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HISTORY AND DEVELOPMENT OF A PHILOSOPHY
OF EVALUATING PURCHASING PERFORMANCE
WITH AN ANALYSIS OF THE RELATIONSHIP
BETWEEN PURCHASING DEPARTMENT OPERAT-
ING COST AND END PRODUCT MATERIAL COST.

The Ohio State University, Ph.D., 1964
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HISTORY AND DEVELOPMENT OF A PHILOSOPHY OF EVALUATING
PURCHASING PERFORMANCE WITH AN ANALYSIS OF THE
RELATIONSHIP BETWEEN PURCHASING DEPARTMENT
OPERATING COST AND END PRODUCT
MATERIAL COST

DISSERTATION

Presented in Partial Fulfillment of the Requirements for
the Degree Doctor of Philosophy in the Graduate
School of The Ohio State University

By

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* * * * *

The Ohio State University
1964

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This dissertation is the culmination of some 26 months of effort. It has been extremely interesting research and the author hopes that it will contribute to the purchasing profession some insight regarding the area of evaluating purchasing performance.

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CHAPTER I

SCOPE AND IMPORTANCE OF THE PROBLEM

Statement of the Problem

Little attention was given to the purchasing function by industry prior to World War I. Essentially, purchasing was considered a passive function, one that was routine and easily accomplished. It was predominantly decentralized and the responsibility of the manufacturing departments; the purchasing department, if it existed, merely placed orders. Essentially it was a clerical type function.

The lean years of the 1930's made industry more cost conscious. Increasing competition forced industry to analyze its operation in an effort to reduce its product cost. During this period, industry began to recognize the importance of the purchasing function and its potential contribution to company profit. Organizations began to centralize purchasing and to give it more responsibilities and influence in overall management decisions. Purchasing began to be recognized as a profession.

Prior to and throughout the period in which purchasing began to rise in status and to become a centralized operating

department, the question of how to evaluate the performance of a purchasing department plagued industry.

In 1930, The National Association of Purchasing Agents in conjunction with the National Association of Cost Accountants initiated a contest regarding means of measuring the efficiency of a Purchasing Department. Clark, in an address before a joint meeting of the Purchasing Agents Association of New York on October 20, 1931, discussed the findings of the contest. He commented that although the contest failed to produce "a single standard of purchasing efficiency for comparative purposes," it did disclose certain points of merit including the fact that all prize-winning papers agreed that purchasing efficiency is measureable only in terms of "cost."¹

The search for yardsticks of Purchasing Performance continued. In 1947, the National Association of Purchasing Agents Committee on methods for evaluating the purchasing function essentially ruled out the possibility of establishing an absolute yardstick for measuring the efficiency of all purchasing operations. In discussion of its findings it

¹Donald G. Clark, "Measuring Purchasing Efficiency," An address before a joint meeting of the Purchasing Agents Association of New York and the New York Chapter of the Cost Accountants Association, October 20, 1931, p. 2.

commented that certain contributions of purchasing are intangibles which do not lend themselves to measurement:²

Included among these intangibles are such items as (a) The personal characteristics of the purchasing agent; (b) The value of goodwill secured for the company through fair buyer-seller relationships; and (c) The return on expenditures for purchasing research and information.

It costs money to earn, or save, money; so funds are spent in obtaining information on new materials, markets, new processes, sources of supply, new equipment and the like. The direct value of this information cannot be measured on any absolute scale. Rather, it will be found in lower material and production costs.

Again, the findings of the study indicated the important role of operating cost--"it costs money to earn or save money." Also, it implied that the true indicator of purchasing performance is lower material and production costs. The implication of the above comments is that performance of a purchasing department is related to its operating cost and is indicated by end product material costs.

Basically, there are three concepts regarding the relationship of operating costs to purchasing performance implied by the 1930 and 1947 National Association of Purchasing Agents studies:

1. The relationship tends to be direct--at least to some operating cost point, that is, higher cost means better performance.

²"Measuring Purchasing Costs," Bulletin of the National Association of Purchasing Agents (October, 1947), p. 2.

2. Though the intangible contributions of purchasing cannot be measured absolutely, they are reflected in higher operating costs and in lower material costs.
3. The basic indicator of purchasing department performance is lower material and production costs.

The question of how to measure purchasing performance continues to plague purchasing people as indicated by the following comment by Pearson, Chairman of the National Association of Purchasing Agent's Committee on Evaluating Purchasing Performance made in a lecture at the Air Force School of Logistics, WPAFB, Dayton, Ohio, August 10, 1959:³

Its need (research on methods of evaluation) was more than highlighted when at the annual convention in Chicago (1958) almost every speaker on the program directly or indirectly pointed up the need to evaluate our work. Everybody tells of the need to evaluate but there is little useful information on the subject.

A similar comment appears in a publication by Pleydell, Vice President of Management Services Associations, Inc., New York City:⁴

Measuring the efficiency of an operation is not a new idea. Shops have been doing it for years. More recently, many large offices have developed yardsticks for judging various repetitive clerical efforts. Anyone wishing to install a system for measuring either factory or office productivity will find voluminous literature to draw upon.

³Art Pearson, "Evaluating Purchasing Performance," Air Force School of Logistics, Dayton (August, 1959), p. 2.

⁴Albert Pleydell, "Measuring the Efficiency of a Public Buying Office" (New York: Management Service Associates, 1959), p. 2.

But the situation is quite different if you want to evaluate the work of a purchasing department. In contrast to the plentiful supply of information concerning the measurement of factory and routine white collar operations, there is very little material available about purchasing. Yet there is a growing demand by management for measuring the efficiency of the spending functions.

These and similar comments which are common in purchasing literature indicate that the need exists for a penetrating study of methods of evaluating purchasing performance, particularly regarding the nature and maturity of a philosophy of evaluating purchasing performance. A philosophy, as conceived by Davis is

. . . a system of thought based on some logical relationship between concepts and principles that explains certain phenomena and supplies a basis for solution of related problems. A business philosophy is a system of thought that explains basic business problems and supplies the basis for an intelligent approach to their solution.⁵

This study is concerned with determining to what extent there has developed a philosophy of evaluating purchasing performance, as well as the extent to which said philosophy correlates with contemporary management control theory. In the course of the research for this dissertation no evidence was found of any attempt to trace the evolving concepts of evaluating purchasing performance as reflected in historical literature, nor was any study found which satisfied the requirement for a contemporary philosophy. Accordingly, the author has directed his efforts towards the

⁵Ralph Currier Davis, The Fundamentals of Top Management (New York: Harper & Brothers, Publishers, 1951), pp. 6-7.

accomplishment of these goals, namely the tracing of the evolution of concepts regarding evaluating purchasing performance and the documentation and analysis of the contemporary philosophy. Throughout the development of the evaluation philosophy, a common thread of emphasis emerged: that end product costs attributed to purchasing operations are the ultimate measure of purchasing performance. This concept is analyzed intensively in the study as well as the factors which have the greatest effect on end product material costs.

Purpose of the Study

Specifically this study was directed to determine:

1. Who were the contributors to the development of a philosophy of evaluating purchasing performance and what were their concepts?
2. What conclusions regarding the stage of development of purchasing evaluation philosophy can be drawn from a comparison of it to management control theory?
3. Does the comparison of the prevailing philosophy with current management control theory suggest any modification of the historically evolved philosophy?
4. Does current industrial practice indicate a knowledge and use of the evolved philosophy? Does practice lag or lead theory?
5. Can the long mentioned concept in purchasing literature regarding an inverse relationship between purchasing department operating costs and end product material costs be quantitatively substantiated?
6. What factor or factors of purchasing department costs have the greatest effect on end product material costs?

Importance of the Study

The importance of determining meaningful methods of evaluating the performance of the purchasing department becomes self-evident when one recognizes that in most manufacturing companies the cost of materials and component parts constitutes at least 50 per cent of the cost of goods sold. A survey conducted in 1952 by the National City Bank of New York of the 100 largest corporations in the United States revealed that 77 of these corporations were manufacturing companies. It was found that an average of 56 cents of every sales dollar of these companies was spent for goods and services.⁶ If sales are one billion dollars, a company pays about 600 million dollars for purchased materials. A reduction in material cost of 5 per cent would mean a savings of 30 million dollars. In extreme cases the money made (or lost) on inventory can outweigh that made or lost in regular operations. In 1957, for example, brass fell to \$.39/lb. from its 1956 peak of \$.48/lb., a reduction of 37 1/2 per cent. Poor buying and inventory management during this time period could have resulted in substantial losses.⁷ The magnitude of expenditures made by purchasing is only one indicator of the importance of controlling purchasing per-

⁶S. H. Westing and I. V. Fine, Industrial Purchasing (New York: John Wiley and Sons, 1955), p. 4.

⁷Franklin G. Moore, Manufacturing Management (Homewood, Ill.: Richard D. Irwin, Inc., 1961), pp. 700-701.

formance. When the effect of such occurrences as material outages and processing expenses incurred on materials of improper quality are considered, it is evident that proper performance of the procurement function is fundamental to competitive operations.

Another indication of the importance of the problem is the interest shown by the trade association of the purchasing field, the National Association of Purchasing Agents. The National Association of Purchasing Agents has a committee studying the problem and has granted funds for a doctoral study of the area.

Review of Previous Studies

As discussed previously the writer found no comprehensive studies regarding the development and/or documentation of a philosophy of evaluating purchasing performance. Indeed the only study found in the area of evaluating purchasing performance is the National Association of Purchasing Agents special committee report published in October, 1947. This was briefly discussed in the introduction and is synopsized in detail in the part of this study covering the historical evolution of a philosophy of evaluating purchasing performance.

A review of purchasing literature, both texts and periodicals, disclosed numerous articles on evaluating purchasing performance. These also are treated in detail in the portion of this study devoted to tracing the evaluation

of concepts in the development of a philosophy of evaluating purchasing performance.

Limitations

This study is directed toward tracing and documenting the development of a philosophy of evaluating purchasing performance as well as the determination and documentation of the contemporary philosophy as indicated by industrial practice. Of necessity, the study required the establishment of certain limits:

1. The study is concerned only with industrial purchasing of a non-governmental nature.
2. The statistical aspect of the study is naturally limited to the industries selected, admittedly rather arbitrarily.

Methodology

The following steps were executed by the writer in the development and performance of this research project:

1. Discussions were held with purchasing executives to determine what they considered the more important problem areas in the purchasing field. These discussions indicated that one of the major problem areas, in their opinion, was how to evaluate purchasing performance.
2. A brief survey of purchasing literature was made to determine if this was indeed a major problem. The survey clearly indicated that the area did apparently constitute a problem.
3. Dissertation Abstracts, Published by University Microfilms, Inc. were reviewed to determine previous research performed in the area of industrial purchasing. The review disclosed only one dissertation, that by H. J. Feron, "Purchasing Research in American Business," Michigan, 1961. (The Abstracts list

Doctoral dissertations of most major universities in the United States.)

4. The following indexes were reviewed to determine the nature and extent of research regarding the evaluation of purchasing performance:

- a. Industrial Arts Index--1913 - present
- b. Readers Guide to Periodical Literature 1900-1964
- c. 19th Century Reader's Guide to Periodical Literature, 1890-1899
- d. Poole's Index to Periodical Literature 1887 -
- e. Wall Street Journal Index--all indexes, 1892 -
- f. Publications of National Association of Purchasing Agents.

5. The writer concluded at this point that there did indeed exist a need for a penetrating study of the development and adequacy of purchasing evaluation philosophy.

6. The development of the present philosophy of evaluating purchasing performance was traced and documented from periodicals and texts in the purchasing field.

7. Contemporary practice was determined in two ways, namely:

- a. Discussion with and personal letter from members of the American Management Association's Purchasing Planning Council, and other purchasing executives.
- b. Data result from a questionnaire sent to 450 companies representing seven different industries.

8. Contemporary management control theory was determined by a review of numerous management texts and periodicals.

9. Data regarding the relationship between a purchasing department's operating costs and end product material cost was collected by the above referenced questionnaire, and analyzed for correlation on an International Business Machine 7090 computer.

10. The historically evolved philosophy of evaluating purchasing performance was compared with contemporary management control theory.

11. The summarization and review of the qualitative and quantitative findings of the study permitted the drawing of various conclusions relating to the specific goals of this study.

The Questionnaire

A comprehensive questionnaire covering various aspects of the nature of the company's purchasing department was sent to 450 companies representing seven different industry classifications as indicated by the Thomas Register. The industries were selected arbitrarily but with the following criteria as a basis: the industry should have

1. a relatively small number of companies so the entire population could be covered.
2. relative product similarity within industries so that the companies would be as comparable as possible in relation to material requirements and production methods.

The questionnaire was developed and field tested prior to final mailing. Field testing consisted of

- a. discussion of questionnaire purpose and design with purchasing agents to insure proper terminology.
- b. discussion of questionnaire purpose and design with a statistician regarding data requirements for the linear and multiple correlation analysis.
- c. mailing of test questionnaire to 40 companies and analysis of their response.
- d. redesign and final mailing to selected companies.

The final form for the questionnaire is shown in Appendix A.

CHAPTER II

CONTEMPORARY MANAGEMENT CONTROL THEORY

Introduction

This chapter provides a short synopsis of management theory regarding the basic nature of management and the role of evaluation in the management process. Its main purpose is to provide a logical framework which will permit the objective comparison of writings and practices regarding evaluation of the purchasing function with general management control theory. It is not intended to be an exhaustive treatment of management control theory, merely a concise treatise indicating the present state of the art. The subject matter covered includes discussions of

- 1) Definitions of management by noted management authorities,
- 2) The organic functions of management,
- 3) The control function,
- 4) The sub-functions of control including evaluation,
- 5) Performance standards, their nature, development and use,
- 6) State of the art of standards development.

Definitions of Management

Definitions of management abound in business organization literature. There are as many definitions of management as there are writers in the field. The following definitions are representative:

Ralph C. Davis

Management is the function of executive leadership. It is the work of planning, organizing and controlling the activities of the organization in the accomplishment of its objectives.¹

Ordway Tead

Management is the direction of people in association to achieve some goal temporarily shared. It is the inclusive process of integrating human efforts so that a desired result is obtained.²

Encyclopedia of the Social Sciences

Management may be defined as the process by which the execution of a given purpose is put into operation and supervised.³

L. A. Appley

Management has been defined in very simple terms as getting things done through the efforts of other people, and that function breaks down into at least two major responsibilities, one of which is planning, the other control.⁴

¹Davis, op. cit., p. 20.

²Ordway Tead, Administration: Its Purpose and Performance (New York: Harper and Brothers, 1959), p. 2.

³Encyclopedia of the Social Sciences (New York: Macmillan Co., 1933), Vol. X, pp. 76-77.

⁴L. A. Appley, "Management and Simple Way," Personnel (January, 1943), p. 34.

Petersen and Plowman

Management may be defined as a technique by means of which the purposes and objectives of a particular human group are determined, clarified and effectuated.⁵

George R. Terry

Management is a distinct process consisting of planning, organizing, actuating and controlling, utilizing in each both science and art, and followed in order to accomplish predetermined objectives.⁶

Terry provides the following diagrammatic form illustrating his definition.⁷

Entity	MANAGEMENT
Identity	is a Distinct Process Consisting of
Fundamental Functions	Planning Organizing Actuating Controlling
	Applied To
Direction	Efforts of the Members of the Group to Utilize Efficiently
Available Resources	The Group's Material Machines Methods Money Human Effort
Purpose	In order to Achieve the Predetermined Objective

Fig. 1.--Diagrammatic definition of management as conceived by George Terry and reflected in Principles of Management (Homewood, Ill.,: Richard D. Irwin, Inc., 1960), p. 33.

⁵E. Petersen and E. G. Plowman, Business Organization and Management (Homewood, Ill.: Richard D. Irwin, Inc., 1958), p. 35.

⁶George R. Terry, Principles of Management (Homewood, Ill.: Richard D. Irwin, Inc., 1958), p.32.

⁷Ibid., p. 33.

Organic Functions of Management

Terry points out that management "is a distinct process consisting of planning, organizing, actuating and controlling." Other authors use different classifications in discussing and/or dissecting management into its basic functions. Davis, e.g., as seen from his definition of management lists planning, organizing, and controlling. A brief synopsis of the classification of other noted management authors is shown in Figure 2 below:

	Classification of Organic Management Functions
Henry Fayol ⁸	Plan, organize, command, coordinate, control
R. C. Davis ⁹	Plan, organize, control
USAF Air University ¹⁰	Plan, organize, direct, coordinate, control
George Terry ¹¹	Plan, organize, actuate, control
Brecht Balderston ¹²	Plan, organize, control
Norman J. Ream ¹³	Plan, organize, assemble, direct, control

Fig. 2.--Organic management functions.

⁸H. Fayol, Industrial and General Administration (Pittman Publishing Corp., 1949), pp. 8-9.

⁹Davis, op. cit., pp. 154-155.

¹⁰United States Air Force, Curriculum, Senior Officers Military Management Course (Air University: 1950), p. 4.

¹¹Terry, op. cit., p. 32.

¹²Balderson, Brecht, Karabasy, and Riddle, Management of an Enterprise (Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1949), p. 6.

¹³Norman Ream, "Management Control Systems," Proceedings of Symposium held at Systems Development Corp., Santa Monica, California, July 29-31, 1959, p. 85.

Davis comments that organic management functions "are management functions that must be performed somewhere, somehow, by someone, at some time, in or for the organization."¹⁴ Davis defines his organic functions as follows:¹⁵

Creative Planning has to do with the original determination and specification of the factors, forces, effects, and relationships in the accomplishment of designated objectives.

The function of organizing has to do with creating in advance of execution the basic conditions that are a prerequisite for the successful achievement of objectives.

Control "involves the work of constraining and regulating business activities in accordance with the requirements of a plan. Comparisons between actual and predetermined progress must be made in terms of standards of performance that were set up in the plan.

It is to be noticed that Davis specifies that standards of performance are a prerequisite of control and must of necessity be provided for in the organic phase of creative planning. Rathe explains this relationship between planning and control as follows:¹⁶

There is an interesting parallel between . . . planning and review:

(1) Planning looks ahead, determines what should be done; review looks back, establishing what is actually happening.

¹⁴Davis, op. cit., p. 154.

¹⁵Ibid., p. 155.

¹⁶Alex W. Rathe, "Management Controls in Business," from proceedings symposium held at Systems Development Corp., Santa Monica, California, July 29-31, 1959, pp. 37-39.

(2) Planning thinks about operations in advance; review thinks out the lessons represented in the realization of these plans.

(3) Planning might be considered the organization's windshield, review as its rear view mirror . . . at best review can point out failures after they have happened; planning can prevent some of them from happening in the first place. . . . Planning is the prerequisite of control.

The interplay between planning and review . . . can perhaps be summed up by stating that the better the planning, the easier the control. Put another way, it is clear that we cannot control matters sensibly unless we have first planned properly.

Another interesting statement regarding the relationship of planning and control is that attributed to Appley, namely: "Planning without control is merely wishful thinking."¹⁷ Still another is that of Cornell: "Planning is of little value unless there is subsequent control to make certain that plans are carried out."¹⁸

Control and Its Subfunctions

Like management, control can be subdivided into basic or organic elements. Also like management, various authors have considered the control function in different ways. Perhaps the most comprehensive control philosophy is that of

¹⁷ Art Pearson, "Evaluation, a Purchasing Management Control," A presentation at the Air Force School of Logistics, WPAFB, Ohio, August 10, 1959, p. 4.

¹⁸ W. B. Cornell, Organization and Management in Industry and Business (New York: Ronald Press, 1947), p. 59.

Davis who details eight subfunctions of control:

Routine Planning--Routine provision of information concerning the particular plan that is to be executed.

Scheduling--Determines when or at what rate the principal phases of the plan must be completed to meet the final time objective of the project.

Preparation--Assures that the factors and conditions required for the execution of the plan will be available as needed.

Dispatching--The function of assuring proper coordination through controlling the release of authority to act.

Direction--Function of instruction concerning the requirements for proper execution of the plan.

Supervision--Function of assuring that execution is taking place in accordance with plans and instructions.

Comparison--Function of determining the degree of agreement between actual and planned results on the work that has been completed at a given time.

Corrective Action--The function of promptly removing any interferences with planned execution, and of restoring effective coordinated action.¹⁹

The relation of these subfunctions of control to organizational level is shown in Figure 3 on the following page.

The control functions of routine planning, scheduling, preparation and dispatching tend to be performed in advance of execution. Davis, therefore, refers to them as the preliminary functions of control.²⁰ The remaining functions

¹⁹Davis, op. cit., p. 647.

²⁰Ibid., p. 649.

tend to be performed concurrently with execution, hence they are referred to as the concurrent phases of control.

Comparison Function

Davis defines comparison "as the function of determining the degree of agreement between actual and predetermined performance for completed projects or programs, or phases thereof. The primary mission of comparison is to determine where significant deviations from planned performance are taking place and report them promptly to the responsible line authority."²¹ Regarding the prerequisites for performance of the function Davis goes on to say:

Dutton has pointed out that comparison is always in terms of past experience. This experience may be gained on the job by the process of trial and error. It may be gained by scientific research under controlled conditions. It may be gained by a combination of both. The results of experience must be classified and codified in any case. One purpose is the development of standards of various kinds. The significant type of criteria in performing the comparison function is the performance standard. Such standards were defined previously as criteria of the results that should be obtained by the performance of designated functions as directed. There can be no satisfactory performance of the comparison function without them. There can be no satisfactory control of an action without adequate performance of comparison. Satisfactory accomplishment of a joint objective is most unlikely without adequate control.²²

Failure to control a planned action can and probably will result in deviations from planned accomplishment. It

²¹Ibid., p. 719.

²²Ibid., p. 720.

is not possible to foresee all interferences that may develop. These interferences cause the action to deviate from its planned course.

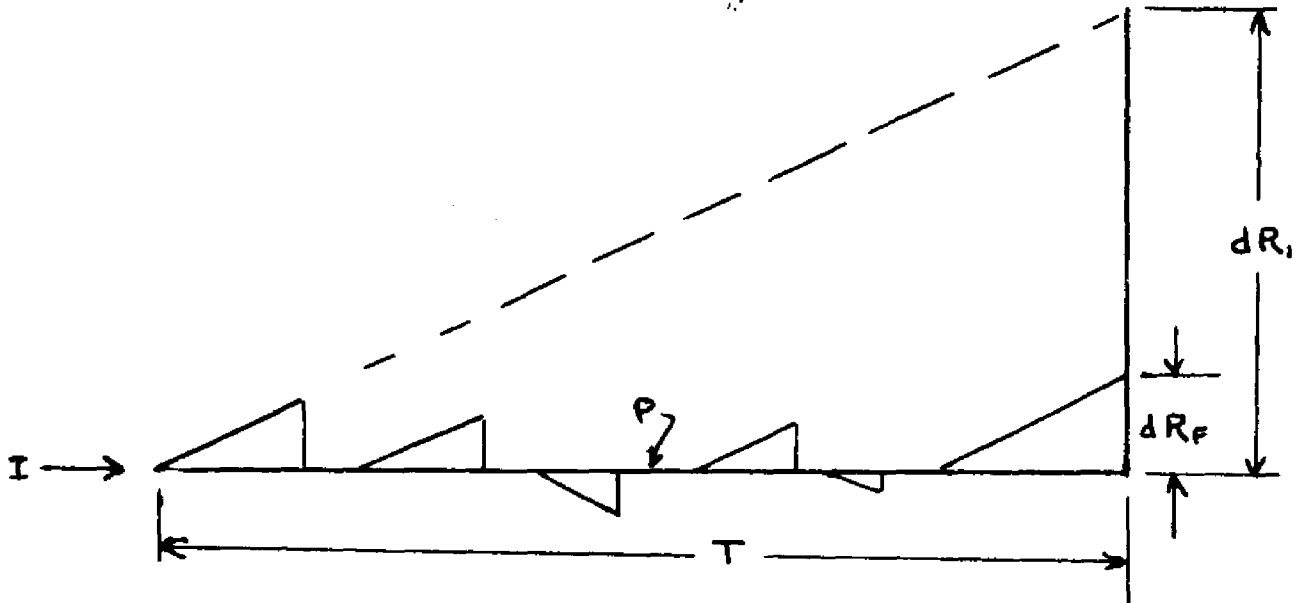
It will continue to deviate obviously unless steps are taken by someone to eliminate the interference and return the action to its planned course. The magnitude of the deviation will continue to increase unless this is done. The magnitude may be so great at completion of action that the mission is a failure. [This is shown in Figure 4 by magnitude dR_1 .] It is necessary then that the comparison function be performed somehow by someone.²³

The nature and importance of the comparison function is further clarified by Urwick in his principle of comparison. He comments:

All figures and reports used for purpose of control should be in terms of standards of performance required, and where necessary, of past performance. . . . Figures set against a pre-planned performance which the management intended to reach at least show whether its intentions are being realized or not and suggest inquiry into the why and the wherefore of discrepancies. . . . There is much nonsense talked about the difficulty of setting standards. It is not difficult. It is always possible to set up some kind of mark to aim at. At first, it may be rather an arbitrary mark. . . . The important point is that the administrator should have a mark and force himself to examine and to explain all the reasons for deviation from that mark. Whether the mark itself is in fact an accurate estimate of what the actual accomplishment should be is a secondary consideration, provided it is not too modest an estimate. Examination of the reasons for deviation will quickly suggest necessary modifications.²⁴

²³Ibid., p. 719.

²⁴L. Urwick, The Elements of Administration (London: Harper & Brothers, 1943), p. 108.



