the research objectives is presented. The theoretical concepts of research and the

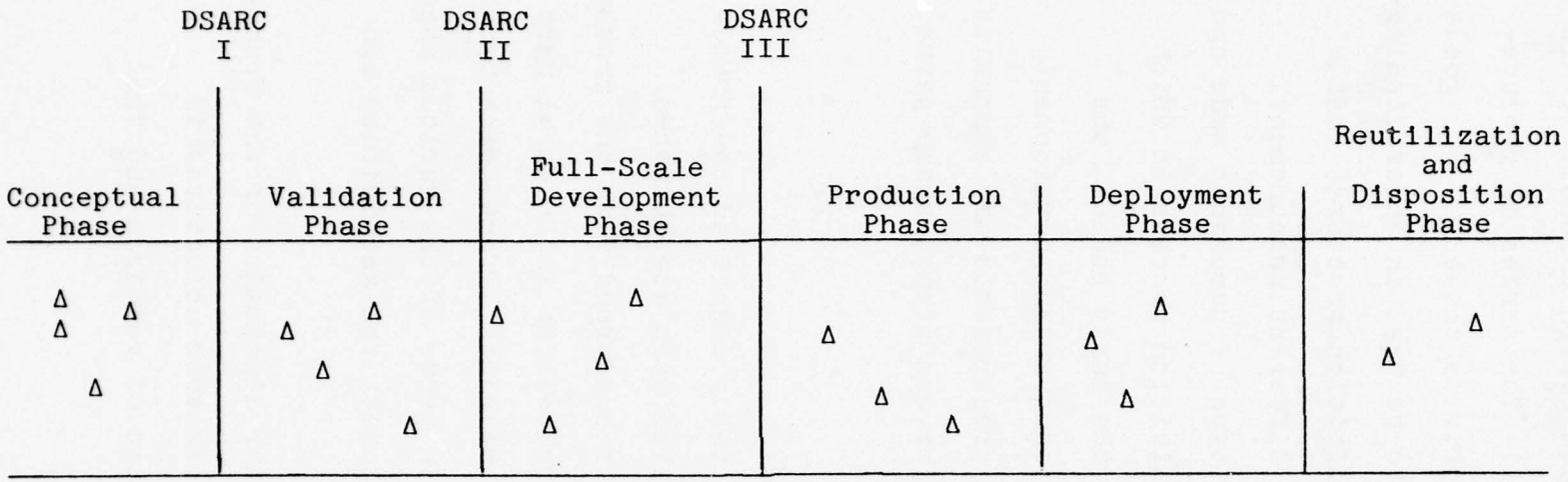

Fig. 3-4: A Conceptual Model of the Interrelationship of the Acquisition and Procurement Processes (37).*

* Each Δ represents a separate procurement process which may occur within each phase of the acquisition process. The depicted Δ's are representative in nature only.

scientific method are discussed, and the background provided offers additional insight through which procurement research can be defined and characterized.

CHAPTER IV

AN OVERVIEW OF RESEARCH CONCEPTS

Introduction

To define procurement research, this study must examine both procurement and research. The review of the acquisition and procurement processes in Chapter III provided part of the framework upon which procurement research is based. In this chapter, the rest of the framework is presented to complete the necessary background for the study.

A review of the characteristics of science and research provides the structural and methodological characteristics which procurement research must have to qualify as true research. Subsequently, the discussion of the scientific method, research, and the classification of science is related to procurement to provide the background for what procurement research should be.

The Scientific Method

The scientific method is an ". . . investigation of nature by means of observation, induction, hypothesis, experiment, calculation, prediction, and control [22:5]."

> The "nature" which is investigated includes the entire . . . world of matter and energy with its multi-layered integrative levels, containing whatever is disclosed to experience by means of sensation, reason, and action, whether it came about as the result of human invention or not: stones and trees, animals and plants, space, time, and the galaxies, but also cities and human behavior patterns [22:5-6].

Much effort has been expended in the field of scientific methodology; this effort has emphasized the improvement of procedures and criteria for scientific research. Each scientist or investigator selects one particular sub-area of one science for his study. This specialization in applying the scientific method suggests that more than one method exists. For example, techniques used in chemistry are not used in economics. However, these differences in the application of scientific method are imposed by unique characteristics of the field under study - not a difference in the scientific method. These differences in application are not necessitated by nature; rather, the differences are the result of human limitations in applying the scientific method (22:6;43:7).

" . . . The methods of science are systematic, cumulative, and require that results of research be widely and freely communicated [43:7]." These characteristics imply an orderly methodology, the maintenance of an existing body of knowledge, and the efficient sharing of the results of research.

The previously mentioned characteristics of observation, induction, hypothesis, experiment, calculation, prediction, and control are the logical steps of the scientific method. Not all of these steps are used in every investigation, but the description serves as an overall method (22:7-8).

> Observations are made in order to uncover provocative facts. This stage is one of purely descriptive knowledge. Inductions from the provocative facts are made next in order to discover hypotheses worthy of investigation. This is the stage of brilliant originative insights. The hypotheses are set up for testing in this fashion, then they are tested in three ways. The first way is the one peculiar to science; it involves testing the hypotheses by means of experiments. In the second way, the hypotheses are tested against existing theories by means of mathematical calculations. This is the stage in which the quantitative laws are shown to be the necessary, logical consequences of a few axioms or assumptions. Finally, the third way is to make predictions from the hypotheses and to use them as instruments to exercise control over practice. Those hypotheses which pass all three tests successfully are considered to be established, however tentatively, as laws [22:7-8].

The goal of the scientific method is a continual process of searching for truth; however, the concept of truth is very elusive. Truth, itself, is difficult to define, yet the characteristics of scientific truth do provide an insight into the goal of the scientific method. Four of the characteristics of scientific truth are universal accessibility, anonymous application, passive existence, and limited applicability. First, scientific truths are accessible to the whole public; each person has an equal chance to discover them. Secondly, the researcher does not direct his findings to a specific group; rather,

anyone who reads the published work can make use of scientific truths. Third, scientific truths have a passive role as they stand available on the shelf ready for anyone's use; and last, the truths cannot be used as an authority or application for any other areas outside their own content (47:50-52). In the search for truth through the scientific method, the researcher must be especially careful to maintain objectivity and to minimize any sources of bias. The scientific method and its search for truth can be related to the objectivity of the research process as discussed in the next section.

Research

Research is defined as " . . . all efforts directed toward increased knowledge of natural phenomenon and environment and toward the solution of problems in all fields of science [70:281]." Research " . . . implies a systematic investigation relative to a specific subject. The investigation is characterized as diligent and all inclusive . . . [41:13]." A parallel exists between this definition of research and the definition of the scientific method. Sound research follows the scientific method; however, research includes " . . . any organized inquiry designed and carried out to provide information for solving a problem [18:8]." Thus, research can include unscientific techniques; however, the usefulness and soundness of any research effort " . . . depends on its objectives, its design, and the skill and integrity with which it is conducted [18:8]."

Research can have many and various objectives; some of these objectives may be "to improve mankind," "to find a cure for cancer," or "to maximize the return on investment." Research in any of these areas can " . . . be classified according to [its] immediate objectives [18:8]." Emory (18) suggests that research objectives include description, prediction, and explanation (diagnosis). The research objective is description when the ". . . researcher seeks a wide range of information, which he uses in a correlative analysis of relationships to discover similarities and differences among the various [data] [18:8]." Prediction seeks to assemble a basis of facts and assumptions to make inferences about future conditions. Sophisticated techniques have been developed to predict the outcomes of various courses of action. Finally, the research objective of explanation considers the break-down of a phenomenon, presents a theory for the phenomenon, and applies a test to account for the theory (18:8-9).

Sound and useful research follows the scientific method of investigation. The scientific research process normally follows generally accepted steps. The first step is "observation or perception through a searching process [43:26]." Research may begin as the result of an idea or as the result of a personal experience. The second step is the "definition of the research problem [43:26]." Important in this step is a statement of the reason for doing the research and the objective of the research. The third step is the "formulation of the research plan [43:27]." This plan

consists of the proposed methodology and the testing for validity. The fourth step is "gathering of data and facts and testing the hypothesis or evaluating the relationship or concept [43:27]." The fifth step is the formulation of new hypotheses, decision rules, or generalizations in the form of conclusions; the last step is "documenting the research project [43:27]."

Taxonomy of Research

The review of the scientific method and research, including the relationships between the two processes, the objectives of research, and a description of the research process, logically leads to a taxonomy or description of research characteristics. Helmstadter (27:27-32) has devised a taxonomy of research in the behavioral sciences that can be generalized to include the research process in other sciences.*

Helmstader's taxonomy classified research along three continuums: breadth of application, level of outcome, and degree of control. Within each of these continuums are detailed categories that further define research. A research effort can be generally characterized by assigning one category along each continuum to describe the effort (27:279)(See Figure 4-1).

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*It will help if the reader will keep in mind the fact that taxonomies, like theories, are best thought of not as right or wrong but rather as useful or useless for different particular purposes [27:27].

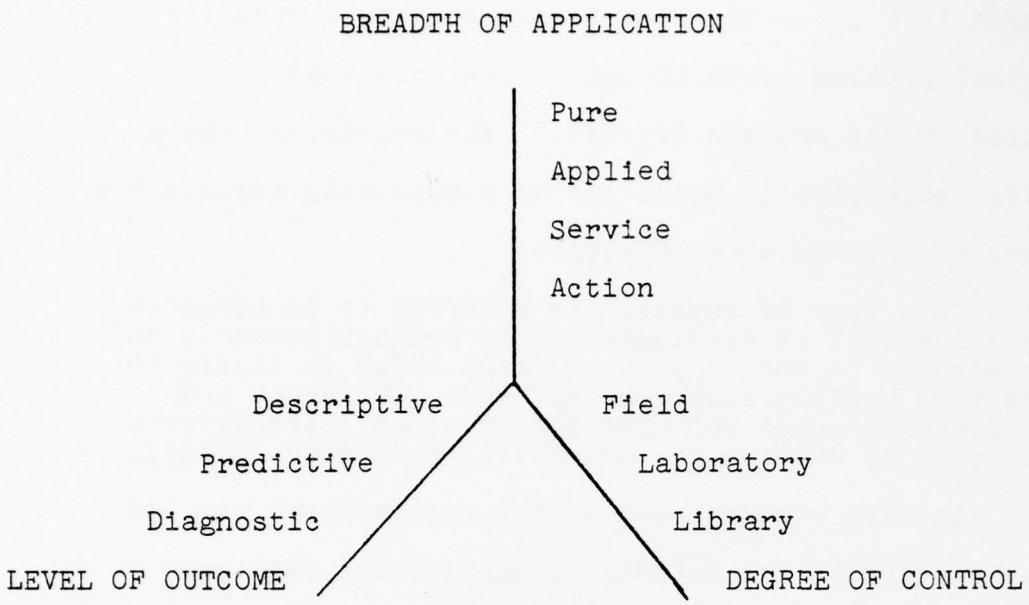

Figure 4-1: A Taxonomy of Research (27:28)

The breadth of application is probably

> . . . the most frequently used dimension for distinguishing among types of research . . ., although it is often referred to in terms of the reason the researcher has become involved in the problem [27:27].

The categories of this continuum include pure, applied, service, and action research. Pure research is motivated by curiosity; it is " . . . motivated soley by intellectual interest and directed toward the acquisition of knowledge for knowledge's sake [23:94]." The pure researcher is interested in increasing his knowledge about some subject or specific area without any practical application in mind. Pure research, also known as basic or fundamental research, results in " . . . concepts or theories, or simply a set of relationships offered as knowledge [27:28]." In contrast, applied

research is " . . . directed toward solving a specific practical problem, even though no new knowledge [is] acquired in the process [23:94]." The researcher has a specific objective in mind, and he continually adjusts his efforts to satisfy that objective.

> This type of research is referred to in business and industry as developmental or product research and obviously is the type of research which is likely to be more readily supported by those government and private agencies who must justify their expenditures to persons outside the scientific community [27:29].

Service research and action research are the last two categories on the breadth of application continuum.

> Here [in service research], the initiation of the research is not generally from the researcher himself as in the first two categories, but rather comes from some administrator or practitioner who wants a study done to solve a problem with which he is personally faced. The motive of the investigator here then is to provide a service to someone; and generally speaking, the results of this kind of research are much more limited in scope than either of the first two cases. In this instance the solution that is found is often applicable only to the particular solution at hand. This is in contrast to applied research, where, while the outcomes are foreseeable and practical, the hope is that they will be useful in a wide variety of specific situations [27:30].

Service research focuses on the local situation and is designed only to resolve one problem in a specific setting or to evaluate a local tentative solution. The results of service research apply only to the specific situation, and at most, to similar future problems in that situation (27:30). The last category is action research. Some people feel that action research is not really research because

> . . . [its] motive is not necessarily that of getting the problem solved. The motive may be as much to gain the interest and attention of certain members of the community or to bring about in-shop improvement of applied workers as it is to get an accurate answer to the question raised. Although those who advocate action research are quick to point out that there is no logical necessity for it to be so restricted, almost without exception this type of research turns out to be strictly practical and limited to a particular solution. . . . Action research has seldom resulted in a precise answer to the initial question raised. Regardless of other desirable outcomes, from a strictly research point of view, action research produces results which are the least broadly applicable of all [27:30].

The second continuum of research taxonomy is the level of outcome; this continuum is divided into descriptive, predictive, and diagnostic categories (27:31).

> When research simply asks what something is like, it is said to be descriptive; when the outcome is that of anticipating the future, it is labeled predictive; and if it seeks to answer the more complex question of why, that is, if the outcome is a specification of a cause-and-effect relationship, then the study is frequently labeled diagnostic [27:31].

These three categories represent different degrees of complexity of the research. The descriptive research determines and characterizes the who, what, where, when, and how of a subject; emphasis is on the gathering of data with little knowledge of where it will lead. The predictive research involves the extension of concepts and the anticipation of future occurrences based upon past facts and theories. The gathering of descriptive data is sometimes used to justify predictive research. The last category of

diagnostic research implies a relationship between descriptive research and predictive research to suggest a future course of events. In this area, hypothesizing can offer direction to a study (27:31).

> . . . The level of refinement of the techniques used both for measurement and for analysis of the data often differ so greatly when one of the three [levels of outcome] is seen as the outcome of the investigation rather than the other [that] it seems worthwhile to continue to use the separate categories of description, prediction, and diagnosis [27:31].

The third continuum of research taxonomy is the degree of control; this last continuum includes the laboratory, field, and library categories (27:31-32). Although this continuum

> . . . represents the degree of control exercised by the investigator, the broad levels most frequently applied refer to the place in which the study is carried out [27:31].

The laboratory research follows a planned process of observation under a highly controlled environment. In contrast to field research, laboratory research is characterized by its isolation from natural environmental influences. Most laboratory investigations are conducted apart from actual operations; the investigator can manipulate variables to observe the effects (43:75).

> . . . When the investigation is referred to as a field study, it is implied that the only control used [involves] the selection of the time and place for making observations [27:32].

Field research is done in a natural setting where events can occur normally; this research is not conducted in an

artificial environment. Field research may include introduction of extraneous variables into the environment or the limitation of some natural processes (43:176).

The category of library research suggests that a researcher explores solutions to problems by using data which other individuals have collected; he has " . . . no control [over the data] except that of choosing those which he would accept or reject as valid [27:32]." Library research includes analytic and synthetic concept investigation and genetic and comparative research.

> Analytic concept investigations are concerned with working with available data to draw inferences directly or to develop models from which inferences can be made. Synthetic concept investigations are concerned with the synthesis of knowledge to derive general principles or models [43:178].

Genetic research follows the evolution, history, and development that can explain current conditions, while comparative research adds the control or limiting variables of time and space (43:178). Library research generally utilizes a historical approach that is non-quantitative (43:32).

The research taxonomy as presented by Helmstadter can be broadened by adding a fourth continuum: the level of effort applied. This continuum consists of both the time required to complete the research and the "rigor" or depth of study necessary to achieve the desired results. Several examples of research along this continuum are a research report, a professional paper, a master's thesis,

and a doctoral dissertation. Strayer and Lockwood (57:16-17) have suggested a "rigor index" as a composite of application, objectivity, and outcome that can be applied along this continuum (See Figure 4-2).

> Rigor must be traded off in order to get responsiveness . . . this [tradeoff] is frequently a cause of considerable concern to people facing the pressure of deadlines and the uncertainty of decision which must be made on less than complete information . . . [57:26-37].

Classification by level of effort and time suggests limitations imposed by the exigency for the research product. The effort is limited by the availability of research people, funds, and facilities, plus the suspense date and the level of sophistication at which the effort is being conducted.

The research report can be generated either internally as a staff study or externally as a contracted research study. This report's main function is to aid management in making decisions, thus the format does not follow the logical order of many other classifications. Instead, to save the manager valuable time, the statement of purpose is followed immediately by the conclusions, then the methodology and analysis are discussed. This report may require research from two to eighteen months and vary in length from just a few pages to over a hundred. The research report generally discusses applied research while the professional paper can discuss either applied or pure research. The professional paper can serve many purposes: to report, to question, to summarize current progress, or to suggest new methods. It is similar

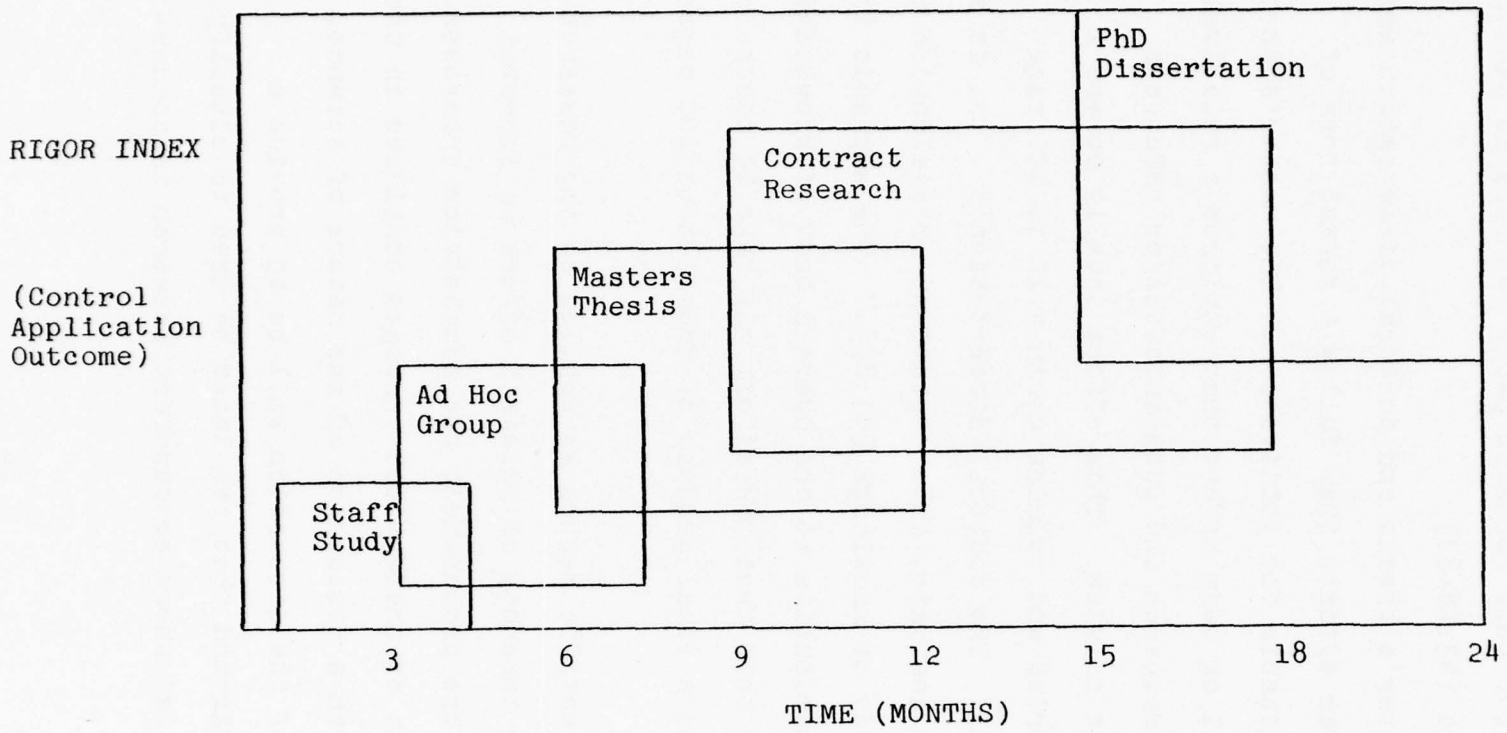

Fig. 4-2: Strayer/Lockwood Level of Effort Continuum (57:27)

to a research report but has a wider application. Length of preparation for this research paper can vary as can the length of output (43:78-82).

The master's thesis and doctoral dissertation are academic research efforts that follow a formal form of organization suitable for publication. The master's thesis is an individual or team effort that explores a relatively narrow area of research and substantiates or refutes a particular point of view. This effort usually covers a twelve month period and culminates in a 20 to 100 page thesis (43:82-3). The doctoral dissertation " . . . is a formal essay in analysis, interpretation, or evaluation of a subject or body of knowledge [43:83]." The emphasis is on original contribution to the overall body of knowledge. Preparation for this research effort may take 24 months or longer and yield a final product of from 120 to 200 pages (43:83-5).

The scientific method as applied to the research process and the taxonomy of research offers an improved perspective of the procurement and acquisition processes. This development of theoretical concepts continues in the next section with a discussion of the nature of science. The objective of the discussion will be to provide a scientific background that can later be used to classify the scientific area(s) where procurement research is concentrated.

The Nature of Science

Current literature (33;43;50) describes science in terms of its method, its structure, and its classification into subdivisions of knowledge. All of these elements contribute to an explanation of the nature of science. The scientific method was described earlier in this chapter; the other two elements are the subject of this section.

The Structure of Science

In terms of structure, Murdick (43:4) defines science as " . . . knowledge which has been tested and set in order." The structure of science consists of:

1. Observations (empirical data)[facts, experiences, data].

2. Concepts and constructs which are abstractions of phenomena or of other higher-level concepts.

3. Hypotheses which express possible explanations of causes or effects.

4. Principles or laws which consist of hypotheses that have been subjected to some form of experimental verification.

5. Theories or derived propositions which relate data, hypotheses, and laws in a general and consistent structure [43:4].

The Classification of Science

Science, as accumulated knowledge, is subdivided or classified in terms of its component disciplines:

(1) Abstract Science

(2) Natural Science

(a) Physical Science

(b) Biological Science

(3) Social Science (33:8; 44:5)

This classification scheme is only one of many that philosophers and librarians have proposed as an orderly arrangement of human knowledge. The scheme presupposes a logical arrangement of science on the basis of the overall subject matter included.

The component disciplines of science each fulfill a specific role in the overall body of knowledge. Abstract science, limited in this research effort to mathematics, is generally pervasive throughout the methodology and nature of the other sciences. Mathematics, as a language of science, is used to express " . . . the laws of a science, the quantitative relations within a science, and the application of a science in everyday life [33:8]." Natural science is the empirical study of actual material events of nature, both physical processes and things (33:146). By dividing all physical things and processes into living and non-living entities, natural science is further subdivided into the physical sciences (non-living) and the biological sciences (living) (64:31). Social science, sometimes called behavioral science, is the study of social phenomena and " . . . deals

with the observable behavior of men in societies [51:5]." Specific, unique characteristics of these sciences require further discussion.

"Mathematics has often been lauded as the model science because it has perfected the logical virtues of exactness, certainty, and systematic reasoning [50:13]." The subject matter is explicit; it deals with such concepts as number, space, time and function, all of which require precise determinations. Mathematics has also invented and conventionalized distinct and exact symbols which permit clear and economical representation of ideas (50:13-29). The results of mathematics are systematic and contain " . . . some of the most precise and harmonious logical structures that human reason has produced [50:29]."

The natural sciences, both physical and biological, are characterized by judicious " . . . experimental observation and precise measurement [50:74]." Natural science " . . . finds evidence in the observation of physical things and processes . . . [28:147]." The study of this science typically occurs in the artificial world of the laboratory where the scientist has control over the variables; moreover, the study is based upon the objective analysis of empirical data (35:169-70).

Natural science makes extensive use of mathematical models and representations of observed phenomena.

> The natural scientist aims at describing observed phenomena in generalizations which shall be as simple, comprehensive, and as well organized as possible . . . The natural scientist has made [sic] extensive use of various geometrical or mechanical models to aid the mind in picturing and explaining principles . . . Mathematics remains the most powerful tool yet devised for the interpretation of natural phenomena [50:74-75].

Natural science is based upon the empirical study of nature and is completely divested of the researcher's personal influence. The data that is recorded reflect only the observed phenomena with no value judgements included. Precise conditions, techniques, and measurement allow the replication of the experiments by other researchers (28:148-149).

The natural sciences emphasize experimentation, while "the great defect of the techniques of the social science is the lack of the experimental method [50:138]." Social sciences are a recent addition to the world of science and have not been as systematically developed as other sciences. Generally, the social sciences employ the comparative method and concentrate on description of behavioral processes (50:136-38).

> The realities with which social science is primarily concerned are the activities of human beings having consequences which are widespread in their effects, i.e., affecting others [50:139].

Many of the scientific techniques that are useful in the natural sciences are not adequate for the social sciences. The social sciences deal with a large number of inter-related events which are heterogeneous and complex. The

number of relevant factors, and thus the possible combination of influences, must be included when explaining events in the real world; thus, the precise techniques of natural science are often not appropriate (35:170).

The social sciences suggest new discoveries through " . . . the understanding of expressions or 'objectifications' of mind [28:146]." The role of subjective evaluation in the social sciences can influence both the design and the interpretation of the results of an experiment. The possible sources of influence through value judgement include: the personal judgement of the analyst, the effect of normative issues on interpretation, the selection of the research project, and the reflection of the researcher's motives in observing human actions (35:170). Thus, the current "state of the art" can influence the researcher's perspective and his everyday reflection of human nature (28:147-48).

The study of social science covers a broad spectrum of heterogeneous individuals. The imprecise nature of human behavior presents many variables that need examination. In the past, social or behavioral scientists designed experiments so that the number and complexity of calculations were minimized. With the use of the computer, however, the social scientist can now quantify both his outlook and his methodology and get meaningful statistical results. Problems still exist because of the subjective designs and interpretations because experimental results are open to exception, thus replication can be difficult. Finally, the results of

research in the social sciences are often expressed in terms of an "ideal process" or "ideal behavior"; the interpretation of the qualities of this "ideal" can be very controversial (35:168-80).

The natural and social sciences have often been contrasted and compared on the basis of their tendency to demonstrate the following characteristics:

(1) Invariability of Observations - which implies that the phenomena observed and reported can be reproduced or replicated by others (35:168-70).

(2) Objectivity of Observations and Explanations - the observation, experimentation, explanation, and interpretation of phenomena are free of value judgements (35:170-72).

(3) Verifiability of Hypotheses - infers that a set of hypotheses can be tested and verified

> . . . by deducing from some set of general assumptions the logical consequences, and comparing these with records of observations regarded as the approximate empirical counterparts of the specific assumptions and specific consequences [35:173].

(4) Exactness of Findings - the development of a unified comprehensive theoretical system, or

> . . . the possibility of constructing a theoretical system of idealized models containing abstract constructs of variable and of relations between variables, from which most or all propositions concerning particular connections can be deduced [35:173].

(5) Predictability of Future Events - the degree to which events perform as forecasted (35:175).

Machlup (35:168-79) contrasted and compared the natural and social sciences on the basis of the above characteristics. He concluded that the only real differences in these two sciences were the invariability of observations and the verifiability of hypotheses; the social sciences were found to be "inferior" to the natural sciences in these characteristics. However, he concluded that this supposed inferiority did not represent defects in the social sciences.

> [Sic] That there are variety and change in social phenomena; that, because of the impossibility of controlled experiments, hypotheses in social science cannot be easily verified . . . these are not defects to be remedied but fundamental properties to be grasped, accepted, and taken into account. Because of these properties, research and analysis in the social sciences hold greater complexities and difficulties [35:180].

Machlup's conclusions imply that, as with the natural sciences, the social sciences can and do effectively apply the scientific method of research.

Summary

The purpose of this chapter has been to complete the perspective for procurement research. The review of procurement and acquisition in Chapter III combined with the discussion of science and research in this chapter provides the basis for classifying and defining the methodology for the rest of the research effort.

The procurement process and the acquisition process have both been the focus of much criticism (See Chapter I). Research and science offer a systematic methodology for

finding improvements for these processes. The different sciences and classifications of research emphasize different techniques to achieve their goals. By identifying where procurement research fits into the schemes of research and science, the most efficient techniques can be applied to improve these processes.

The objectives of this research are to define procurement research, to classify it, to identify the areas where it is emphasized, and to build a taxonomy of it. By accomplishing these objectives, it is possible to ascertain where procurement research fits into the scheme of science and which subcategories of research are most prevalent. Also, the areas of the procurement and acquisition processes that most often require research can be identified.

Chapter V discusses the plan for accomplishing these objectives.

CHAPTER V

RESEARCH METHODOLOGY

Overview

To answer the research questions presented in Chapter II, a two-part methodological approach was used. The background presented in Chapters III and IV served as a logical base for this approach.

The first part of the methodology was designed to determine the scientific research characteristics of procurement research. The methodology suggested by Leedle and Coslett (32:21-43) was adopted. From an adaptation of content analysis as developed by D. Fox (23:656-59), their outline provided a logical process to analyze the selected sub-population of procurement research.

From the universe of research, the sub-population of procurement research as reported in the "Proceedings" of the first five DOD Procurement Research Symposia was selected. The analysis consisted of a census that was taken of the total sub-population of these five "Proceedings" and the application of the content analysis technique.

The second part of the methodology logically followed from the results of the first analysis. After the completion of the content analysis of the "Proceedings," a taxonomy of procurement research was constructed based on characteristics

derived from the content analysis and a review of existing literature. This taxonomy was then presented to various educational and functional experts in the procurement field to determine whether the taxonomy truly reflected the procurement process with its associated subsets. The taxonomy was refined through an evolutionary, cumulative process. Based on the above findings, an algorithm was then developed to determine whether a research effort is procurement research.

Universe

Procurement research is one population from the universe of research. Within this population of procurement research, a division was made between foreign and domestic research. Within the domestic population, the delimiting process was continued to a lower level: the research accomplished by the DOD within the public sector. DOD procurement research was further divided into two lower levels called reported and non-reported research. Reported research was defined as all procurement contained in the three central information repositories available within DOD; these repositories are the Defense Logistics Studies Information Exchange, the Defense Documentation Center, and the published "Proceedings" of the DOD Procurement Research Symposia. Non-reported research was that research not contained within the three repositories (See Figure 5-1 for population break down).

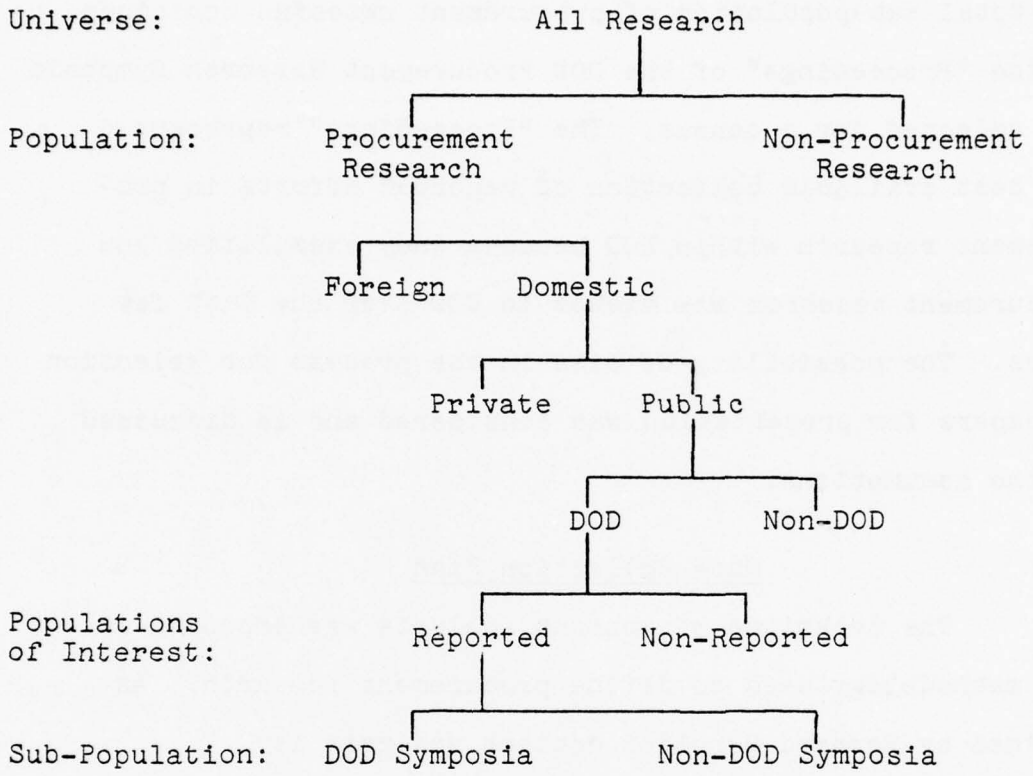

Fig. 5-1: Census Determination

Population

Rather than utilizing a sampling plan of other data, the total sub-population of procurement research contained in the "Proceedings" of the DOD Procurement Research Symposia was selected for a census. The "Proceedings" represented the best available collection of reported efforts in procurement research within DOD because they exemplified how procurement research was viewed in DOD over the past few years. The possibility of bias in the process for selection of papers for presentation was considered and is discussed in the assumptions.

Data Collection Plan

The technique of content analysis was employed in the methodology used to define procurement research. As defined by Bernard Berelson content analysis is: " . . . a research technique for the objective, systematic, and quantitative description of the manifest content of communication [7:18]." It has been used in the fields of social science to study the content of newspapers, to analyze literary styles, and during World War II, to study the propaganda output of various organizations in order to parallel their output with the propaganda of enemy countries (7:21-25). Most importantly, it has been used to study the development of various scientific and artistic fields. Berelson says:

> Such analysis not only describes the developmental trends of a discipline, but also supplies the definition or composition of the field at any particular time [7:33-34].

A review of the literature disclosed an increasing interest in the area of procurement research and in defining procurement research (Chapter II, pp. 6-25), but no suggestions have been made as to how it should be classified into a taxonomy. Content analysis provided a technique for grouping various procurement research efforts: by degree of control, by division of scientific study, by level of effort, by breadth of application, by level of outcome, and by placement in the acquisition and procurement processes. Through a system of summarizing and categorizing, these various groups were used to suggest a definition for procurement research.

The two levels of content analysis available to the researcher are the manifest level and the latent level. At the latent level, the researcher is interested in determining the underlying meaning or aspects motivating the author, the speaker, or the respondent. At the manifest level, the researcher analyzes the exact words as spoken or written; no inferences are made. Because content analysis can be accomplished reliably and validly at the manifest level but not at the latent level (23:647-48), the manifest level was chosen for this research effort.

Having decided upon the level of content analysis, next a " . . . distinction must be made between the recording unit and the context unit [7:135]." The recording unit is the smallest body of content which contains a reference to the specific characteristic being counted, while the context unit is the largest body of content used to analyze and characterize a recording unit (7:135). For this research effort the article (thesis, report, or abstract) was chosen as the recording unit. As Budd et al. state, " . . . using the entire article as a coding unit [recording unit] is acceptable when the project goals and the category system employed are of a general nature . . . [10:34]." The "Proceedings" was chosen as the context unit. "The context unit needs to be large enough to provide the background necessary to permit accurate judging, but not so large that the codes become confused [10:36]."

Finally, to determine the exact levels and characteristics of procurement research, semantic content analysis of coding was chosen. As defined by D. Fox, semantic content analysis " . . . involves the development of a set of categories intended to represent the dimensions and specifics of the actual content of the responses [20:656]." These categories should possess the attributes of homogeneity, inclusiveness, usefulness, and mutual exclusiveness.

Homogeneity requires that all categories be related in content to each other and to the research purpose; also,

the categories must show continuity within each level of abstraction. Inclusiveness requires that all responses be classified; generally, a special code ("other") must be established for items that do not fall into the primary classifications. Usefulness requires that each category serves a meaningful purpose and delineates a meaningful dimension of the items under study. Lastly, the attribute of mutual exclusiveness requires that there be one place, and one place only, to code the data; otherwise, the validity of the coding is weakened (23:675-76).

In this study seven categories of research classification and relationships between research and the acquisition and procurement processes were utilized. Each of these categories was assigned a specific location in a seven digit content analysis coding. The digits, with a short explanation of each category and subcategory, are listed below. Further explanation of the coding follows the code listing.

CODE FOR SEMANTIC CONTENT OF PROCUREMENT RESEARCH

FIRST DIGIT = Division of Science

1 = abstract
2 = natural
3 = social sciences
4 = combination of 1 and 2
5 = combination of 1 and 3
6 = combination of 2 and 3
7 = combination of 1, 2, and 3
9 = unable to determine

SECOND DIGIT = Breadth of Application

1 = pure
2 = applied
3 = service
4 = action
9 = unable to determine

THIRD DIGIT = Degree of Control

1 = library
2 = field
3 = laboratory
9 = unable to determine

FOURTH DIGIT = Level of Outcome

1 = descriptive
2 = predictive
3 = diagnostic
9 = unable to determine

FIFTH DIGIT = Level of Effort

1 = PhD dissertation
2 = master's thesis
3 = staff study/Ad Hoc report
4 = business research report
5 = professional paper/research monograph
9 = unable to determine

SIXTH DIGIT = Phase of the Acquisition Process

1 = conceptual
2 = validation
3 = full-scale development
4 = production/deployment
5 = reutilization/disposition phase
6 = addresses more than one phase of the acquisition process
7 = not concerned with the acquisition process
9 = unable to determine

SEVENTH DIGIT = Phase of the Procurement Process

1 = pre-award
2 = award
3 = post-award
4 = addresses more than one phase of the procurement process
5 = not concerned with the procurement process
9 = unable to determine

Rationale for Coding Scheme

The semantic content analysis code classified procurement research characteristics as they related to categories identified in the coding scheme. The seven categories have been previously discussed in Chapters III and IV and are summarized in the following discussion.

Each digit in the seven digit code represented a category of science, research, the acquisition process, or the procurement process. The first digit was coded to show the division of science used in procurement research. The second digit was coded to show the breadth of application of research techniques used. The third digit was coded to identify the amount of control used by the researcher and where the research was accomplished. The fourth digit was coded to determine the level of outcome of the research effort: what could be said about the area studied, did it describe a situation, or could a model be developed to predict future events? The fifth digit was coded to indicate the level of effort used in the research, i.e., the amount of time and depth of effort necessary to accomplish the research. The sixth and seventh digits were coded to indicate the phases of the acquisition and procurement processes with which the research was concerned.

A coding example: As an example of the coding, this thesis effort was coded as follows:

Division of Science - 5 (Combination of 1 and 3 [abstract/social]): The results of this research effort have been determined through the use of basic mathematics to determine the frequency distribution and the use of social science (history) to determine the taxonomic categories of procurement research.

Breadth of Application - 3 (Service): The research effort was accomplished to answer in part a question posed by the AFBRMC. It, therefore, was research accomplished in response to a specific question with limited application.

Degree of Control - 1 (Library): The primary source of data was obtained from a library, or an information repository. It was data that was previously reported.

Level of Outcome - 1 (Descriptive): The research effort only describes what has been accomplished in the area of procurement research; it does not attempt to show a cause and effect relationship and therefore predict future trends in research areas, only to show which areas have been researched generally and to suggest where other research efforts could be concentrated.

Level of Effort - 2 (Master's Thesis): This research effort was accomplished as a Master's Thesis.

Phase of the Acquisition Process - 6 (Addresses More Than One Phase of the Acquisition Process). This research effort was concerned with analyzing the reported

research on the acquisition process and determining where research emphasis had been placed.

Phase of the Procurement Process - 4 (Addresses More The One Phase of the Procurement Process): As in the acquisition process, this research effort was concerned with the total procurement process to determine where major emphasis lay and to find if any area was lacking in research.

Further discussion of the definitions of the coding is found in Appendix A. To validate the coding, a pilot study was accomplished and is discussed next.

Pilot Study

The use of the content analysis technique for this research effort required that a pilot study be accomplished to establish the reliability of the coding system. A judgemental sample of the population was selected and then used for the pilot study. Notable differences in responses were traced to the lack of precision in defining several subcategories. After several iterations of revising and retesting, the final code was established.

Reliability of the Code

Reliability of both the code and coders was essential to the use of content analysis. Previous experiments had exhibited a reliability range from 66 percent to 96 percent.

with a mean of 90 percent (7:172). D. Fox (23:669) states that a reliability figure of at least 90 percent should be reached by the coders using one-or-two-digit codes. However, one source suggested that the use of an article as a recording unit will produce " . . . a lower index of agreement between coders than if the coding unit [recording unit] were a smaller segment of content [9:34]." Thus, to enhance the reliability of this research effort a "target" reliability percentage of 90 percent was used. Additionally, random samples were taken of articles coded by one coder and re-coded by another coder to insure the reliability of the coding process. Individual differences were identified and resolved, then the article was recoded.

The reliability of the code was determined by computing the percentage of times the independent coders agreed when they each coded the same material. This formula was suggested by D. Fox [23:669]:

$$\text{Percent Agree} = \frac{100 \times \text{Number of Units Coded Identically}}{\text{Total Number of Units Coded}}$$

During the pilot study, the coding was analyzed for compliance with the requirements of homogeneity, inclusiveness, usefulness, and mutual exclusiveness. The results of the pilot study revealed that several categories did not meet the requirements of homogeneity and mutual exclusiveness; re-coding of several of the categories and subcategories was accomplished. Additionally, the coding responses were analyzed at the subcategory level, "unable to determine,"

to insure that no more than 5 percent of the responses appeared there. If more than 5 percent appeared in that subcategory, those elements were re-analyzed to determine whether they could be placed in another category [23:676].

Research Design

The research design was divided into five areas:

1. Classifying procurement research efforts and functions into categories and subcategories.

2. Identifying the areas of procurement research that were most frequently investigated.

3. Defining procurement research in terms of characteristics which were evidenced in the study.

4. Suggesting a taxonomy of procurement research.

5. Designing an algorithm to use in deciding if an effort is procurement research.

The first three areas of the research design were planned to answer the first and second research objectives. The fourth design area was planned to answer the second and third objectives and the fifth design area was planned to answer the third objective.