Legend:

dR_1 - Final magnitude of the first deviation, if the action is uncontrolled

dR_f - Magnitude of final deviation if action is controlled

I - Initiation of action

P - Line of planned action

T - Schedule time for the action

Fig. 4.--Deviation tendencies in planned performance, by R. C. Davis from his The Fundamentals of Top Management (New York: Harper & Brothers, 1951), p. 720.

Steps in Control Phase

As mentioned, various authorities and/or writers handle the subject of control differently (Figure 5 indicates the development of management control theory). A brief review of the concept of Davis has been discussed. For comparison as well as to provide further insight into the nature of Management Control, a brief synopsis of the philosophy of control of the West Penn Power Company is presented below:²⁵

The West Penn Power Company Handbook lists the steps in the Control Phase as:

1. Specifically determining what it is we want to control.
2. Selection of a Control Unit.
3. Establishment of yardsticks or criteria against which we measure the Control Units.
4. Establishment of reporting systems both to and from the monitoring point.
5. The actual comparison of Control Units with yardsticks.

The handbook comments as follows regarding each of these steps:

1. Specifically determining what it is we want to control. Recognize this--the more specific our control objective, the more specific our information and action can be. Our goal, then, is to establish specific control points to monitor specific data. Our reason is that broad controls supply broad (vague) information. In this step

²⁵William R. Davidson and James Healey and Associates, Power Management, The Management Handbook of the West Penn Power Company (Penn.: 1957), pp. 191-198.

Management Functions ^a	F. W. Taylor 1903	Henri Fayol 1906	Harrington Emerson 1912	A. Hamilton Church 1914	John A. Ottobeen 1917	Wobster Robinson 1925	Oliver Sheldon 1930	H. P. Dutton 1931	E. C. Davis 1934, 1940	Heiden, Fish, Smith 1941
Creative Planning		Plan		Design		Direction & Forecasting Results	Design	Information and Decision	Creative Planning	Objective Procedure & Criteria
Organizing		Organize		Equipment			Equipment		Organizing	Organization
Controlling		Command Coordinate Control								
Definition of Control: The function of coordinating and regulating action in accordance with the requirements plans for the accomplishment of project and or group objectives.	Recognized importance of control but did not make detailed analysis of it.	Recognized importance of control but did not make detailed analysis of it.	Written Standard Practice Instruction	Control	Planning		Planning		Routine Planning	
			Standards and Schedules		Scheduling	Forecasting Results		Scheduling		
					Preparation			Preparation		
			Dispatching	Control	Production		Dispatch	Dispatching		
						Direction		Direction		
						Supervision		Supervision		
			Records	Comparison	Inspection	Recording Results	Comparison	Progress Record Report Follow-up	Comparisons	Results Appraisal
Discipline Efficiency Reward	Comparison		Placement of Responsibility			Corrective Action				
Operative Performance				Operation			Production	Performance		

^aE. C. Davis 1936. Balderston, Brecht, Karobasse and Riddle adopted same breakdown in 1949.

Figure 3.--The Development of Management Control Theory (based on writings of selected authorities) as developed by Davis, *op. cit.*, p. 679.

we are narrowing down from district to local level, from office to individual job, from job to task.

We are attempting to get our finger on a specific pulse. Once we are satisfied that we are at the area to be monitored, we must decide exactly what it is that is to be controlled. Do we want information :

quality?

quantity?

time?

expense?

some combination of these?

Only when we have narrowed down the field, both by location and in terms of our criteria (quality, quantity, time, expense) are we ready to move on to. . . .

2. Selection of a control unit. Here we are looking for something that can be counted that accurately represents the area to be controlled. The Control Unit may be:

Kilowatts

Hours

Dollars

Pounds

Gallons

Inches - Feet - Miles

Poles - Meters

Bills issued

Payments made

The main question to be answered about the Control Unit is, Will it measure what you want to control?

Other questions about the Control Unit are:

--Can it be counted?

--Is it representative of the work being done?

--Is the quality of the Control Unit consistent?

--Is the Control Unit in language that is familiar to all people concerned?

3. Establishment of criteria.--These are the schedules, quotas, goals against which we will be measuring our Control Units. They originated in the plan when we determine end results that we wanted from the process that we are now putting under control. Yardsticks are built around the word "per." If we are golfing, the Control Unit would be strokes and the yardsticks would be a predetermined number of strokes per hole. The yardstick in our golf game could be based on what we had done in the past--or on a par established by the course--or what the other members of our foursome do.

Yardsticks can be:

- kilowatt-hours per customer
- dollars per customer
- cents per kilowatt-hour
- billings per typist per hour

The yardsticks, like all parts of the Control Phase, vary in type and scope from level to level in the organization.

There are several ways to establish these criteria. They can be engineering standards that were established while the work was being planned. They can be standards based on past performance--or set by stopwatch while the work is being done--or they can be negotiated standards that are set through discussion.

4. Establishment of reporting systems. Under ideal conditions, the monitoring point would be right where the work is done so that immediate adjustments are possible. Usually, the ideal situation doesn't exist--which calls for two reporting systems, one to the monitor from the work and a second system to the manager from the monitor. Or, an alternative can be to pass the undigested information direct to the manager from the work.

To send information from the work to either the monitor (who measures and compares) or the manager (who decides and acts), these are two points to consider--one involves expense, the other speed.

Controls require desks, floor space, pencils, people. In other words, controls cost money. To keep these costs down, our control should "Live off the existing systems." Control information should be as much a by-product of the actual work being done as possible. Rather than developing special control forms, are there production figures, sales slips, lists of payments now required by the operative departments that can furnish the facts needed?

Working against the concept of economical controls by blending with the existing system is the need for speed.

Control information, in a company of any size, can never change what is going on now. The best it can do is change what is going to happen next.

Control speed is based on:

- a. Assembly time--how long does it take to get all data to the monitor and to spot exceptions?
- b. Transmission time--how many bottlenecks exist between the monitor and the manager responsible for action?
- c. Reaction time--how long does it take the manager to get to the message, to make his decision to direct new action, and to see that the new action has been successfully taken.

Reducing one or more of the three time spans may call for a separate and independent control system. Each organization calls its own custom-tailored answer to the proper balance of economy with speed in building a control reporting system. To this point, we have been talking primarily about the flow of information from the work to the monitor. There is the second flow to be considered--from the monitor to the manager. Here the message is filtered, formalized, and put into new language. We change from, "Joe Smith was out two days with flu," to "Number of man-hours lost due to illness." Here we strive for balance between over- and under-communication.

The step between the monitor and the manager causes us to look at the organization structure from a different point of view. The managers become decision-centers and the prime question is, "What data, in what form, are necessary to make these decisions?" The second question is, "What reporting system furnishes the shortest distance, the straightest line, the best balance of speed and economy between monitor and decider?" The third question is, "What coordinating advantages can the reporting system supply?" In addition to the deciding manager, who else needs to know?

The reporting system can be no better than its terminal points, the monitor and the deciding manager. When preparing a control system, we should not assume that decisions must be made "at the top." Often, the decision is made better and more quickly at a level nearer the work. By overlooking this, a control system can develop "intercepted feedback." The system feeds control data to a level above the manager immediately concerned. And from that point, the data continues to rise, resulting in lack of control because the manager involved was not only excluded from the original communications network,

but as time goes on, the information gets farther and farther away from him and is put into terms less and less useful to him. The moral of this section is:

- a. The reporting system needs to combine speed with economy.
- b. An approach to this combination is both monitoring and deciding as close to the actual workplace (in terms of both real and organizational distance) as possible.

5. Comparison of control units with yardsticks or criteria. First of all, it is not uncommon for the language of figures to be much more precise than the systems those figures represent.

Many control systems are not accurate within a ten per cent range. This means that figures five per cent above or five per cent below the yardstick may be system error rather than an accurate reflection of the current work process.

Due to this, deciding managers are inclined to use a range rather than a specific figure as a control yardstick. Rather than saying, "Notify me when we vary from 75," he may say, "Notify me if we go under 70 or above 80."

Secondly, there is a definite distinction between monitoring and deciding. Because deciding is an operation calling for much greater skill and judgment, the jobs are usually, but not always, separated. Whenever the control work is handled by both a monitor and a deciding manager, the "exception principle" emerges. This principle was pointed out earlier when "under 70 or above 80" were mentioned. In addition to control system error, the work is "under control" when there is little need for the manager to involve himself in the control process. His talents come into use when abnormal signs show up in the control data. These are the signs that the deciding manager determines in advance should be called to his attention.

Without advance determination, there is no exception method. There is nothing of "when" and "how."

Some reports are needed daily, others are required weekly, monthly, or annually. Some may be needed only when they are "exceptions" regardless of the time intervals.

Some reports are informal oral controls; others are permanent records. The language of the permanent records may be a combination of figures, charts, and written materials. Some of the writing may be "weak link reports" giving the progress of a particular part of the process that is temporarily in difficulty. Summarizing, the manager's duties in the comparison step are establishing ranges, reporting times, and reporting methods. The monitor's duties are getting the data, posting them, comparing them with the yardsticks and ranges, and submitting them when requested and as requested. In some cases, the manager may do the work of the monitor.

Testing the control phase

Now let's look at all five of the steps in the Control Phase. Briefly, they are:

- Selecting specific control points,
- Selecting countable, representative control units,
- Selecting yardsticks or criteria,
- Preparing a reporting system,
- Comparison.

These steps form the vital "playback link" between the work being performed and the men managing that work.

Are there ways to test this link in the control system? Are there yardsticks against which the controls themselves can be measured? Yes, controls can be evaluated. Some of the key questions to ask about a control are:

1. What is its purpose? Does the control exist because of tradition, or is it a necessary finger on a necessary pulse?
2. Are the monitoring and deciding points as close to the work as possible? This is the accountability test. Are we organized for most efficient control? Are the road-blocks to decentralized control real or artificial? How far down the line can accountability go without loss of control?
3. Is it worth what it costs? Is the control productive? Is its "output" worth its "input" in dollars, hours, floor space?
4. Is it fast enough? Does it furnish facts we can do something about, or "post mortem" information?
5. Is it precise enough? Is it sensitive without being wild? Specific without breeding gaps or overlaps?

6. Is it brief enough? Is it pertinent? In most readable, understandable form?
7. Is it adaptable? Is it in a form and language that allows it to be related to other control information?
8. Is it used? How often do we actually make decisions based on this control? Is it frequent enough; too frequent?

Performance standards

It has been noted by both Davis and Urwick that the comparison phase of the organic management function of control requires as a prerequisite the development of performance standards. Performance standards are "criteria of the results that should be obtained by the performance of designated functions as directed. Such results should be measured in terms of specified objectives to determine whether or not they are adequate and satisfactory. These terms are the quantity, quality, and expense of whatever values are required, relative to time. They must be expressed in measurable units."²⁷

Performance standards do more than enable one to measure the degree to which actual performance has been satisfactory. "They supply criteria of results that may be expected under specified conditions. They assist in predicting and preplanning performance. They enable us to express objectives in concrete, measurable terms. They facilitate the stimulation of performance by means of incentives."²⁸

²⁷ Davis, op. cit., p. 34.

²⁸ Ibid., p. 35.

They are in essence a prerequisite for effective planning, as previously pointed out.

Criteria for standards

Davis lists the following criteria regarding standards.

They should be

1. Reasonably stable
2. Reducible to permanent form
3. Reproducible
4. Representative
5. Applicable
6. Universal within limits of problem
7. Free from ambiguity²⁹

Stages of development

Like business organization, standards development can be viewed as passing through various stages of development, namely:

1. Recognition of a need for better standards
2. Development of experience standards
3. Development of rational standards with development of technical staff function
4. Organization for standards development
5. Control of standards development
6. Provision for standards maintenance
7. Provision for periodic review of standards³⁰

State of the art

Some enlightening comments regarding the state of the art of standards development were made by Rathe in a presentation at Systems Development Corporation in 1959.

²⁹Ibid., p. 24.

³⁰Ibid., p. 39.

He discusses the tools available and the extent to which they have been used and indicates his opinion regarding prospects for future applications. The major points of his presentation are quoted below:

1. Accounting. Concerned exclusively with Financial Data, it is the review technique with the longest record of splendid and effective achievements. . . .
2. Work-Measurement is another old timer. Its domain is the time aspect of output.

Today, work measurement is firmly established in most well run organizations. But even in the best, the likelihood is high that its scope remains the same as when this technique was first introduced into business some seventy-five years ago, namely, routine repetitive plant operations. This limitation of existing recording techniques to their original habitat, the plant, is also typical of:

3. Production control, which reflects this restriction even through its name. Its realm is quantitative considerations of performance. . . .
4. Inspection is the fourth member of the quartet of recording techniques. Its mission is to record quality characteristics of output. . . . Once again, an outstanding feature of this technique is its shyness in venturing into non-manufacturing arenas.

These four techniques constitute the bulk of managerial performance measuring in today's business practice. They have two common denominators in which is wrapped up much of the cause for dissatisfaction with the way "control" has worked in many cases:

1. Each of these tools has acted like a hermit of the middle ages who, once settled in his retreat, refused to leave it for better pastures.

Therefore, all give us information on manufacturing with more detail and greater accuracy, as well as with higher precision than on any other activity of business.

2. Every one of these four instruments measures only material aspects-finance, time, quantity and quality. True, these are four of the most common factors of any performance; there is nothing wrong with attention to each as long as this does not draw a borderline beyond which interest shall not advance.

Is it any wonder that the executive whose view is limited to these four considerations finds himself confined in the splendor of isolation. Is it surprising that review techniques which were born as slaves to such narrow objectives become specialists which span in ever narrowing circles. . . . Progressive managers have shown the way out of the jungle of such narrowness. They have added three lanes to the review road:

They have widened the application of these four recording tools from exclusive use in the plant to establishing all of them in other phases of business activity.

They are demanding measures of non-material, i.e., the human component of business.

They require the design of yardsticks and the collection of data on activities and factors of performance which none of the recording instruments discussed so far can provide.

The adaptation of accounting and work measurement, or production control and inspection to non-manufacturing tasks is paying off handsomely. . . .

As to the second point, the measurement of the as yet most unmeasurable of 'all things,' the human being, the situation is not yet encouraging. The fundamental reason for this is the sad fact that we still know so little about Homo Sapiens--what makes him tick?

Regarding the third point, in progressive companies we find steadily, new and additional yardsticks of performance which are not the result of the four review techniques listed above. The General Electric Company pioneered in this area when it embarked several years ago upon the task of measuring every one of its departments as well as the corporation as a whole in what it calls its seven key result areas, namely:

- Profitability
- Market position
- Productivity
- Product Leadership
- Personnel Development
- Employee Attitudes
- Public Responsibility

Especially the last category, public responsibility makes the point that we can measure whatever we wish today provided only that

The executives involved are convinced that this is desirable.

We do not expect scientifically precise yardsticks.

At this stage of development, the attempt at obtaining more and better measures hinges upon being satisfied with approximations in many cases, at least as a first step. Experience has shown time and again that even rough yardsticks can be refined quickly as long as they are used consistently. With this qualification, we can proceed to measure any aspects of performance by designing yardsticks specifically for each situation.³¹

In summary, effective management regardless of the business function requires the performance of the organic management functions of planning, organizing and controlling. Controlling in turn requires the performance of certain sub-functions including comparison. Evaluation is part of the comparison function and requires as a prerequisite the development of performance standards. Thus to manage purchasing one must control it, and to control it one must develop performance standards against which one can compare actual performance. Actual performance is thus evaluated by comparing it to pre-established performance objectives.

³¹Rathe, op. cit., pp. 42-49.

CHAPTER III

THE HISTORY AND DEVELOPMENT OF A PHILOSOPHY REGARDING THE EVALUATION OF PURCHASING PERFORMANCE 1900-1940

Introduction

This chapter and the next trace the history and development of a philosophy of evaluating purchasing performance as reflected by purchasing literature, both texts and periodicals. This chapter is subdivided into two sections as follows:

Contributions prior to 1930
Contributions from 1930-1940

Chapter IV presents the contributions from 1940 to present.

A history of the development of any philosophy must be considered in the light of the industrial and economic climate of the period under consideration. Hence, a brief description of the prevailing "climate" is presented as a prelude to each period covered.

Contributions Prior to 1930

Economic and industrial climate

The growing population of the United States increased significantly during the period 1900 to 1930. Increasing

prosperity made possible by technological advances and increasing consumer demand fostered the expansion of business and industry. Basic industries expanded and new industries arose. Significant advances in the development of mass production techniques were motivated by World War I. American business developed a high degree of prosperity and optimism in the early and middle years of the twenties. During this industrial expansion, the scientific management movement initiated by Taylor expanded and significant contributions to the development of a philosophy of management were made by such men as Taylor, Emerson, Church, Gilbreth, Fayol, Gantt, and others. The first conference on scientific management was held in 1911 at the Amos Tuck School of Administration and Finance. The first textbooks written for the teaching of management in schools of engineering and business were published, the more notable ones by Kimball, a professor of industrial engineering at Cornell University,¹ and Jones, a professor of commerce and industry at the University of Michigan.²

During this period from 1900-1930 purchasing began to be recognized as a distinct and separate business function. Businesses began to establish separate purchasing departments.

¹Dexter S. Kimball, Principles of Industrial Organization (New York: McGraw-Hill Book Co., 1913).

²Edward D. Jones, Business Administration (New York: The Engineering Magazine Co., 1914).

The National Association of Purchasing Agents was formed in 1915 and the first textbooks on the subject of purchasing were published.

The first text devoted solely to the subject of purchasing was published in 1915. Its title was appropriately "Purchasing" and its author Rindfoos.³ However, it was not until the year 1928 that a truly comprehensive text, one that discussed and presented concepts rather than mere techniques, appeared. Its title was "Scientific Purchasing" and its authors Gushee and Boffey.⁴ In total there were eight texts devoted to the subject of purchasing published during this period of 1900-1930, with four of them containing some direct or indirect reference to evaluating purchasing performance. Since these represent the first references the author found in print on evaluating purchasing performance, they are briefly outlined below by author and year.

John S. Dinsmore - 1922

The first reference to the necessity and/or desirability of evaluating the job being done by the purchasing organization appears in a textbook by Dinsmore Purchasing, Principles and Cases. The reference is not direct, that is,

³Charles S. Rindfoos, Purchasing (New York: McGraw-Hill Book Co., 1915).

⁴Edward T. Gushee and L. F. Boffey, Scientific Purchasing (New York: McGraw-Hill, Inc., 1928).

he does not discuss evaluation per se, but rather discusses a tool which can be a basis for evaluation, the budget:

Just as there does not seem to be a sound argument against the establishment of a centralized purchasing department, just so there does not seem to be any sound argument against the establishment of the budget in any business. . . . Spending money without regard to a definite plan of control, is like sailing without a chart.⁵

It is interesting to note that the comment is made in conjunction with a statement on the desirability of a centralized purchasing organization. The interest in finding effective measures of purchasing performance followed closely (as might be expected) the trend towards centralizing purchasing responsibility and authority in a separate, autonomous staff operation.

H. B. Twyford - 1924

Another indirect reference to the necessity and/or desirability of controlling purchasing performance (hence evaluating it) is found in Twyford's Purchasing, Its Economic Aspects and Proper Methods published in 1924. Twyford indicates the results of promiscuous buying and regulated buying in Figure 6.⁶

Though Twyford properly proclaims the merits of controlled purchasing, he fails to indicate how to accomplish

⁵John C. Dinsmore, Purchasing, Principles and Cases (New York: Prentice-Hall, Inc., 1922), p. 94.

⁶H. B. Twyford, Purchasing, Its Economic Aspects and Proper Methods (New York: Van Nostrand Company, 1924), p. 3.

Results of PromiscuousResults of Regulated
Buying

- | | |
|---|--|
| 1. Poor prices | Lowest prices for quality purchased. |
| 2. Inferior quality | Highest quality for price paid. |
| 3. Purchases made in excess or short of requirements. | Exact quantities needed are ordered. |
| 4. Articles substituted for those actually bought. | Articles purchased are those actually delivered. |
| 5. Investment in Materials and Supplies excessive. | Minimum investment in Materials and Supplies. |
| 6. Erratic deliveries | Delivery made in accordance with needs. |
| 7. Unchecked, incomplete or excessive deliveries. | Exact quantities ordered are delivered. |
| 8. Improperly checked and delayed invoices. | Properly checked and promptly. Approved invoices. |
| 9. Loss of cash discounts. | Cash discounts secured by passing invoices promptly. |
| 10. Duplicate payment of invoices. | Security against over-payment. |
| 11. Inefficient service, losses and extravagances | Adequate service, economical operation. |

Fig. 6.--Results of promiscuous buying compared to results of regulated buying by H. B. Tywford, from his Purchasing, Its Economic Aspects and Proper Methods (New York: Van Nostrand Company, 1924), p. 3.

this desired "Regulation." He infers that good methods are the answer, i.e., proper forms, work flow, and procedures.

William Mitchell - 1927

The first direct reference to measuring purchasing performance is made by Mitchell in his text Purchasing in his discussion on the use and need of reports.

Reports provide the means by which records are made useful to the executive. By means of these he keeps informed concerning the activities of his business and measures the performance of his subordinates. The reports of the purchasing

department may for convenience be classified as follows:

1. Those pertaining to buying operations
2. Those concerning the payment of vendor's accounts
3. Those pertaining to the control of inventories.

Pre-control of buying operations is the primary interest of the purchasing manager, and in order that he may have a proper grasp of the situation, reports should be designed which will periodically analyze operation and point out significant aspects of the departments' activities.⁷

Figure 7 shows a monthly summary statement recommended by Mitchell which provides "a comprehensive review of the month's business." It should be noted that the report requires the establishment or forecasting of desired results in the form of estimates. Thus Mitchell, though not specifically stating so, recognized the need of performance standards.

Edward T. Gushee and
L. F. Boffey - 1928

Scientific Purchasing by Gushee and Boffey is considered by many as the first significant text on purchasing.⁸ Certainly, it is the first comprehensive treatise on the subject of purchasing. In it are voiced many concepts and predictions which history has justified and time made no less true.

⁷W. N. Mitchell, Purchasing (New York: Ronald Press, 1927), p. 236.

⁸Gushee and Boffey, op. cit.

Figure 7.--SUMMARY OF BUYING OPERATIONS, by William Mitchell, from his "Purchasing" (New York: Ronald Press, 1927) p. 232.

CLASS OF PURCHASE	NUMBER OF ORDERS PLACED		ORDERS OBTAINING LOS OF MONTH		ORDERS OBTAINING GAINS END OF MONTH		ORDERS RECEIVED		ORDERS RETURNED		IN STOCK BEARING MONTH		PURCHASES SINCE JANUARY 1st		PLACED IN STOCK SINCE JANUARY 1st																																																																																																																																																																																																																																																																
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The text emphasized the need for increased study of the purchasing function:

For some incomprehensible reason, it (scientific management) has devoted little thought and study to the third variable of manufacturing and production, which is materials. Yet the possibilities of economy in the purchase and utilization of materials are tremendous. In fact there are greater potential savings in this direction than in any other phase of management. . . .

So little concerted study has been given to purchasing . . . that there are virtually no data based on experience of other concerns. The few books on purchasing, all of them the product of the past 12 years, are elementary in scope and devoted largely to the routine of work in the purchasing department.⁹

There are writers who hold the same conditions exist today, namely, that the rewards to be reaped in purchasing by the application of techniques from other disciplines-- manufacturing for example, can be found nowhere else in the business enterprise. Phrased in a less complementary way-- the inefficiencies of purchasing present a new frontier for cost reduction programs. Certainly, the comment regarding experience data of other firms is still valid.

Gushée and Boffey recognized the necessity of controlling purchasing. In this regard they make the following comment:

In the process of analyzing and controlling the administrative cost of the department, the P.A. will find it necessary to maintain and constantly check records of salaries, performance, and cost of operating each of the departmental divisions,

⁹Ibid., p. 3.

volume of purchase orders from month to month, cost of issuing purchase orders, total operating cost of the department, percentages of such cost in relation to the total value of all purchases, and many other phases of departmental operations.¹⁰

They also recognized the limitations of utilizing the cost of issuing a purchase order and purchasing department cost expressed as a percentage of total purchases as indicators of purchasing performance:

Individually these studies have little value but from a comparative standpoint they are important. To illustrate the administrative cost of a purchase department in one industry may be 1/2% of the total value of purchases; in another, it may be 1 1/2% of the total value of purchases. Both may represent efficient purchasing, the variation being due to differences in the nature, size, location of the industries. A fluctuation from normal in either case would require investigation by the purchasing agent. . . .¹¹

Likewise "the cost of issuing a purchase order is an interesting study, but again the chief value of such information is found in comparison."¹²

A particularly significant contribution, though it had apparently little impact at the time or through the years, is Gushée and Boffey's comment on the relationship between a purchasing department's operating cost and its performance: "Increased overhead properly applied means increased divi-

¹⁰Ibid., p. 165.

¹¹Ibid., p. 163.

¹²Ibid., p. 165.

dends because of more proficient buying."¹³ This concept is repeated by later writers (as will be seen) and is substantiated quantitatively by the author in this research project. This is the first reference the author found to this concept in print.

Summary 1900-1930

The contributions to purchasing evaluation philosophy during this period are shown by author and year in Figure 8. As might be expected, the writers of the period do not indicate a very sophisticated knowledge of management control theory. This might be expected because management control theory itself had not as yet been really clearly defined (see page 24, figure 5). As indicated in Figure 8, the writers of the period emphasized the need to control departmental operating costs and suggested various types of reports and/or statistical data for the purpose. Boffey and Gushée, however, suggested that departmental operating cost and purchasing performance were directly related, that consequently low department cost could not be used as the sole criterion of purchasing performance.