The first design area was used to identify specific scientific and research characteristics of procurement research as evidenced in the "Proceedings." Through content analysis, the articles of the "Proceedings" were classified into various categories and subcategories of characteristics.

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A PROPOSED DEFINITION AND TAXONOMY FOR PROCUREMENT RESEARCH IN --ETC(U)
SEP 77 G R HEUER, J C KINGSTON, E L WILLIAMS

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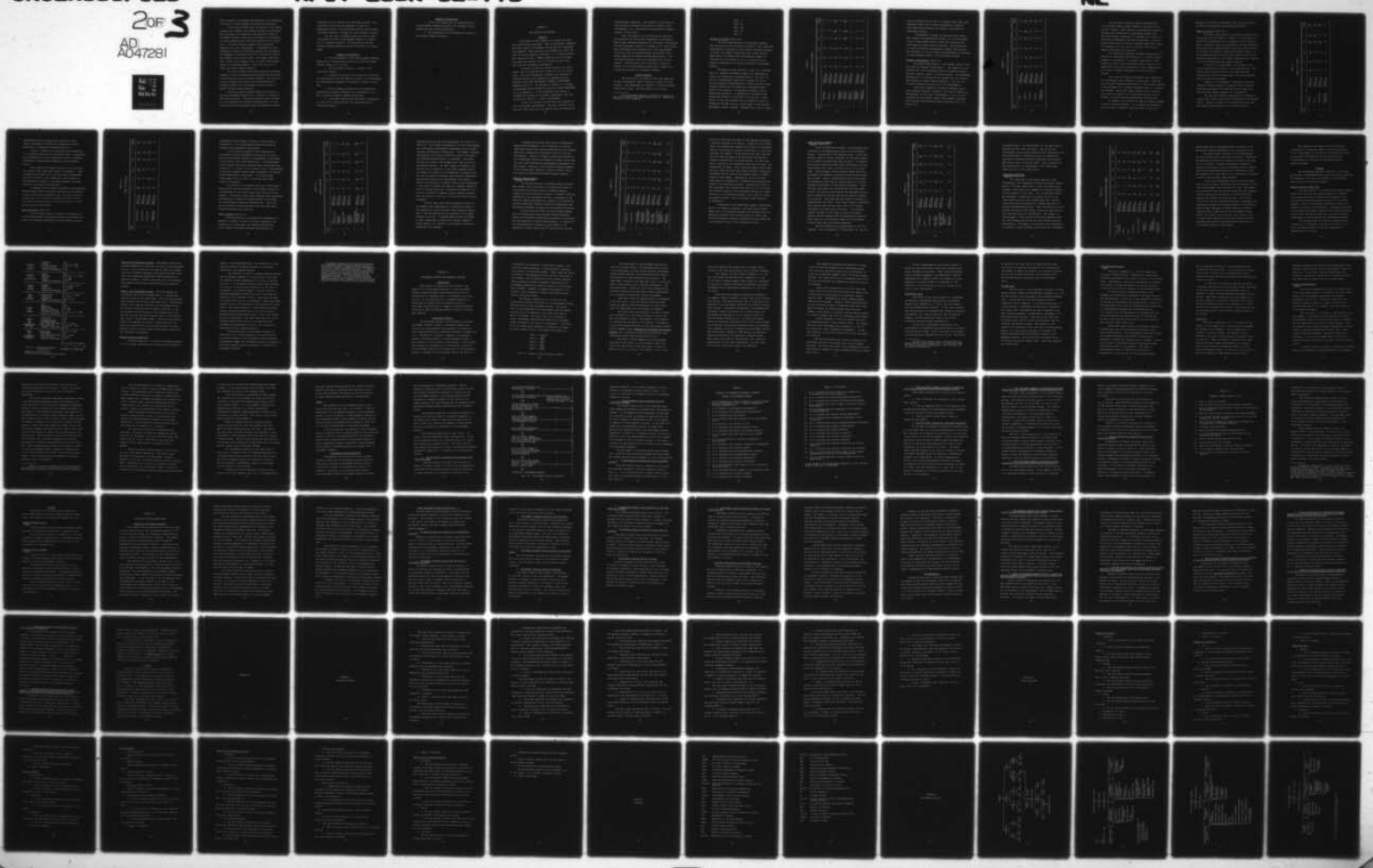

These scientific and research characteristics were correlated with areas of the procurement and acquisition processes.

In the second design area, the results of the content analysis were combined into relative frequency distributions. Each subcategory was analyzed to determine those areas of procurement research which were most frequently investigated and which characteristics were most prevalent in the population. A relative frequency analysis was accomplished separately for each "Proceedings." A comparison was made sequentially among the individual analyses and then against the aggregate to determine any shift in the area of procurement research over the five years. For example, had there been a shift in the category "level of effort" from Master's theses to professional papers? This effort was used to answer the second research question.

The third research design area, defining procurement research in terms of characteristics evidenced in this study, resulted directly from the previous analysis. The characteristics of research and science were incorporated into a conceptual definition of procurement research itself to answer the first research question.

The fourth area of research design was utilized to classify procurement research into a taxonomy, as stated in the second objective. The grouped characteristics included not only scientific and research characteristics, but also those derived from literature review and subsequent personal

interviews to fully describe the procurement process. The correlation of this data was employed to construct a suggested taxonomy of the procurement process, and therefore procurement research, to answer the third research question.

The last area of research design was used to determine whether an effort is procurement research by comparison to a designed algorithm. The algorithm was derived from the taxonomy suggested from the fourth area of research design.

Summary of Assumptions

1. The "Proceedings" of the DOD Procurement Research Symposia are a representative population of DOD procurement research between 1972 and 1976.

2. The procurement process is a subset of the acquisition process.

3. Possible bias exists in the selection of material for presentation at the DOD Symposia; however, the "Proceedings" are representative examples of procurement research for each year.

4. Since stringent criteria are not available for classifying procurement research, the "Proceedings" are as good as other procurement research populations.

5. Procurement research has identifiable characteristics that can be correlated with the characteristics of science and research.

Summary of Limitations

1. If the "Proceedings" are not representative of the procurement research population, the findings of this research may have limited application.

2. The conclusions of this research are limited to the proposed research questions.

CHAPTER VI

DATA ANALYSIS AND FINDINGS

Overview

The purpose of this Chapter is to answer the first and second research questions: "What is procurement research?" and "Which areas of procurement research are most frequently investigated?" These questions were answered to fulfill the first and second research objectives: (1) to define procurement research so that a common foundation can be used when discussing this subject, and (2) to identify those areas that were most frequently investigated.

The method of semantic content analysis was used to answer these two questions and to meet the first two objectives. The five "Proceedings" (1972-76) were analyzed to determine whether they possessed the characteristics as mentioned under CODE FOR SEMANTIC CONTENT OF PROCUREMENT RESEARCH (pp 73-74). The presence or absence of a category or subcategory was determined by using the CODING DEFINITIONS found in Appendix A. If the researchers were unable to determine the presence of a specific subcategory, that subcategory was coded (9) - "unable to determine."

In all, 114 articles and abstracts that appeared in the "Proceedings" were analyzed. The only "articles" which were not coded (and, thus, not counted) were the opening and

closing remarks summations. The analysis focused solely on those articles or abstracts that were the "body" of each "Proceedings," i.e., that material concerned with "reported research" of some form.

When the coding of all 114 articles and abstracts was completed, the results were summarized by subcategory. Results were tabulated separately for each year's "Proceedings" for each subcategory (Tables 6-1 through 6-7).* Additionally, Table 6-8* depicts the contributions to the "Proceedings" by Services, DOD (excluding Services) and non-DOD (other Federal Agencies and Private Business/Universities). The following discussion relates the findings of the content analysis. The discussion covers the shifts in areas of interest in the research and concludes with a summary and a proposed definition of procurement research.

Content Analysis

The discussion of the data is first done separately by each "Proceedings," then followed by a summary for each category. The Proceedings are referred to by Roman numerals, rather than by year. The relationship is as follows:

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*All percentages depicted on Tables 6-1 through 6-8 have been rounded to the nearest whole percent. Results are accurate to (±) one percent.

1972 - I

1973 - II

1974 - III

1975 - IV

1976 - V

Division of Science (Table 6-1)

The first characteristic of procurement research that was coded was the "division of science." This coding was accomplished to determine to which science (Abstract, Natural, or Social) procurement research was most closely related. Combinations of sciences were also available (codes 4-7) (See Table 6-1 and Chapter V, p. 73) to provide for any possible combination of sciences interacting in procurement research.

Reviewing the data (depicted in Table 6-1) disclosed that the reported procurement research was predominantly social or a combination of abstract/social. The total for all five "Proceedings" showed that 46 percent of the 114 articles possessed characteristics of social sciences; these research efforts were concerned with investigating some aspect of the behavior of procurement personnel, such as negotiating procedures. A combination of abstract/social science was evident in 48 percent of the articles. These results of the study indicate that the abstract science of mathematics has been used in a large number of the reported procurement research studies. Mathematics was used to measure

TABLE 6-1

DIVISION OF SCIENCE

Code			I	II	III	IV	V	TOTAL
1	Abstract	Total #	0	2	0	1	1	4
		Percentage	0	11	0	3	3	4
2	Natural	Total #	0	0	0	0	0	0
		Percentage	0	0	0	0	0	0
3	Social	Total #	7	9	8	10	18	52
		Percentage	58	50	67	30	46	46
4	Abstract/ Natural	Total #	0	0	0	0	0	0
		Percentage	0	0	0	0	0	0
5	Abstract/ Social	Total #	5	6	4	20	19	54
		Percentage	42	33	33	61	49	47
6	Natural/ Social	Total #	0	0	0	1	0	1
		Percentage	0	0	0	3	0	1
7	Abstract/ Natural/ Social	Total #	0	0	0	0	0	0
		Percentage	0	0	0	0	0	0
9	Unable to Determine	Total #	0	1	0	1	1	3
		Percentage	0	6	0	3	3	3

areas of interest such as cost, to quantify those areas into meaningful terms, and to develop mathematical formulas to show relationships between the variables influencing the procurement process.

"Proceedings" I through III indicated that procurement research was predominantly social, but in "Proceedings" IV and V, more abstract/social scientific techniques were noted than just purely social techniques. The predominance of social and abstract subcategories suggests that procurement research is a social science using mathematical techniques to study problems related to the procurement process.

Breadth of Application (Table 6-2)

The second characteristic of procurement research that was coded was "Breadth of Application." The emphasis on this characteristic was to determine whether procurement research was pure, applied, service, or action research. The predominant characteristic in this area of the research was that procurement research is mainly "applied research." Only one case of "pure" research was found in all the "Proceedings."

Aside from a somewhat rectangular frequency distribution between "Applied," "Service," and "Action" research in "Proceedings" II, all other "Proceedings" (I, III, IV and V) indicated that procurement research was primarily "Applied" with frequency distributions between 58 percent (III) to 73 percent (IV).

TABLE 6-2

BREADTH OF APPLICATION

CODE			I	II	III	IV	V	TOTAL
1	Pure	Total #	0	1	0	0	0	1
		Percentage	0	6	0	0	0	1
2	Applied	Total #	8	7	7	24	25	71
		Percentage	67	39	58	73	64	62
3	Service	Total #	1	6	1	4	5	17
		Percentage	8	33	8	12	13	15
4	Action	Total #	3	4	2	5	7	21
		Percentage	25	22	17	15	18	18
9	Unable to Determine	Total #	0	0	2	0	2	4
		Percentage	0	0	17	0	5	4

The next most frequently observed characteristic of procurement research under "Breadth of Application" was "Action" research. This research is specifically designed to persuade other researchers to investigate problems with which the original researcher is concerned but on which only preliminary investigation has been accomplished. The frequency distribution for "Action" research ranged from a high of 25 percent (I), to a low of 15 percent (IV), with an overall distribution of 18 percent.

The third most frequently evidenced characteristics of "Breadth of Application" was "Service" i.e., research accomplished at the request of an external organization. This research is done to solve a specific problem related to that organization with little application to other organizations, or at least no general application to other situations implied.

Four cases of "Unable to Determine" were evidenced in the "Proceedings" under "Breadth of Application." This was only a relative frequency distribution of four percent; however, in "Proceedings" III, a relative frequency count of 17 percent was attained. This latter figure exceeded the five percent limit stated in Chapter IV, but when the articles were reanalyzed, no further precise determination could be made.

In summary, the conclusion is that procurement research is mostly "Applied" research. It is research accomplished to find solutions to problems facing more than one agency or

manager in the field of procurement, and the solutions that are derived can generally have broad applications.

Degree of Control (Table 6-3)

The third characteristic of procurement research that was analyzed was the "Degree of Control," i.e., the amount of control the researcher is able to maintain over the subject matter (variables) which he is analyzing. Was the researcher accomplishing his research based on historical data (Library) or on data he obtained in a natural environment (Field), or did he manipulate data and have strict control over all the variables (Laboratory)? The dominant characteristic evidenced in all the "Proceedings" was Library research.

Initially, in "Proceedings" I, 92 percent of the articles analyzed were based on Library gathered data. The articles were mainly historical; the researchers were reporting what had been accomplished in the newly emerging field of procurement research.

Analysis of "Proceedings" II through V showed that "Library" research remained the dominant type of research performed; although in "Proceedings" IV, the research was evenly divided between "Library" and "Laboratory."

The next most dominant characteristic of "Degree of Control" was "Field" (except for "Proceedings" IV as discussed above). Overall 24 percent of the research articles coded were field research based, i.e., the effort involved

TABLE 6-3

DEGREE OF CONTROL

CODE			I	II	III	IV	V	TOTAL
1	Library	Total #	11	8	7	11	24	61
		Percentage	92	45	58	33	62	54
2	Field	Total #	0	6	3	8	10	27
		Percentage	0	33	25	24	26	24
3	Laboratory	Total #	1	4	1	11	2	19
		Percentage	8	22	8	33	5	17
9	Unable to Determine	Total #	0	0	1	3	3	7
		Percentage	0	0	8	9	8	6

researching specific problem areas occurring in their natural environment and using data obtained from direct observation of previously identified variables.

Lastly, 17 percent of the research was accomplished in a laboratory away from any environment impact. Researchers were creating data to use in simulation models to determine the effects of manipulating variables in the procurement process.

Also, under this category, seven of the 114 articles (six percent) were coded under "Unable to Determine." These occurrences were found only in the last three "Proceedings" and were due mainly to the submission of brief abstracts. These abstracts consisted of one short paragraph that made coding in this category very difficult.

In summary, the procurement researcher is accomplishing research based on data previously obtained; the only control he has is which data he selects to use. He takes previously assembled data on procurement personnel operating in their environment and manipulates it to describe, predict, or show cause-and-effect relationship.

Level of Outcome (Table 6-4)

In the category "Level of Outcome," the emphasis was on determining whether procurement research was primarily concerned with reporting information about procurement research

TABLE 6-4

LEVEL OF OUTCOME

CODE			I	II	III	IV	V	TOTAL
1	Descriptive	Total #	10	9	10	13	21	63
		Percentage	83	50	83	39	59	55
2	Predictive	Total #	0	0	2	5	6	13
		Percentage	0	0	17	15	15	11
3	Diagnostic	Total #	2	9	0	14	11	36
		Percentage	17	50	0	42	28	32
9	Unable to Determine	Total #	0	0	0	1	1	2
		Percentage	0	0	0	3	3	2

(Descriptive), with trying to predict a future course of procurement, or with analyzing procurement problems and showing a cause-and-effect relationship.

In the content analysis of this characteristic, procurement research was generally descriptive in nature. This was particularly evident in "Proceedings" I; 83 percent of the articles were coded "Descriptive." In "Proceedings" II the research was evenly divided between "Descriptive" and "Diagnostic" 50 percent in each category. Only in "Proceedings" IV were more research efforts coded "Diagnostic" (42 percent) versus "Descriptive" (39 percent). In the last three "Proceedings" (III, IV, and V) 13 articles were coded "Unable to Determine."

The results of the analysis under this characteristic indicate that the major emphasis of procurement research is in explaining the "who, what, where, when, and how" of procurement. The trend in recent years indicates that researchers are beginning to examine the cause-and-effect relationship in the procurement process as problems arise. Also, they are anticipating future occurrences based upon past facts through forecasting and projection.

Level of Effort (Table 6-5)

This characteristic of research was investigated to determine the amount of rigor (or effort) expended by the researcher in a study area. The frequency distribution of the dominant subcategory provided this measure; the

TABLE 6-5

LEVEL OF EFFORT

CODE			I	II	III	IV	V	TOTAL
1	PhD Dissertation	Total #	0	0	0	0	1	1
		Percentage	0	0	0	0	3	1
2	Master's Thesis	Total #	0	0	0	1	1	2
		Percentage	0	0	0	3	3	2
3	Staff study/ Ad Hoc	Total #	1	4	2	4	4	15
		Percentage	8	22	17	12	10	13
4	Business Research Report	Total #	1	4	2	4	3	14
		Percentage	8	22	17	12	8	12
5	Professional Paper/Research Monograph	Total #	10	10	8	21	29	78
		Percentage	83	56	17	64	74	68
9	Unable to Determine	Total #	0	0	0	3	1	4
		Percentage	0	0	0	9	3	4

research results by the five subcategories was depicted in Table 6-5. The dominant subcategory in all five "Proceedings" was "Professional Paper/Research Monograph" with an overall frequency distribution of 68 percent. The largest remaining subcategories were "Staff Study/Ad Hoc Report" (13 percent) and "Business Research Report" (12 percent). Only three articles were coded in the academic area "PhD Dissertation and "Master's Thesis." The small number of codings in this area may not be reflective of the actual research efforts but rather of a failure of the researcher to document fully the level at which his research effort had been undertaken. Many articles found in the "Proceedings" were known (a priori) to be abstracts of Master's thesis work accomplished in the School of Systems and Logistics' graduate program at AFIT; but because there was no specific information in the article, the method of semantic content analysis required that the article be coded as a "Professional Paper/Research Monograph."

Articles were coded "Staff Study/Ad Hoc Report" if the research was accomplished by a researcher internal to the organization, while they were coded "Business Research Report" when accomplished by the researcher for an agency external to his own. An example might be when the AFBRMC or APRO accomplished a study for an external Command or Federal Agency, i.e. external to the Command to which the researchers were assigned.

Although most articles were coded as "Professional Paper/Research Monograph," this finding may not be very significant because the criteria established in this research effort may contradict the reporting criteria of the five "Proceedings." However, a change in reporting criteria for the "Proceedings" would only decrease the number of articles that were coded "Professional Paper/Research Monograph" by a small amount. Generally, the procurement research reported in the "Proceedings" indicated a "Level of Effort" that is less than that required for advanced academic degrees.

Phase of the Acquisition Process (Table 6-6)

The interest here was to determine whether procurement research was concentrated in one particular phase of the acquisition process, whether procurement research covered the entire acquisition process, or whether it was not interested in the acquisition process. The assumption was made that because procurement is a subset of the acquisition process, researchers would be interested in improving those procurement processes concerned with the acquisition process.

The data from the content analysis coding revealed that the research was evenly divided between procurement within the acquisition process and procurement not associated with the acquisition of major weapon systems. A synopsis of the subcategories one through six under "Phase of the Acquisition Process" showed that 52 articles were concerned

TABLE 6-6

PHASE OF THE ACQUISITION PROCESS

Code			I	II	III	IV	V	TOTAL
1	Conceptual	Total #	2	0	0	5	0	7
		Percentage	17	0	0	15	0	6
2	Validation	Total #	0	0	0	0	0	0
		Percentage	0	0	0	0	0	0
3	Full Scale Development	Total #	0	0	1	0	0	1
		Percentage	0	0	8	0	0	1
4	Production/ Deployment	Total #	0	0	0	0	1	1
		Percentage	0	0	0	0	3	1
5	Reutilization/ Disposition	Total #	0	0	0	0	0	0
		Percentage	0	0	0	0	0	0
6	More Than One Phase	Total #	7	8	6	10	12	43
		Percentage	58	44	50	30	31	38
7	Not Concerned With the Acquisition Process	Total #	3	10	5	13	22	53
		Percentage	25	56	42	39	56	47
9	Unable to Determine	Total #	0	0	0	5	4	9
		Percentage	0	0	0	15	10	8

with one or more than one phase of the acquisition process; a relative frequency of 46 percent. Except for two isolated cases, the research was concerned with either the conceptual phase of the acquisition process (six percent), or more than one phase (37 percent). Those articles that were concerned with more than one phase of the acquisition process were normally concerned with the entire process. No effort was made to sub-divide the subcategory "More than one Phase" into combinations of phases. This limitation became evident when the pilot study disclosed that research efforts fitting this subcategory did not specify the necessary detail to differentiate to that degree. Additionally, no articles were coded under the "Validation" or "Reultilization/Disposition" phases of the acquisition process. Those articles coded in the subcategory "Not concerned with the acquisition process" were research efforts on the procurement process not related directly to the acquisition process, i.e., a study on a base procurement problem. Nine articles were coded "Unable to to Determine."

A comparison of the yearly data showed no appreciable shift in the areas of interest in the acquisition process. Almost half of the articles analyzed were concerned with the acquisition process, while the rest were not; these other articles pertained to general procurement problems which were not necessarily a part of the acquisition process.