¹³Ibid., p. 163.

<u>Year</u>	<u>Author</u>	<u>Concepts and/or Contributions</u>
1922	John C. Dinsmore	1. Need to control department costs--suggests use of a budget
1924	H. B. Twyford	1. Indicated results of controlled purchasing--stressed need for sound forms and procedures.
1927	William Mitchell	1. Developed monthly summary report--comparing actual with <u>estimates</u> (recognized need for standards though did not use that term)
1928	Gushée and Boffey	<ol style="list-style-type: none"> 1. Stressed need for research in purchasing. 2. Stressed need to control departmental cost--suggested various statistical ratios. 3. Recognized limitations using the cost of issuing a purchase order or purchasing department cost as a per cent of total purchases as measures of purchasing performance. 4. <u>Suggested that increased costs could mean more proficient buying.</u>

Figure 8.--Contributions to Purchasing Evaluation Philosophy, 1900-1930.

Recognition of the Need to Evaluate
Purchasing Performance 1930-1940

Economic and industrial climate

There was almost uninterrupted decline in business activity from 1930 to 1932. Sales volume of American business suffered significant reductions and corporate income decline. The volume of American Industry dropped to half its 1929 volume. In 1932, the total amount of money paid out in wages was approximately 60 per cent less than in 1929;

over 12 million people were unemployed out of a civilian labor force of 50 million.¹³ Industry and business became concerned with cost reduction as a matter of necessity as survival became a primary problem for many businesses. According to Prentice, there emerged in business a new type of leader, the professional manager:

I refer to what are commonly known as 'career' men in business: men who never hope to own any large portion of the enterprise of which they are a part; men who realize that the bonanza days of the old captains of industry are over; men who see in business something more than the mere making of money; men who are imbued with a deep sense of social stewardship; men who are keenly sensible of the fact that they are trustees of other people's money with heavy responsibilities to discharge to employees and the public as well as to the stockholders; men who find deep spiritual satisfaction in the direction of their brains and energy toward the creation of a better and more abundant life for all of their fellow human beings.¹⁴

Management thought during the thirties was towards a general approach to organization with a developing interest in management functions. The literature of the period continued to appear with titles of organization and management with some bearing titles limited to organization alone. Three publications dealing with organization appeared in 1931. They were Onward Industry by Mooney and Reiley,

¹³John Franklin Mee, "A History of Twentieth Century Management Thought" (unpublished Doctoral dissertation, The Ohio State University, 1959), p. 200.

¹⁴H. W. Prentice, Jr., "Liberal Education for Business and Industry," Bulletin of the American Association of University Professors, XXXVIII (Autumn, 1952), p. 346.

Organization Engineering by Dennison, and Principles of Organization by Dutton. These trends, namely the necessity to reduce cost, the trend towards professionalism, and the emphasis on organization structure and management functions increased the rate at which purchasing was emerging as a separate and distinct function of business. More companies established centralized purchasing departments in an effort to reduce costs. The trend towards centralization spurred the search for effective measures of purchasing performances.

This period of 1930 to 1940 was marked primarily by two significant events regarding contributions to a philosophy of evaluating purchasing performance. The first event was a contest on methods of measuring a purchasing department's efficiency which was jointly sponsored by the National Association of Cost Accountants and the National Association of Purchasing Agents. The second was the publication of the first academic text on purchasing by the noted purchasing authority H. T. Lewis of Harvard University.¹⁵ A synopsis of the three prize-winning papers of the contest is presented below as well as a discussion of the concepts of Lewis. Also included is short synopsis of the non-prize winning papers of the contest.

¹⁵Howard T. Lewis, Industrial Purchasing (New York: Prentice-Hall, 1933).

William H. Carney - 1931

Carney received first prize in the National Association of Purchasing Agents' Contest. Carney suggested that the factors on which efficiency should be judged were fairly well known. It was the measuring of these factors in objective terms that was the difficult problem.¹⁶ He enumerated these factors and the means by which he suggested they be measured:

1. Clerical operations--Carney commented that "the performance of this work is comparable to any set of clerical operations and is relatively easy to measure."

2. Research work--He suggests that "in general the work of this section could be measured by a consideration of the following factors:

- A. Number of purchased items put on a specification basis within the period under review.
- B. Annual purchase value of the materials put on a specification basis within the period, with estimated savings.
- C. Specific estimates of savings agreed to by the executives and operating departments for improvements effected by the research work.

Carney suggests that with the above data prepared regarding research work, "a definite statement of actual and potential savings to the company from purchasing research work could be prepared and a portion of the amount assigned as a

¹⁶William H. Carney, "Measuring the Efficiency of the Purchasing Department," Bulletin No. 12 of National Association of Purchasing Agents (New York: 1931), pp. 2-7.

department bonus. . . ."17 This is the first printed or published reference the writer found to the use of an incentive in the purchasing function.

3. Inventory economies and turnover.--Carney indicates the economies or savings to be realized in this area include "the definite financial saving from the interest value of money released from inventory . . . the release of valuable floor space . . . savings from lower obsolescence losses, . . . savings from reduced waste in storage and production since fresh stock is being used at all times."18

4. Cost of materials.--Carney recommended that one compare the total cost of materials actually used in production for a given period against total cost as it would have been had the purchasing department always bought on the basis of the current cost at the time of usage.

5. Producing economies or improvements.--This would include

all suggestions coming from the purchasing department which tend to reduce production cost without changing the quality of the article or to improve the quality without an increase in cost. . . . The objective measurement of results obtained by the company from these suggestions is many times rather difficult to establish. It is possible to consider them only as specific items . . . of those suggestions which are adopted and prove profitable it would seem fair that management give credit for the savings by an arbitrary split among the departments contributing to the improvement with a

¹⁷Ibid., p. 2.

¹⁸Ibid., p. 3.

generous share to the purchasing department for initiating the suggestion.¹⁹

Carney recommends that reports covering the five areas enumerated above should be fairly detailed in scope and should be prepared monthly and forwarded to management for consideration.

V. M. Jones - 1931

Jones's paper received second prize in the contest. It is particularly interesting since it is the first published article which recommends the use of a purchasing efficiency index. In the paper, Jones comments that the measuring of purchasing efficiency begins after the preparation of the budget and determination of quantities of materials which have to be purchased. He specifies seven measures, namely:

1. One first measure is inventory turnover and ability to operate within budget . . . a statement of the purchasing budget of expenditures and inventories as compared with actual expenditures presents in quite simple fashion the degree of success with which the budget has been maintained.
2. Cost compared with market and standard. This applies to purchases, inventories, and outstanding commitments. . . . Standard cost procedures of accounting for deviations from standard through the means of variance accounts, furnishes an ideal foundation for analysis of purchasing efficiency on this basis.
3. Depreciation and obsolescence of existing inventories. Chart 1 shows a bar chart which sets forth

¹⁹Ibid., p. 4.

in condensed form the results of material obsolescence. The long bar on the left shows a total inventory value of obsolete material for the year, aggregating \$12,000. Of this \$8,000 was purchasing responsibility and \$4,000 was a loss over which purchasing had no control. The small bar to the right shows an actual realization of \$6,000 on the obsolete stock, \$5,000 of which was attributed to purchasing ability, and \$1,000 of which was realized through the plant's ability to make up some of the loss. This leaves a net charge of \$3,000 due to obsolescence, chargeable to both purchasing department and plant or some other form of expense. This is portrayed in the projection of the bar to the upper right. . . . The significant part of this chart is the bearing it has on measuring purchasing performance. The amount of this loss may be calculated as a percentage to the total value of purchases and the size of this percentage treated as an index of the efficiency displayed in eliminating obsolescence.²⁰

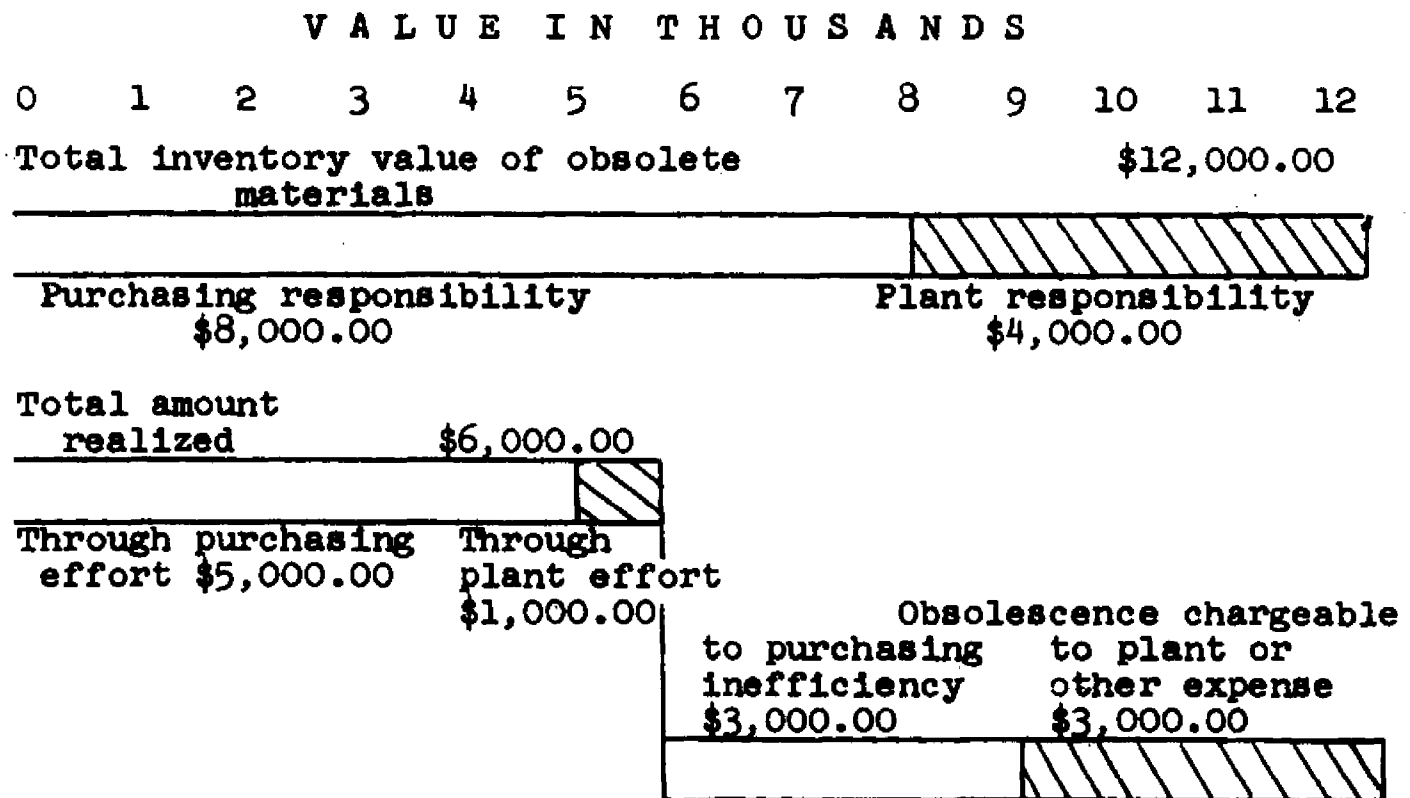


Figure 9.--Results of material obsolescence.

²⁰V. W. Jones, "Seven Points that Determine Purchasing Department Efficiency," Bulletin No. 12 of National Association of Purchasing Agents (New York: September, 1931), p. 8.

4. Flexibility of purchasing program and class of vendor purchased from

In this regard Jones points out that

A consideration of the total quantity of various commodities purchased and the number and reliability of the sources of supply which are utilized may be used as a barometer, reflecting the alertness exhibited in utilizing the element of competition for gaining the benefits of price advantage.²¹

5. Losses experienced due to lack of materials on hand

The losses caused by production stoppages due to lack of material should be charged against the purchasing department. He points out that

With the vast amount of capital that is tied up in automatic equipment, where the loss even of minutes in a perfectly planned production schedule means thousands upon thousands of dollars, no element of delay can be tolerated. The purchasing agent is guilty of mismanagement who causes frequent delays and shut-down for (1) lack of raw or other materials required in production, (2) lack of sufficient operating supplies, or (3) an inadequate supply of maintenance materials, resulting in shut-downs for repairs. The purchasing agent cannot afford to lose sight of this in his drive for economy. But as in other cases, the extent of his responsibility must be thoroughly diagnosed and understood.

Jones indicates that a report of all such losses from shut-downs or delays, caused by lack of material being on hand when needed, should be made in detail and the cost of the loss so sustained reflected against the purchasing

²¹Ibid., p. 10.

department. Figure 10 shows the format of such a report.²²

Cause of Loss	Cost of Loss	Total Average Inventory	Loss % of Average Inventory	Total Purchases	Loss % of Purchases

Figure 10.--Statement of losses sustained through material shortages, etc., by V. W. Jones from his article, "Seven Points that Determine Purchasing Department Efficiency," Bulletin #12 NAPA (New York: September, 1931), p. 11.

6. Income from scrap and salvage materials

Mr. Jones states:

The efficiency of the purchasing department, in realizing on scrap items, is disclosed very nicely with the aid of variance accounts, a standard price being set for the year, which is intended to cover the fluctuations. The efficiency could be determined by calculating the per cent which the value received was of the standard value of the scrap sold.

7. Cost of physical operation of department

Jones considers this strictly a problem of office management.

Jones summarizes his concepts in the Purchasing Efficiency Statement shown in Figure 11.²³

²²Ibid., p. 11.

²³Ibid., p. 13.

Donald G. Clark - 1931

Clark won third prize for his paper. He proposed a Master Cost Sheet for the purchasing department

on which would be debited all items properly chargeable to the cost of purchasing and which are affected by departmental efficiency and inefficiency, and on which are credited all items which are properly allowable as credits against the cost of purchasing, provided they are likewise affected by departmental efficiency or inefficiency.²⁴

Clark considers the cost of purchasing as consisting of:

- a) the price of things bought,
- b) the expense of maintaining a department to buy things,
- c) any expense caused by errors, losses, or delays in securing them,
- d) the expense of keeping and storing the things bought from the time of their receipt until they are used.

Regarding the method of obtaining these four aspects of the cost of purchasing, Clark suggests that the first element, the price of things bought, can be obtained by "comparing the average market with actual costs." He specifies that departmental cost should include

- 1) Salaries and wages.
- 2) Traveling expense.
- 3) Supplies and stationery.
- 4) Subscriptions.
- 5) Maintenance, heat and light, rent, use of equipment.
- 6) Telephone and telegraph.
- 7) Transportation charges.
- 8) Stenography and postage.
- 9) Supervision.

²⁴Donald G. Clark, "The Balance Sheet of Departmental Efficiency," Bulletin No. 12 of National Association of Purchasing Agents (New York: 1931), pp. 19-23.

On the subject of errors, losses, and delays, he says:

We propose . . . that the purchasing department should be responsible for a returned goods account, to which should be debited the value of all goods returned to vendors and all claims against vendors for defective, wrong or unsatisfactory goods. For each order received late, the purchasing department should be debited with a fined amount. This amount we believe, should be estimated departmental cost for handling an order.²⁵

On the fourth aspect of purchasing costs, Clark believes that one cannot measure departmental efficiency on all transactions without taking into account the cost of carrying the inventory of purchased materials, including

- 1) Interest on the investment represented by the inventory at current rates of return on invested funds.
- 2) Store costs.
- 3) Losses from storage.
- 4) Depreciation.

He suggests that one make an estimate of the total carrying charge in the form of a percentage on the value of the inventory. Clark's Master Cost Sheet is shown below with his comments on how to calculate efficiency (Figure 12).

Clark explains the use of this cost sheet as follows:

This percentage is not a measure of purchasing efficiency; rather it is a measure of purchasing in efficiency. The theoretically perfect purchasing department would save over market prices enough to pay all departmental expenses; it would have no losses, errors, or delays to its debit; it would need no inventory to support it and therefore there would be no inventory carrying charges. Its percentage of efficiency, then, would be one hundred. Every item on the debit side of our Master Cost Sheet is a deduction from that one hundred per cent of efficiency.

²⁵Ibid., p. 19.

MASTER COST SHEET FOR THE PURCHASING DEPARTMENT

RESULTS		CREDITS	
Prices paid in excess of average market prices ¹		Savings on average market prices ¹	
Lumber	\$1,122.83	Pig iron	\$1,091.20
Foundry Scrap	642.91	Coal	419.00
Flour	309.00	Coal	2,110.30
Total	\$2,074.76	Linseed Oil	2,140.01
Departmental Expense		High Speed Steel	4,650.00
Salaries and wages	17,143.10	Bolting	764.39
Traveling account	313.25	Oils and Greases	1,621.00
Stationery, supplies and postage	1,767.24	Total	13,430.50
Subscriptions, dues, etc.	205.00	Substitutions and savings, estimated (Accepted by management)	4,000.00
Rent, heat, light equipment	3,730.00	Total	\$18,230.50
Telephone and telegraph	2,400.19		
Excess transportation charges over cheapest way	3,144.37	Revenue from Salvage Sales	1,810.00
Total	28,065.15	TOTAL CREDITS	20,031.44
Departmental Deficiency		Net cost of purchasing	\$8,871.16
Losses and errors	632.44		
Deficiency in returned goods account	1,127.91		
Cost of delays			
Total orders placed	29,697		
Departmental expense	\$28,065.15		
Cost per order9727		
2816 orders received			
late, @ .9727 each	2,739.12		
Total	4,490.48		
Expense of carrying inventory of purchased goods			
Average inventory	\$362,301.72		
Estimated cost of carrying	12%		
Carrying charge on inventory	43,452.21		
TOTAL RESULTS	\$78,902.60		

EFFICIENCY	
Total purchases for year	\$1,234,567.00
Total purchases divided into net cost of purchasing (\$8,871.16)6477
Standard of perfection	100.00%
Minus percentage of purchasing inefficiency	4.77
Percentage of Purchasing Department Efficiency	95.23%

¹ These items are illustrated by use of a series of basic commodity charts furnished by the National Association of Purchasing Agents.

Figure 12.--Master Cost Sheet²³ by Donald G. Clark, "The Balance Sheet of Departmental Efficiency," Bulletin #12 of NAPA (New York: Sept. 1931) p. 22.

²³ 1914, p. 22.

We therefore subtract from one hundred per cent the percentage arrived at by relating the net cost of purchasing as shown in our Master Cost Sheet to the value of purchases made, and thus arrive at the desired figure expressing the percentage of purchasing efficiency. In the illustration used in the previous paragraphs, the percentage of efficiency would be 95.

Our formula for purchasing efficiency is, therefore, the following:

Purchasing department efficiency may be expressed by deducting from 100 per cent, the standard of perfection, that percentage of the total value of goods purchased in the period under consideration, which represents the cost of the department to the company for the same period, including in that cost departmental expense, expense incurred by all departmental failures and shortcomings, and the expense of carrying the inventory of purchased goods, less any net savings over market prices which may be proved, and less net returns from salvage sales.²⁶

In 1931, Clark, who, as has been noted was one of the prize winners in the NAPA contest on measuring purchasing agents association in New York in which he discussed the results of the contest.²⁷ In the presentation he seeks to answer two questions, namely, what did the contest provide in the way of a yardstick of purchasing efficiency, and what "are we going to do with it?" His important comments regarding these questions are quoted below:

In my opinion, we have not achieved, as yet, any absolute, universal, or complete measuring-rod of purchasing efficiency.

With all respect and admiration in the world for the two splendid papers that ranked first and second in the recent Contest, neither of them does or even professes to, offer any scheme by which the Purchasing Departments of a dozen concerns can be measured against a standard, and properly and accurately rated and ranked as to their comparative efficiency.

²⁶Ibid., p. 23.

²⁷Donald G. Clark, "Measuring Purchasing Efficiency," an address before a meeting of the Purchasing Agents Association of New York, October 20, 1931.

To put this in the positive form, one of the things we have gained from the Contest is the certainty that purchasing efficiency is not measurable by the same methods that horse-power, height, cubic content and the purely physical phenomena are measurable. Rather efficiency in this case, is a human phenomenon, and the purchasing efficiency percentage of a steel mill in Pittsburgh can no more be computed and fairly compared with that of a breakfast food factory in Battle Creek, than can a betting average in the Texas League with one in the American League, or the gross sales of a locomotive salesman with those of a grocery clerk.

So far as present indications go, we must forego our dream of a single standard of purchasing efficiency for comparative purposes as an immediate result of this contest.²⁸

What, then, was gained? The contest indicated that there were certain points on which all prize-winning papers were in accord, namely:

1) Purchasing efficiency is measurable only in items of cost. All the papers agreed on reducing the matter of measurement at once to a basis of cost.

2) The cost of purchasing is a far broader subject than the mere prices one pays for materials.

3) The purchasing function must be broken down into its various factors and phases as a preliminary to any attempt at measurement.

This to my mind is one of the most important things to be remembered. The very complexity of the buying job in a modern industrial organization makes the isolation and study of the various jobs-within-the-job a necessity not merely for measuring, but for having efficiency.²⁹

²⁸Ibid., p. 1.

²⁹Ibid., p. 2.

4) There is substantial agreement in at least some of the more important factors in purchasing efficiency and in the weight they must have in the final index of efficiency. One finds in each of the three prize-winning papers recognition of Department Expense, Inventory Control, Departmental Errors, Variation between Purchase Prices and Market or Standard Costs.

5) One finds in each of the three papers the thought that standards of performance must be set for the Purchasing Department to shoot at in its various functions.

This, to my mind, is the real lesson to be taken from the contest--the lesson that each company has a real obligation to measure the efficiency of its purchasing department, not so as to compare it on any absolute basis with that of some other company, but to use as a basis for standardizing its own efforts and improving its own efficiency.³⁰

Clark concludes as follows:

I have said before we must forget the ideal of a single efficiency standard or measuring stick for universal use. But we must not forget it forever, only for the present. It seems to me that the development of a "yardstick" like that of most good things, is to come slowly and by process of evaluation.

If all purchasing departments will take any one or all of the plans presented in the contest, study their own functions in the light of these papers, set up their own yardsticks, which may be suggested in whole or in part by the papers, and record the results they obtain, then we shall be well started on the second stage of our journey toward the final ideal.

I should say that the contest had negated the hope of "Efficiency by Formula." It has instead, pointed the way to efficiency by analytical study of the particular purchasing set-up, with the hope that such study, together with tabulation and comparison of the results, may lead in the future to establishment, not of mere formulae, but of proved formulae for measuring purchasing efficiency.

³⁰Ibid., p. 3.

National Association of Purchasing
Agents Bulletin No. 13

The above referenced bulletin summarizes the forty-five papers submitted in the National Association of Purchasing Agents contest on Measuring the Efficiency of the Purchasing Department.³¹ The article's main contribution is its delimitation of the objectives of measuring purchasing efficiency. This is the first reference the writer found regarding the reasons for evaluating purchasing performance. The objectives specified are

1. To enable the purchasing executive to comprehend more clearly the requirements and possibilities of his job.
2. To enable management to visualize with accuracy just what the purchasing department is accomplishing in the way of spending or saving the company's money.
3. To secure real efficiency through the only known method, of setting a standard and measuring the approach to it.
4. To provide a basis of comparison with other competing or non-competing industries.

In summarizing the plans the article comments that the majority of the plans submitted ". . . proposed to measure efficiency by taking the chief functions of the department and comparing actual performance or accomplishment in each respect with a standard. . . ." ³² In order of the frequency

³¹Stuart F. Heinritz, "Measuring the Efficiency of The Purchasing Department," Bulletin No. 13 of National Association of Purchasing Agents (New York: 1931).

³²Ibid., p. 4.

with which they were mentioned, the significant functions were:

- | | |
|--------------------------------------|------------------------------|
| 1. Cost of material | 6. Distribution of purchases |
| 2. Inventory control | 7. Depreciation and |
| 3. Cost of departmental
operation | obsolescence |
| 4. Cost of errors and
delays | 8. Scrap and salvage |
| 5. Research | 9. Cash discounts |
| | 10. Returnable containers |

One other type of measurement was proposed. Three papers were based upon the principle generally known as the rating scale, in which the purchasing officer is graded on a given set of characteristics, with points awarded for a fair, good, or excellent rating under each heading. The editor, Stuart Heinritz offered the following comments on their use:

While such plans are not uncommon in personnel work, for the present inquiry they have three serious shortcomings that they (1) represent opinion rather than objective measurement, (2) have no standard of comparison other than an arbitrary conception of perfection, and (3) are inclined to stress personal attributes rather than departmental accomplishments.³³

Howard T. Lewis - 1933

Lewis is considered by many to be the leading educator in the field of purchasing. His Industrial Purchasing published in 1933 is considered a classic in the field. His discussion regarding the measurement of purchasing efficiency

³³Ibid., p. 13.

includes comments on the desirability of measurement, the difficulties involved, and the characteristics of a satisfactory standard. His comments are quoted below:³⁴

On need for research

It is a rather interesting commentary on the development of business practice that the procurement (function) of industrial goods has been the subject of less analytical discussion than any of the other major functions of business. In fact, it is safe to say that there are many businessmen and others who will deny that it is a major function at all.³⁵

On desirability of measuring performance

Neither are there many who doubt the desirability of measuring on some basis or other the efficiency with which the purchasing function is performed.³⁶

On difficulty of measuring purchasing performance

The difficulties, however, to be encountered in any attempt to set up any such measure are very real. . . . the obstacles in the way of development of such a standard are so great as to daunt almost anyone.³⁷

On characteristics of satisfactory standard

Lewis comments that a satisfactory standard should be:

- 1) based on factors over which purchasing has control
- 2) simple, definite, understandable
- 3) not subject to manipulation
- 4) a measure of the efficiency not only of prior years but also to other companies.³⁸

³⁴Howard T. Lewis, Industrial Purchasing (New York: Prentice-Hall, 1933).