Phase of the Procurement Process (Table 6-7)

As in the acquisition process, the researchers were interested in determining which phase of the procurement process was involved in the research effort. Of all the articles coded, 47 percent concerned the "Pre-Award Phase," and 33 percent concerned more than one phase. No research was directed toward the "Award Phase" exclusively, and only three percent were solely concerned with the "Post Award" phase. Those research efforts directed toward "More than one Phase" were normally concerned with the entire procurement process. Again no sub-divisions were included under the subcategory "More than one Phase" because of a lack of information necessary to allow further refinement. Those articles coded under "Not Concerned with the Procurement Process" (13 percent) were articles that addressed procurement in general but did not identify any specific phase(s) of the process. They addressed such issues as training or organizational structures. Those coded "Unable to Determine" (four percent) were articles that could not be clearly classified as to their area of interest. No correlation analysis was made in the coding to relate procurement research efforts concerned with the acquisition process to those coded under the category "Phase of the Procurement Process" other than that already mentioned.

The most frequently encountered phase in the "Proceedings" with the exception of "Proceedings" III, was the

TABLE 6-7

PHASE OF THE PROCUREMENT PROCESS

CODE			I	II	III	IV	V	TOTAL
1	Pre-Award	Total #	6	9	2	19	16	53
		Percentage	50	50	17	58	44	47
2	Award	Total #	0	0	0	0	0	0
		Percentage	0	0	0	0	0	0
3	Post-Award	Total #	0	0	0	0	3	3
		Percentage	0	0	0	0	8	3
4	More Than One Phase	Total #	4	9	8	7	10	38
		Percentage	33	50	17	21	26	33
5	Not Concerned With The Procurement Process	Total #	1	0	2	5	7	15
		Percentage	8	0	17	15	18	13
9	Unable to Determine	Total #	1	0	2	5	7	15
		Percentage	8	0	0	6	5	4

"Pre-Award Phase." In "Proccedings" III, the major area of interest was "More than one Phase." Only in the last "Proceedings" was any direct research effort expressed in the "Post-Award Phase." Historically then, the emphasis has been made in refining the process associated with procurement actions prior to contract award. Little interest has been evidenced by the "Proceedings" in the "Post Award Phase" and none in the "Award Phase."

Contributing Services/ Agencies (Table 6-8)

As a corollary to the content analysis of the "Proceedings," the researchers recorded the Service, Federal Agency, or Private organization to which the research was assigned. Each Service was regarded as a separate "Agency" for the purposes of this study. Also, contributors within the Department of Defense but not members of one of the three primary Services, were grouped under DOD. Non-DOD contributors were sub-divided into "Federal Agencies" and "Private Business/Universities." Table 6-8 depicts the total non-DOD contributions and further sub-divides them into the two previously mentioned subcategories. For example, in "Proceedings" I, total non-DOD contributors numbered three: one from "Federal Agencies" and two from "Private Business/ Universities." The census of contributors was accomplished to ascertain the most frequent contributors and to determine

TABLE 6-8

SYMPOSIUM CONTRIBUTING AGENCY

		I	II	III	IV	V	TOTAL
DOD (Non Service)	Total #	3	0	1	0	5	9
	Percentage	25	0	8	0	13	8
Army	Total #	1	1	5	7	5	19
	Percentage	8	6	42	21	13	17
Navy	Total #	2	3	3	2	4	14
	Percentage	17	17	25	6	10	12
Air Force	Total #	3	8	2	14	12	39
	Percentage	25	44	17	42	31	34
Non-DOD (Total)	Total #	3	6	1	10	13	33
	Percentage	25	33	8	30	33	29
Federal Agencies	Total #	1	2	0	1	7	11
	Percentage	8	11	0	3	18	10
Private Business/ Universities	Total #	2	4	1	9	6	22
	Percentage	17	22	8	28	15	19
Articles By Symposium	Total #	12	18	12	33	39	114
	Percentage	11	16	11	29	34	100

whether there was an increase/decrease in interest in the Procurement Research Symposiums by any contributory body.

The major single contributor to the "Proceedings" was the Air Force with 39 articles (34 percent). Second was the Army with 19 articles (17 percent) followed by the Navy (14, or 12 percent). Non-DOD contributions comprised 29 percent (33 articles) of total contributions with 22 coming from "Private Business/Universities." Contributions from DOD organizations, other than one of the Services, contributed a total of nine articles (eight percent).

Of the five "Proceedings" the Air Force has always been the most frequent contributor with the exception of the third "Proceedings" which was led by the Army. The number of contribitions from the various contributors has increased over the years with the exception of the Navy which has maintained an average of three each year. The interest noted in the "Private Business/Universities" subcategory was significant because this increasing number of contributions over the years indicates a rising concern which private enterprise has in improving the DOD procurement process. Some of the research was conducted at the request of DOD or other Federal Agencies, while other research was self-generated and broad in scope with general application to both private and public institutions.

The increase in the number of the participants (evidenced by the increased number of articles appearing in the "Proceedings") is indicative of the growing interest in procurement problems and the realization that the "Proceedings" are a platform for sharing procurement research findings.

Findings

The methodology employed in this part of the study was directed toward answering the first two research questions. The findings of the effort are related to each research question in the following discussion.

Research Question Number One

The first objective - to classify procurement research efforts and functions into various areas and to identify those areas that are most frequently investigated - was successfully achieved by using the results of the content analysis. The total "Frequency Distribution" (Figure 6-1) depicts the results of this analysis. Categories one through seven classify procurement research efforts while categories six and seven identify the areas that are most frequently investigated in the acquisition and procurement processes.

The findings under the first five categories are reviewed in the discussion of the second research question while the findings under the last two categories are addressed now, as follows.

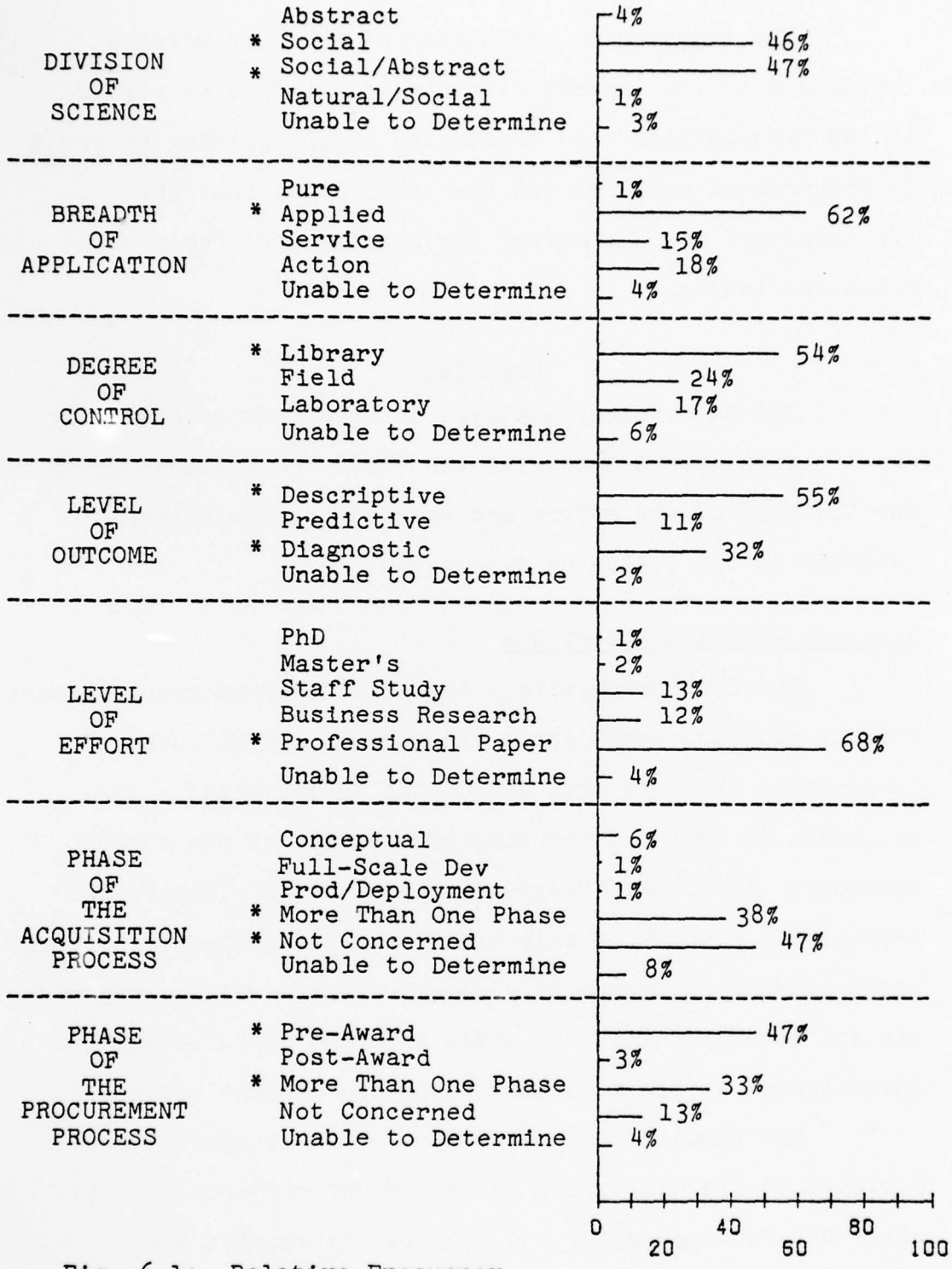

Fig. 6-1: Relative Frequency Distribution

*Dominant characteristics
**Zero percent subcategories not depicted

Phase of the Acquisition Process. Procurement research was generally emphasized in more than one phase of the acquisition process. Little interest in any specific phase was evident. This lack of research emphasis on any particular phase indicates that researchers emphasized a broad perspective in doing the research. However, less than half of the procurement research efforts were concerned with the acquisition process.

Phase of the Procurement Process. The major emphasis of the research was in the Pre-Award Phase. No studies were conducted solely on the Award Phase. Less than three percent were concerned with the Post Award Phase alone. Thirty-three percent of the research devoted to the procurement process was concerned with more than one phase; therefore, it can be concluded that the majority of the interest was in the area that can have the most important effect on the procurement process - the Pre-Award Phase. Improving this phase can benefit the remaining two phases. These results met the goal of the second objective, and also answered the second research question of which areas of procurement research are most frequently investigated.

Research Question Number Two

The second objective - to define procurement research so that a common foundation can be used when discussing this

subject - was accomplished also. The combination of data from the analysis provided the outline of a proposed definition of procurement research.

The "Division of Science" category findings indicate that procurement research is a social science which uses the abstract sciences (mathematics) to assist in problem solving. It is an applied research science that considers the solution to broad problems pervasive to the field of procurement. Its primary "Degree of Control" involves using data gathered by someone else who is not under the direction of the researcher; hence, library data provides the primary data base for the researcher. Also, procurement research is more often descriptive than predictive or diagnostic. The primary measure of accomplishing procurement research and reporting has been at the level of effort associated with a professional paper, though this finding may not be significant. The other characteristics of procurement research that relate to the acquisition and procurement processes have previously been discussed in answering the first research question.

The characteristics of procurement research as evidenced by the content analysis of the sub-population of reported research in the procurement research symposia "Proceedings" suggest the following definition in response to the second research question calling for a definition of procurement research:

Procurement research (and acquisition research) is an applied science using the characteristics of the social sciences in combination with mathematical sciences to solve procurement problems. It tends to rely heavily on the use of previously gathered data to seek solutions to problems, equally dividing its efforts between the acquisition process and the procurement process. In the acquisition process, emphasis is placed on the total process; while in the procurement process, emphasis is on the pre-award phase in an effort to identify cost-related problems.

CHAPTER VII

PROCUREMENT TAXONOMY AND RESEARCH ALGORITHM

Introduction

This chapter is divided into two sections. The answer to the third research question -- does procurement research possess definable characteristics which can be collected into a taxonomic form -- is provided in the first section. In the second section, a research algorithm is constructed to address the third research objective -- from these classifications, to suggest a detailed algorithm which may be used for deciding whether an effort is procurement research.

Procurement Taxonomy

The procurement process is the foundation upon which procurement research is based. Procurement research can involve both the procurement and acquisition processes and their interrelationship, as previously discussed in Chapter III, p. 41. Therefore, to construct a taxonomy of procurement research, focusing primarily on the procurement process, it was necessary to build a model of this process. Since procurement research is concerned with the procurement process and the procurement process as an integral part of the acquisition process, a taxonomy of the procurement process can serve as

a foundation for a taxonomy of procurement research. The areas and issues pertaining to these processes, therefore, also pertain to procurement research. These areas and issues, as related to the procurement process are the focal point of this research and the descriptors of the research taxonomy. Content analysis provided the general characteristics of procurement research and a partial structure of the procurement processes. However, to complete the taxonomy of the process, it was necessary to conduct interviews and make further literature reviews.

The taxonomy (Appendix D, pp. 171 thru 180) was constructed to display five levels of the procurement process. The first level is the procurement process. The second level is the three phases (Pre-Award, Award, and Post-Award). The third level is comprised of the cycles that make up each of the phases. The fourth level is a continuum of events (Procurement Continuum) that describe the necessary actions pertinent to the life of a "procurement." The fifth level, the lowest level presented, is composed of a number of issues related to each of the events (See Figure 7-1).

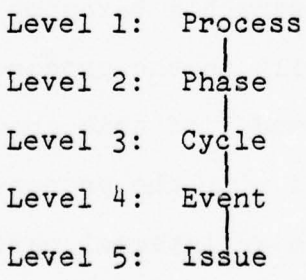

Fig. 7-1: Levels of the Procurement Process

The three phases of the procurement process are made up of several cycles. The Pre-Award Phase consists of the Requirement, Purchase Request/Military Interdepartmental Purchase Request, Solicitation/Evaluation Cycles -- all actions up to and including source selection. The Award Phase consists of the Award Cycle only -- all actions after source selection up to contract distribution. The Post-Award Phase consists of the Contract Administration Cycle and includes all events after contract distribution up to contract close-out and contract retirement.

Each cycle should be completed prior to proceeding to the next cycle. Also, all cycles within each phase should be completed before proceeding to the next phase until the final phase for a procurement is complete.

The fourth level was constructed to show a Procurement Continuum of 31 functional processes or events that must be performed to carry a "procurement" from inception to close-out and retirement of the contract. The genesis of this level was derived from the Army Procurement Research Office's general guide, Resources for Performing Procurement Research (63), interviews (25;34;37;38;49;56;59;74), and literature reviews (8;19;20;24;40;58;67;70;71).

The order of events suggested by the Procurement Continuum (fourth level) is not intended to imply that this is the only order in which they occur, or that all events occur in the life of a "procurement." Some of the

events are separated by dotted lines to indicate either overlap or that they may possibly occur in another sequence.

For example, the event Payment (Appendix D, p. 179) may occur before the Delivery event (Appendix D, p. 179) if the issue of Advance Payment under Payment is considered. In the case of formally advertised procurements, the events Pre-Negotiation and Negotiation (Appendix D, p. 176) will not occur.

The events were ordered as depicted in Appendix D to suggest a logical sequence to better focus on the procurement process. The occurrences and order of these events are dependent on the procurement office and the specific procurement involved. Procurement accomplished in the Research and Development areas could involve all of these events, but procurement accomplished at an Air Logistics Center or a Base Procurement Office may not. At a Base Procurement Office the procuring contracting officer (PCO) would probably not be involved in the events associated with the Requirement Cycle; whereas, the PCO in a Research and Development Procurement Office would, because he often advises the requester during the drafting of the requester's purchase request. Thus, within each event of the Continuum, most issues are considered by the PCO before proceeding to the next event, but not every listed issue needs to be addressed.

The sequential structure and definition of these events collectively definitize the procurement process. This collective definition should help the researcher to focus on a significant segment (event) of the procurement process. The issues that are to be considered both by the PCO and the researcher are suggested by the fifth level of the taxonomy.

Those issues represented at the fifth level were placed under the events where they would most likely occur, or would easily be identified by a researcher, given a specific event. Referencing the issue, Advance Payment, under the event Payment: though it occurs before Delivery in the procurement process, a researcher would most likely begin his search for Advance Payment under the event Payment, since Payment is a generic term and Advance Payment is a type of payment that would be classified under Payment.

Further breakdown to sixth and seventh levels was not addressed as part of this research effort. For example, under the event Procurement Plan (Appendix D, p. 174) is the fifth level issue, Compensation Arrangement. A sixth level breakout could be Firm Fixed Price or Cost Plus Award Fee contracts.

The brief discussion that follows is limited to the procurement process at the fourth level, the Procurement Continuum. The fifth level issues are not generally discussed unless used as examples of issues considered during the fourth level events.

Prior to discussing the fourth level events, it should be noted that several issues were considered pervasive throughout the process. These issues (Procurement Ethics, Contract Management, and Organization) were not identified with a specific event, but rather, as totally separate as is shown on page 173 of Appendix D. The discussion of the fourth level events is grouped by the cycle to which they pertain.

Requirement Cycle

The events of this cycle consist of: Requirement Determination, Requirement Specification, and Purchase Request Issue (Appendix D, p. 173).* The cycle begins with the Program Approval Receipt. In the event, Requirement Determination, the requester must consider the general requirements (e.g. mission, function) for the approved program. He must analyze the risks of the various alternative approaches under consideration.

In the event, Requirement Specification, the requirements are translated into specifications to communicate the required needs. The PCO can assist the requester in definitizing his specifications for the PR. The actions

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*Strayer and Lockwood offer a somewhat different perspective as to which issues should be considered under the event Requirement Determination. (See reference 58 for further information.)

of the PCO do not imply that he is generating the need, only that he is assisting the requestor in clarifying the requirement to enhance and expedite the procurement process once the PR has been received by the procurement office. The Purchase Request Issue event ends the Requirement Cycle.

PR/MIPR Cycle

The next event in the Procurement Continuum, Purchase Request Receipt, begins the PR/MIPR Cycle (Appendix D, p. 174). The PCO receives the PR and begins the Procurement Planning event. During this event the PCO reviews the Type of Acquisition that is required. Is he buying spare parts or a weapon system? Consideration of the Type of Acquisition will assist him in determining the Type of Agreement (e.g. Basic Ordering Agreement) or Compensation Arrangement (e.g. Firm Fixed Price) required. These issues and others are considered before the PCO writes his Procurement Plan and completes the proposal package. This package is then submitted for evaluation in the next event, Pre-Solicitation Review. If a sole source procurement is proposed, the proposed contractor may be requested to comment on the suggested proposal. The solicitation is released during the Formal Solicitation Release event. This event completes the PR/MIPR Cycle.

Solicitation/Evaluation Cycle

This cycle (Appendix D, p. 175-176) begins with the event, Response Receipt. Responses are received from potential contractors who have been solicited in the previous event. Additionally, unsolicited proposals may be received from offerors who have knowledge of the specific project, but who were not directly contacted in the preceeding event.

In the next event, Technical Evaluation, the responses are evaluated for compliance with stated criteria and specifications. Should all of the responses be deficient in meeting the requirements and specifications, a return to the Requirement Cycle occurs for re-defining the stated tasks in the requirement package and re-initiating the PR. If at least one of the responses is in accordance with the stated requirements and specifications, or revisions can be made to the response in the case of sole source procurement, the next three events occur.

These three events (Review of Contractor Capability, Proposal Audit, and Cost Analysis/Price Analysis) occur almost simultaneously. Once the responses have been selected for further evaluations, the offeror's (contractor's) capability to perform the required work is reviewed. Letters are also sent to the Defense Contract Audit Agency (DCAA) requesting an audit of the proposals. This audit is accomplished pursuant to ASPR and local directives. Concurrently, a price analyst or PCO is accomplishing a

Price Analysis/Cost Analysis of the proposals pursuant to ASPR and local directives. At the completion of these three events, the next event, Pre-Negotiation starts. Strategy and Objectives are established before starting the Negotiation event.

At this time the Government team and the offeror (a separate negotiation is held with each offeror when there are multiple offers) meet at the negotiation table to determine the most fair and reasonable settlement for both parties. When there exists more than one proposal for a specific contract, the Contractor Selection event occurs. The final decision is made by the Government as to which offeror will be awarded the contract. This event ends the Solicitation/Evaluation Cycle and the Pre-Award Phase of the process.

Award Cycle

This cycle (Appendix D, p.177) consists of five events. In the Funding event, final financial commitment is obtained for the program. In the Writing event the contract is actually written. The contract is then reviewed in the event, Contract Review, by several levels of authority. Legal sufficiency is insured by the Judge Advocate General's legal representatives, for example. These review processes are completed before the event, Award Announcement, occurs. In this event public notice is given by a respective Congressional member or other

authority, dependent upon the level and significance of the contract; protests may be filed by unsuccessful offerors at this point. In the event, Contract Distribution, the contract is printed and distributed to the various parties. This event ends the Award Cycle and the Award Phase.

Contract Administration Cycle

This cycle encompasses the entire Post-Award Phase of the procurement process. It consists of the last eleven events of the Procurement Continuum of the taxonomy (Appendix D, pp. 178-180). This cycle begins when the approved contractor starts to produce or provide the services stipulated in the contract. The cycle ends when the contract is retired.

The first event in the Contract Administration Cycle is Assignment. The administrative assignment of primary and secondary authority is given, and the agency or agencies who will administer the contract is (are) assigned. These are agencies such as Defense Contract Administration Services (DCAS) or the plant representative office (PRO). Under Contract Authority Delegation, procedural inspection is finalized. As the contract "ages" and the contractor's production system "solidifies," the event System Compliance occurs.

In System Compliance, issues of purchasing, accounting practices, production, quality, and design are investigated.

The DOD and the contractor interface to insure that the contract specifications are being met. Almost concurrently with System Compliance is the next event, Performance Measurement.

The various applicable performance measurement systems of the DOD Resource Management System and Government contracts interact with the contractor's management information systems to obtain necessary cost and schedule information on the contract. The Government insures that the contractor is conforming with the various criteria imposed by ASPR, such as Cost/Schedule Control System Criteria (C/SCSC), when applicable. For example, information such as delivery schedule, contract changes, is input into data automation systems, such as the Acquisition Management Information System (AMIS), and is used by AFSC in monitoring the weapon systems being acquired for the Air Force. AMIS and similar information systems provide both Government and contractor management with the data necessary for the decision making process of system acquisition. This information also provides the contractor a basis for receiving Progress Payment (Appendix D, Payment event, p. 179) from the DOD as the contract reaches specific milestones. As the first products are completed, the Quality Assurance event is initiated.*

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*Quality assurance procedures are utilized throughout the production process, but are presented in the Procurement Continuum as a specific event for a point of reference.

The finished product is reviewed for completeness and the product is tested to insure conformance with specifications. If requirements have not been met, defects are corrected before the product is accepted. Should there be major changes due to changed requirements not stated at the time of contract award, Contract Modification may occur. Changes made to the contract may be unilateral or bilateral, based on the provisions of the original contract.

After the product has been accepted by the DOD, the next event, Delivery, occurs. The contractor must deliver the specified amount on schedule to the proper destination. Once the delivery criteria have been met by the contractor, the Payment event commences.

The contractor is paid for the product he has delivered. Adjustments are made for meeting/not meeting time and cost schedules. The issues that are listed under Payment may not occur at this time but are listed here because of their relationship to the generic term -- Payment.

Should the product become unusable in the "field," the next event applies, Warranties. The product may be returned to the contractor for replacement or repair, dependent on the type of warranty agreed on prior to contract award. Warranties do not affect all products or systems but are important to the procurement process. The DOD is concerned with exercising its option under the warranty clause

to insure that the Services are receiving the best support possible. If the product fails, the contractor must meet his obligation as stated in the warranty clause.

If any differences of interpretation arise between the contractor and the Government and cannot be resolved, a dispute is filed with the Armed Services Board of Contract Appeals (ASBCA). Out of the ASBCA's rulings evolve remedies which may result in contract termination, withholding of payments, making adjustment in favor of the contractor, or other solutions. This event in the Procurement Continuum is called Remedies.

After all disputes have been settled, warranty obligations have been met, and final payments have been made, the final event, Completion, can occur. This event may take years to achieve depending upon disputes or other requirements of the contract, such as follow-on buy options or spares supply. When all these issues have been resolved, the contract can be closed out; unused funds can be recovered; and the contract can be officially retired.

The procurement process may take a great deal of time, and it is possible that the originally designated PCO or Administrative Contract Officer (ACO) may never witness the total procurement process of a contract to which he has been assigned. Nevertheless, there is a procurement process relative to each contract.

Although not on the Procurement Continuum per se, another event, Post Contract, does occur. The Renegotiation

Board will review retired contracts for excessive profits; should it find that a contractor has been paid too much for the work performed, the Board will file for recovery of those funds which were over-paid to the contractor.

Summary

This overview of the procurement process at the fourth level has been just that - an overview! It was not envisioned to be an in-depth discussion of the procurement process, but only to serve as a familiarization vehicle for the procurement process, the Procurement Continuum, and the issues that must be considered when viewing the total life of a contract by researchers or procurement personnel.

In the next section, the taxonomy of the procurement process is combined with the general phases of the acquisition process, as well as the characteristics of the scientific method and the characteristics of procurement research, to form an algorithm to assist a procurement research manager and/or analyst in determining whether a research effort is procurement research.

Procurement Research Algorithm

The purpose of this section is to meet research objective number three by providing a detailed algorithm which can be employed in determining whether an effort within DOD is related to procurement and whether it is research. Situations must be avoided where benefits from procurement research are foregone because the effort

was not recognized as procurement research. Equally important, situations must be avoided where scarce procurement research resources are expended on efforts that are not procurement research. The algorithm which has been developed is a natural extension of the results of the content analysis that was performed and the information that was gained through personal interviews and the literature review.

The developed algorithm, as depicted in Figure 7-1, basically follows the format of a decision flowchart; it is composed of a series of eight decision points, all of which (except one) require an affirmative response before an effort can finally be considered to be procurement research.

The algorithm begins with an input effort. The effort enters the algorithm without qualification. It can be the completed results of a research study, or it can be the proposal for a research effort. The input effort is then sequentially submitted to each of the decision questions displayed in Figure 7-2. A discussion of these questions follows.

1. Is the effort concerned with satisfying a perceived DOD need?

A general question that must first be asked is whether the effort relates to a DOD need as accomplished in performance of DOD assigned missions, either as defined by a formal authority or as justified as relevant by the

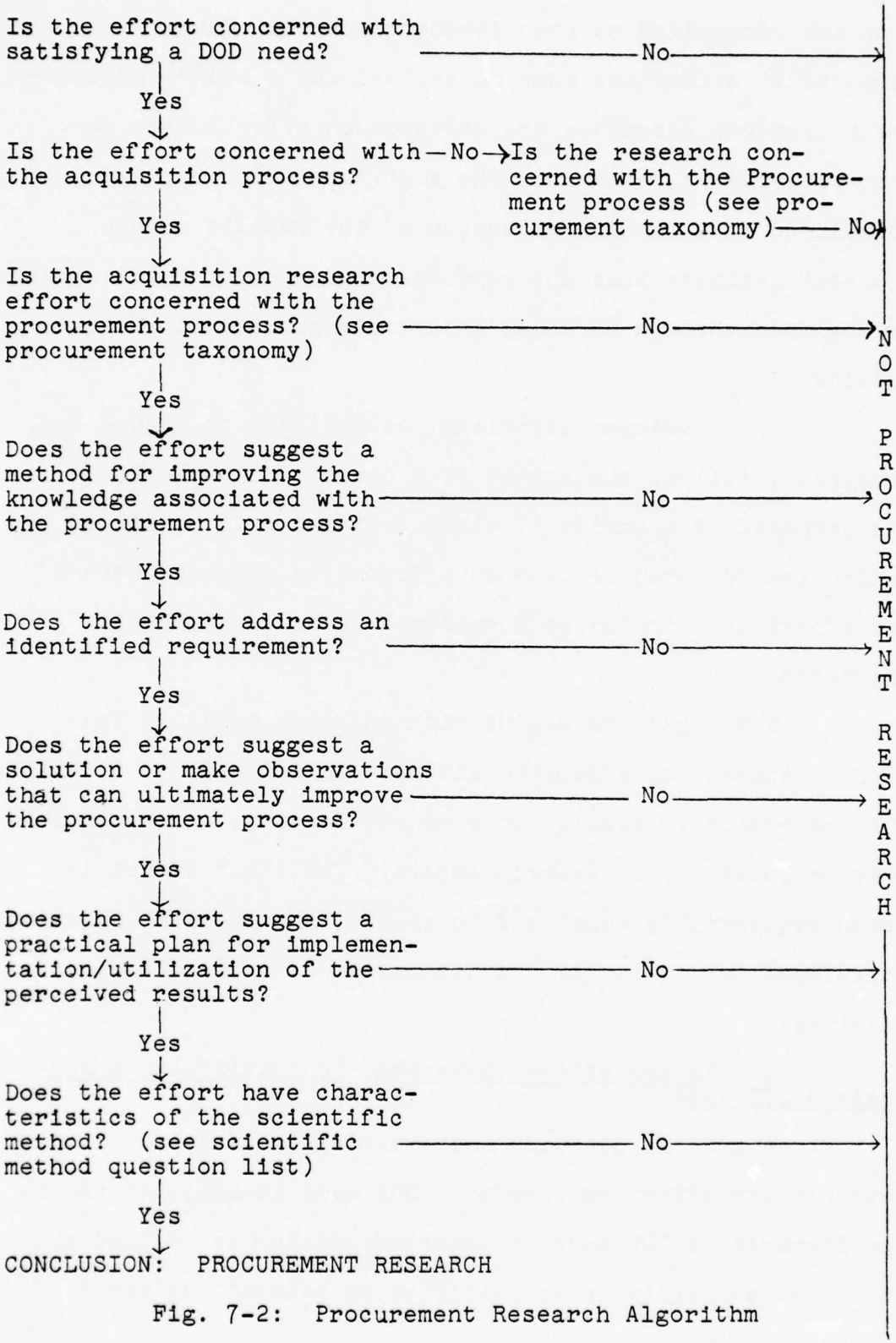

Fig. 7-2: Procurement Research Algorithm

researcher himself? Is the effort attempting to solve a problem or to describe a process within the DOD? If it is not, it should not be considered further as procurement research in the DOD.

2. Is the research effort concerned with the acquisition process?

The second decision point in the algorithm determines whether the research is concerned with the acquisition process. Is the research effort attempting to investigate the acquisition process as defined in Chapter III (pp. 36-41) and as changed by OMB Circular A-109? If the answer is negative, a second question is posed: Is the effort concerned with the procurement process? To answer this question, the evaluator refers to the procurement taxonomy (Appendix D) or Table 7-1 to determine whether the effort is related to any of the characteristics listed in the taxonomy. If the answer is "Yes," the effort proceeds to the fourth question. If the answer is "No." the effort is not considered to be procurement research.

Had the answer to the second question been affirmative, the effort would have been concerned with the acquisition process and would have proceeded on to the third question.

3. Is the research concerned with the procurement process?

Here the research effort is compared to the procurement taxonomy (Appendix D) using the questions listed in Table 7-1. If it contains any one of these characteristics, the effort is labeled procurement and continues on to the next question.

TABLE 7-1

CRITERIA FOR DETERMINING WHETHER A RESEARCH

EFFORT IS PROCUREMENT RELATED

1. Is it concerned with issues pervasive to the procurement process (procurement ethics, contract management, training, organization)?
2. Is it related to requirements determination?
3. Is it concerned with requirements specification?
4. Is it concerned with PR issuance?
5. Is it concerned with other aspects of the requirements cycle?
6. Is it related to the receipt of a PR?
7. Is it concerned with pre-solicitation review?
8. Is it concerned with formal solicitation issuance?
9. Is it concerned with other aspects of the PR/MIPR cycle?
10. Is it concerned with the receipt of responses to solicitation?
11. Is it related to the technical evaluation of responses?
12. Is it concerned with proposal audits?
13. Is it concerned with cost analysis/price analysis?
14. Is it concerned with pre-negotiation issues?
15. Is it concerned with contract negotiation?
16. Is it concerned with contractor selection?
17. Is it concerned with other aspects of the Solicitation/ Evaluation Cycle?
18. Is it concerned with some aspect of the pre-award phase?
19. Is it concerned with contract funding?
20. Is it concerned with contract writing?

TABLE 7-1 (Continued)

21. Is it concerned with the review of a contract prior to announcement and final signature?

22. Is it concerned with award announcement procedures?

23. Is it concerned with contract distribution procedures?

24. Is it concerned with other issues of the award cycle or award phase?

25. Is it concerned with the assignment of the contract for administration?

26. Is it concerned with contract system compliance?

27. Is it concerned with performance measurement of the contractor?

28. Is it concerned with quality assurance/product acceptance?

29. Is it concerned with contract modifications?

30. Is it concerned with product delivery?

31. Is it concerned with contractor payment?

32. Is it concerned with contract warranties?

33. Is it concerned with contract disputes?

34. Is it concerned with remedies resulting from contract disputes?

35. Is it concerned with contract completion and close-out?

36. Is it concerned with any other issues of the contract administration cycle or the post-award phase?

37. Is it concerned with post contract issues such as re-negotiation?

IF THE ANSWER TO ANY OF THE ABOVE QUESTIONS IS "YES" THEN THE EFFORT IS RELATED TO PROCUREMENT.

4. Does the effort suggest a method for improving the knowledge associated with the procurement process?

Three general questions can be asked of the research effort:

a. Does it decrease the uncertainty of the procurement process?

b. Will the suggested results of the research effort provide more knowledge of the procurement process, knowledge of an area that has not been investigated before?

c. Does the effort clarify events, areas, or issues in the process?

5. Does the effort address an identified requirement?

If the "need for research" identified by the effort has not been identified as an area requiring research, the procurement community should generally be queried as to the relevance of this effort to the present problem. Possibly the researcher perceived an area in need of research when he proposed the effort, but the person analyzing the effort does not have information as to the value of this effort. Therefore, before passing judgement on the effort, a review by relevant procurement personnel should be obtained to establish the validity of the undertaking. If, after submitting the effort to the selected procurement individuals the answer is negative, the effort should either be discarded or placed in a "hold" file for reevaluation at a later time. If the answer is affirmative, the effort continues on to the next question in the algorithm.

6. Does the effort suggest a solution or make observations that can ultimately improve the procurement process?

An effort that is classified as procurement research should be directed toward the improvement of the procurement process. The research effort may suggest a solution which may decrease the cost of, or the time required for, an event or events in the procurement process. The solution suggested may increase the quality, reliability, and/or the overall performance of the procurement process. Alternatively, the research effort may not result in a solution. It may define problems, describe institutions, evaluate experiments, or otherwise make observations that can be used as "stepping-stones" to the ultimate improvement of the procurement process.

The key to this decision point in the algorithm is that the research effort contributes to the improvement of the procurement process either through a solution to an existing problem or through observations that may lead to the understanding and solutions to future problems. If the research effort "qualifies" as procurement research in either of these two respects, then the effort should be submitted to the next decision point in the algorithm.

7. Does the effort suggest a practical plan for implementation or utilization of the perceived results?

An effort may be directed at the ultimate improvement of the procurement process. It may suggest a solution to an existing problem or it may be used as a "stepping

stone" to solutions of future problems. However, if the effort suggests using implementation/utilization procedures and/or techniques that would be impractical, the effort is suspect.

Application of this decision point requires a word of caution. Implementation/utilization plans suggested by some research efforts may be deemed impractical now, only to be proven practical at some future point in time. This fact may require that the final determination of whether some research efforts are procurement research needs to be deferred to a later date.

Finally, if the effort satisfies this criteria in the procurement research algorithm, it should be evaluated to determine if it follows the scientific method of investigation as discussed under the last question.

8. Does the effort have characteristics of the scientific method?

Determination of whether the effort follows the scientific method is made by subjecting the effort to the series of questions listed in Table 7-2. These questions need to be addressed by the research analyst and/or, procurement manager when evaluating the effort or the completed research. Depending on whether an effort is proposed, ongoing, or completed, several of the above questions would not be applicable. If the effort is proposed, questions (1-10) would be applicable, but if the effort was completed research, all questions would be applicable. If negative answers were obtained, the effort should be discarded, or

TABLE 7-2

SCIENTIFIC METHOD QUESTION LIST

1. Does it define the problem?
2. Does the effort survey existing pertinent literature?
3. Has the researcher evaluated past studies for applicability to his effort?
4. Does the effort build on previously developed knowledge?
5. Is the scope defined and specified, and are the specified objectives to be met, listed?
6. Does the effort suggest the testing of a hypothesis or the answering of a research question?
7. Is there a specified plan?
8. Does the effort list assumptions/limitations?
9. Is the methodology logical and appropriate for the objectives specified?
10. Does the effort gather data and/or facts?
11. Are the data valid and reliable?
12. Does the effort report, describe, predict or explain?
13. Do conclusions logically flow from the data?
14. Can the effort be replicated to achieve consistent results?

returned to the researcher for reclarification and rework and then returned for further analysis by the research approving agency.*

This algorithm suggests that a certain level of effort be undertaken by the researcher who proposes the study prior to its submission to the approving agency for acceptance. Resources available to the procurement research community are necessarily limited and need to be applied only to pertinent research proposals. Time and funds cannot be ill-spent on poorly defined research proposals that return marginal results or have no applicability to the procurement process.

This algorithm puts the "burden of proof" of a research effort on the researcher. It forces him to apply rigorous subjectivity to his evaluation of his effort prior to submission. If his "study" can pass the "test" prior to submission, it should pass the "test" applied by the approving agency. If it fails, the researcher is forced to reevaluate his effort, and the time devoted by the approving agency in evaluating the numerous efforts submitted to them for approval is decreased; a researcher's rigorously subjective pre-test should eliminate unnecessary efforts.

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*Managerial questions as to "who" is going to accomplish the research or "where" it should be done, were not addressed by this algorithm. They should be answered (asked) by the research manager only after the effort has been identified as "procurement research." These questions naturally follow this algorithm and not only address the issue of "who" and "where," but also "when" it will be studied (if not ongoing) and "what funds are available."

Findings

The purpose of this chapter was to answer the third research question and meet research objective number three. The results of this effort are summarized below:

Research Question Number Three

"Does procurement research possess definable characteristics which can be collected into a taxonomic form?"

The procurement taxonomy in Appendix D, pp. 171-180 provides the answer to this question. Procurement research does possess general characteristics that allow it to be collected into a taxonomic form.

Research Objective Number Three

This objective was: "from these classifications, to suggest a detailed algorithm which can be used for deciding whether an effort is procurement research."

The classifications developed from the content analysis, interviews, and the taxonomy provide the base on which the algorithm was developed. The suggested algorithm outlines a process for determining whether a research effort labeled procurement is actually procurement research.

From the efforts discussed in this chapter, certain conclusions can be drawn and recommendations made. The last chapter of the thesis addresses these conclusions and recommendations.

CHAPTER VIII

CONCLUSIONS AND RECOMMENDATIONS

Progress in Procurement Research

This research effort represents just one step toward a better understanding of what procurement research is, how it can be defined through its predominant characteristics, and how it can be classified into categories. The original research questions and objectives called for specific requirements from procurement research: a definition, most frequently investigated areas, definable characteristics, a taxonomy and an algorithm for deciding whether an effort was procurement research. The findings of this study have provided a tentative response for each of these requirements.

The definition for procurement research (See p. 109) was based upon the results from a content analysis of the last five published "Proceedings" of the DOD Procurement Research Symposiums. This sub-population of procurement research offered only a small "sample" for analysis but had three important advantages: (1) the contents of the "Proceedings" were recognized as procurement research in the DOD; (2) the "Proceedings" were selected from a "base" that covered the entire DOD; and (3) the articles presented in the "Proceedings" were conducive to the selected research methodology. The resultant definition represents a first attempt to actually

define procurement research based upon empirical evidence. As subsequent studies are completed by other researchers modifications to improve this definition will evolve.

The most frequently investigated areas of procurement research, as well as the definable characteristics of procurement research were derived from the content analysis results. The characteristics were supplemented with information from literature reviews and personal interviews. Procurement research was characterized as a social science combined with mathematics most of the time. Efforts were primarily applied to solving problems. The research was primarily accomplished through a selected aggregation of information (library), and the level of outcome was usually descriptive. The relationship of procurement research with the acquisition process showed that efforts generally involved either more than one phase of the acquisition process or were not specifically concerned with the acquisition process at all. Emphasis in the procurement process was primarily in the pre-award phase, but many articles dealt with more than one phase.

Conclusions drawn from the research effort indicate that procurement research almost always occurs in response to a problem situation. Even at the thesis or dissertation level of effort, the research is usually applied to a real world problem. The degree of control concentrated on gathering historical data and making inferences based on the data. Efforts in the acquisition process cover broad areas rather than specifics, while primary efforts in the procurement

process are in pre-award preparation. The entire perspective is on the present processes and correcting problems today.

The last requirement imposed by the research questions was the establishment of a procurement taxonomy. The proposed taxonomy (See Appendix D) is the culmination of all efforts, research, and information used in this study. The taxonomy resulted from an evolutionary process of interviews, literature reviews, and research team meetings. Like the definition of procurement research, the taxonomy is tentative and will need adjustments and additions as further information become available.

This taxonomy was then incorporated into an algorithm for evaluating research efforts, as to their applicability to procurement research to meet the last research objective - "from these classifications, to suggest a detailed algorithm which can be used for deciding whether an effort is procurement research." The algorithm can be of benefit to both the researcher and research agency. It requires that they both more carefully evaluate proposed and completed research as to its application to procurement. If the research applies to procurement within DOD it should be researched or classified as procurement research.

In summary, the status of procurement research has been clarified by this study effort. A definition has been offered; characteristics have been described; and a tentative taxonomy and algorithm have been constructed. This progress offers a structured perspective for people in the procurement research world.

What Procurement Research Should Be . . .

The previously discussed research efforts concentrated on what procurement research is and has been during the past few years. From exposure to the information that was reviewed in this effort, the research team gained an insight into procurement research and herein suggest what procurement research should be:

1. It should concern the acquisition or procurement processes.

Research accomplished by procurement researchers that does not involve the procurement or acquisition processes makes an inefficient use of limited resources. Non-procurement studies should be performed by researchers in other fields of endeavor, i.e., procurement researchers should not do research in areas other than "procurement" as defined by the taxonomy in this study.