³⁵Ibid., p. 4.

³⁶Ibid., p. 370.

³⁷Ibid., p. 370.

³⁸Ibid., p. 371.

He comments that comparisons ought to be possible between similar types of businesses.

On the difficulties involved in measuring purchasing performance

In discussing the problems involved in measuring purchasing Lewis notes that

- 1) Some contributions are not measurable.
- 2) The purchasing function performed by the purchasing department varies between companies.³⁹

On the perfect department

The theoretically perfect purchasing department would save over market prices enough to pay all departmental expenses; it would have no losses, errors or delays with which it could be debited, it would need no inventory to support it and therefore, there would be no inventory carrying charge.⁴⁰

On true measure of efficient operation

The value of efficient operation is to be found in the smooth and profitable functioning of other departments rather than in the purchasing department itself. If the work there is well done, the production costs are kept down and sales volume is kept up.⁴¹

On use of past performance as a standard

If management wishes to know whether or not the purchasing department is performing its work well, rather than simply whether or not it is doing better than it has done in the past, than this basis (comparison with past performance) is not enough.⁴²

³⁹ Ibid., p. 374.

⁴⁰ Ibid., p. 376.

⁴¹ Ibid., p. 377.

⁴² Ibid., p. 378.

It should be noted that Lewis was the first in purchasing literature to define criteria for a satisfactory standard. He also criticized the prevailing thinking expounded by Clark that purchasing departments cannot be compared; he felt as indicated above that it ought to be possible to compare similar types of businesses.

L. P. Alford - 1934

The 1934 edition of the Cost and Production Handbook suggests the use of a purchasing efficiency index similar to that recommended by Jones. It suggests first establishing the factors which determine purchasing efficiency and then utilizing these factors to calculate a purchasing efficiency index. It suggests the following factors be utilized:

1. Proved savings. These will include:
 - a) proved savings of prices paid over (under) market prices upon goods bought.
 - b) proved savings achieved by initiation of improved methods or substitution of better or cheaper materials.
2. Expense of operating purchasing department.
3. Expense caused by purchasing department failures-- which include:
 - a) purchasing loss and error account

b) cost of failure to have material on hand when needed.

4. Inventory expense.⁴³

These factors would be utilized as shown in Figure 13 below:⁴⁴

Master Cost Sheet for Purchasing Departments

Debits

Prices paid in excess of average market prices	XXXX
Departmental expense	XXXX
Departmental deficiency	XXXX
Expense of carrying inventory of purchased goods	<u>XXXX</u>
Total debits	XXXX

Credits

Savings on average market prices	XXXX
Substitutes and savings estimated (accepted by management)	XXXX
Revenue from salvage sales	<u>XXXX</u>
Total credits	XXXX

Figure 13.--Master Cost Sheet, by L. P. Alford, Cost and Production Handbook (New York: Ronald Press, 1934), p. 406.

A final index of purchasing efficiency then may be stated as a percentage. Net ultimate cost of department (including operating expense, cost of its failures, and cost of carrying inventory) with proved savings subtracted divided by total volume of purchases, gives a percentage figure which is actually an expression of ultimate purchasing

⁴³L. P. Alford, Cost and Production Handbook (New York: Ronald Press, 1934), p. 186.

⁴⁴Ibid., p. 406.

cost in ratio to value of goods purchased. Subtraction of this percentage from 100 per cent gives an index figure of purchasing efficiency.

Summary

The period 1930-1940 produced some significant contributions to the development of a philosophy of evaluating a purchasing department's performance. The National Association of Purchasing Agents' Contest produced general agreement on several points including the delineation of those factors which were related to and indicative of total purchasing department performance, namely, purchasing department operating costs, inventory control, savings due to sound purchasing, losses due to poor purchasing, purchased material cost and income of salvage operations. Other points on which there developed general agreement included the need to develop performance standards against which actual performance might be compared.

Several writers suggested combining the above listed factors into a performance index or total performance standard, and suggested methods by which this could be accomplished. Lewis enriched purchasing evaluation philosophy by his analysis of the difficulties involved in measuring purchasing performance as well as his development of criteria for a satisfactory standard. He stressed that the true measure of purchasing performance was end product costs, and also

disagreed with some of his contemporaries by indicating he felt it ought to be possible to compare similar companies, that is, though it may not be possible to develop a universal yardstick for all companies, it should be possible to develop a yardstick for similar ones. This concept, that is utilizing end product cost as a measure of purchasing department performance was combined by the author (the writer) with Gushée and Boffey's concept regarding "increased overhead properly applied means increased performance" in the development of his ratio which is discussed and analyzed in Chapter V of this research project.

Figure 14 below indicates the contributions of this period by year and author. It can be clearly seen that the approach recommended during this period was basically and solely a quantitative one.

Year	Author	Classification of Approach			Basic Concepts
		Quantitative	Qualitative	Combination	
1930	Kelly	x			Recommended use of various statistical records to measure performance including department cost, inventory turnover, losses due to delays and obsolescence, savings due to sound purchasing, income from scrap and material cost.
1931	Carney	x			Recommended the use of various statistical records to measure certain functions or factors of purchasing performance. Said that important factors were known, the problem was to objectively measure them.
1931	Jones	x			Recommended a total index of purchasing performance based on reconciling various credits and debits attributable to purchasing department performance.
1931	Clark	x			Developed total performance index similar to Jones. Also summarized contest results, indicated main contribution of contest was recognition of need to break purchasing into important functions, to establish standards in these areas and then to measure performance against these standards.
1931	N.A.P.A. Bulletin 13				Summarized results of N.A.P.A. contest--specified the objectives of evaluating purchasing performance.
1933	Lewis				Contributions primarily in realm of theory: (1) difficulties involved, (2) need for standards, (3) Real measure is product cost, (4) criteria for standards, and (5) should be possible to compare similar companies.

Figure 14.--Contributions to a philosophy of evaluating purchasing performance 1930-1940.

CHAPTER IV

THE HISTORY AND DEVELOPMENT OF A PHILOSOPHY REGARDING THE EVALUATION OF PURCHASING PERFORMANCE 1940-1962

Renewed Interest in Measures of Purchasing Performance 1940-1950

Industrial and economic climate

World War II had a significant influence on the industrial and economic climate of the forties. Unprecedented industrial and military expansion resulted from the requirements of waging a global war. Essentially all economic activity was subordinated to the necessity of waging the war; consumer products were in short supply and the buying public postponed much of its normal consumption until the end of the war. The immediate postwar years were characterized by a sellers' market as the consumer eagerly satisfied his long subdued desire for such items as new cars, washing machines, and the like. During this period interest in evaluating purchasing waned as cost became a secondary consideration. The period did, however, produce a number of significant contributions to purchasing evaluating philosophy. Of particular interest are (1) the results of two studies made by special committees of the National Association of Purchasing

Agents made public in 1945 and 1947, and (2) the concepts of Heinritz contained in his text on purchasing published in 1947.

National Association of Purchasing Agents special committee on measuring the efficiency of a purchasing department - 1945

In 1945, the National Association of Purchasing Agents made public the findings of a special committee on measuring the efficiency of a purchasing department. Its main point is its suggestion that any real measurement of purchasing efficiency must be broken down into two definite groups:¹

A) Statistical (tangible)

B) Intangible (executive and research duties)

It mentions that evaluation of the intangible aspects of performance "would probably have to be accomplished by a management committee . . . a further thought was to give a weight of 40% to the statistical information and 60% to the intangibles."²

Regarding the measurement of intangibles the report favors cost of production, "using a method which will show up the savings accruing through the experienced, efficient know how of trained procurement men."³

¹"Measuring the Efficiency of a Purchasing Department, The Findings of a Special National Association of Purchasing Agents Committee (New York: 1945); p. 2.

²Ibid., p. 2.

³Ibid., p. 3.

National Association of Purchasing Agents committee on development of methods for evaluating the purchasing function - 1947

In 1947 the National Association of Purchasing Agents published an article in its bulletin which summarized the findings of the NAPA's Committee on Development of Methods for Evaluating the Purchasing Function.⁴ It also summarized the comments of various noted purchasing men. The main points of the article are summarized below.

On findings of National Association of Purchasing Agents committee.--The committee concluded that it was not possible to apply a mathematical formula or to establish an absolute yardstick for measuring the efficiency of all purchasing operations. In June, 1947, the Committee on Development of Methods for Evaluating the Purchasing Function under chairman McCoffrey definitely ruled out this possibility in its final report to the Executive Committee of the National Association of Purchasing Agents.

The principle factors defying measurement were found to be the intangible values of the purchasing function. . . . Any standard which measures the responsibility for wise expenditure of company funds, represented by materials and service purchased, in terms of operational costs alone, fails to measure the true value of purchasing.⁵

⁴"Measuring Purchasing Performance," Bulletin of the National Association of Purchasing Agents, October 1, 1947.

⁵Ibid., p. 2.

The committee included among the intangibles such items as (a) personal characteristics of the purchasing agent, executive ability and relations with the other divisions and executives; (b) the value of goodwill secured for the company, through fair buyer-seller relationships; (c) the return on expenditures for purchasing research and information. It concluded it costs money to earn, or save, money; so, funds are spent in obtaining information on new materials, markets, new processes, sources of supply, new equipment and the like.

The direct value of this information cannot be measured on any absolute scale. Rather, it will be found in continued production, lower material and production costs, more reliable suppliers, better working conditions, higher morale and most important, better end products.⁶

The committee comments that although no single yardstick to measure efficiency had been found, the work had not been entirely in vain. Purchasing could be evaluated by use of various techniques though no single yardstick was available. The techniques suggested by various men are discussed and summarized below.

Donald G. Clark - 1947

Reversing his thinking of fifteen years ago, Clark no longer considers it possible to measure purchasing efficiency by a mathematical formula. Rather he suggests a series of

⁶Ibid., p. 4.

six check points to evaluate the efficiency or lack of efficiency in the purchasing department. The six parts are

1. Evaluation of the characteristics, ability, and organization skill of the head of the purchasing department.
2. Broad statement of policy.
3. Manual procedures.
4. Delivery of the proper quality and quantity of goods on the necessary time schedule.
5. Prices paid for material procured
6. Operating costs. ⁷

E. P. Scully - 1947

Scully comments that a single yardstick is not adequate to evaluate purchasing. He offers three supporting reasons: (1) purchasing generally buys what someone else specifies, (2) purchasing operates on fluctuating markets and is not always free to buy according to the tides, and (3) management decisions may not coincide with desirable market conditions respecting the materials to be bought. These three factors constitute a triangle within which purchasing must operate.⁸

"There can be no yardstick other than the results obtained and your preceding report for comparison." He suggests

⁷Ibid., p. 5.

⁸Ibid., p. 3.

a three-part report covering (a) forecasts and recommendation on materials and departmental operation, (b) efficiency of operation, and (c) results. To project, measure, and report these results, the use of a job analysis work sheet is recommended.

Such a work sheet would list and evaluate the duties and responsibilities of the personnel in the purchasing department and also indicate the particular characteristics considered essential for acceptable performance in the various assignments. Weight factors may be assigned and a point-total obtained.

According to the author, a work sheet offers something more tangible to start with and report on, and it can be applied by the year, month, project, product, or shop release. He suggests calling this work sheet a "Purchasing Department Analysis Work Sheet" using it to obtain a point-total for the department, which could be set up as "par" for acceptable or normal performance.

Scully believes that once the standard or "par" is set for the department, any major buying activity or buying period can be measured against it.

E. H. Weaver, 1947

Weaver expresses the opinion that the best method for proper evaluation of purchasing efficiency is a combination of two factors: the tangible and the intangible.

Weaver suggests adopting a method similar to a civil service examination for an important position, where a weight of 40 per cent is given for the written examination and 60 per cent for the intangibles which are determined by personal interview. On this basis, the purchasing agent might advocate a determination of his value by a combination of statistics and intangibles.⁹

Stuart Heinritz - 1947

Heinritz concerns himself initially with the approach to evaluating purchasing efficiency termed scientific job analysis and evaluation. This process proposed by management when purchasing failed to provide a definite standard of measurement would first set up a job definition in terms of the minimum requirements of functional performance and personal qualifications to do the job and would then proceed to see how actual performance and qualifications measure up to the job as defined.

He mentions three shortcomings of the method:

- a) the intangibles are just as elusive as ever.
- b) it still attempts to measure the larger factor in terms of the lesser one.
- c) There is the danger that the minimum requirements expressed in the definition will tend to become

⁹Ibid., p. 5.

the maximum opportunities permitted to that function.¹⁰

In analyzing purchasing performance from the management viewpoint, Heinritz draws the conclusion that what we are seeking is not efficiency but proficiency in purchasing performance, "which is a vastly different, far more rare, and infinitely more valuable quality in its contribution to profitable company operation."¹¹ According to the author, a definition for proficient purchasing should contain the following personal qualifications:

1. Resourcefulness and insight to maintain a functional approach to the job
2. Knowledge of one's company--its facilities, operation and basic requirements
3. Knowledge of materials purchased and how they are produced
4. Knowledge of suppliers
5. Knowledge of costs, primary and end
6. Command of the respect and confidence of other departments, and cooperation with them

He concludes with the comment that "For every dollar saved in efficiency there are a hundred, or a thousand to be made by proficiency in procurement."¹²

¹⁰Ibid., p. 6.

¹¹Ibid., p. 7.

¹²Ibid., p. 8.

On the interest in developing reliable yardsticks.--

Heinritz points out that purchasing and management executives alike would welcome some reliable yardstick for measurement of efficiency in purchasing. Consequently, a great deal of serious thought has been given to the problem over the years. This research has not resulted in any formula or method capable of general application; however, it has developed a number of principles that are helpful and worthy of consideration in approaching the problem as it affects the individual company operation.¹³

Heinritz points out that it is easy to fall into the error of oversimplification in measuring purchasing performance. The most common fallacy is to express department cost as a percentage of total purchase expenditures.

This percentage is necessarily an average for it is obvious that there is a wide disparity between purchasing cost in respect to orders of relatively small value hard to find items, which are required only occasionally so that procurement must start with the most elementary, considerations of quality, source, and value, and the cost of procuring standard and familiar materials from established sources in substantial volume. Examples can be found of purchasing costs ranging all the way from 3/4 of 1 per cent of expenditures to 2 per cent or more each of which could reflect efficient performance in the particular situation involved. A reasonable average figure would be from 1 1/2 to 2 per cent.

The Fallacy is that it can be reduced by paying more for materials. Another oversimplification is the Cost per Order. It does have the virtue of being tied to actual operations performed, rather than to

¹³Heinritz, Purchasing, op. cit., p. 584.

the incidental factor of funds expended. However, it too is subject to criticism as it can be reduced by issuing more orders.¹⁴

Heinritz points out that the lesson to be learned is that there are two aspects to purchasing, namely:

- a) efficiency in department administration--cost of operation.
- b) efficiency in purchasing--cost of procurement.

He considers the most satisfactory measurements as those where the two phases are considered separately. He designates them efficiency and proficiency. Of the two he considers the second as the more characteristically related to specific professional skill in procurement, which is the functional purpose of the department. Furthermore he points out that it is the phase which embraces total expenditures and product costs, whereas departmental cost represents only a small percentage of total cost, and of indirect nature. He stresses that in his opinion no really useful purpose is served by trying to force a relationship between the two, much less to measure the greater and more fundamental performance in terms of the minor factor.¹⁵

On the difficulties involved.--Heinritz considers the main difficulty in trying to measure purchasing performance to be the number and nature of the variables involved which

¹⁴Ibid., p. 585.

¹⁵Ibid., p. 586.

he enumerates as follows:

- a) Value of purchased materials may range from 20 to 80 per cent of total product cost.
- b) Organizational structure and responsibilities vary.
- c) Price is a variable.
- d) Inventory policy depends on market conditions.¹⁶

On a system of measurement.--Heinritz states that a system of measurement should focus attention and effort upon performance rather than upon the details of rating; it should conscientiously segregate the factors for which each department is directly responsible, in order that the credits and demerits may be equitably applied.

The end result of purchasing is product cost and the measurement of purchasing performance can logically be based on that consideration. The direct responsibility of the purchasing department is the net cost of product materials up to the point of use. . . . The standard of measurement is standard costs which are in effect a purchase budget . . . it provides a practical and significant basis for the measurement of purchasing performance.¹⁷

Modifying factors.--Heinritz comments that although in many cases the basic rating will be sufficient, there are a number of other factors involved in the complete operation and responsibility of purchasing which affect full evaluation of performance. These he states can be separately considered and the results, properly weighted, applied as a

¹⁶Ibid., p. 586.

¹⁷Ibid., p. 588.

credit or demerit to the rating above. The more important of these he considers as follows:

1. Inventory performance--assuming a carrying charge of 10 per cent, and policy of 60 days' supply--any reduction in necessary amount--say 45 days--would be credited to rating. (Obsolescence, production delays, and extra transportation charges do not lend themselves to quantitative rating.)
2. Quality--demerits for rejects.
3. Savings other than price (value engineering).
4. Administrative cost: he cautions that while effort should be made to keep departmental expenses at a practical minimum, this attitude should not be emphasized to degree that would suggest or encourage going without such activities as research, training, and analysis.¹⁸

The measure of departmental costs, he concludes, should therefore be made against a budgeted standard cost developed by an analysis of activities, the volume of specific operations such as the number of requisitions handled and purchase orders issued, an allowance for incidental functions and special projects, recommendations and budget requests of the department head, and a proportionate share of general administrative overhead. The budget should be liberal enough to include personnel and facilities for carrying on a complete and progressive program of procurement "spending money to save money."

¹⁸Ibid., p. 589.

Summary of plans.--Heinritz summarized his thoughts as follows:

Under such a plan, the total evaluation of purchasing department performance consists of a basic rating on product cost, which is the real test of the department's performance, and 5 modifying factors representing various phases of departmental responsibilities and accomplishment. Three of these factors, inventory ratios, cost of maintenance and supply items, and administrative cost, are measurable on a scale comparable to the basic rating and can be applied directly to that figure by giving them weight commensurate with their importance on a logical mathematical basis. The other two, errors in quality of purchased items and savings due to other causes than price, require a somewhat arbitrary point evaluation in applying them to the scale. The whole calculation can, however, be put in mathematical terms, arriving at a figure which may be either more or less than 100.¹⁹

Besides his own thoughts regarding what he considers the best approach to measuring purchasing performance, Heinritz comments on other techniques including job evaluation and the check point or management audit approach. His comments are summarized below:

On job evaluation.--

It is a workable method and can be applied to all grades of personnel in a purchasing department--however it has serious limitations in that its significance depends entirely on the adequacy of the basic definitions. . . . The greatest values of good purchasing performance as a contributing factor to efficient company operation and profits lie in the superior field of performance that is broadly indicated by the term "proficiency" involving those attributes of imagination and resourcefulness that are outside of any definition.²⁰

¹⁹Ibid., p. 596.

²⁰Ibid., p. 596.

On the check point approach.--

An analysis of this sort giving proper weight to the relative importance of the various points checked, will not provide a numerical rating of efficiency, but it should establish with a reasonable degree of certainty whether the purchasing department is operating satisfactorily in respect to its major responsibilities.²¹

Summary

The literature of the period 1940-1950 is characterized by recommendations calling for greater use of judgment in the purchasing evaluation process. The universal yardstick based on mathematics sought during the 1930's was abandoned by most writers of the 1940's because of their inability to include in it the intangibles of purchasing performance. Emphasis shifted to discussion and development of approaches or techniques of evaluating purchasing performance. The findings of two National Association of Purchasing Agents' committees were made public during this era, both of which stressed the unattainability of a universal yardstick of purchasing performance. The findings also stressed the relationship between a purchasing department's operating cost and its performance. The committee commented that it is necessary to spend money on such functions as materials research to save money (or increase purchasing performance). The era also produced the most comprehensive approach to evaluating purchasing performance, developed by Heinritz,

²¹Ibid., p. 597.

editor of Purchasing Magazine. Heinritz, contrary to the NAPA committee recommendation, suggests an approach based on a materials budget which permits the development of an overall performance index. His main contribution, however, lies in his distinction between purchasing efficiency and purchasing proficiency. He stresses that purchasing efficiency or departmental cost is secondary to purchasing proficiency. The point once again is that one must spend money to save money. He also suggests that the true measure of purchasing performance is end product costs. This era also witnessed the introduction of scientific job analysis and the management audit (check list) approach to evaluating purchasing performance. As will be seen, the management audit approach gains increasing recognition in later years. The contributions of this period by author and year are shown in Figure 15.

Year	Author	Classification of Approach			Basic Concepts
		Quantitative	Qualitative	Combination	
1945	National Association of Purchasing Agents			x	1) Must consider intangible contributions as well as tangible aspects. 2) Evaluation must consequently involve the qualitative as well as the quantitative approach. 3) Favored a cost of production basis for intangibles
1947	National Association of Purchasing Agents			x	1) Cannot measure purchasing performance by a mathematical formula because of intangible contributions of purchasing. 2) Emphasized that it is necessary in purchasing "to spend money to save money."
1947	Heinritz			x	1) Must consider proficiency in purchasing as well as efficiency. 2) Scientific job analysis does not provide a basis to measure the intangible contributions of purchasing. 3) One of the main reasons purchasing is difficult to measure is that every purchasing department is different. 4) The true measure of purchasing performance is product cost. 5. Purchasing proficiency more important than purchasing efficiency.

Figure 15.--Contributions to a philosophy of evaluating purchasing department performance 1940-1950.

Contributions to Purchasing Evaluation
Philosophy of Period 1950-1962

Economic and industrial environment

The essential characteristic of the fifties was increasing prosperity with decreasing profit margins. The sellers' market brought about by the shortage of consumer goods during World War II gradually changed to a buyer's market as pentup demand became satisfied and product supplies increased. Discount operations broke down traditional market markups and manufacturers initially sought solutions through fair trade laws, which eventually proved ineffective because of various court rulings. The necessity to sell one's products again became a reality, and with increasing competition and high taxes business and industry once again began self analysis in an effort to reduce operating and product costs.

The contributions to profit that can be made by an effective purchasing department began to be more generally recognized. Interest in how to evaluate the purchasing function once again increased, with more literature on the subject appearing during this period than in any former like span of years.

Substantial and undesirable duplication would result if all the literature of the period were reviewed in this section. Consequently, the review is limited to significant contributions (new and/or more comprehensive discussion of

old ideas). Other literature of the period is referenced in the footnotes and bibliography.

Stuart Heinritz - 1951

The April and May issues of Purchasing Magazine in 1951 contained articles by Heinritz on the subject of "Measuring Purchasing Performance." The articles cover the subject of why to evaluate, what to evaluate, and how. It is the culmination of Heinritz' thinking on the subject and contains both theoretical and practical subject matter. It is the most comprehensive treatment of the subject to be found in print. The articles are summarized below by subject matter.

Why evaluate purchasing?--Heinritz lists the following objectives of evaluating purchasing:

1. To determine the work load so as to determine personnel requirements.
2. To improve performance.
3. To discover reasonable potentials beyond present performance
4. To determine what the purchasing job is worth.²²

Steps in evaluation.--Regarding the necessary steps in the evaluation process, Heinritz states:

Any program of evaluation implies measurement. One problem thus resolves itself first of all into finding elements of the purchasing job that are capable of measurement . . . the second step is one of interpreting these factors. Once we have

²²Stuart F. Heinritz, "Can't Measure Purchasing," Purchasing (April, 1951), p. 73.

determined what is measurable and what is worth measuring, we can proceed to the establishment of standards or norms.²³

"The general classification of factors to be measured and evaluated should also be considered at this point." Heinritz lists these as

performance in the discharge of the procurement or service responsibilities of purchasing; inventory performance; price performance; departmental administration; cost saving; and various intangibles.²⁴

Heinritz specifies how each of his factors can be evaluated. His major concepts are presented below.²⁵

Evaluation of procurement performance.--Heinritz lists eight measurable criteria available to aid in evaluating performance, namely:

1. Machine down time due to lack of materials. This can be measured in number of instances, in hours, or in cost.
2. Number of schedule revisions necessary due to lack of materials. The actual loss from machine down time has been avoided, but a lack of planning and coordination is indicated.
3. Number of successful substitutions made by purchasing to avoid down-time or schedule revisions. This is one of the few "plus" measurements coming within this classification.

²³Ibid., p. 74.

²⁴Ibid., p. 74.

²⁵Ibid., pp. 74-75.

4. Follow-up action required beyond routine. When exceptional follow-up action becomes necessary to get deliveries, or when the situation applies to an unduly large proportion of orders, it may indicate that the wrong suppliers are being used, or that the importance of prompt delivery is not being sufficiently impressed upon suppliers.

5. Number and amount of premium transportation charges incurred. Too frequent reliance on such premium transportation indicates a condition that needs correction for better purchasing performance.

6. Number of "rush" orders. A large or increasing number of such transactions calls for investigation and remedial action.

7. Number of overdue orders in the open order file.

8. Rejections of deliveries. A substantial number of rejections may indicate wrong suppliers are being selected.

Evaluation of inventory performance.--Inventory, he says, can easily be measured by units or by dollar value. As a matter of performance measurement, however, these figures must be related to other factors. Heinritz lists these factors as:²⁶

1. Forward coverage

From the standpoint of assurance of supply to maintain manufacturing schedules, the important measurement is in terms of time--the coverage for

²⁶Ibid., pp. 75-76.

say 30 days, 60 days, or some other predetermined period of estimated requirements at current rate of use. The length of forward coverage desired is a matter of policy. Purchasing performance would therefore logically be measured in terms of adherence to that policy.

Heinritz comments that there are two or three additional points of importance regarding forward coverage, among these: (1) calculations should be made individually in respect to a selected list of key commodities or to various inventory classifications, (2) forward coverage is accomplished in two ways by the inventory actually on hand and by supply represented by goods in transit or on order. To the extent that adequate coverage may be provided by commitment rather than completed purchase, working capital is conserved and inventory carrying charges avoided. A breakdown of coverage along these lines is measurable and can be very helpful.

2. Cost of forward coverage. Heinritz considers this cost a legitimate business expense, and the inventory protection is assumed to be worth the extra cost provided the latter does not get out of bounds. The measurement and the comparison afforded by successive measurements in following periods are of value in checking the latter point and in directing corrective or control action if indicated.

3. Inventory turnover is "probably the most common measurement of inventory performance. It is a useful criterion, readily measurable and subject to control."²⁷ He

²⁷Ibid., p. 76.

points out, however, that it has serious limitations as a measure of efficiency unless it is keyed to other considerations.

4. Best ordering quantity. Heinritz believes a significant measurement in inventory analysis would be the number or porportion of stock items that are purchased in the "best ordering quantity."

5. Out of stock frequency. This is another criterion which Heinritz feels may reflect either inadequate inventory policy or inadequate purchasing performance. He considers it a measurement worth noting as a guide to corrective action in either field, as may be indicated when the facts are known and analyzed.

Evaluating price performance.--Heinritz indicates that ". . . the problem is to find a proper standard against which prices can be measured."²⁸ Six such standards are suggested:

1. Previous Cost
2. Market Price
3. Market Average
4. Market Price at time of use
5. Published Price Index
6. Standard Cost

Evaluating administrative performance.--Heinritz lists a number of measurable factors that have a specific bearing on the administrative phases of purchasing. Among these are:

1. Cost per order

²⁸

Ibid., p. 76.

2. Work load--such as number of orders issued, the number of sales interviews, number of requisitions processed, and the number of invoices checked. (The primary purpose of having such information is to keep workload and personnel in reasonable balance.)

3. Interviewing time

4. Prompt clearance of orders

5. Cash discounts earned and forfeited.

Cost saving attributed to purchasing.--This is

A criterion readily understood and appreciated by management, and may indeed be the measurement of greatest importance and effect in establishing purchasing as a management function in the company organization . . . to be authoritative, the advantage claimed must be a real saving . . . another way of saying this is that cost-saving purchasing actually engineers basic cost out of product purchased.²⁹

Evaluation of intangibles.--Heinritz recognizes that by definition an intangible cannot be objectively or positively measured, yet he feels that there are certain criterion by which these aspects of purchasing may be evaluated. He lists the following as examples:

1. Does the department have definite and sound policies for purchasing?
2. Does the purchasing executive have the confidence and conviction to support these policies as a part of general company policy?

²⁹Stuart F. Heinritz, "Can't Measuring Purchasing," Part 2, Purchasing (May, 1951), p. 72.

3. Are the policies positively recorded, as in a Policy Manual?
4. Are they clearly understood by all concerned?
5. Is purchasing conducted in accordance with these policies?
6. Does your purchasing department make a constructive contribution to company management?
7. Does it pass along economic, market, and product information to others in the organization who might be affected by such developments?
8. Does it make suggestions as to company policies and schedules and operating methods, new products, and markets?
9. Does the purchasing executive actively participate in trade and professional organizations?³⁰

"These are important questions, but their true significance lies in their evaluation by management rather than by the department head."

Howard T. Lewis - 1952

Lewis expands on his earlier concepts (1933) in his text published in 1953. His more important concepts are summarized below:

Why evaluate?--"The improvement of the department is the only logical objective."³¹

What to evaluate.--"We want to study the department as a whole."³²

³⁰Ibid., pp. 73-74.

³¹Howard T. Lewis, Procurement: Principles and Cases (Homewood, Ill.: Richard D. Irwin, 1952), p. 771.

³²Ibid., p. 771.

How to evaluate.--Lewis comments that the standard must be something practical, concrete, and usable. He considers it futile to attack the problem through statistical formulas or indexes; rather the task is the simpler one of trying to determine by practical means whether one can better the performance of those particular responsibilities that have been assigned to the department by the company's management.

He discusses two different approaches, namely: (1) external-consultant or (2) department head. He states both approaches in the long run seek the same objectives--setting reasonable goals, appraising accomplishment, and establishing means of more nearly approaching these goals. Basically he recommends the management audit approach, utilizing a series of questions to determine the adequacy of policies, procedures, organization structure, etc., and statistical data and reports for gauging operating results. He stresses the use of meaningful reports as a control device for the administrator.

Albert Pleydell - 1953

Pleydell also suggests the management audit or check list approach to evaluating purchasing efficiency. He expresses the opinion that the greatest single difficulty is the absence of any norm or standard against which the purchasing agent can measure his performance. He states that

short of retaining outside help and making extensive detailed outside studies, it is next to impossible for him to rate his performance against what is being done elsewhere or against what he might be doing to achieve maximum effectiveness. He does not believe that the effectiveness of a particular purchasing office can be measured solely against general standards. Instead, all judgments must be made within the limits of a company's policies.³³

Pleydell suggests certain very specific questions that he feels are valuable in making such an appraisal. These fall into two broad categories, professional and administrative:³⁴

Professional

1. Does he get fair prices?
2. Does he have respect of his suppliers?
3. Does he shop around enough?
4. Does he have a good standards program?
5. Does he engage in new product research?
6. Does he visit his sources of supply?
7. Does he get around to see how the materials he purchases are used?
8. Does he maintain adequate records?
9. Does he participate actively in his professional association?
10. Does he keep abreast of new developments?
11. Does he periodically review past transactions for:
 - a) prices?
 - b) volume--price relationship?
 - c) delivery record?
 - d) analysis of "emergency" requisitions by using department?
 - e) general reliability of suppliers?

³³Albert Pleydell, "A Management Consultant Looks at The Purchasing Department," Purchasing (June, 1953), p. 71.

³⁴Ibid., p. 74.

12. Does he have sound inspection procedures?
13. Does he have sound scrap disposal procedures?
14. Does he reduce paper work by combining requisitions, using blanket orders, or other suitable means?

Administrative

1. Is there clear-cut delegation of authority and responsibility within the department?
2. Is the supervision effective?
3. Is the staff well trained?
4. Is morale good?
5. Are the office methods and procedures designed to conserve clerical effort?
6. Is discipline good?
7. Does the work flow smoothly and on schedule?
8. Are the records well kept?

J. H. Westing and I. V. Fine - 1955

These two professors from the University of Wisconsin added their thoughts on the subject of purchasing evaluation in 1955.³⁵ Their comments covered the subjects of (1) the difficulties involved, (2) the objectives of evaluating purchasing, (3) the use of the cost of purchasing as a standard, (4) what should be evaluated, and (5) how the evaluation should be accomplished. A brief review of their concepts is indicated below by subject heading.

On the difficulty of evaluating purchasing performance.--The authors indicate that the purchasing department is one of the more difficult ones to evaluate because, like sales, the purchasing personnel do some of their most

³⁵J. H. Westing and I. V. Fine, Industrial Purchasing, Buying for Industry and Budgetary Institutions (New York: John Wiley and Sons, 1955), pp. 262-275.

effective work for the company in the area of interpersonal relations.

On the objectives of evaluating purchasing.--Two objectives are listed by the authors: (1) to improve performance and (2) to establish an acceptable basis on which to judge the abilities and capacities of the personnel assigned.

On the cost of purchasing.--The authors point out that a survey of 1,000 representative purchasing agents indicated the cost of purchasing of the companies they represented ranged from \$.00083 to 0.095 with an average cost of \$.0154. In percentage terms the range is from less than .01 to 9.5 per cent. They indicated that one can see from these figures that the variation between companies is so great that little would be gained through trying to evaluate the purchasing department of one company by comparing it with that department of another company. They stress that this does not prove that such measures are completely useless, but rather that they must be interpreted with great care. "Even a poor tool is better than no tool at all."³⁶

What is evaluated?--Quality, quantity, price, time, and place are suggested by Westing and Fine. They can be measured as indicated:

1. Quality--measured by number of rejections.
2. Quantity

³⁶Ibid., p. 264.

- a. amount of downtime
 - b. amount of rescheduling due to lack of materials
 - c. number of emergency and rush orders
 - d. extent of forward buying
 - e. inventory turnover
 - f. obsolescence
3. Price
 - a. short term against average long term percentage of product cost
 - b. comparison of price indexes
 4. Time and place--delivery record

Another approach to evaluation mentioned is to analyze performance in terms of specific steps in the purchasing process. For instance, one might consider the total number of purchase orders issued as an indication of the work load of the department. Other factors that might be considered include: number of salesmen interviewed, average time to process an order, relation between company and vendors, and relation with other departments.

How to evaluate?--The best approach to evaluation of purchasing performance in the opinion of these authors seems to be a comparison of the current and past performance within the department of those aspects of the purchasing function that are capable of statistical measurement and the application of executive judgment to the intangibles of purchasing.

Alfred W. Sutter - 1954

Sutter authored a publication of the Small Business administration entitled "Judging Your Purchasing Efficiency."³⁷ The article advocates the "check list" approach and provides a list of 20 pertinent questions. It also includes a table of tangible purchasing factors which permit comparison over a period of years, and a purchasing evaluation chart based on a rating scale concept. The list of questions and the table and chart are contained in Appendix C.

Albert Pleydell - 1956

Pleydell first expressed his concepts on evaluating purchasing performance in an article in the June, 1953, issue of Purchasing magazine. He added to these concepts in 1956 in a pamphlet entitled "Measuring the Efficiency of a Purchasing Department."³⁸ The main contribution of this pamphlet is Pleydell's discussion on the need for caution in the use of various statistical ratios. He points out that

one yardstick after another can be devised to measure purchasing, yet, unless great care is used in interpreting the figures, we can be 100 per cent misled.

Numerical yardsticks should be developed, carefully selected to fit the particular needs of our own buying work. But we have to know what we are doing, not to arrive at conclusions that are contrary to true facts.

³⁷ Alfred W. Sutter, "Judging Your Purchasing Efficiency," Management Aids for Small Business No. 45, March, 1954, Small Business Administration.

³⁸ Pleydell, op. cit., p. 1.

Pleydell suggests the place to start is by measuring status quo and developing a program for gradually correcting found deficiencies. "With a good set of ratios and unit costs developing under our control, can we feel satisfied that we are measuring the efficiency of our buying work? Emphatically no! We are only measuring quantity--there still remains quality."

Pleydell goes on to indicate that the quality aspect is much harder to appraise because so much depends on personal judgment, but although it is difficult, it must still be accomplished. He suggests the use of the check list of questions or the Management Audit Approach.

Pleydell also includes some charts which can be utilized to help gauge purchasing performance. They are included in Appendix B.

Alice Hodnett - 1958

Hodnett of the Atomic Energy Commission discussed an interesting approach regarding the evaluation of purchasing performance in an article in Purchasing Magazine, October 27, 1958.³⁹ She indicated that they use a statistical evaluation program to back up human evaluation. The statistical program is simple and practical. The purchasing agent is measured

³⁹Alice Hodnett, "A Simple Way to Measure Purchasing Efficiency," Purchasing (October 27, 1958), pp. 62-64.

only on factors he can control, and the results provide a basis of comparison.

The Atomic Energy Commission program statistically appraises three areas of procurement activity:

1. Adherence to policy and procedure
2. Utilization of purchasing personnel
3. Price performance

Regarding adherence to policy and procedure, this is determined by studying a cross section of purchase orders and supporting documents for procedural infractions. A chart is used to assign arbitrary weights to common infractions. The weights are totaled and adjusted to a per-hundred-order basis. This figure is then deducted from 100. The result is the rating for this phase of the evaluation. For example, if 200 orders are examined and found to have procedural infractions whose weights add up to 4.5, the grade would be calculated as follows:

Total weight of infractions = 4.5

Equivalent weight per 100 = 2.25

Rating = $100 - 2.25 = 97.75$

This rating can be compared to the purchasing agent's past performance and to the performance of other purchasing agents.

Personnel efficiency is measured by the man hours required per purchase transaction. The manhour utilization figure serves many purposes.

If the figure is high, there may be too many people in the purchasing department, or their efficiency may not be up to standard. A low figure combined with sub-standard performance in adherence to procedures would indicate insufficient personnel. The man hour utilization figure also can be used to forecast staffing requirements.⁴⁰

Additional information is developed to aid in analyzing the manpower figure. This includes the ratio of requisitions received to purchase orders issued, backlog of requisitions, an estimate of the average number of items per purchase order and a breakdown of orders into dollar categories (see Figure 16).

Price performance.--The objective is to see if the purchasing agent is getting reasonable prices on routine purchases.

To do this purchases are selected at random from among items having a high use rate or high unit cost. Comparative prices are then obtained on these items, duplicating as far as possible conditions prevailing during the contractor's purchase, or a check, is made against established commodity price indices--a check on prices may indicate that the purchasing agent is lax in testing the market, or that he just isn't aware of more economical sources. The results of this evaluation give a good over-all picture of a purchasing agent's department.⁴¹

Hodnett points out that statistical measures do not reflect the creative efforts of the purchasing agent. This may be evidenced by his influence over procurement policy, his judgment in value analysis, and his ingenuity in effecting savings. Accomplishments in these areas lend perspec-

⁴⁰Ibid., p. 62.

⁴¹Ibid., p. 64.

Utilization of Purchasing Personnel

Month	Number Workdays	Number Persons	Purchasing Man-Hours	Number Purchase Transactions	Average Man-Hours per Purchase Transaction Processed
1956					
July	21	23	3864	1657	2.33
Aug.	23	22	4048	1561	2.59
Sep.	19	21	3192	1360	2.35
Nov.	23	22	4048	1529	2.48
Dec.	19	21	3192	1486	2.15
1957					
Jan.	22	22	3872	1924	2.01
Feb.	19	22	3344	1812	1.84
Mar.	21	22	3696	1961	1.88
Apr.	22	22	3872	1956	1.98
May	22	22	3872	1849	2.09
June	20	22	3520	1784	1.97
July	22	21	4596	1974	2.33
Aug.	22	21	4596	1744	2.63
Sep.	20	20	3200	1523	2.10
Oct.	23	20	3680	1717	2.14
Nov.	19	19	2888	1632	1.77
Dec.	21	19	3192	1654	1.93

Here are the results of a manhour utilization study made by the AEC. It relates monthly manhours of purchasing personnel to the number of purchasing transactions completed.

Figure 16.--From "A Simple Way of Measure Purchasing Efficiency" by Alice Hodnett, Purchasing (October 27, 1958), p. 62.

tive to the results of the statistical data and must also be recognized (see Figure 17).

Price Performance

<u>Purchase Order No.</u>	<u>Item</u>	<u>Price Paid</u>	<u>Test Price</u>
64149	Wire, Thermocouple	\$.145/ft. less 10%	Same
40273	Diodie, Crystal	\$ 1.34/each	1.10
(Blanket)			
92475	Blades, Hacksaw, Molybdenum	\$47.64/C	42.60/C
52516	Bottle, Polyethylene	\$21.00/gross	14.40/gr. 56.80/M
27049	Argon	\$35.00/cyl.	Same
62108	Acetone	.45/lb.	Same
39984	Grease	\$14.80/oz.	Same
74614	Tubing, Rubber	\$ 7.39/C. ft.	10.00/C.ft.

This table gives the results of a price performance study made by the AEC. It shows how check prices on certain items compare with prices actually paid for the items.

Figure 17.--From "A Simple Way to Measure Purchasing Efficiency" by Alice Hodnett, Purchasing (October 27, 1958), p. 63.

Dean Ammer

Ammer, a highly regarded authority in purchasing added his contribution to the literature on measuring purchasing performance in an article in Purchasing magazine in October, 1958.⁴² His more important concepts are summarized below.

Approach to measuring performance.--Ammer comments that it should be easy to measure purchasing performance. There are really just four basic steps:

1. Define the limits of the purchasing job.
2. Determine the desired objectives to be achieved within these limits.

⁴²Dean Ammer, "How to Measure Purchasing Performance," Purchasing (October 27, 1958), p. 59.

3. Develop a program to meet these objectives.

4. Compare progress on the program with objectives.

He concludes, however, that unfortunately, it is far from easy to put these relatively simple theoretical principles into practice.

Need for objectives.--Ammer stresses the need to establish departmental objectives; he references the objectives of a medium-sized metal working company as an example of the type of objectives a purchasing department might set. They are:⁴³

1. Low prices for purchased materials and services.

2. High inventory turnover.

3. More than adequate quality of purchased materials and services.

4. Delivery of purchased materials in sufficient time to insure uninterrupted operation of production lines.

5. Good records.

6. Favorable relations with supply sources.

7. Low cost of acquisition and possession of materials.

8. Low payroll costs.

9. Development of qualified purchasing personnel.

10. Sound policies on reciprocity.

Ammer again stresses the fact that achievement of any one objective brings sacrifices in the achievement of other

⁴³Ibid., p. 61.

purchasing objectives. This, he points out, is the major reason it is hard to measure purchasing performance. "Purchasing is a job requiring considerable judgment, it takes judgment to evaluate it."⁴⁴

The article concludes with comments on the more commonly used techniques, materials and personnel budgets, price indexes, tabulations of vendor quality and delivery performance, cost reduction reports, internal audits and various status reports.⁴⁵

Raymond P. Snow

Snow, in conjunction with Engle and Mansfield, shared editorship of a chapter on evaluating purchasing performance in Aljian's Purchasing Handbook.⁴⁶ The chapter covers two areas: (1) measurement by individuals or groups outside of the purchasing department and (2) measurement by purchasing personnel. The chapter contains discussion on the importance and role of performance measurement. It presents a good synopsis of prevailing thought on the subject as well as a check list of questions for analysis of the intangible aspects of purchasing and list of 16 possible charts and graphs that can aid in measuring performance.

⁴⁴Ibid., p. 61.

⁴⁵Ibid., p. 61.

⁴⁶George W. Aljian, Purchasing Handbook (New York: McGraw-Hill, 1958), pp. 23-22.

Petersen - 1959

Petersen discusses the use of ratio-delay or work sampling as a tool in measuring purchasing performance. This is the first reference the writer found in print regarding the use of this tool in purchasing evaluation. Petersen indicates that Northrop utilizes work sampling techniques to gauge pace of workers.⁴⁷ Through the use of the following formula and a chart, a rate is determined and plotted for control purposes.

$$\% \text{ PACE} = \frac{(\# \text{ assigned} + \text{loans} - \text{idle \& out of area} \times \text{effort rate})}{\# \text{ assigned} + \text{loans} - \text{out-or-area}}$$

PACE, then is a measure of the diligence employees are putting into their jobs. This input must be correlated with output in order to get some indication of how efficiently the humane resources are being utilized. So, along with the PACE line, Petersen staff charts certain output or performance indices:

Personnel Index--ratio of current department population with a base period.

Budget Realization Index--computed by comparing the actual hours spent in a task and the number of hours that had been budgeted previously for the task.

Schedule Index--ratio of actual production to scheduled production.

⁴⁷Petersen, "Work Sampling Gages Purchase Performance," Purchasing (May 4, 1959), p.

Quality Index--established from a formula developed by the Quality Control department.

These indices help gauge purchasing performance, and are based primarily on manpower standards developed by work measurement techniques.

Arthur Cook - 1960

General Electric's Purchasing Service organization initiated a study of methods of measuring purchasing performance in 1958. In December, 1960, it published a bulletin which incorporated the results of the study.⁴⁷

The report suggests that by measuring the four basic purchasing responsibilities namely, price, time, quality and quantity, one measures the over-all purchasing performance. It suggests that each of these four basic responsibilities is itself, a composite of various measurements. For example, four measures of price performance might be the following:

1. Target price of items ordered compared with the actual price of items purchased.
2. Budgeted buying expense compared with actual buying expense.
3. Cost reduction compared with total purchasing expense.

⁴⁸Arthur Cook, "A New Look At Purchasing Measurement," Purchasing Service Division, General Electric Company, December, 1960.

4. Number of items purchased compared with number of buying hours.

Cook suggests that data like that in Figure 18 be used to compare performance on individual price objectives in order to get a composite measure of price performance. As seen in Figure 19, each of the ratios is then plotted in one of the four sides of a matrix. The points plotted in each of the four sides are then connected by lines as indicated. Performance is measured by the point at which the two lines intersect. The matrix and ratios are devised so that performance gets better and better as the point moves towards the upper right-hand corner of the chart. Performance is measured by erecting a perpendicular line from diagonal (dashed) "performance line" to the point of intersection.

In Figure 19, the performance is "71." This figure is meaningless except in comparison with previous performance. The beauty of the system is that the chart shows where purchasing has been weakest, i.e., where the point on the side of the matrix is furthest to the left or the bottom.

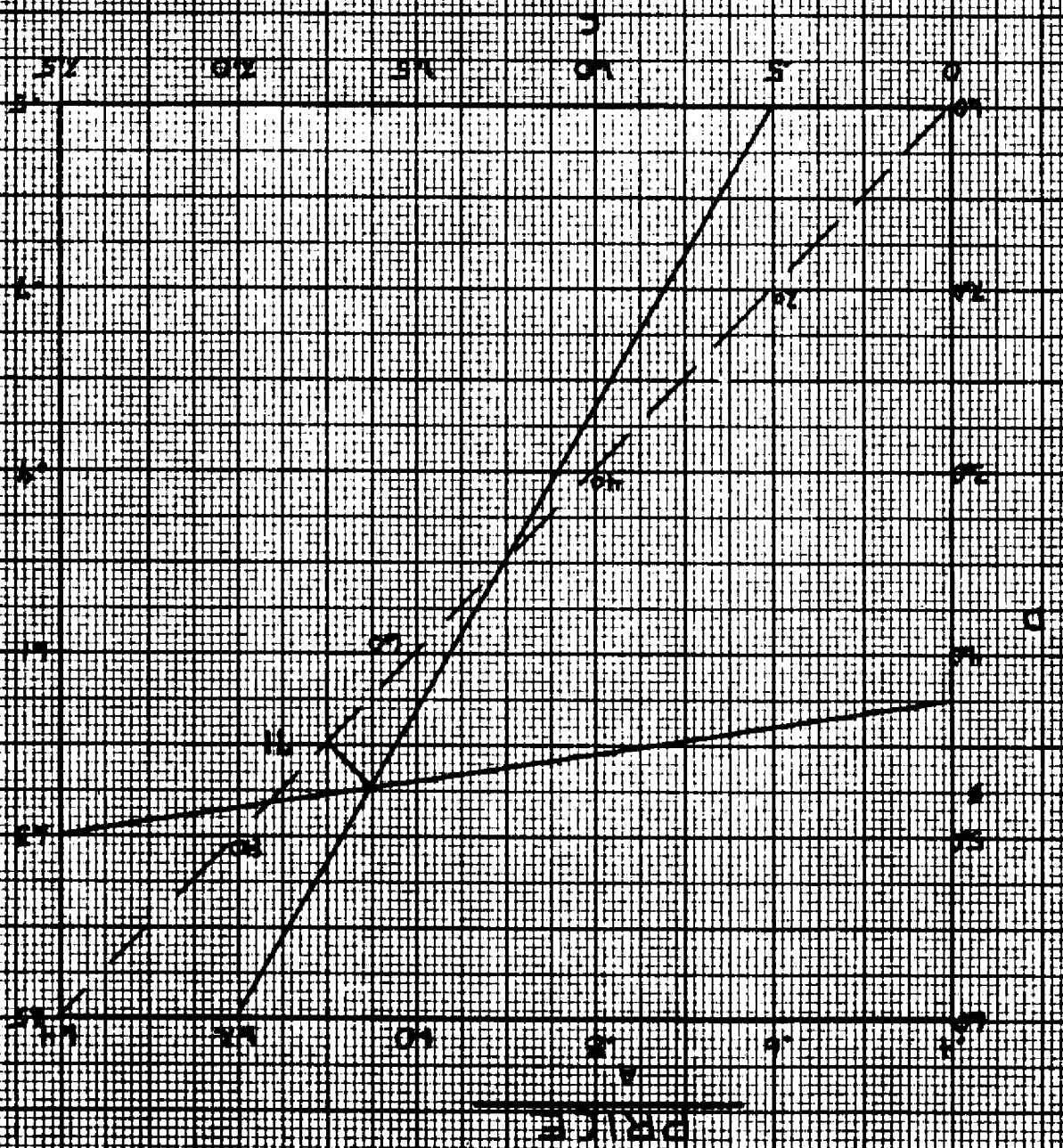
In the example, performance is weakest on factor "C": the ratio of price achievements to actual total purchasing expense. The system is extremely flexible. Each user sets his own standards. (Purchasing Measurement Worksheet in Appendix B indicates the factors used for quantity, quality, and time.)