2. Procurement research should seek solutions to procurement problems.

Procurement research should be applied research; it should be concerned with seeking solutions to problems faced by procurement managers and personnel. The studies that are undertaken should not only provide answers to specific problems, but also, attempt to suggest solutions that may be applied by more than one agency. Most of the research studies analyzed in the content analysis of the "Proceedings" attempted to provide broad answers to immediate questions (problems), rather than concentrating on long-range, repetitive problems.

Research in both areas is necessary to solve current problems and to anticipate and solve future problems.

3. Procurement research should be cost effective.

Procurement researchers should concern themselves with a cost analysis of their own work. Resources are limited. Researchers should document costs of their research processes. If the research can be performed at a lower cost external to the originating research agency, then the effort should be accomplished externally rather than maintaining a suboptimal view and using more costly internal methods. Each research effort should be thoroughly evaluated to determine the most cost-effective method for conducting the study.

4. Procurement research should follow the scientific method.

The "Proceedings" indicated that procurement research did follow the scientific method in its approach to problem solving. Future research should use the same procedures/techniques.

5. Procurement research should be unbiased.

Procurement research should report true findings, not "channel" results to suit the researchers. Procurement research is primarily a social science, assisted by the abstract sciences; therefore, it is subject to bias if the researcher attempts to "force" the findings, rather than reporting what actually happened. The researcher should apply rigorous subjectivity to his research and remain unbiased in his analysis.

6. Procurement research should make use of the best analytical methods.

Poor research techniques produce poor results. Poor techniques waste resources and provide weak solutions to problems that may require strong remedies. A careful, thorough evaluation of a procurement research problem can suggest the best analytical method to use in the effort.

7. Procurement research should be original and not redundant.

Procurement research should be replicated to confirm findings, but it should be not redundant. Two separate agencies should not research the same problem; results should be shared. Prior to doing research, procurement people should review previous studies and ascertain whether a new research effort is justified or whether the findings of a previous study are sufficient.

8. Procurement research should be shared.

Several procurement research agencies exist within the Federal Government and many external to the Government. All research performed by these organizations should be shared. Central procurement information storage facilities should be accessible to all of these organizations. Results should be publicized, such as those found in the "Proceedings." Only through the sharing of information can the redundancy be reduced and resources saved.

9. Procurement research should be simple, yet accomplish the task.

Procurement research should accomplish its specific task in the most direct method possible. It should not confuse the problem-solving methodology with techniques designed to impress the requester while hiding the path the researcher used to seek his solution.

Procurement researchers must consider the above concepts when they evaluate the problems placed before them for study and research. If they can achieve those objectives, then they will be able to perform their research fairly and objectively; above all, they have to consider the need. Is the approach they are taking fair and reasonable? The same question that is applied to the contract must be applied to the research problem in order to achieve the most cost effective solution.

Corollary Observations on Procurement Research

Experience gained during the course of this research may prove enlightening to subsequent researchers. An increasing level of interest in procurement was noted as a definite trend during the past few years. The interviews disclosed that procurement people look at research as a means to help solve both current and future procurement problems.

Along with the increasing interest in procurement research, several other corollary observations were noted. The annual DOD Procurement Research Symposium offers an

excellent means for sharing procurement research information; however, often other research efforts and results are not shared. For example, in October, 1976, the researchers found only one "Proceedings" of the DOD Procurement Research Symposia available through DLSIE under the descriptors "acquisition" and "procurement." Similarly, other procurement studies used in the study were noted as not being listed in the DOD information sources. This lack of reporting results and insuring the availability of procurement studies increases the chances for redundant studies and wasting of valuable time and resources.

Another observation was that procurement researchers generally do not share their current progress or projects. The opportunity sometimes exists to save much time and effort by enlisting the aid of other agencies; but, due to a lack of communication and cooperation -- both intra-service and inter-service -- fragmented efforts and non-standard terminology result. No mechanism exists for sharing procurement research that is currently in progress.

The next observation noted was the narrow perspective of procurement research. The scope of almost all of the efforts was noted to be limited to the immediate current problem. Often the method or technique that resulted from the research could be applied to other problem situations but the research itself was done strictly in response to one problem. General research to improve the overall acquisition and procurement processes was lacking.

Finally, it was noted that the present information systems on previous studies do not provide a totally accessible system to the researcher. Data that is retrieved may or may not relate to the researcher's areas of interest. DLSIE has provided the procurement research field with a general listing of descriptors that apply to the procurement process (63); however, the divisions are not always clear or complete. Originally, the abstracts on procurement related areas from DLSIE were considered as a data base for this study; however, the results of a pilot study on the abstracts indicated that the information was generally insufficient for content analysis. The narrative of each abstract was constructed differently, and needed information was not available.

These corollary observations would be incomplete without some suggestions or recommendations for improvement. Indication of a deficient area implies that better methods are perceived for getting the task done; the next section offers recommendations for improving procurement research.

Recommendations

Further studies must be made and current methods must be changed in order for procurement research to be improved. The results and conclusions from this study suggest starting points for further studies and alternative courses of action for current methods in procurement research. Eight recommendations for further study and procurement research improvement follow:

1. Add research studies with a longer range perspective to present problem/response type studies.

Although managers place great emphasis on actual current problems, studies that address potential future problems offer several advantages. Procurement research as now conducted does not suggest solutions to new problems, rather it responds to problems that have already occurred. Through a change in perspective, researchers could do studies on forecasted or simulated future economic conditions or contracting techniques and thereby be better prepared for problems that may arise.

The addition of some longer range research in procurement may identify influential factors that are not evident in the short-range, reactive approach. This broadened perspective, necessary for longer range research, could make researchers more aware of the whole procurement process by broadening their areas of interest. Potential problem areas may become evident before actual problems occur, and increased efforts can be expended to alleviate them.

2. Areas of procurement research effort, significant research progress, and research results should be shared with the procurement community.

Lack of relevant information and duplication of the same research efforts are inefficient and costly. Some improvement has been made in this area, e.g., yearly publication of articles in the "Proceedings," and the AFBRMC reports; however, more interaction between research agencies is necessary. One possible instrument for achieving better

publication and distribution might be a quarterly publication that includes ongoing research and the results of completed procurement research in a synoptic form. Through this publication, interested researchers could assess current efforts and request further information if desired.

The area of sharing information on procurement research is essential to the DOD procurement community. Further research should be done: (1) to research the extent of the problem of how many completed procurement research studies do not get into the DOD information systems and to correct this deficiency in information flow, and (2) to find a means to identify current DOD procurement efforts in progress and to publicize this information on a regular basis. These changes in procurement research information flow can improve the continuity of DOD efforts and can suggest new areas of procurement research that need investigating.

3. The DOD should adopt the taxonomy developed in this research effort as a common taxonomy of procurement research for use by its agencies.

Because procurement people come from different backgrounds, the potential for misunderstanding and gaps in communication exists. Each Service has a unique educational process for its procurement personnel, as well as different procurement techniques to be used. A standardized taxonomy of procurement research would allow researchers from all DOD agencies to establish a common framework for communication. Not only would researchers be on a common base, but procurement people could understand research results from other

agencies and possibly apply new and better techniques to their own work. Finally, a common taxonomy could be used as a data base for assigning descriptors to procurement research in a computerized information system.

The procurement research taxonomy presented in this thesis could be a logical starting place from which a common DOD taxonomy could be expanded. The partition of procurement research into increasingly more detailed levels offers the needed flexibility, both horizontally and vertically, to obtain or display required information. The open-ended listing of terms and acronyms provides the necessary capacity to which further information can be added. Also, the different levels can be used by a researcher who needs a specialized level of detail for his work.

4. The procurement research taxonomy that is suggested in this study should be critically analyzed and expanded.

The taxonomy is an attempt at categorizing the procurement process and the field of procurement research. Through further study, this taxonomy could be validated and expanded to include requirement definition and use as they impact upon procurement. The current levels are still quite broad and should be subdivided into more detailed levels so that the taxonomy is more usable. This increased detail could best be examined by researchers or data technicians familiar with the total process.

5. Further algorithms for conducting procurement research and for deciding whether to research procurement problems should be constructed and used.

The algorithm presented in this thesis provides a decision rule for deciding whether an effort is procurement research, but other important aspects of procurement research were not addressed. During the construction of the algorithm, the researchers had much difficulty in establishing a perspective from which to construct the algorithm. Procurement research can be viewed in terms of a given output or ongoing process, a method for conducting the research, or a method for deciding whether a procurement problem should be researched by an organization/individual. The first perspective was addressed in this research, but the other two were not.

Future efforts should research these two areas to provide guidelines for conducting the procurement research process and for making the important decision of whether or not to undertake a research effort.

6. A model for DLSIE abstracts should be developed so that key words would provide ready relevant information.

The results of the pilot study on DLSIE abstracts indicated a need for better congruity among abstracts. Research should be done to develop a model for writing DLSIE abstracts so that a content analysis of an abstract would determine key words, words similar to the phases, cycles, events, and issues of the taxonomy presented in Appendix D. Procurement researchers could then identify those studies relevant to their areas of specific research from this content analysis of the abstracts.

7. A sequential analysis of procurement research efforts should be performed.

Hood and Strayer (29) suggested that procurement research, as a developing discipline, can be portrayed as transitioning six development phases in a sequential evolutionary process from a new discipline to full maturation. The significance of this evolution process and its developmental phases is that each phase differs in terms of the kinds of question or issues addressed and types of research activity conducted within each phase. Since " . . . what can be accomplished through research is [dependent] on [its] knowledge base [29:10]" and that knowledge base is established by previous research, a sequential analysis of procurement research efforts highlights the phases of the developmental process previously addressed (knowledge acquired) and indicates the kinds of questions or issues that should be raised and the types of research activity that should be conducted to establish procurement research as a recognized mature discipline.

8. Research should be done to prioritize those "issues" of the procurement research taxonomy that offer the greatest opportunity for cost savings and improvement.

An analysis at the "issue" level of the procurement research taxonomy could identify those areas that are costly to implement, difficult to administer, and subject to frequent delay, as well as those areas that offer the greatest benefits to the DOD, the public,and industry. A priority system of procurement research issues would identify those areas that

should receive the most research emphasis. Limited resources could be applied to "issues" from the top down so that the most important areas are researched first.

A caveat should be considered in this recommendation. The resulting list of priorities for procurement research would only be applicable to those areas in procurement research as identified in the taxonomy. Similarly, priorities should be established in the need generation and the use portions of the acquisition process, and then the priorities from all three areas should be integrated!

Summary

This final chapter of the study has reviewed the learning process which occurred during the course of the research effort. The conclusions were stated in terms of the progress made toward defining and classifying procurement research. The background gained during this effort led to suggestions on what procurement research should be and some general observations that may be useful to later researchers. Finally, recommendations were made for further studies to learn still more about this subject.

This study represents one small step in the difficult task of defining, classifying, and otherwise bringing some order to procurement research. The authors realize that many imperfections exist in the work but hope that future researchers will use this effort as a "stepping-stone" for obtaining an ever-improving grasp of procurement research.

APPENDICES

APPENDIX A

CODING DEFINITIONS

The First Digit defined the Division of Science that the research effort adressed. It was coded as follows:

1. Abstract--was coded when the relations were expressed quantitatively.

2. Natural--was coded when the phenomenon that was observed was an actual material event of nature.

3. Social Science--was coded when the phenomenon that was observed was the result of, or was the behavior of, men in society.

4. Combination of 1 and 2--was coded when a natural material event was expressed quantitatively.

5. Combination of 1 and 3--was coded when a social phenomenon was expressed quantitatively.

6. Combination of 2 and 3--was coded when the phenomenon observed was a combination of an actual material event of nature and was the result of, or was the behavior of, men in society.

7. Combination of 1, 2 and 3--was coded when sub-categories 1-3 applied.

9. Unable to Determine--was coded when sub-levels 1-7 did not apply.

The Second Digit defined Breadth of Application - the reason a researcher became involved with a particular problem - and was coded as follows:

1. Pure--was coded when the research was solely for increasing knowledge about a subject with no application specified.

2. Applied--was coded when the researcher was interested in solving a practical problem he had identified. The results may have had broad application.

3. Service--was coded when the research was conducted to answer a specific problem posed to the researcher by an administrator. This research normally had limited application to a specific problem only, with some application to similar future problems in that situation.

4. Action--was coded when the research was conducted to solve a specific problem with no application to any future situation. The research may not have provided an answer to the original problem but was initiated solely to bring attention to a problem.

9. Unable to Determine--was coded when subcategories 1-4 did not apply.

The Third Digit defined the Degree of Control - the amount of control applied by the researcher in obtaining data - and was coded as follows:

1. Library-was coded when the researcher used data collected by others and the only validity check the researcher could apply was whether to accept or reject the data.

2. Field--was coded when the research was conducted in natural settings where events occurred normally.

3. Laboratory--was coded when the researcher was able to manipulate variables and to observe the effects.

9. Unable to Determine--was coded when no determination could be made.

The Fourth Digit defined the Level of Outcome - did the research describe, predict, or diagnose a situation? - and was coded as follows:

1. Descriptive--was coded when the research emphasized the gathering of information to characterize a subject.

2. Predictive--was coded when the research outcome anticipated the future.

3. Diagnostic--was coded when the research outcome specified a cause-and-effect relationship.

4. Combination of 1 and 2--was coded when the research asked what something was like yet had anticipated the future.

5. Combination of 1 and 3--was coded when the research asked what something was like and also had stated a cause-and-effect relationship.

6. Combination of 2 and 3--was coded when the research specified a cause-and-effect relationship and had anticipated the future.

7. Combination of 1, 2 and 3--was coded when the research met the requirements of subcategories 1, 2 and 3.

9. Unable to Determine--was coded when none of the above characteristics could be determined from the research effort.

The Fifth Digit defined the Level of Effort - the time required and the depth of study necessary to complete the research effort - and was coded as follows:

1. PhD Dissertation--was coded when the research was accomplished as part of doctoral degree requirements.

2. Master's Thesis--was coded when the research was accomplished as part of master's degree requirements.

3. Staff Study/Ad Hoc Report--was coded when the research was accomplished internally in the organization to answer a specific managerial problem.

4. Business Research Report--was coded when the research was accomplished external to the organization to answer a specific managerial problem.

5. Professional Paper/Research Monograph--was coded when the research was completed to report, to question, to summarize current progress, or to suggest new methods.

9. Unable to Determine--was coded when the research effort could not be coded in subcategories 1-5.

The Sixth Digit defined the phase of the Acquisition Process that the research discussed and was coded as follows:

1. Conceptual--was coded when the research addressed any procurement activities up to and including DSARC I.

2. Validation--was coded when the research addressed any procurement activities after DSARC I and up to and including DSARC II.

3. Full-Scale Development--was coded when the research addressed any procurement activities after DSARC II and up to and including DSARC III.

4. Production/Deployment--was coded when the research involved procurement activities after DSARC III and up to weapon system phase out. (Production was combined with deployment because of overlapping activities.)

5. Reutilization/Disposition--was coded when the research was concerned with procurement activities involving the major modification of an existing weapon system to meet newly defined requirements. Also, it includes any procurement activity associated with the disposition of a weapon system.

6. Addressed More Than One Phase of the Acquisition Process-was coded when more than one phase of the acquisition process was addressed by the research.

7. Not Concerned With the Acquisition Process--was coded when the research did not involve the acquisition process but did involve other procurement activities.

9. Unable to Determine--was coded when no distinguishable characteristics allowed coding under one of the previous seven subcategories.

The Seventh Digit defined the Phase of the Procurement Process with which the research was concerned. The five cycles addressed in Chapter III were combined into three phases: Pre-Award, Award, and Post-Award. This digit was coded as follows:

1. Pre-Award--was coded when the research involved the requirement, PR/MIPR, or Source Selection/Evaluation cycles of the procurement process.

2. Award--was coded when the research involved the awards cycle, i.e., all procurement actions from source selection to contract distribution.

3. Post-Award--was coded when the research involved the contract administration cycle including all activities up to contract close-out, retirement of the "files," and re-capture of any unused funds.

4. Addressed More Than One Phase of the Procurement Process-was coded when the research involved more than one of the phases.

5. Not Concerned With the Procurement Process--was coded when the research addressed procurement in general but did not identify any specific phase(s) of the process (e.g. training, procurement ethics).

9. Unable to Determine--was coded when a specific phase could not be determined.

APPENDIX B

CODING QUESTIONS

Division of Science

1. Abstract

a. Did the research make use of quantitative relationships?

b. Were the ideas represented by mathematical symbols?

c. Did the research deal with concepts, such as number, space, time, and function that require precise determinations?

2. Natural

a. Does the research address objective analysis of empirical data in Nature?

b. Does the research reflect observed phenomena with no value judgements included?

c. Does the research reflect precise conditions, techniques, and measurements that would allow replication?

d. Does the article deal with the biological or physical sciences?

3. Social

a. Did the research deal with human actions?

b. Was the research aimed at generalizations of men in society?

c. Did the research deal with the various institutions?

4. Combination of 1 and 2.

5. Combination of 1 and 3.

6. Combination of 2 and 3.

7. Combination of 1, 2 and 3.

9. Unable to Determine.

Breadth of Application

1. Pure

a. Was the research accomplished to increase knowledge about a subject with no application specified (theoretical)?

b. Was the research initiated by the researcher?

2. Applied (Developmental, Product)

a. Was the research directed toward solving a specific problem?

b. Was the research continually adjusted to satisfy a specific objective?

c. Can the research results be generalized to similar situations?

d. Was the research initiated by the researcher?

3. Service

a. Was the research in response to a problem faced by an administrator or practitioner separate from the researcher himself?

b. Did the research focus on a local situation?

c. Was the research designed to resolve one problem in a specific setting?

4. Action

a. Was the research done to highlight a problem/potential problem situation?

b. Was the research done to improve the efficiency of applied workers?

9. Unable to Determine.

Degree of Control

1. Library

a. Did the research explore solutions to problems by using data which other individuals collected?

b. Was the research a synthesis of prior work over which the researcher had no control except that of choosing those items which he would accept or reject as valid?

c. Did the research follow the evolution, history, and development that can explain current conditions or did it use the controls of limiting variables of time and space?

2. Field

a. Did the only control used in the research involve time and place?

b. Was the research done in a natural setting where events could occur normally?

c. Did the research include introduction of extraneous variables into the environment or the limitation of natural processes to observe the effects?

3. Laboratory

a. Was the research isolated from natural environmental influences?

b. Was the research conducted apart from actual operations?

c. Was the investigator able to manipulate variables to observe the effects (disregarding the selection of time and place)?

d. Was a computer simulation employed?

9. Unable to Determine.

Level of Outcome

1. Descriptive.

a. Did the research attempt to answer the questions: who, what, where, when, or how of a subject?

b. Did the research ask what something is like?

c. Was the emphasis on gathering data with little knowledge of where it would lead?

2. Predictive.

a. Did the research anticipate future occurrences based on past facts and theories?

b. Did the research involve the extension of concepts?

3. Diagnostic.

a. Did the research show a cause-and-effect relationship and thereby predict a future course of events?

b. Was the research descriptive and predictive?

9. Unable to Determine

Level of Effort

1. PhD Dissertation.

Was the research done as part of a PhD dissertation effort?

2. Master's Thesis.

Was the research done as part of a Master's thesis effort?

3. Staff Study/Ad Hoc Report.

Was the research a combined effort of a group of experts within the organization to address a specific area of interest?

4. Business Research Report.

Was the research contracted by management to address a specific area of interest?

5. Professional Paper/Research Monograph.

a. Was the research conducted by one or two people to add to the body of knowledge and to be reported to a group?

b. Can the solution be adapted to many companies/agencies through presentation at a professional symposium or in professional publication?

c. Did the research cover a single subject area of interest to a group?

9. Unable to Determine.

Phase of the Acquisition Process

1. Conceptual.

a. Did the research activity center on procurement actions prior to and including DSARC I?

b. Did the research identify improved procurement activities used to acquire technical assistance in refining weapon system concepts?

c. Was the research concerned with improving procurement planning for a weapon system (e.g. preliminary cost estimates)?

2. Validation.

a. Did the research deal with procurement activities involved with the acquisition of prototypes?

b. Did the research focus on procurement activities up to and including DSARC II?

c. Did the research involve procurement activities that were concerned with test and verification of the preliminary design of a new weapon system?

d. Did the research focus on activities centered on "fly-offs" as applicable?

3. Full-Scale Development.

a. Was the research concerned with procurement activities centered on improving the final production model?

b. Was research on the improvement of procuring of plans for production, logistics, and training support?

c. Was research on the procurement activities between DSARC II and DSARC III?

4. Production/Deployment.

a. Was the research concerned with procurement activities involved with actual production/deployment of weapon systems?

b. Was the research concerned with the procurement of initial spares, facilities and training equipment?

c. Was the research concerned with the procurement of weapon systems modification resulting from operational test and evaluation prior to the delivery of the last weapon system?

5. Reutilization/Disposition.

a. Assuming the last production model has been received, was the research concerned with procurement activities designed to improve the existing weapon systems to meet a new requirement.

b. Did the research involve any other activities between production/deployment and deactivation of the weapon system?

6. Addressed More Than One Phase of the Acquisition Process.

Did the research address one or more than one phase in acquisition process?

7. Not Concerned With the Acquisition Process.

a. Was the research only concerned with the procurement process?

b. Was the research concerned with something other than the acquisition process?