FOUR FACTORS OF PRICE

Factors	Measurement Periods		
	\$ Volume Qty	Converted Ratio	
A	Target price of Items Ordered	\$62,000	1.2
	Total Price of Items Purchased	\$52,000	
B	Budgeted Buying Expense	\$ 4,000	1.3
	Actual Buying Expense	\$ 3,200	
C	Price Achievements	\$ 3,200	.4
	Total Purchasing Expense	\$ 8,000	
D	Number of Items Purchased	\$ 1,350	4.5
	Number of Buying Hours	\$ 300	

Figure 18.--Four Factors of Price, by Arthur Cook, from his A New Look at Purchasing Measurement (General Electric: December, 1960).

FIGURE 2B - PRICE WATER BY
ARTHUR COOK FROM HIS NEW YORK AT
DURING MEASUREMENT OF GREEN
ELECTRIC, DECEMBER 1901



100

A composite chart to measure over-all performance can be constructed so that on its four sides are plotted price, time, quality, and quantity performance. The result is a chart like that shown below in Figure 20.

In discussing his plan Mr. Cook stresses that the plan does not establish standards of performance for you; it does, however, permit you to set your own levels of acceptable performance and to measure progress from that level.

Victor H. Pooler, Jr. - 1960

Pooler suggests the use of graphs to control purchasing performance.⁴⁹ He states that although a single yardstick which can be used to evaluate all purchasing departments is not available, there are year-to-year variations within a given department that can be utilized as indicators of purchasing efficiency. Pooler refers to these as Indicators of Purchasing Efficiency or IPE's.

The first step in developing IPE's is to collect all readily available pertinent facts. The data he considers the purchasing officer should utilize are shown in Figure 21. He suggests comparing them over at least a five year period-- longer if possible. He recommends that the list be used as a starting point and that one remove or add certain factors according to individual requirements. Simple graphs can be

⁴⁹Victor H. Pooler, Jr., "Indicators of Purchasing Efficiency," Purchasing (January 18, 1960), p. 75.

PERFORMANCE

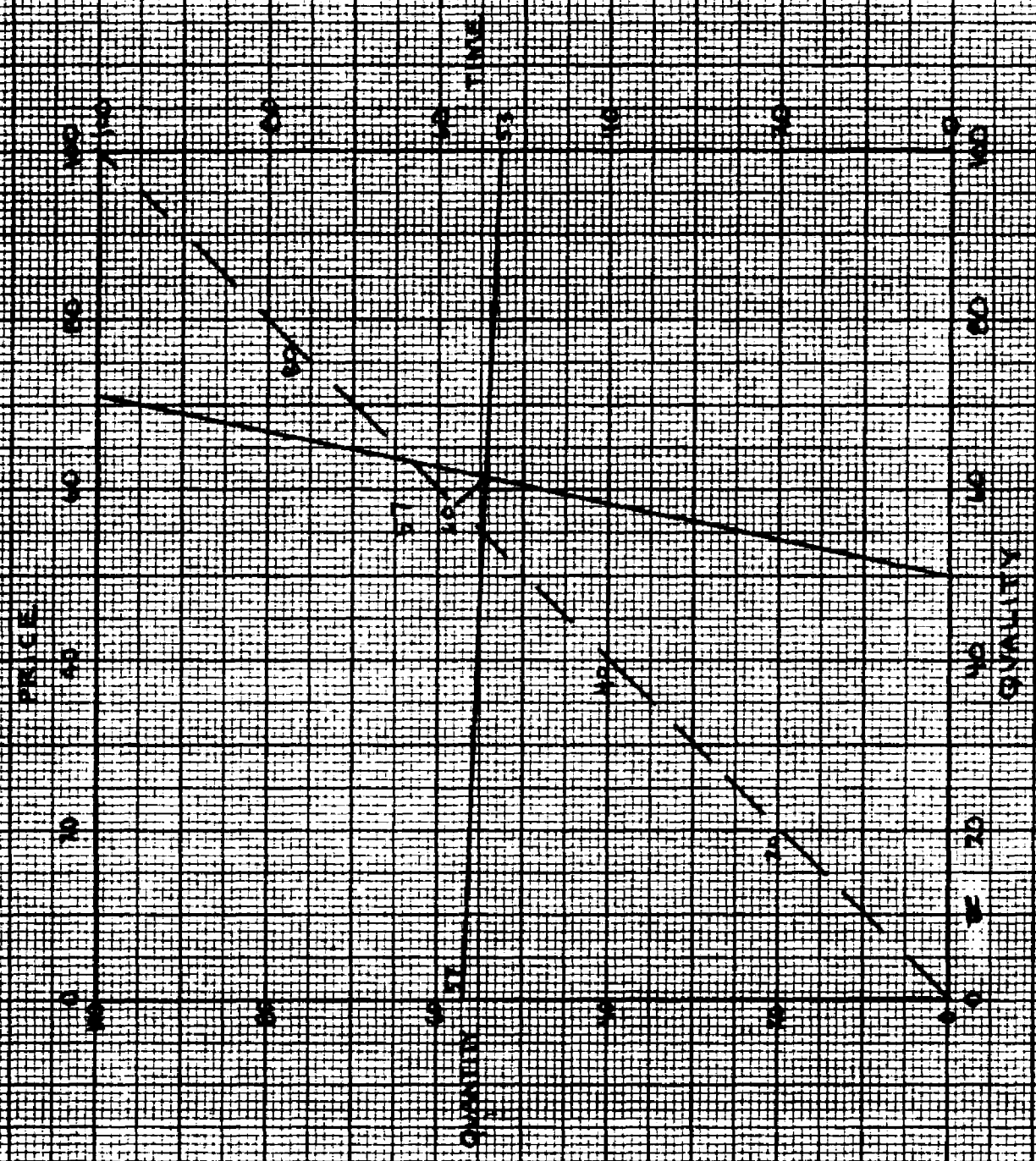


FIGURE 24 - OVERSAMPLING PERFORMANCE
 PERFORMANCE BY ARTISE LOOK FROM ALL
 PAMPHLET - A NEW LOOK AT PURCHASING
 PERFORMANCE (GENERAL ELECTRIC)
 DECEMBER 70; 1169

DATA CHART FOR DETERMINING
INDICATORS OF PURCHASING EFFICIENCY

NO.	FACTOR	HOW DERIVED	YEAR				
			1955	1956	1957	1958	1959
1	\$ PURCHASES PER YEAR (MILLIONS)		12.4	16.6	20.4	16.8	18.0
2	\$ SALES PER YEAR (MILLIONS)		24.3	33.0	41.3	33.6	33.7
3	\$ PURCHASES / \$ SALES (%)	FACTORS No. 1 + No. 2	51.0	50.2	49.0	50.0	50.3
4	PURCHASE ORDERS ISSUED PER YEAR		24,909	25,530	25,655	26,220	26,000
5	AVERAGE NUMBER OF PURCHASING EMPLOYEES		19	23	23	24	22
6	RATIO OF PURCHASING TOTAL EMPLOYEES		1/124	1/122	1/126	1/131	1/146
7	P.O. PER PURCHASING EMPLOYEE PER WEEK	4 + 5 (x 52)	25.1	21.4	19.8	21.0	22.7
8	\$ PURCHASES PER PURCHASING EMPLOYEE PER YEAR	1 + 5	653,000	722,000	816,000	700,000	819,000
9	AVERAGE \$ VALUE PER PURCHASE ORDER	1 + 4	500	650	793	640	691
10	PURCHASING EMPLOYEE PER \$ MILLION PURCHASES	5 + 1	1.53	.90	1.22	1.43	1.22
11	COST OF PURCHASING PER YR.		120,000	140,500	153,500	150,000	152,000
12	\$ COST PER PURCHASE ORDER	11 + 4	4.83	5.49	5.97	5.73	5.83
13	COST OF PURCHASING % OF PURCHASES	11 + 1	.097	.085	.075	.089	.085
14	COST OF PURCHASING % OF SALES	11 + 2	.0495	.0428	.037	.0446	.043
15	\$ SAVED PER YEAR		125,200	127,000	321,000	353,000	295,000
16	\$ SAVED / \$ PURCHASES (%)	15 + 1	1.01	0.77	1.58	2.10	1.64
17	INTERVIEWS PER WEEK		235	217	296	214	225
18	TELEPHONE EXPENSES PER MONTH		265	326	369	351	300
19	PURCHASES MATERIAL PRICE INDEX	% INCREASE (1949 = 100)	30.1	31.2	35.3	30.1	61.0
20	DIRECT LABOR \$ (MILLIONS)		1.82	2.07	2.09	2.15	2.24
21	RATIO OF PURCHASES DIR. LABOR \$		6.9	8.0	9.0	7.0	8.0
/eb							

Dollar figures used in this chart, while hypothetical, are sufficiently accurate to demonstrate the IPB system. Numbers in "How Derived" column refer to the factors listed in the second column.

prepared from this data to highlight trends pictorially. The graphs indicate weekly whether you are maintaining a level of performance or getting less efficient (see Figure 22). These indicators highlight what should be examined closely--not what is correctly or definitely wrong. An analysis may prove that the question raised by the IPE is fully justifiable.

Certainly, these graphs won't solve all your problems. There is no way of predicting how your company's statistics would chart and what IPE's would be evident. But one thing is certain. No one could know more about your operations, for what else remains that can be reduced to figures? The rest is the art of buying in which factors like personality, integrity and intelligence are extremely important. These can never be charted.⁵⁰

Dean Ammer - 1961

Ammer, executive editor of Purchasing Magazine, discusses the use of a "new" tool for measuring purchasing activity--working sampling. He mentions that more and more purchasing directors are turning to this industrial engineering technique to find out what goes on in their departments. He explains work sampling as follows:

Hundreds of different observations are made of various workers and from the data it is possible to calculate how each worker divides his time. For example, a work sampling study might show that at 10:02 a buyer was talking on the telephone; at 11:06, he was talking to a supplier; at 2:35 he was out of the office, and so on. After making hundreds of observations, it would

⁵⁰Ibid., p. 76.

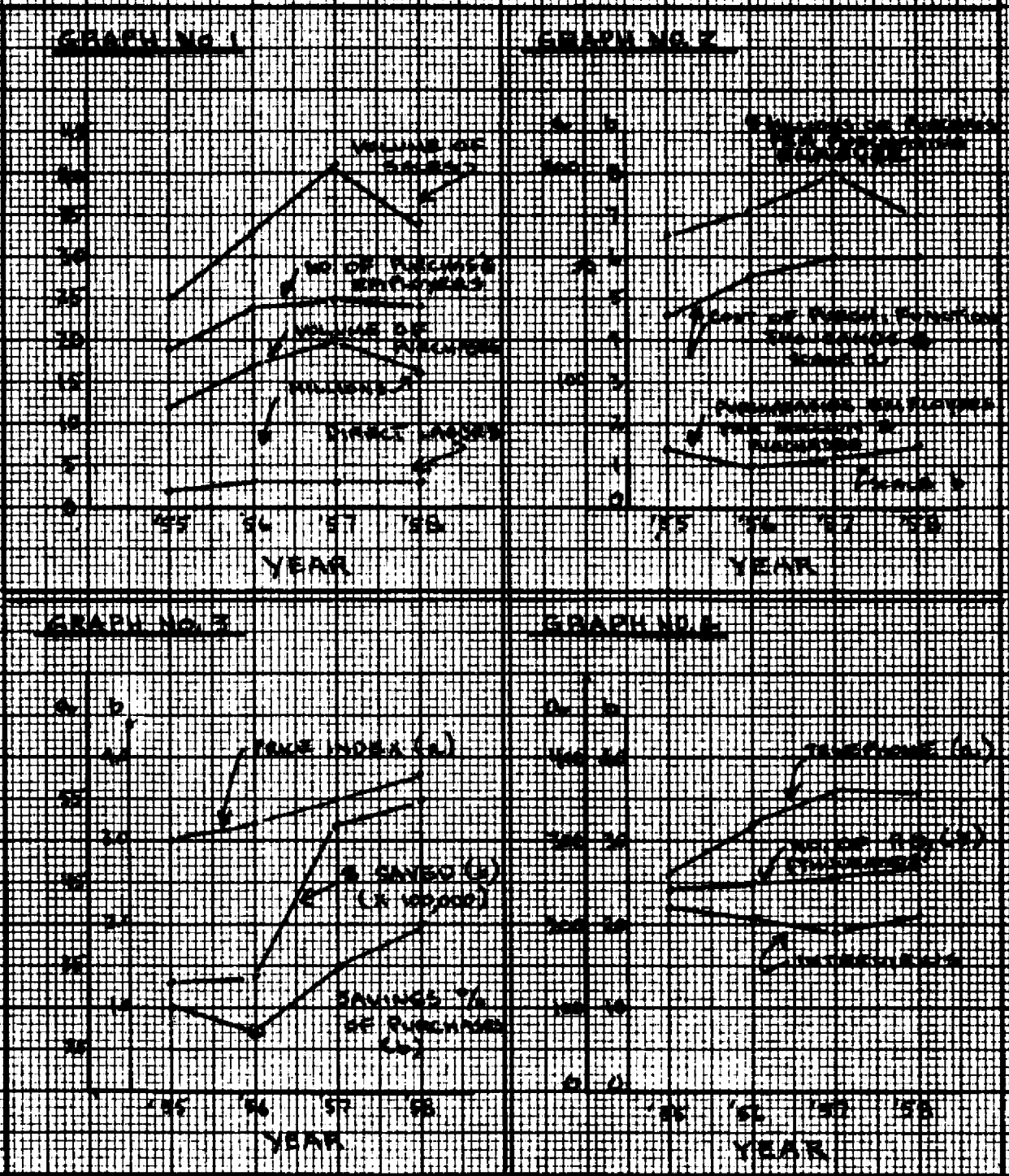


FIGURE 22 - INDICATORS OF PURCHASING EFFICIENCY (I.P.E.) BY V. W. POOLER 'INDICATORS OF PURCHASING EFFICIENCY', PURCHASING, JANUARY 6, 1958, P. 24

be possible to determine the average percentage of his working time that a buyer devotes to each basic activity. A typical study might show that a buyer spends his time this way [Figure 23].⁵¹

	<u>Per Cent</u>	<u>Number of Observations</u>
Talking to suppliers in office	12	1200
Talking to other purchasing personnel	5	500
Talking to other company personnel in office	5	500
Writing	38	3800
Talking on telephone	15	1500
No apparent activity	8	800
Out of office	11	1100
Out of building	6	600

Figure 23.--Work Distribution Data.

You study this data and note that the buyer spends remarkably little time out of the building visiting suppliers. He also spends a tremendous amount of time on paper work. In fact he spends more time "writing" than he does talking with suppliers on the telephone, talking to them in his office, or visiting supplier plants.

Ammer points out that this is a clear case of misapplication of effort, the buyer is not being paid to perform clerical functions. Additional clerical help should be provided. Some of the problems which work sampling can help solve are

1. Manpower planning,
2. The most economical method of operation,
3. Work distribution analysis,
4. Office standards.

⁵¹Dean Ammer, "How to Measure Purchasing Activity," Purchasing (September 25, 1961), pp. 89-91.

He concludes by saying:

Work sampling can be invaluable in improving purchasing administration and planning and it can suggest methods improvements. Unlike time studies, which require expert standards engineers, work sampling can be a do-it-yourself project. All you need are some forms and a list of random numbers.⁵²

Air Force System Command - 1962

The Air Force System Command as part of its continuing effort to improve contractor performance initiated rating teams in 1961. The teams utilize Air Force Systems Command Manual 70-3 which outlines the Air Force's approach to Evaluating the Purchasing Function⁵³ A brief summary is given below with quotes and discussion:

Objective: The objective of the review is to provide a means for evaluating the efficiency and effectiveness with which contractors spend Air Force Funds.

The Purchasing system review is a complete, intensive investigation and analysis of a contractor's purchasing system to determine the degree of confidence that may be placed in it.⁵⁴

The review is essentially a management audit approach covering

1. Corporate background and purchasing organization,
2. Policies and procedures,
3. Processing the purchase,

⁵²Ibid., p. 91.

⁵³The Purchasing System Review, Air Force System Common Manual 70-3, dated January 2, 1962.

⁵⁴Ibid., p. 2.

4. Selecting the source,
5. Pricing,
6. Subcontract administration and purchase-order expediting and follow-up,
7. Inventory control,
8. Management and coordination of the purchasing function.

Technique

The review is based on an analysis of all pertinent data regarding the above referenced areas. Use is made of sampling techniques to limit the workload, particularly in the area of Purchase Order Review.

The first step in the review is the accumulation of specific relevant data including but not limited to the following:

1. Organization chart of company--down to first level department head.
2. Organization chart of purchasing--down to the first level of supervisor.
3. Copies of the contractor's purchasing policy statement(s).
4. Copies of the contractor's purchasing procedures.
5. Copies of all important purchasing forms.
6. Summary of the most recent year's purchasing activity; this should include
 - a. Number of purchase orders placed,

- b. Dollar value of purchases,
 - c. Dollar value of and number of purchase orders to small business,
 - d. The number of purchase orders with subcontracts:
 - under \$100 in value,
 - between \$100 and \$1,000 in value,
 - between 1,000 and 5,000 in value,
 - between 5,000 and 10,000 in value,
 - between 10,000 and 25,000 in value,
 - above 25,000 in value.
 - e. Volume, number and dollar value of purchase order changes.
 - f. A breakdown between competitive and single-bid purchases.
7. Summary of the previous year's sales volume.
8. List of major products--name, face value, undelivered dollar balance.
9. List of major subcontracts and/or high-dollar purchase orders currently outstanding, showing vendor, item being produced, type of contract, dollar amount at face value, and undelivered dollar balance.
10. Copies of one or two of the contractor's major Air Force prime contracts.
11. Copies of management reports, such as shortage reports, weekly or monthly work load and work backlog reports, scrap/salvage reports, etc.

The above data are analyzed and supplemented by interviews with various purchasing personnel, including the director, department heads, and individual buyers. Each of the areas specified above is thoroughly analyzed. An example of the approach suggested is given below for Purchasing Organization and Purchasing Policies and procedures.

1. Purchasing organization

Management's attitude toward purchasing: is a most important area of the purchase review. Top management's failure to understand the importance of the purchasing function will almost certainly result in poor purchasing performance . . . top management must pay more than lip service to the purchasing function; it must know and understand the policies and practices of its purchasing organization, the companies that the purchasing department deals with on major procurements, how and why these companies were selected for awards, and, in general, how the vendors and subcontractors are performing. It must also be responsive to purchasing's problems, reading purchasing reports that merit its attention. . . . It follows logically then that the director of purchases should be a member of the top management team. He should report direct to the chief executive.

2. Organization structure

The organizational alignment should reflect the nature and scope of the purchasing task. . . . However, the buying function is organized (project, commodity, etc.) the division of responsibility among the several sections must be clearly defined and the numbers of personnel assigned to each adequate but not excessive.

3. Written policies and procedures

The following questions are suggested for evaluating this area:

a. Are they clearly stated and is their applicability clear? For example are procedures for complex subcontracting differentiated from those

for purchasing standard commercial items. . . .? Have the significant differences between research and development and production procurement been recognized?

b. Are they distributed and maintained at the locations where they are needed and in sufficient quantity for practical use?

c. Are the policies and procedures understood? Do purchasing personnel and others affected have confidence in them? Are the written policies and procedures referred to and followed?

Regarding forms

a. Are forms consistent with written policies and procedures and with each other?

b. Is the right type of form being used? Is it really needed? Are other forms needed to make or administer purchases or for purposes of record-keeping and management control?

c. Is the design of the form suitable? Does it convey the needed information in a logical sequence of presentation? Is the form simple and at the same time complete?

d. Do the contractor's personnel know how to use the forms properly?

e. Is there unnecessary duplication of paperwork?

NAPA Booklet on purchasing performance

There is presently in preparation by the National Association of Purchasing Agents a booklet on evaluating purchasing performance. It is being prepared by a committee headed by Pearson. Basically the booklet covers three areas: (1) Purchasing Climate, (2) Procurement Planning Goals, and (3) Controlling to these goals.

It discusses the importance of evaluating "against the background of the purchasing climate in which the function is performed." The tentative outline of the pamphlet is shown in Appendix C.

International Business Machines
computer program for industrial
purchasing

International Business Machines is utilizing a computer program to evaluate purchasing performance at its Endicott General Products Division Purchasing Function.⁵⁵ The basis of the program is the computation of a price index which shows the net result of all factors influencing the purchase price, which by reason code analysis, explains the degree of price change of the various influencing factors. After the development of a price index, quality and delivery indexes are also computed.

Because we intend to establish a total composite index number of the three variables, it is necessary to determine a percentage relationship among the three. A management survey indicated that the following weights should be used:

- a. Price = 50%
- b. Quality = 30%
- c. Delivery = 20%

The weights are naturally subjected to varying influences and to changing economic and policy decisions which confront most purchasing operations. As such, they should be reviewed frequently to make necessary adjustment. Individual indexes for price, quality and delivery are computed separately for each of the following categories:

- a. Total selected parts
- b. Departments
- c. Suppliers
- d. Commodities
- e. Products
- f. Buyers

With the weights established for price, quality and delivery a composite index number is completed for all items in the separate categories . . . furthermore, the index report will convert the price index

⁵⁵"Purchasing Operating System and Management Controls," IBM Technical Report, Document 20.0059, GPD Purchasing Function, Endicott, New York, August, 1962, pp. 37-66.

into a plus or minus dollar variance as compared to the total base dollar. This figure represents the net dollar change of all factors that have influenced prices for the selected parts. Coupled with an analysis of why prices changed . . . the variance indicates the degree of purchasing profit performance for the report period as compared to predetermined economic targets.

The indexes measure price, quality and delivery performance for the present period as compared to the previous year. Thus they are relative measures and not absolute. In other words, a vendor could have a delivery index of 100 per cent and a quality index of 100 per cent even though his average delivery performance is 15 days late for this year and for the previous year and his quality was equally unacceptable in both periods. Therefore, absolute as well as relative measures should be considered in evaluation.⁵⁶

By measuring price, quality, and delivery for the selected inventory part numbers, representing over 85 per cent of the purchasing dollar expenditures for the previous year, the following benefits are realized:

a. The data identify purchase areas such as commodities, buyers, departments, products, and vendors that reflect adverse index variance from the previous years' purchase order activity for the inventory part number being analyzed.

b. The quarterly reports prepared for this program provide price trends on all six areas being measured.

c. The system develops an aggregate net index on selected inventory parts purchased on the base year.

d. The data provide indicators for areas representing the greatest cost reduction potential

⁵⁶Ibid., p. 50.

e. It aids in the purchasing evaluation program.

f. It explains areas and degree of total cost increases. The detail buyer report cost increase--reason code analysis and the quarterly summary report are shown in Figures 24 and 25 and 26.

Summary

Interest in controlling and thus evaluating the purchasing department gained impetus during the period 1950 to 1962. This renewed interest resulted from the increased cost consciousness caused by dwindling profit margins and high corporate taxes. The fact that substantial contributions to profit could be made by an effective purchasing department began to be more generally recognized.

Substantial contributions were made to the development of a philosophy of evaluating purchasing performance by Heinritz, Lewis, Ammer and others. The concept that many of the contributions of purchasing are intangible and consequently not measurable quantitatively became widely accepted. The acceptance of this concept led most of the writers of this era to recommend a combination of quantitative and qualitative techniques to evaluate over-all purchasing performance. It was generally agreed that the evaluation of a purchasing department must be accomplished on an individual department basis.

Cost Increase--Reason Code Analysis as of 09/30/00

Total Base Dollars = \$65,000,000
 Parts = 38500

Reason Code	Identity	No. Parts	Base Dollars $P_0 \times Q_0$	Curr. Dollars $P_m \times Q_0$	Variance $P_n Q_0 - P_n Q_0$	% of Total Base Dollars
0	Source Code	172	3,695,790	3,714,265	18,475	.03
1	Labor and Material	15	100,907	106,307	5,130	.01
2	Learning Curve	33	305,806	351,802	45,996	.07
3	Negotiation	435	17,508,449	14,008,505	3,499,944--	4.99--
4	Eng. Change	83	1,692,906	1,649,201	43,705--	.06--
5	Qty. Increase	286	2,122,877	1,983,906	138,971--	.20
6	Qty. Decrease	179	1,034,797	1,183,967	149,170--	.21
7	Supplier Change	89	2,258,291	2,063,411	194,880--	.28
8	Quality	8	176,871	214,540	37,669	.05
9	Delivery	9	87,943	77,803	10,140--	.01--
		1,309	28,984,637	25,353,437	3,631,200--	5.18

Figure 24.--Reason Code Analysis from "Purchasing Operating System and Management Controls," IBM Technical Report Document 20.059, G.P.D. Purchasing Function, Endicott, New York, August, 1962, p. 62.