9. Unable to Determine.

Phase of the Procurement Process

1. Pre-Award.

a. Was the research concerned with a purchase request, procurement planning, solicitation, determination, specifications, RFP's, RFQ's or IFB's, new methods of cost/price analysis of received bids and proposals?

b. Did the research identify need improvement, identification, procurement planning, solicitation, evaluation, or negotiation or selection of bids.

c. Was the research concerned with any part of the procurement cycle up to and including the completion of negotiation and selection of the contractor in the case of bids?

d. Was the research concerned with new methods of cost/price analysis of received bids and proposals?

2. Award.

a. Did the research deal with the actual administrative procedures in letting of the contract.

b. Did the research concern itself with any activity involved with final approval of the contractor, once the contract had been signed by him and had been sent forward for final approval.

3. Post-Award.

Did the research address contract administration through retirement of files?

4. Addressed More Than One Phase of the Procurement Process.

Did the research address more than one phase of the procurement process?

5. Not Concerned With the Procurement Process.

Was the research concerned with procurement, but not the process (i.e. training, procurement ethics)?

9. Unable to Determine.

APPENDIX C

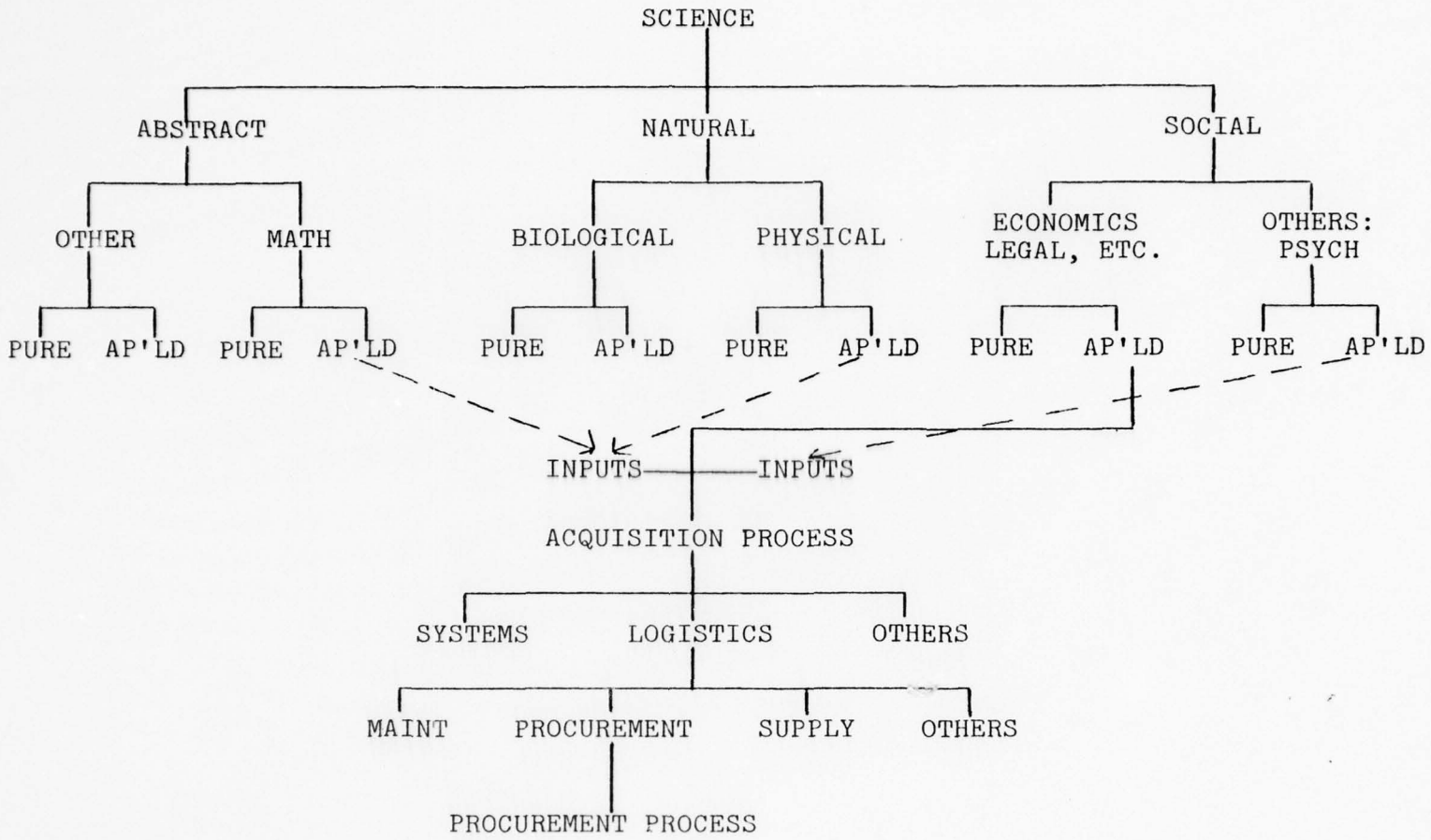
ACRONYMS

ACO	Administrative Contracting Officer
AFBRMC	Air Force Business Research Management Center
AFIT	Air Force Institute of Technology
AFLC	Air Force Logistics Command
AMIS	Acquisition Management Information System
AFSC	Air Force Systems Command
APRO	Army Procurement Research Office
ASBCA	Armed Services Board of Contract Appeals
ASD/I&L	Assistant Secretary of Defense/Installations and Logistics
ASPR	Armed Services Procurement Regulations
COGP	Commission on Government Procurement
C/SCSC	Cost/Schedule Control System Criteria
D&F	Determinations and Findings
DCAA	Defense Contract Audit Agency
DCAS	Defense Contract Administration Services
DCP	Decision Coordinating Paper
DLSIE	Defense Logistics Studies Information Exchange
DOD	Department of Defense
DODD	Department of Defense Directive
DSARC	Defense System Acquisition Review Council
EOQ	Economic Order Quantity
GAO	General Accounting Office
FPI	Federal Procurement Institute
HQ AFLC	Headquarters Air Force Logistics Command

HQ USAF	Headquarters United States Air Force
IAW	In Accordance With
IFB	Invitation for Bid
JAG	Judge Advocate General
NCMA	National Contract Management Association
NPS	Naval Postgraduate School
OFPP	Office of Federal Procurement Policy
OMB	Office of Management and Budget
OSD	Office of the Secretary of Defense
PCO	Procurement Contracting Officer
PIECOST	Probability of Incurring Estimated Cost
PM	Project Management
PR	Purchase Request
PR/MIPR	Purchase Request/Military Interdepartmental Purchase Request
PRCC	Procurement Research Coordinating Committee
RFP	Request for Proposal
RFQ	Request for Quote
(S)SARC	(Service) Systems Acquisition Review Council
SECDEF	Secretary of Defense
SOW	Statement of Work

APPENDIX D

PROCUREMENT TAXONOMY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SOCIAL
OTHER
MATH
BIOLOGICAL
PHYSICAL
ECONOMICS
LEGAL, ETC.
OTHERS:
PSYCH
PURE
AP'LD
PURE
AP'LD
PURE
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PURE
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AP'LD
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MAINT
PROCUREMENT
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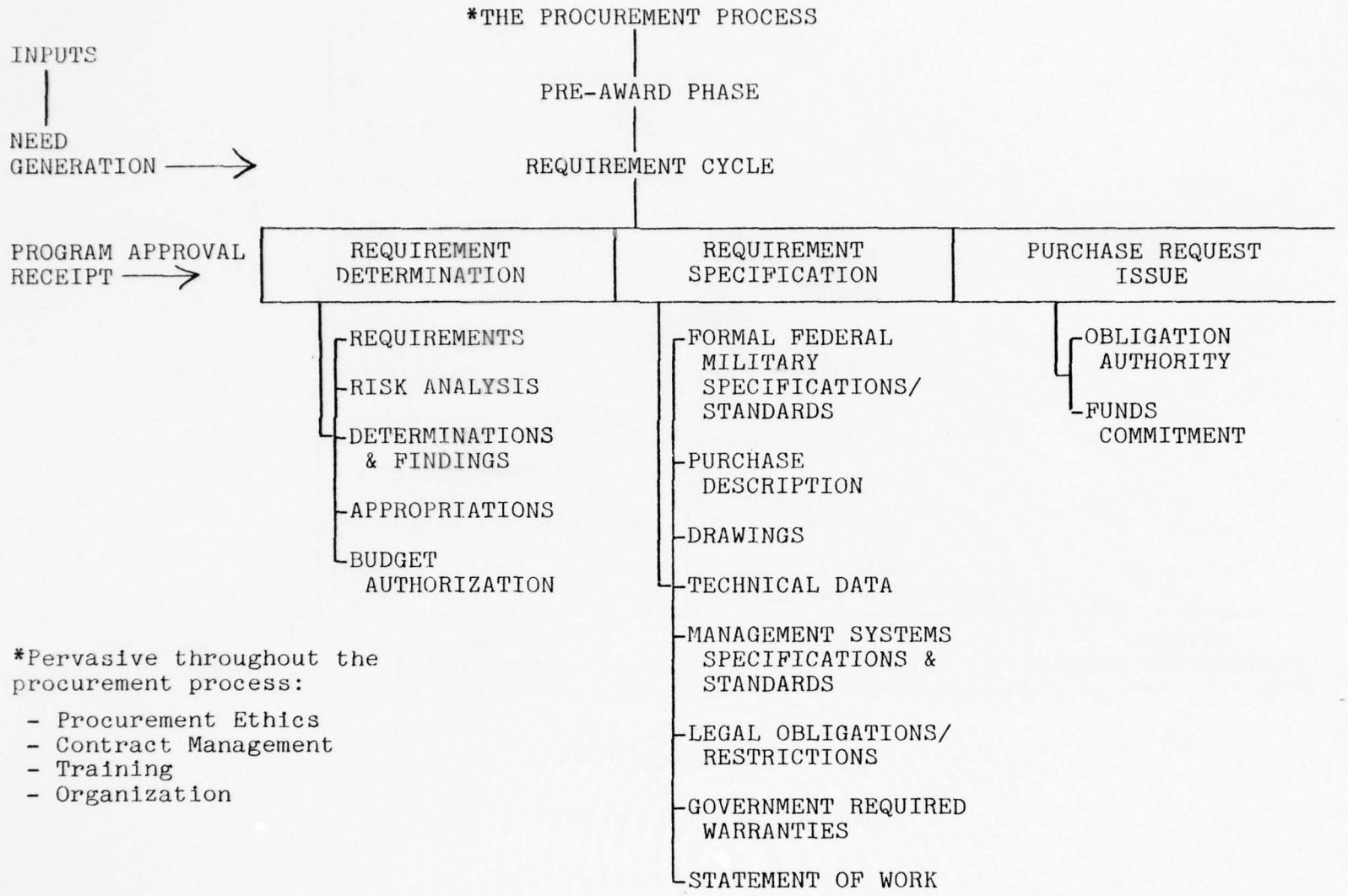
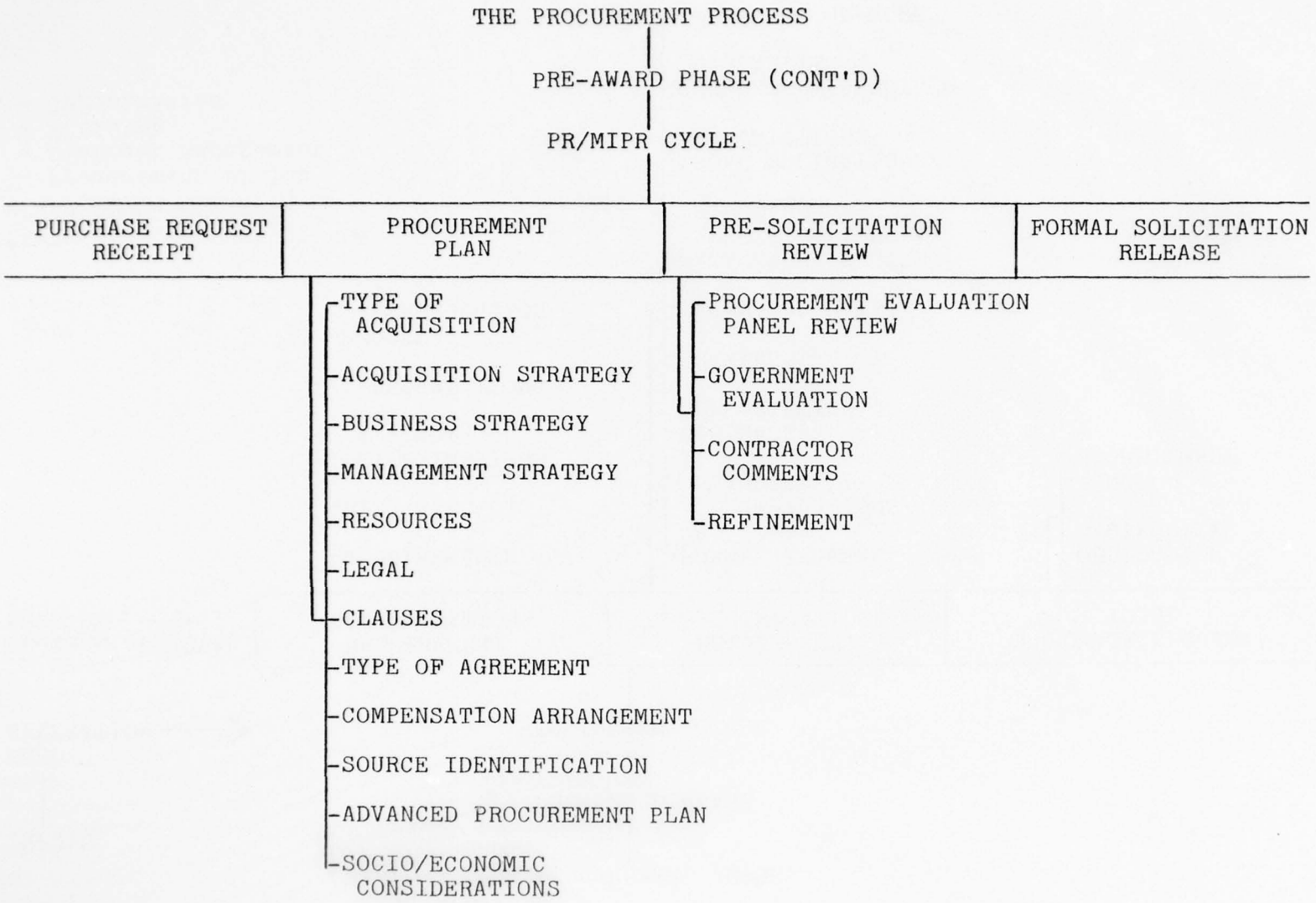
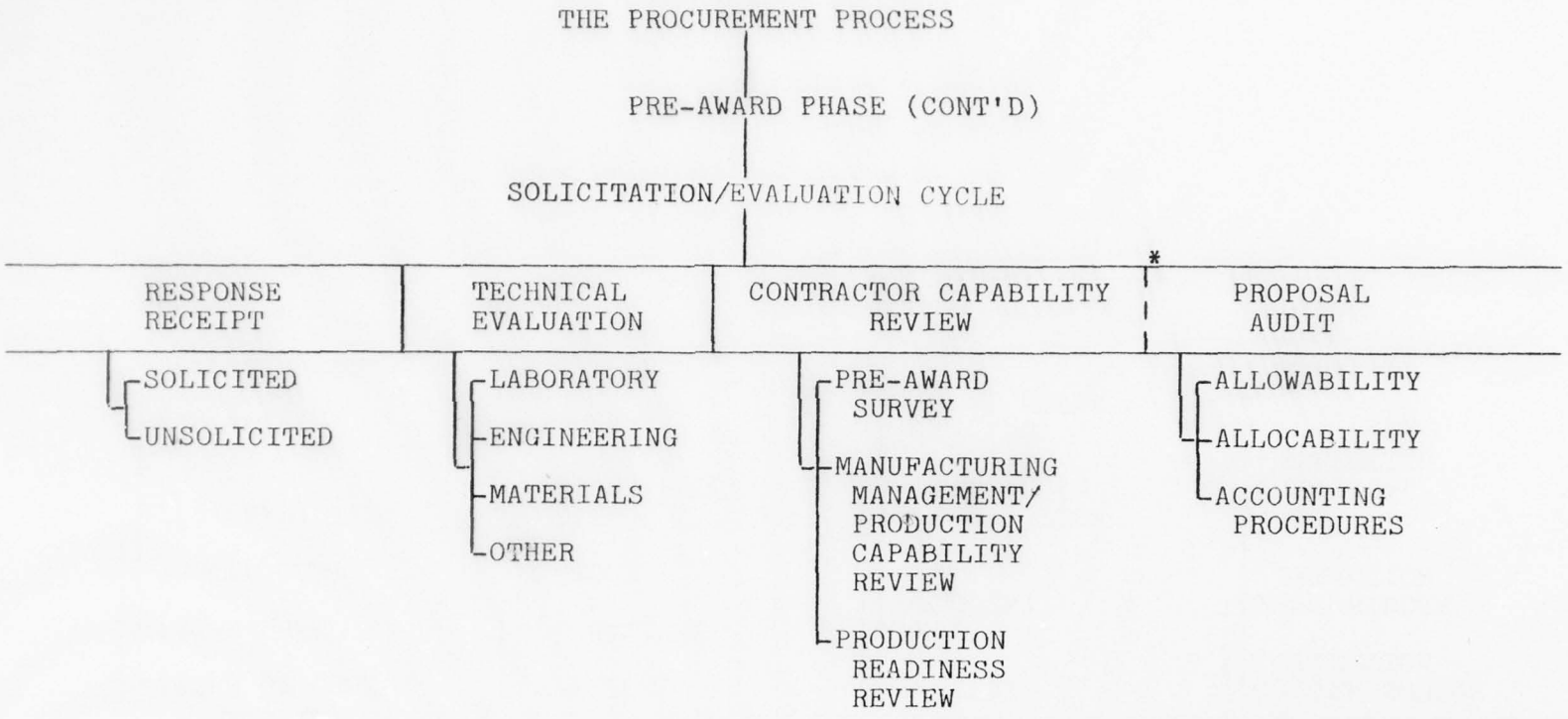
OTHERS
PROCUREMENT PROCESS


*THE PROCUREMENT PROCESS
INPUTS
NEED GENERATION
PRE-AWARD PHASE
REQUIREMENT CYCLE
PROGRAM APPROVAL RECEIPT
REQUIREMENT DETERMINATION
REQUIREMENT SPECIFICATION
PURCHASE REQUEST ISSUE
REQUIREMENTS
RISK ANALYSIS
DETERMINATIONS & FINDINGS
APPROPRIATIONS
BUDGET AUTHORIZATION
FORMAL FEDERAL MILITARY SPECIFICATIONS/ STANDARDS
PURCHASE DESCRIPTION
DRAWINGS
TECHNICAL DATA
MANAGEMENT SYSTEMS SPECIFICATIONS & STANDARDS
LEGAL OBLIGATIONS/ RESTRICTIONS
GOVERNMENT REQUIRED WARRANTIES
STATEMENT OF WORK
OBLIGATION AUTHORITY
FUNDS COMMITMENT
*Pervasive throughout the procurement process:
- Procurement Ethics
- Contract Management
- Training
- Organization


THE PROCUREMENT PROCESS
PRE-AWARD PHASE (CONT'D)
PR/MIPR CYCLE
PURCHASE REQUEST RECEIPT
PROCUREMENT PLAN
PRE-SOLICITATION REVIEW
FORMAL SOLICITATION RELEASE
TYPE OF ACQUISITION
ACQUISITION STRATEGY
BUSINESS STRATEGY
MANAGEMENT STRATEGY
RESOURCES
LEGAL
CLAUSES
TYPE OF AGREEMENT
COMPENSATION ARRANGEMENT
SOURCE IDENTIFICATION
ADVANCED PROCUREMENT PLAN
SOCIO/ECONOMIC CONSIDERATIONS
PROCUREMENT EVALUATION PANEL REVIEW
GOVERNMENT EVALUATION
CONTRACTOR COMMENTS
REFINEMENT



*Broken line denotes possible overlapping events or that another sequence may be possible.

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A PROPOSED DEFINITION AND TAXONOMY FOR PROCUREMENT RESEARCH IN --ETC(U)
SEP 77 G R HEUER, J C KINGSTON, E L WILLIAMS

UNCLASSIFIED AFIT-LSSR-12-77B NL

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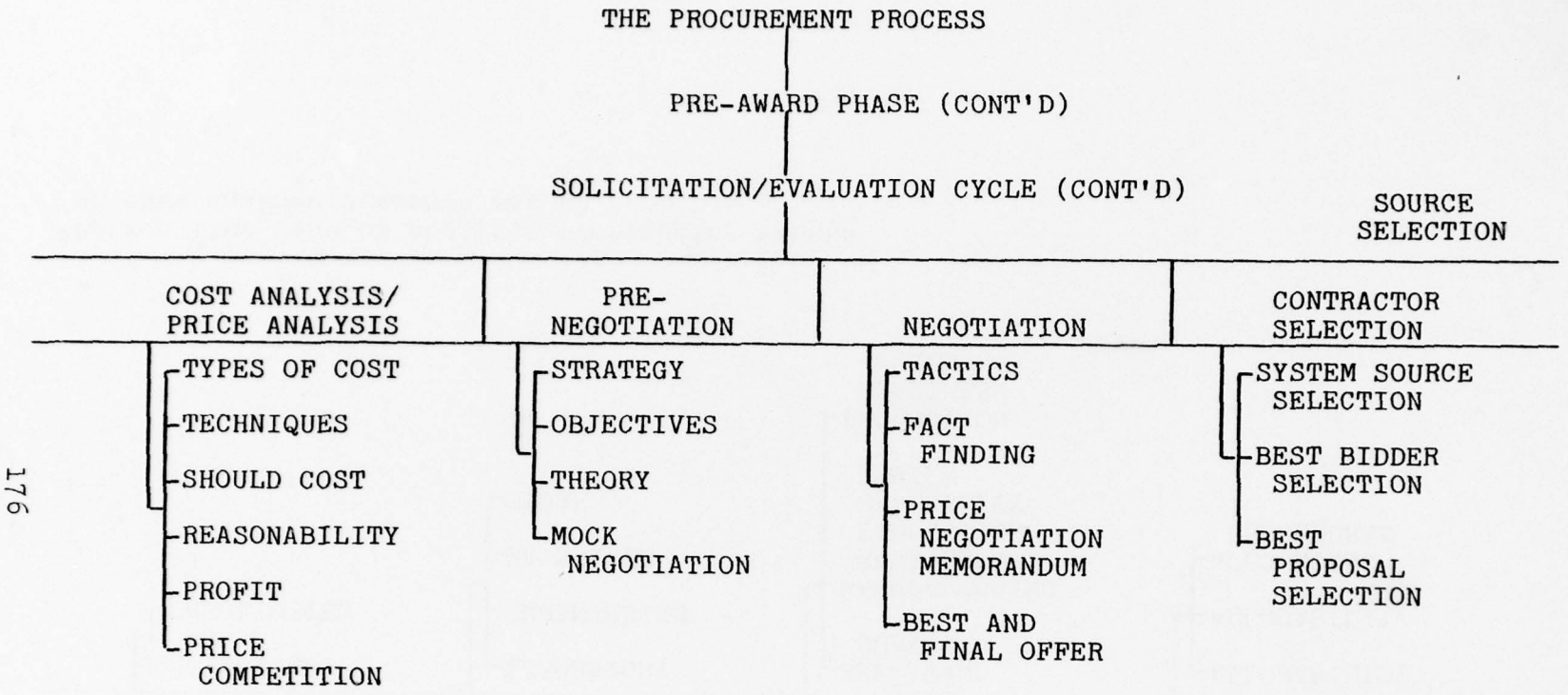
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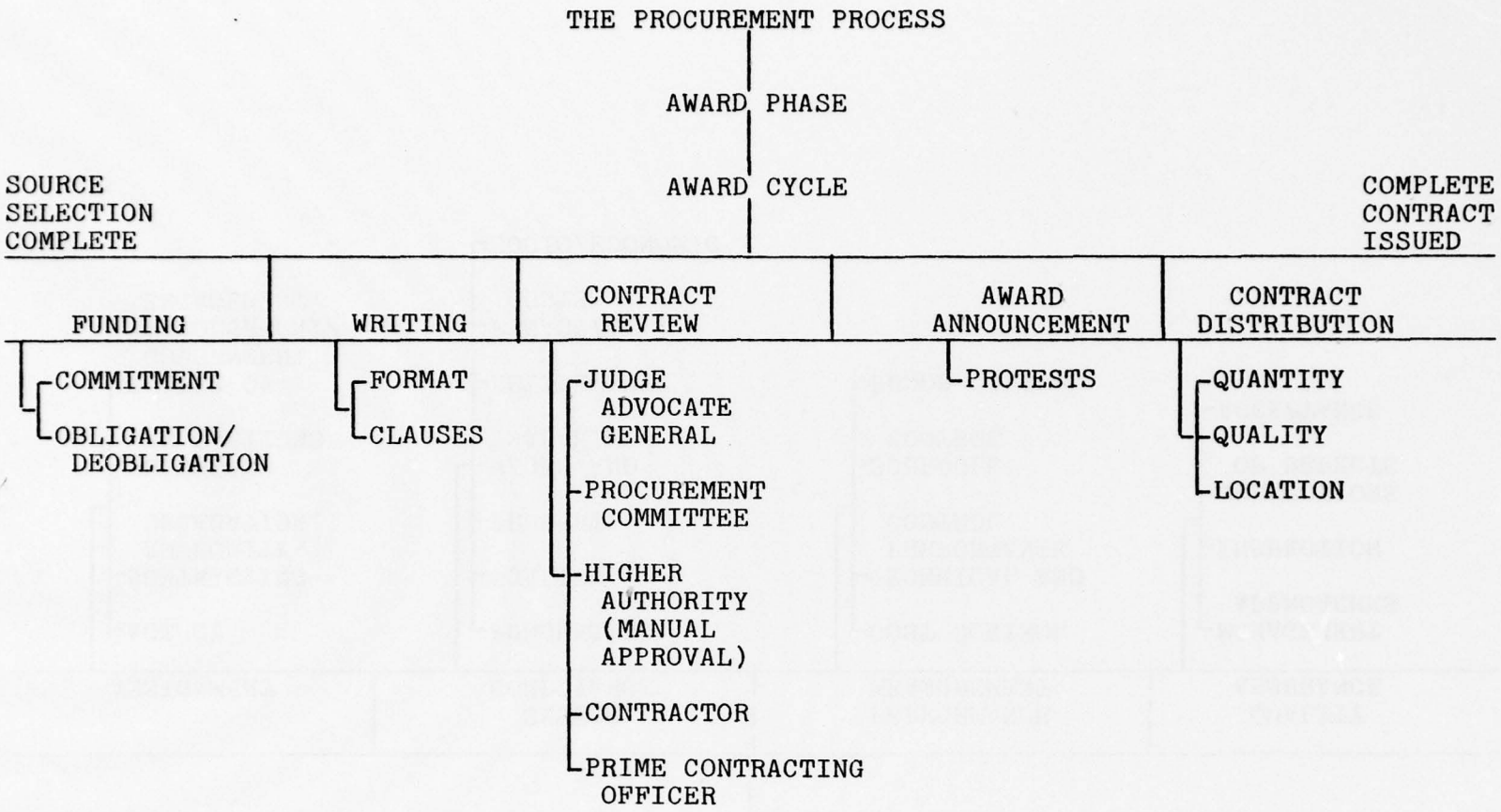
SOLICITATION/EVALUATION CYCLE (CONT'D)
SOURCE SELECTION
COST ANALYSIS/ PRICE ANALYSIS
PRE-NEGOTIATION
NEGOTIATION
CONTRACTOR SELECTION
TYPES OF COST
TECHNIQUES
SHOULD COST
REASONABILITY
PROFIT
PRICE COMPETITION
STRATEGY
OBJECTIVES
THEORY
MOCK NEGOTIATION
TACTICS
FACT FINDING
PRICE NEGOTIATION MEMORANDUM
BEST AND FINAL OFFER
SYSTEM SOURCE SELECTION
BEST BIDDER SELECTION
BEST PROPOSAL SELECTION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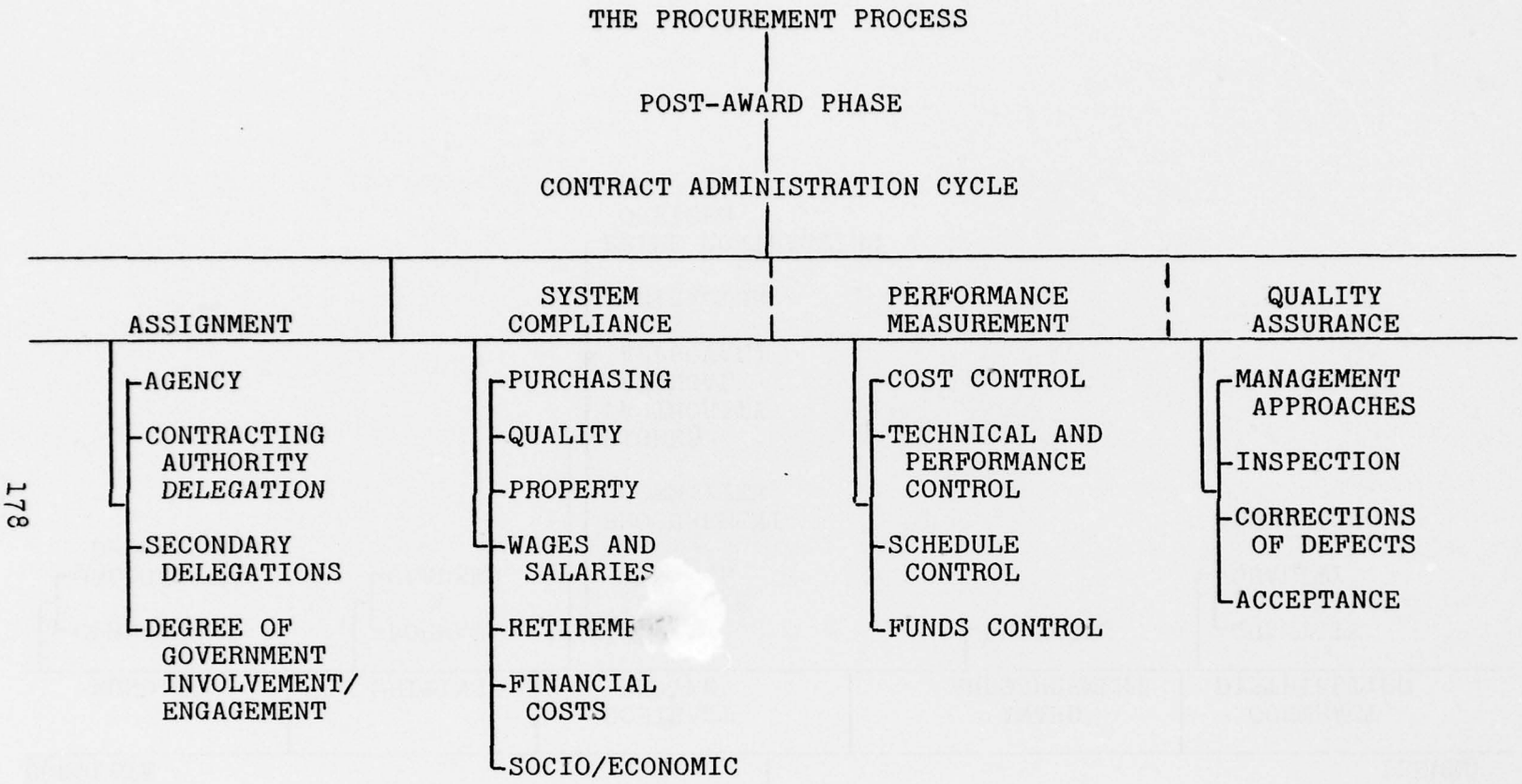
AWARD PHASE
AWARD CYCLE
SOURCE SELECTION COMPLETE
COMPLETE CONTRACT ISSUED
FUNDING
WRITING
CONTRACT REVIEW
AWARD ANNOUNCEMENT
CONTRACT DISTRIBUTION
COMMITMENT
OBLIGATION/ DEOBLIGATION
FORMAT
CLAUSES
JUDGE ADVOCATE GENERAL
PROCUREMENT COMMITTEE
HIGHER AUTHORITY (MANUAL APPROVAL)
CONTRACTOR
PRIME CONTRACTING OFFICER
PROTESTS
QUANTITY
QUALITY
LOCATION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POST-AWARD PHASE
CONTRACT ADMINISTRATION CYCLE
ASSIGNMENT
AGENCY
CONTRACTING AUTHORITY DELEGATION
SECONDARY DELEGATIONS
DEGREE OF GOVERNMENT INVOLVEMENT/ ENGAGEMENT
SYSTEM COMPLIANCE
PURCHASING
QUALITY
PROPERTY
WAGES AND SALARIES
RETIREME
FINANCIAL COSTS
SOCIO/ECONOMIC
PERFORMANCE MEASUREMENT
COST CONTROL
TECHNICAL AND PERFORMANCE CONTROL
SCHEDULE CONTROL
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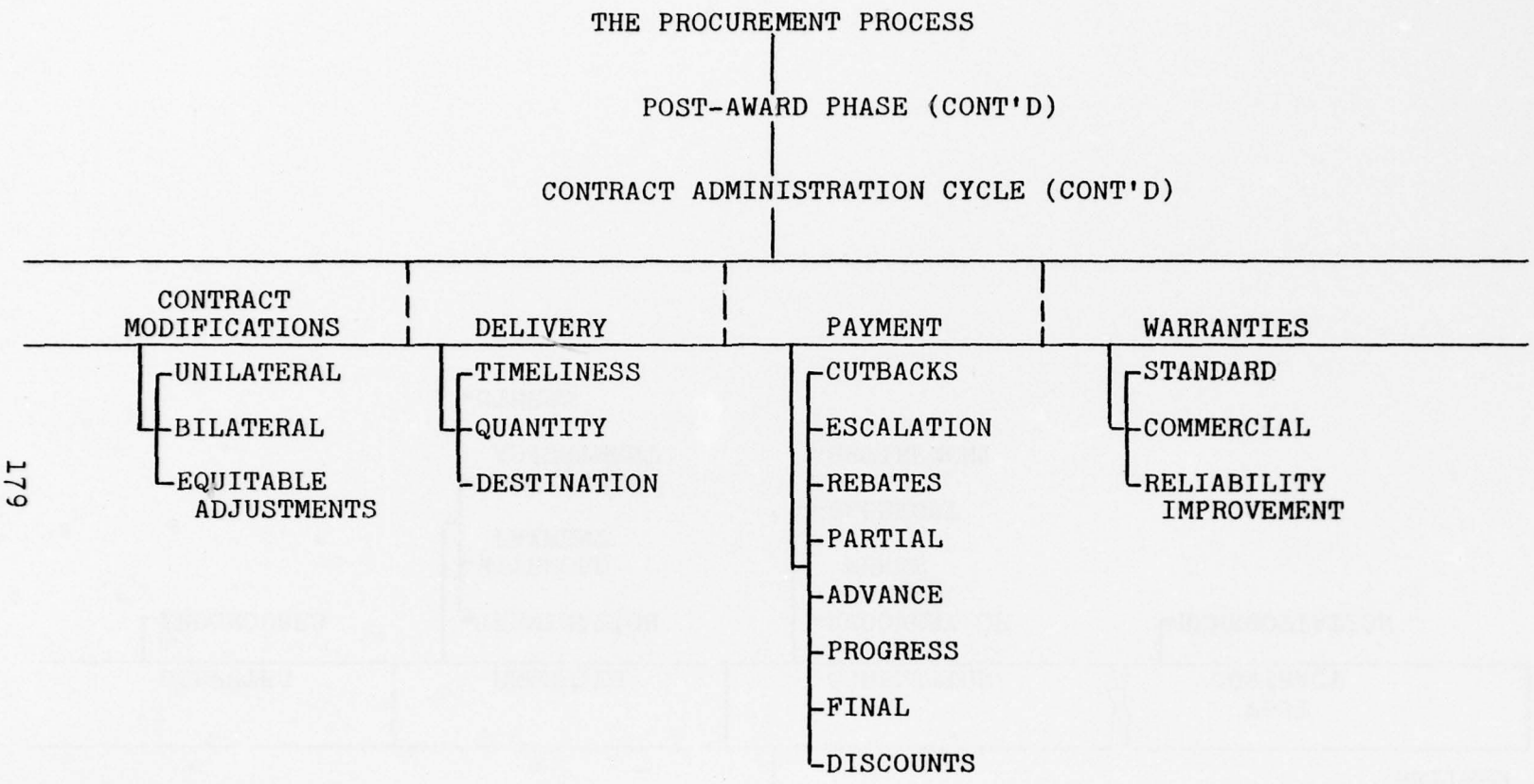
QUALITY ASSURANCE
MANAGEMENT APPROACHES
INSPECTION
CORRECTIONS OF DEFECTS
ACCEPTANCE


THE PROCUREMENT PROCESS
POST-AWARD PHASE (CONT'D)
CONTRACT ADMINISTRATION CYCLE (CONT'D)
CONTRACT MODIFICATIONS
UNILATERAL
BILATERAL
EQUITABLE ADJUSTMENTS
DELIVERY
TIMELINESS
QUANTITY
DESTINATION
PAYMENT
CUTBACKS
ESCALATION
REBATES
PARTIAL
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FINAL
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WARRANTIES
STANDARD
COMMERCIAL
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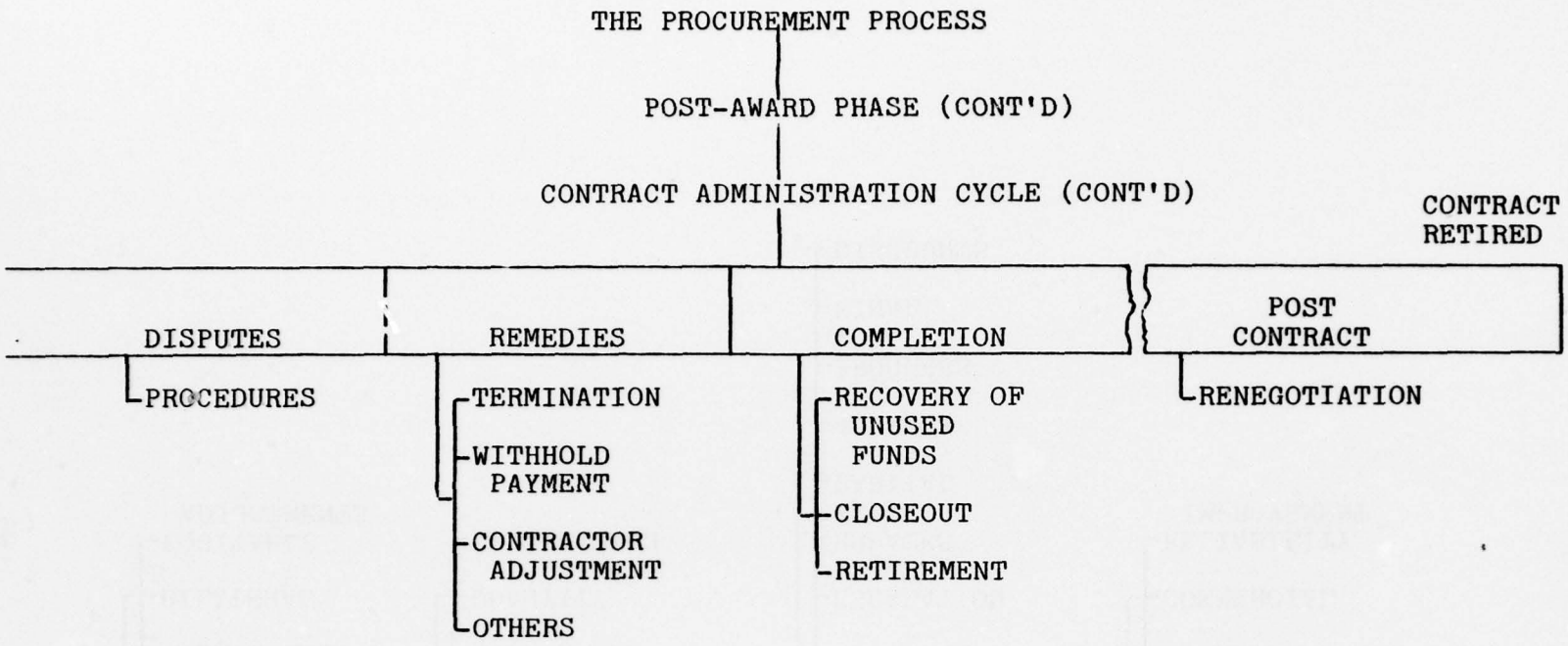
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POST-AWARD PHASE (CONT'D)
CONTRACT ADMINISTRATION CYCLE (CONT'D)
CONTRACT RETIRED
DISPUTES
REMEDIES
COMPLETION
POST CONTRACT
PROCEDURES
TERMINATION
WITHHOLD PAYMENT
CONTRACTOR ADJUSTMENT
OTHERS
RECOVERY OF UNUSED FUNDS
CLOSEOUT
RETIREMENT
RENEGOTIATION

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Captain John C. Kingston is a native of New York State. He received a Bachelor of Arts degree in Biology from Hamilton College, Clinton, New York in 1967. In July 1967, Captain Kingston entered the Air Force through Officer Training School. After commissioning, he attended Undergraduate Navigator Training and Navigator-Bombardier Training at Mather AFB, CA. Assigned to SAC in B-52's, he spent four years at Westover AFB, MA and three years at Griffiss AFB, NY. Upon graduation from AFIT, he will be assigned to the AFPRO at the McDonnell-Douglas plant in St. Louis, MO.

Captain Eddie L. Williams was born in Latham, Alabama, 18 February 1947. He received a Bachelor of Science degree in Agriculture at Tuskegee Institute, Alabama in 1969 and a Master of Science degree in Agricultural Economics from the University of Illinois, Urbana, IL. in 1970. In September 1970, Captain Williams entered the Air Force through the ROTC program. His initial four years in the Air Force were spent as a Missile Launch Control Officer at F.E. Warren AFB, WO. The two years prior to assignment to AFIT were spent as a Logistics Plans and Program Officer at McGuire AFB, NJ. Upon graduation from AFIT, he will be assigned to the International Logistics Training Program, Headquarters AFLC, Wright-Patterson AFB, OH.