Report Period

Quarterly Purchase Index Report As of 09/30/69										
Items By Parts	Identity	Price Index	Qual. Index	Vol. Index	Total Index	Shrink Dollars	Dollar Variance	No. of Parts		
	Contract Purch.	93.11	96.39	96.30	94.70	23,000,000	1,161,300	130		
	Tool & Equip. Purch.	90.30	97.30	83.53	91.40	10,000,000	840,000	430		
	General Purch.	91.33	94.39	90.70	93.30	33,000,000	2,000,000	3100		
								<u>2030</u>		
AIRBORNE										
112370	Jan. Electronic	73.44	94.03	70.26	82.10	2,300,444	500,339	94		
130710	Feb. Tool	94.49	93.36	103.00	94.30	3,120,000	1,300,000	171		
200040	Mkt. Industr.	90.30	99.30	96.30	97.90	1,000,000	340,000	70		
200140	Apr. Building	107.07	90.00	90.30	102.30	1,093,003	70,410	101		
402030	May Machin.	90.36	97.36	93.03	97.12	1,774,000	354,000	130		
630030	June Induct.	93.02	97.00	101.00	96.00	3,530,000	230,300	194		
								<u>772</u>		
COMMODITIES										
010	Alum. Mta Cargo.	90.44	99.20	93.03	90.17	1,270,000	240,000	63		
230	Plastic Building	100.93	90.76	83.30	90.79	2,100,000	10,930-	103		
020	Capitula	94.12	94.33	93.57	94.13	3,377,000	214,000	40		
030	Boilers	99.01	91.66	80.34	94.66	2,700,000	37,000	130		
077	Sheet Mtl. Convrs	90.37	94.31	109.30	99.30	3,100,000	64,300	202		
919	Assemblies	99.32	101.03	84.32	94.97	1,313,400	6,300	91		
								<u>877</u>		
PRODUCT GR00										
03	MS	92.64	94.35	97.00	94.30	12,000,000	640,000	504		
09	1403	97.05	90.30	74.66	93.34	4,700,000	94,000	130		
73	1401	94.27	93.03	101.00	93.70	3,515,000	190,000	330		
74	004	97.18	90.71	90.00	97.30	2,300,000	64,000	229		
76	100	99.10	99.30	92.00	97.60	2,130,000	21,300	194		
78	1310	93.40	90.00	100.00	93.30	1,700,000	102,000	207		
								<u>1702</u>		
MTR000										
00	Smith, G.	93.50	97.00	72.04	90.72	7,000,000	430,000	207		
00	Wardley, W.	04.18	97.01	97.49	90.94	2,000,000	300,000	100		
04	HEMER, G.	104.30	99.52	70.04	97.61	0,000,000	330,000-	200		
00	Jones, A.	94.30	94.02	03.00	93.00	3,000,000	300,000	240		
1A	Pollock, E.	03.03	93.09	104.35	91.30	6,000,000	940,000	240		
2A	Harvey, V.	100.00	99.75	97.00	99.40	4,000,000	0	210		
								<u>1497</u>		

Figure 25--Quarterly Purchase Index Report From "Purchasing Operating System and Measurement Controls," IBM Statistical Report Summary 20,0007, GPO Publishing Function, Bethesda, Md Tech, August 1967, p. 03.

Report Format

Buyer Price Index As of 09/30/00

PRC CHRT	TOTAL PARTS	PART NO.	VENDOR NAME	BT CD	FR CD	MAT CD	ISM CD	BASE PRICE	CREDIT PRICE	PRICE RATIO
100.00 and Under	100									
100.01-105.99	33	203203	Feb. Tool Co.	GT	74	077	344	3.982	3.114	101.17
105.00-110.99	24	207401	May Machining	GT	33	077	69	11.307	12.500	109.77
111.00-120.99	20	474333	Oct. Mfg. Co.	GT	01	077	0	6.657	5.399	115.93
121.00 and Over	24	132374	Nov. Corp.	GT	74	077	74	6.779	6.400	126.06

Buyer Quality Index As of 09/30/00

PRC CHRT	TOTAL PARTS	PART NO.	VENDOR NAME	BT CD	FR CD	MAT CD	ISM CD	DEFECTS Total Acc.	PERCENTAGE Base Corr.	QUAL. RATIO
100.00 and Under	220									
100.01-105.99	0	474293	May Machining	GT	74	077	4	45	100.00	97.70
105.00-110.99	4	243400	Mar. Mfg.	GT	74	077	3	31	84.30	77.42
111.00-120.99	3	400775	Jan Metal	GT	09	077	48	93	83.30	74.10
121.00 and Over	2	477903	Oct. Mfg. Co.	GT	47	077	5	41	86.30	70.70

Buyer Delivery Index As of 09/30/00

PRC CHRT	TOTAL PARTS	PART NO.	VENDOR NAME	BT CD	FR CD	MAT CD	ISM CD	AVERAGE DAYS LATE Base	Current	DEL. RATIO
100 and Under	161									
100.01-105.99	15	206487	Feb. Tool Co.	GT	01	077	63	69	20	102.04
105.00-110.99	12	112067	May Machining	GT	32	077	94	33	20	106.06
111.00-120.99	10	400074	Jan Metal	GT	09	077	00	30	12	120.00
121.00 and Over	0	243999	Nov. Corp.	GT	74	077	47	24	23	137.30

Legend: BT = Buyer Code, FR = Product Code, MAT = Material Code, ISM = Season Code

The literature of the period reflects a growing appreciation of basic management concepts. The objectives and necessary steps in the evaluation of the purchasing department were discerned and refined. The necessity of standards or yardsticks to measure performance gained wide recognition and acceptance. The use of statistical sampling was introduced as both an analytical tool and as an aid in standards development. The use of graphs as control tools with indicated control zones (management by exception) was introduced. New techniques which provide an over-all purchasing performance index were developed by General Electric and International Business Machine Corporation. The importance of leadership, policies and procedures and other business factors was recognized particularly by the United States Air Force and is clearly stated in their procurement evaluation manual AFSCM 70-3, a most comprehensive document based on the management approach to evaluating purchasing performance. This document stresses the importance of purchasing effectiveness rather than purchasing efficiency. Indeed, the prevalence of the management audit approach in general during this era reflects an appreciation of Heinritz's basic differentiation between purchasing efficiency and purchasing effectiveness and the unquestionable pre-eminence of the latter. The concept that end product costs attributed to purchasing operations are the ultimate measure of purchasing performance is also stressed in this Air Force manual, as well as by other writers of this

era. The literature reflects a general acceptance that in purchasing, departmental operating costs are secondary to departmental capability. Gushée and Boffey's comment expressed in 1928 that "increased overhead properly applied means increased performance" gained wider acceptance during this era.

The era produced usable approaches to evaluating individual purchasing department performance. However, the ultimate or universal yardstick which would permit the comparison of one purchasing department with another remained elusive. The contributions of this period by individual and date are shown in Figure 27.

Writer	Year	Basic Classification of Approach			Primary Contributions
		Quanti- tative	Quali- tative	Combi- nation	
Heinritz	1951		x		1. Defined objectives of evaluation, specified steps necessary, indicated factors that should be measured and how they could be measured. Recommended combination of statistical measures and executive judgment based on check list of questions.
Lewis	1953		x		1. Specified that the objective of evaluation was to improve performance, that the subject of evaluation should be the whole department. Recommended combination of statistical data and check list of questions for tangible and intangible aspects respectively.
Pleydell	1953 (1956)		x		1. Evaluation must be made in light of over-all company policy--suggested combination of statistical data plus check list of questions. Must use statistical ratios with caution.
Westing and Fine	1954		x		1. Defined difficulties involved in evaluating purchasing performance, specified objectives, indicated factors to measure were price, quantity, quality and delivery.
Sutter	1955		x		1. Developed charts to measure tangible and intangible aspects of purchasing. Recommended combination of statistics plus management audit.
Pearson	1957		x		1. Extensive check list for management audit technique.
Hodnett	1958		x		1. Discussed application of statistical sampling in evaluating purchasing performance.
Petersen	1958	x			1. Developed charts based on use of work measurement techniques to evaluate manpower performance, as well as other performance indices.

Writer	Year	Basic Classification of Approach			Primary Contributions
		Quanti- tative	Quali- tative	Combi- nation	
Ammer	1958				1) Discusses the uses of work measurement (ratio-delay).
Cook	1960	x			1. Suggests an over-all performance index based on charting factors of price, quantity, quality and delivery.
United States Air Force	1962				1. Extensive publication on evaluating purchasing--basically the management audit approach. Easily, the most comprehensive document on subject.
IBM	1962			x	1. Suggests a computerized purchasing evaluation system.

Figure 27.--Contribution to a Philosophy of Evaluating Purchasing Performance 1950-1962.

CHAPTER V

RELATIONSHIP BETWEEN DEPARTMENTAL OPERATING COSTS AND PURCHASING PERFORMANCE--AND EVALUATION PRACTICES IN SELECTED COMPANIES

A. Relationship between Departmental Operating Cost and End Performance

The review of purchasing literature presented in the previous chapters disclosed that there has evolved since 1928 a philosophy regarding the evaluation of purchasing performance. Concepts and techniques have been developed which properly used provide a basis for evaluating and controlling the performance of an individual purchasing department. This philosophy is discussed at length in the conclusions section of Chapter VI.

The elapsed years since 1930 had not, however, produced the long sought universal yardstick which would permit the comparison (and evaluation) of different purchasing departments, one with the other. In fact the prevailing opinion appears to be that such a yardstick is unattainable.

Upon analyzing the evolved philosophy certain concepts became evident regarding the ultimate measure of purchasing performance. Boffey and Gushée in 1928 had indicated that increased overhead properly applied meant increased

performance. Lewis, Heinritz, the 1947 National Association of Purchasing Agents Committee on Evaluating Purchasing Performance and the USAF concurred with and expanded this concept. The other significant concept that is clearly evident is that the ultimate measure of purchasing performance is end product costs. Lewis was the first to express this concept in 1933 and it was supported and reiterated in later years by Heinritz and others. In analyzing these two concepts the author hypothesized that there possibly was a definable relationship between the two ideas, and perhaps it might be possible to quantify the relationship. Specifically the writer decided to attempt to determine:

1. If the accepted relationship between purchasing department cost and performance could be substantiated, performance being indicated by end product material cost,
2. If it was possible to determine which function or combination of functions was most effective in increasing purchasing performance (what segment of overhead cost has the greatest effect on end product material costs),
3. If the ratio shown below might be utilized to compare the performance of different purchasing departments.

$$\text{RATIO: } \frac{\text{Purchasing Department Cost as \% of Purchase Material Costs}}{\text{End Product Material Costs as \% of Total End Product Costs}}$$

In addition to the above discussed research objectives, the writer, as discussed in Chapter I, desired to survey present industrial practice to determine if it lagged or led purchasing theory regarding the evaluation of purchasing performance. Another objective was to document any significant contributions that industry may have made regarding a philosophy of evaluating purchasing department performance.

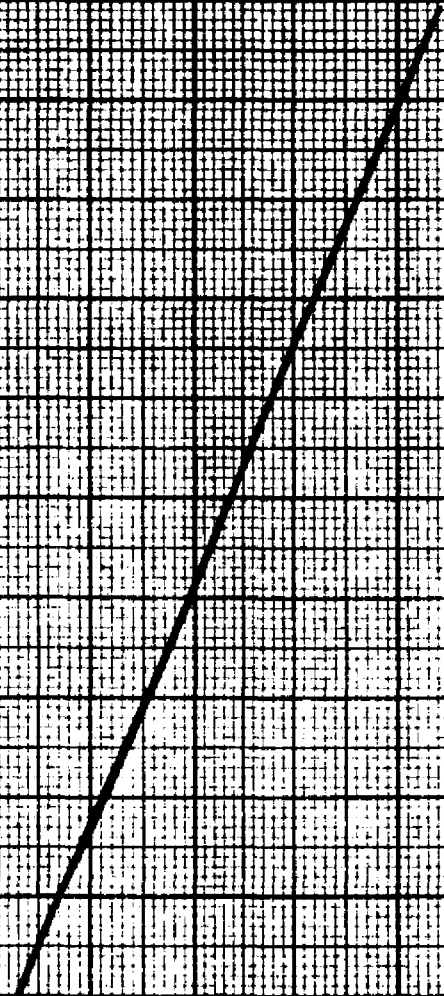
As discussed in Chapter I a questionnaire was utilized to collect the desired data. Quantitative aspects of the research project are contained in the first part of this chapter while data regarding industrial practices are summarized in the second part.

Theoretically or conceptually the relationship between department operating cost and end product material cost is inverse, that is increases in department cost should decrease end product material cost. The theoretical relationship is shown in Figure 28. It is probably not linear but is shown as such for simplicity. It is more likely that it is a hyperbolic function as the net effect of increased increments of departmental costs on end product material costs become less and less according to the law of diminishing returns to the point where the incremental increased cost will be greater than the incremental decrease in end product material cost.

A second consideration involves the question of where or how the operating funds should be increased for maximum

PURCHASED MATERIAL COST AS A PERCENT
OF TOTAL INVENTORY COST

1940 1941 1942 1943 1944 1945 1946 1947 1948 1949 1950 1951 1952 1953 1954 1955 1956 1957 1958 1959 1960



DEPARTMENTAL BEARING COST AND END MARKET
MATERIAL COST

CHART 1

DEPARTMENTAL BEARING COST AND END MARKET MATERIAL COST

DEPARTMENTAL BEARING COST AND END MARKET MATERIAL COST

DEPARTMENTAL BEARING COST AND END MARKET MATERIAL COST

effectiveness, e.g., does the addition of a value analysis program increase purchasing effectiveness more than the addition of a cost analysis program? Where can one expect the greatest return on the dollars invested? What factor or combination of factors has the greatest effect in reducing end product material cost?

In an attempt to test these concepts the writer collected data via the aforementioned questionnaire. Data on department operating cost and end product material costs were collected as well as data relating to the performance or non-performance of numerous functions such as value analysis (see questionnaire). This approach of necessity suffers from a number of limitations including:

1. No consideration of quality was possible regarding performance of the various functions.
2. There is no assurance that the numerous companies involved in the study utilize similar accounting concepts, in fact, there is every likelihood that they do not. Consequently, both the figure for department operating cost as well as end product material cost could vary due to different accounting practices.
3. The products produced and production methods utilized certainly are not identical even in companies of similar size and in the same industry. Again differences in product and production methods could account for any differences in end product material costs.

In an attempt to minimize the effects of the above referenced factors the writer selected industries where the least differences in accounting practice, product, and production methods might be expected. Admittedly, the choice was arbitrary though a careful analysis was made prior to selection.

A total of 116 usable questionnaires was received. The percentage return by industry is indicated below.

TABLE 1
QUESTIONNAIRE RESPONSE BY INDUSTRY

Indus- try	Question- naires sent out	Usable Questionnaires Returned	Per Cent Returns
1	73	17	17/73 = 23%
2	76	20	20/76 = 26%
3	17	7	7/17 = 41%
4	41	6	6/41 = 14%
5	65	24	24/65 = 37%
6	77	10	10/77 = 13%
7	63	32	32/63 = 51%

Linear Correlation Analysis

The data obtained from the questionnaires were analyzed on a total basis as well as by industry and sales volume. The linear correlation analysis of department operating cost as a percentage of total purchases with the percentage of

total end product cost constituted by purchased materials was performed manually; the remaining correlation analyses both simple and multiple were performed by an IBM 7090 computer. The data were analyzed to determine the degree, if any, of correlation between each variable. Each variable was correlated with all other variables. The variables correlated were these:

- sales volume
- employment-company
- total purchases
- purchasing department employment
- purchasing department operating cost
- number buyers in purchasing department
- average monthly salary
- percentage of college graduates among buyers
- number purchase orders issued
- average years of formal education of buyers
- years of experience of buyers

There was no significant correlation between any factor and the percentage of end product cost constituted by purchased materials on a total industry basis. The correlation coefficient between department operating cost and the percentage of end product cost constituted by raw materials was .141, insignificant indeed. Those factors which indicated a correlation greater than .5 are shown in Table 2.

An analysis of the factors which indicate significant correlation shows no surprises; for example one would logically expect sales volume and company employment to show a high degree of correlation which it does in the above data, the correlation coefficient being .95. Again one would

TABLE 2

THOSE FACTORS WITH CORRELATION COEFFICIENT GREATER THAN .5

	Factors	Correlation Coefficient
2-3	Sales volume--employment company	.948
2-4	Sales volume--total purchases	.948
2-5	Sales volume--employment purchasing department	.870
2-6	Sales volume--purchasing department operating cost	.901
2-16	Sales volume--number purchase orders issued	.511
3-4	Company employment--total purchases	.869
3-5	Company employment--purchasing department employment	.951
3-6	Company employment--purchasing operating cost	.957
3-13	Company employment--number buyers in purchasing department	.539
3-16	Company employment--number purchase orders issued	.543
4-5	Total purchases--employment purchasing department	.764
4-6	Total purchases--purchasing department operating cost	.808
5-6	Purchasing department employment--purchasing department operating cost	.983
5-13	Purchasing department employment--number buyers in purchasing	.602
5-16	Purchasing department employment--number purchase orders issued	.526
6-13	Purchasing department operating cost--number buyers in purchasing	.608

logically not expect a very high degree of correlation between purchasing department employment and the number of purchase orders issued from data gathered from several industries, as the nature and average dollar value of purchase orders varies from industry to industry and company to com-

pany. Thus the above correlation coefficient of .53 is no surprise.

In summary, the correlation analysis disregarding industry classifications indicated insignificant correlation between purchasing department operating cost and the percentage of end product cost constituted by purchased materials. Certain other factors, as expected, indicated relatively high degrees of correlation.

Correlation by industry classification

Correlation of department operating cost and the percentage of end product cost constituted by purchased material proved insignificant, being less than .27 for all industries. However, when department cost was divided by total purchases and then correlated with the percentage of end product cost constituted by purchased material on an individual industry basis, certain industries demonstrated a definite correlation. The correlation coefficient by industry is shown in Table 3.

TABLE 3

LINEAR CORRELATION COEFFICIENTS FOR EACH INDUSTRY

<u>Industry</u>	<u>Correlation Coefficient</u>
1	-.669
2	+.274
3	+.
4	Insufficient data
5	-.672
6	Insufficient data
7	-.447

Calculation of the regression equation, standard-deviation, and correlation coefficient for industries 1, 3, and 5 is shown on the following pages.

A possible explanation of why certain industries showed a high degree of correlation and why others showed little or none might be the degree of similarity in product and processes in a given industry. In those industries where there is great similarity in product and processes the degree of correlation is high, while in those which tend towards product differentiation little or no correlation is shown. The writer suspects that the industry classification selected was too broad in these cases and consequently, as in the attempt to correlate all industry data, the companies were too dissimilar for effective comparison.

The direct rather than inverse relationship between department operating cost and the percentage of end product cost constituted by purchased materials found in industry 2 is perplexing. There are several theoretically plausible answers including:

1. All the companies or at least most that were surveyed are operating past the point of diminishing returns.
2. The companies surveyed in the industry are not practicing money saving functions such as value analysis and cost analysis, consequently the data reflect various stages

of efficiency regarding control of routine purchasing department operating costs.

3. The companies included in the data are not comparable due to dissimilar product and production method.

4. The correlation is a chance occurrence.

TABLE 4
CORRELATION DATA--INDUSTRY 1

Observation	X \$Pur. Cost \$Purch. %	Y \$Pur. Mat. \$End Cost %	xy	x ²	y ²	yc	y-yc	d ²
1	.31	38	11.7	.09	1,445	48	-10	100
2	.42	48	20.1	.17	2,310	48	0	0
3	.57	55	31.3	.32	3,020	47	8	64
4	.59	45	26.5	.36	2,021	46	-1	1
5	.79	36	28.4	.62	1,300	45	-9	81
6	.90	49	44.2	.81	2,400	44.6	4	16
7	1.20	38	45.6	1.44	1,445	42.6	-4	16
8	1.24	53	65.6	1.54	2,810	42.2	11	121
9	1.50	45	67.4	2.25	2,020	40.4	5	25
10	1.50	35	52.5	2.25	1,225	40.4	-5	25
11	1.65	44	72.5	2.72	1,935	39.4	5	25
12	.79	42	29.3	.62	1,760	45.0	-3	9
13	1.20	48	57.6	1.44	2,310	42.6	5	25
14	1.03	46	47.4	1.06	2,108	43.7	3	9
15	2.10	34	71.3	4.41	1,155	36.2	-2	4
16	2.30	36	82.7	5.29	1,300	34.7	-1	1
17	2.50	30	75.0	6.25	900	33	3	9
	20.59	722	829.1	31.64	31,464			531

Calculation of regression equation

$$\begin{aligned} \text{I} \quad \Sigma Y &= Na + b \Sigma x \\ \text{II} \quad \Sigma XY &= a \Sigma x + b \Sigma (x^2) \end{aligned}$$

$$\begin{aligned} \text{I} \quad 722 &= 17a + 20.6b \\ \text{II} \quad 829.1 &= 20.6a + 31.64b \end{aligned}$$

$$\begin{aligned} \text{I} \quad 876.0 &= 20.6a + 25.00b \\ \text{II} \quad 829.1 &= 20.6a + 31.64b \\ \hline 46.9 &= -6.65b \\ b &= \frac{46.9}{-6.65} \\ &= -7.06 \end{aligned}$$

$$a = \frac{722 + (20.6)(7.06)}{17} = 51$$

Therefore $y = 51 - 7.06x$

Theoretical deviation

$$\begin{aligned}
 S_y &= \sqrt{\frac{\sum d^2}{N}} \\
 &= \sqrt{\frac{531}{17}} \\
 &= 5.6
 \end{aligned}$$

Standard deviation

$$\begin{aligned}
 T_y &= \sqrt{\frac{\sum Y^2}{N} - \left(\frac{\sum Y}{N}\right)^2} \\
 &= \sqrt{\frac{31,449}{17} - \left(\frac{722}{17}\right)^2} \\
 &= 7.48
 \end{aligned}$$

Correlation coefficient

$$\begin{aligned}
 r &= \sqrt{1 - \frac{S_y^2}{\sigma_y^2}} \\
 &= \sqrt{1 - \frac{5.6^2}{7.48^2}} \\
 &= \sqrt{1 - \frac{31}{56}} \\
 &= \sqrt{.447} \\
 r &= -.669
 \end{aligned}$$

Significance Test

$$\begin{aligned}
 H_0 : p &= 0 \\
 r &= -.669 \\
 t_{.05} &= .482
 \end{aligned}$$

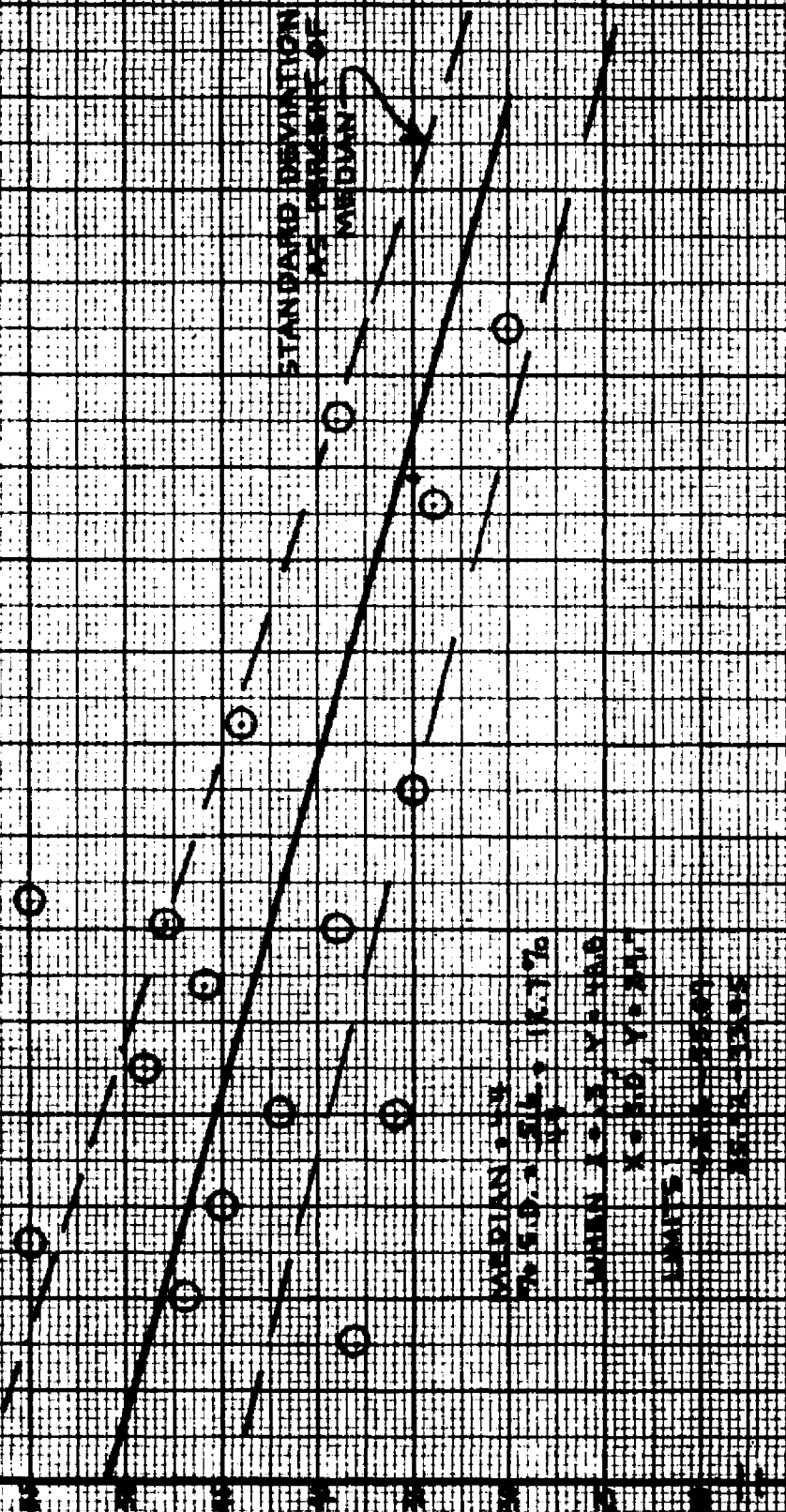
∴ reject hypothesis

CHART 2

RELATIONSHIP BETWEEN PURCHASES AND COSTS

Y = 51 - 7.1X

MECHANICAL MATERIAL COST AS A PERCENT OF TOTAL PURCHASES



Total Purchases (X)	Mechanical Material Cost as a Percent of Total Purchases (Y)
0	51
1	44
2	37
3	30
4	23
5	16
6	9
7	2
8	-5
9	-12
10	-19
11	-26
12	-33
13	-40
14	-47
15	-54
16	-61
17	-68
18	-75
19	-82
20	-89

PURCHASING DEPARTMENT COST AS A PERCENT OF TOTAL PURCHASES

TABLE 5
INDUSTRY 3 CORRELATION ANALYSIS DATA

Observation	Dept. Cost \$Purch.	Pur. Mat. \$Cost End Prod.	xy	x ²	y ²	yc	y-yc	d ²
1	3.0	29	76.0	9.00	841	31.7	-2.7	7.3
2	2.0	33.5	67.0	4.00	1120	36.5	-3.0	9.0
3	1.5	36	54.0	2.25	1295	38.9	-2.9	8.4
4	2.4	37	89.0	5.75	1368	34.6	+2.4	5.7
5	1.5	39	58.5	2.25	1520	38.9	.1	.01
6	2.2	32	79.4	4.84	1022	35.5	-3.5	12.2
7	1.2	40	48.0	1.44	1600	40.3	-.3	.09
	13.8	246	473.9	29.53	8766			42.7

Calculation of regression equation

$$\begin{aligned} \text{I} \quad \Sigma Y &= Na + b \Sigma X \\ \text{II} \quad \Sigma XY &= a \Sigma X + b \Sigma (X^2) \end{aligned}$$

$$\begin{aligned} \text{I} \quad 246 &= 7a + 13.8b \\ \text{II} \quad 473.9 &= 13.8a + 29.53b \end{aligned}$$

$$\begin{aligned} \text{I} \quad 485.0 &= 13.8a + 27.20b \\ \text{II} \quad 473.9 &= 13.8a + 29.53b \\ \hline 11.1 &= \quad \quad - 2.33b \\ b &= - 4.76 \end{aligned}$$

$$a = \frac{246 + 65.7}{7} = 44.4$$

Therefore $y = 44.4 - 4.76x$

Median = 20

Calculation of standard deviation
and correlation coefficient

Theoretical deviation

$$\begin{aligned} S_y &= \sqrt{\frac{\sum d^2}{N}} \\ &= \sqrt{\frac{42.7}{7}} \\ &= \sqrt{6.1} \\ &= 2.47 \end{aligned}$$

Standard deviation

$$\begin{aligned} T_y &= \sqrt{\frac{\sum Y^2}{N} - \left(\frac{\sum Y}{N}\right)^2} \\ &= \sqrt{\frac{8766}{7} - \left(\frac{246}{7}\right)^2} \\ &= \sqrt{1251 - 1230} \\ &= \sqrt{21} \\ &= 4.58 \end{aligned}$$

Correlation coefficient

$$\begin{aligned} r &= \sqrt{1 - \frac{S_y^2}{T_y^2}} \\ &= \sqrt{1 - \frac{2.47^2}{4.58^2}} \\ &= \sqrt{1 - .293} \\ &= \sqrt{.707} \\ r &= -.841 \end{aligned}$$

Significance Test

$$H_0 : p = 0$$

$$r = -.841$$

$$t_{.05} = .754$$

∴ reject hypothesis

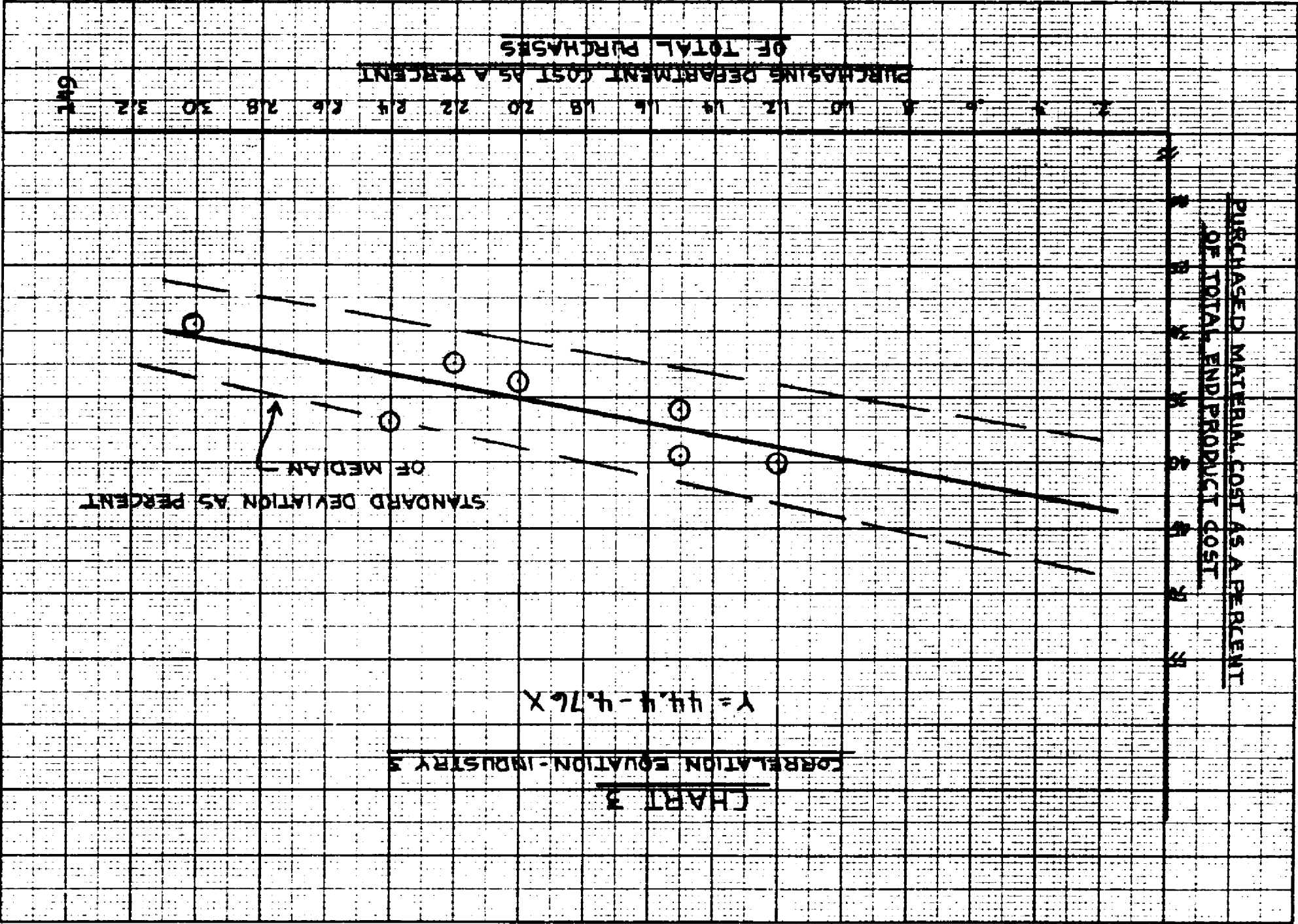


TABLE 6

INDUSTRY 5 CORRELATION ANALYSIS DATA

Observation	X	Y	xy	x ²	y ²	yc	y-yc	d ²
	\$Purch.	\$Purch. Cost						
1	3.1	35	108.2	9.60	1,225	40.9	5.9	34.8
2	3.0	40	120.0	9.00	1,600	41.1	1.1	1.2
3	.4	52	22.8	.19	2,700	46.2	5.8	33.6
4	.7	50	37.4	.52	2,500	45.6	4.4	19.3
5	1.0	52	52.0	1.00	2,700	45.1	6.9	36.0
6	1.0	45	41.7	1.17	2,021	44.9	.1	.01
7	1.3	46	59.8	1.69	2,180	44.5	1.5	2.2
8	1.5	42	63.4	2.28	1,760	44.0	2.0	4.0
9	1.7	44	74.8	2.96	1,935	43.7	.3	.09
10	1.8	48	87.8	3.38	2,300	43.5	4.5	20.2
11	1.5	50	75.0	2.25	2,500	44.1	5.9	34.8
12	1.9	44	83.6	3.61	1,935	43.3	.7	.5
13	2.7	42	113.5	7.30	1,760	41.7	.3	.01
14	2.8	33	92.4	7.84	1,090	41.5	6.5	42.2
15	2.2	38	83.6	4.84	1,442	42.7	4.7	22.1
16	2.0	36	72.1	4.00	1,295	43.	7.0	49.0
17	1.6	47	75.2	2.56	2,210	43.9	3.1	9.0
18	2.4	41	100.5	6.00	1,680	42.2	1.2	1.4
19	2.0	41	82.0	4.00	1,680	43.1	2.1	4.2
20	1.5	44	68.2	2.40	1,935	44.0	0.0	0.0
21	2.1	43	92.5	4.62	1,850	42.9	.1	.01
	38.5	913	1,606.5	81.21	40,298			314

Calculation of regression equation

$$\begin{aligned} \text{I} \quad \Sigma Y &= Na + b \Sigma X \\ \text{II} \quad \Sigma XY &= a \Sigma X + b \Sigma (X^2) \end{aligned}$$

$$\begin{aligned} \text{I} \quad 913 &= 21a + 38.5b \\ \text{II} \quad 1,607 &= 38a + 81.2b \end{aligned}$$

$$\begin{aligned} \text{I} \quad 1672 &= 38.5a + 68.75b \\ \text{II} \quad 1606 &= 38.5a + 81.2b \end{aligned}$$

$$66 = -13b$$

$$\begin{aligned} b &= - \\ &= -5.06 \end{aligned}$$

$$a = \frac{913 + (38.5)(.5)}{21}$$

$$= 913 + 092$$

$$= \frac{1105}{21}$$

$$= 52.6$$

Therefore $y = 52.6 - 5.06x$

Calculation of standard deviation and correlation coefficient

$$S_y = \sqrt{\frac{\Sigma d^2}{N}}$$

$$= \sqrt{\frac{314}{21}}$$

$$= 3.86$$

$$T_y = \sqrt{\frac{\Sigma Y^2}{N} - \left(\frac{\Sigma Y}{N}\right)^2}$$

$$= \sqrt{\frac{40,298}{21} - \left(\frac{913}{21}\right)^2}$$

$$= \sqrt{27}$$

$$= 5.2$$

Correlation coefficient

$$r = \sqrt{1 - \frac{S_y^2}{\sigma_y^2}}$$

$$= \sqrt{1 - \frac{3.86^2}{5.22^2}}$$

$$= \sqrt{1 - .55}$$

$$= \sqrt{.45}$$

$$r = -.672$$

Significance test

$$H_0 : \rho = 0$$

$$r = -.672$$

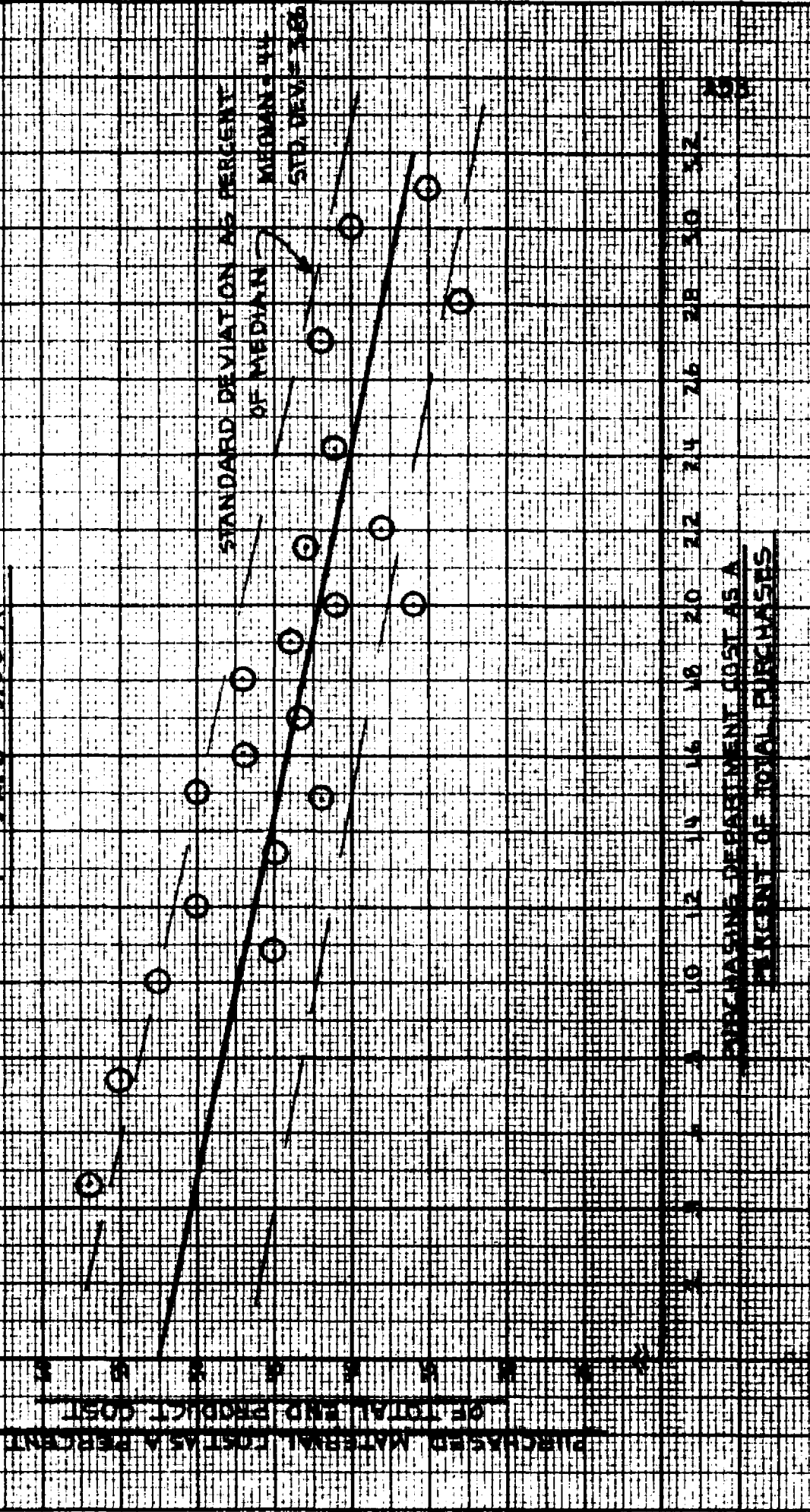
$$t_{.05} = .433$$

∴ reject hypothesis

CHART 4

CORRELATION EQUATION - INDUSTRY 5

$$Y = 57.6 - 5.06 X$$



Multiple Correlation Analysis

Introduction

This section presents the findings of the multiple correlation analysis performed in an attempt to discern what factor or combination of factors had the greatest effect (correlation) on end product material cost. The average end product material cost of those companies indicating that they performed a given function was compared to the average end product material cost of those indicating that they did not perform said function. Multiple correlation analysis was then performed to determine which factors correlated most highly with end product material costs. The results are shown in the following tables.

TABLE 7

EFFECT OF PERFORMANCE AND/OR USE OF SELECTED FACTORS AND/OR FUNCTIONS UPON THE PERCENTAGE OF END PRODUCT COST CONSTITUTED BY PURCHASED MATERIALS

Function/Factor	Average Value of End Product Material Cost as Percentage Total End Product Cost		Percentage Difference
	Companies that have and/or perform fac- tor and/or function	Companies that donot have and/or per- form factor and/ or function	
Membership in National Association Purchasing Agents	41.9%	44.9%	7.2
Subscribe to <u>Purchasing</u> Magazine	41.7	47.1	13.0
Management Development Program	43.6	43.2	
Value Analysis Program	38.1	44.5	16.8
Separate Cost Analysis Section	39.2	44.0	12.2
Purchasing Research	45.8	43.1	(5.9)
Vendor Relations	43.3	43.3	0.0
Methods Analysis	39.1	44.8	14.6
Manufacturing and Engineering Liaison	41.3	44.9	8.7
Educational Reinbursement Plan	41.8	45.9	9.8
Attempt to Evaluate Performance	40.3	47.1	16.9
Written Performance Standards	42.9	43.5	1.4
Work Measurement	43.3	43.3	0.0
Buyer Incentive Program	42.0	43.4	3.3
Electronic Data Processing	36.7	46.0	25.3
Expeditors	49.4	42.3	-(16.8)
Departmental Manual	43.4	44.1	1.6

Multiple correlation analysis

The seventeen factors and/or functions were analyzed on an International Business Machine 7090 Computer to determine which factors had the greatest influence on the percentage of end product cost constituted by purchased materials. The analysis was performed on a total data and individual industry basis. The results are shown in the following tables.

Factor Identification Number	Factor
1	Executive Development Program
2	Value Analysis Program
3	Cost Analysis Section
4	Purchasing Research Group
5	Vendor Relations Program
6	Performance Evaluation Program
7	Electronic Data Processing
8	Departmental Manual

Figure 28.--Factor Identification.

TABLE 8

COMBINATION OF FACTORS WHICH SHOW GREATEST CORRELATION--TOTAL DATA BASIS

Combination of Factors	Multiple Correlation Coefficient	Factors which Show Significance by "t" test
2,3,5,6	.285	6
2,3,4,6	.273	6
3,4,5,6	.270	6
2,4,5,6	.269	6
2,4,6,7	.264	6

TABLE 9

COMBINATION OF FACTORS THAT SHOW HIGHEST CORRELATION
INDUSTRY 1

Combination of Factors	Multiple Correlation Coefficient	Factors which Show Significance by "t" test
1,2,5	.77	1,2
1,2,4	.75	1,2
1,2,3	.72	1,2
1,2,7	.72	1,2
1,2,6	.72	1,2

TABLE 10

COMBINATION OF FACTORS THAT SHOW HIGHEST CORRELATION
INDUSTRY 2

Combination of Factors	Multiple Correlation Coefficient	Factors which Show Significance by "t" test
2,3,5,6	.57	5
2,5,6,7	.56	5,6
2,4,5,6	.54	5,6
1,2,3,5	.52	5
2,3,5,8	.52	5

TABLE 11

COMBINATION OF FACTORS THAT SHOW HIGHEST CORRELATION
INDUSTRY 5

Combination of Factors	Multiple Correlation Coefficient	Factors which Show Significance by "t" Test
3,4,6,7	.904	3,6,7
1,3,6,7	.90	3,6,7
3,5,6,7	.90	3,6,7
2,3,6,7	.89	3,6,7
3,6,7,8	.89	3,6,7

TABLE 12
COMBINATION OF FACTORS THAT SHOW HIGHEST CORRELATION
INDUSTRY 7

Combination of Factors	Multiple Correlation Coefficient	Factors which Show Significance by "t" Test
2,3,5,6	.47	None
1,3,5,6	.46	6
1,3,6,7	.46	6
3,4,5,6	.46	6
3,5,6,8	.46	6

Data Analysis

Effect of performing specific functions--total data basis

The data indicate that the following functions have the effect of decreasing material cost as a percentage of end product cost (in decreasing order of effectiveness):

- Electronic data processing
- Value analysis
- Cost analysis
- Formal purchasing evaluation program
- Methods analysis group
- Subscription to Purchasing magazine
- Educational reimbursement program
- Manufacturing and engineering liaison
- Membership in NAPA
- Purchasing research group

Combination of factors which have greatest effect

Total data basis.--The multiple correlation coefficients indicate that on a total data basis, that is, ignoring industry classification, the following combination of functions have the greatest effect on the percentage of end

product cost constituted by purchased materials:

Value analysis
 Cost analysis
 Vendor relations
 Performance evaluation

Industry classification

The importance of functions appears to vary with industry as can be seen by the ranking in importance of the best combination by industry in Figure 29 below.

<u>Industry</u>	<u>Functions which Have Greatest Effect on End Product Material Cost (listed in order of importance)</u>
1	Executive development program Value analysis program Purchasing research program Vendor relations program
2	Value analysis program Cost analysis program Vendor relations program Purchasing evaluation program
5	Cost analysis program Purchasing research Purchasing evaluation Electronic data processing
7	Value analysis program Cost analysis program Vendor relations program Purchasing evaluation program

Figure 29.--Functions which have greatest effect on end product material cost.

Summary

There appears to be a definable relationship between purchasing department operating cost as a percentage of purchased material, and end product material cost as a percentage of total end product cost on an industry basis. Three of

the five industries for which adequate data were available for analysis indicated significant correlation between these ratios. Also the mere performance of certain functions has a measurable effect on end product material cost with value analysis, cost analysis, vendor relations, purchasing evaluation and electronic data processing producing the greatest effect. The importance of the various functions appears to vary with different industries.

B. Contemporary Practice Regarding The
Evaluation of Purchasing Performance

Introduction

This section summarizes the data collected by the above mentioned questionnaire regarding methods and techniques of evaluating purchasing department performance. Since the survey was limited to a few selected industries, the results cannot be definitely considered as typical for all industries. However, it is likely that the picture presented by these data is representative of many of the industrial concerns in American business.

Total Picture of all
respondent companies

Table 13 summarizes the data gathered by the questionnaire regarding the pertinent questions relating to evaluating purchasing department performance.

TABLE 13

RESULTS OF SURVEY REGARDING METHODS OF EVALUATING PURCHASING PERFORMANCE

Question	Total all Respondents	By Industry Classification				Dollar of Purchase classification				
		a	b	c	d	1	2	3	4	5
Do you evaluate purchasing department performance	54%	56	46	64	58	36%	45%	60%	63%	65%
Do you have written performance standards	39	44	39	37	32	40	22	17	72	45
Do you utilize work measurement in standards development	5	2	6	5	4	0	3	3	6	8
Do you have an incentive program for your buyers	8	11	15	10	5	0	8	17	14	7
Do you utilize a material budget	27	22	32	18	32	24	29	67	29	0
Do you utilize a department operating budget	39	46	31	37	32	12	36	83	86	56
Which of the following do you use as a gauge of purchasing performance:										
Average value of purchase order	22	22	16	18	21	12	0	50	0	22
Number purchase orders issued per buyer	28	44	8	18	32	16	22	50	29	33
The cost of issuing a purchase order	33	40	21	30	38	16	29	50	57	33
The number bids received to bids issued	19	25	14	18	23	16	7	0	57	55
The number of bids issued by dollar category	2	3	0	1	2	0	0	0	0	11
Inventory turnover ratio	48	50	35	44	47	40	43	57	57	33
Dollar value of scrap	42	46	39	40	41	24	22	43	43	60
Price paid versus market price	27	30	20	28	29	28	7	33	43	33
Dollar of cost reduction due sound purchasing	37	41	25	35	39	20	22	50	86	60
Number of production stoppages	27	30	23	27	28	28	14	0	29	33
Number of late deliveries	33	31	30	29	37	32	14	17	43	60
Buyer rating forms	13	11	23	18	10	8	7	17	29	0
Management audit techniques	31	33	8	36	37	28	14	67	29	44

TABLE 13--Continued

Question	Total all Respond-ents	By Industry Classification				Dollar of Purchase classification				
		a	b	c	d	1	2	3	4	5
Do you have a department manual with written objectives, policies, and procedures	39	45	39	46	30	24	36	83	29	56
Do you feel that purchasing performance can be evaluated	71	78	69	73	64	72	72	67	57	78

Legend: Industry Classification
a. ceramic wall and floor tile
b. ball bearings
c. laundry equipment
d. air tanks

Dollar of Purchase Classification
1) less than 1 mill
2) 1-5 mill
3) 5-10 mill
4) more than 20 mill

It indicates that only 54 per cent of respondent companies try to evaluate purchasing department performance. By industry this percentage ranges from a low of 46 per cent in the ceramic wall and floor tile industry to a high of 64 per cent in the laundry equipment industry. By dollar of purchases classification the range is from 36 per cent for companies with purchases less than one million dollars to a high of 65 per cent for those companies with purchases in excess of 20 million dollars. Other findings of some significance include:

1. Approximately 60 per cent of respondent firms do not have written performance standards.

2. Only 5 per cent of respondent companies utilize work measurement as a basis of standards development with the percentage increasing with company size and value of purchase.

3. The use of dollar incentives for increasing buyer performance is very limited with only 8 per cent of respondent companies indicating its use.

4. Less than one-third of respondent companies utilize a material budget while about 40 per cent utilize an operating budget.

5. The factor most frequently used in evaluating purchasing performance is inventory turnover; almost 90 per cent of those companies which indicate they evaluate purchasing performance indicated they utilized inventory turnover as one of the factors.

6. The next most frequently used factors in order of frequency of use are shown in Table 14.

TABLE 14

FACTORS USED TO EVALUATE PURCHASING PERFORMANCE

<u>Factor</u>	<u>Per Cent than Use^a</u>
Dollar of scrap	77
Dollar cost reduction due sound purchasing	68
Cost of issuing a purchase order	61
Number of late deliveries	61
Management audit techniques	58
Number purchase orders issued per buyer	52
Number of production stoppages	50
Price paid versus market price	50
Average value of purchase order	41
Number BIDS Received to BIDS ISSUED	35
Buyer rating forms	24
The number bids issued by dollar category	3

^aPercentage is based on the number of firms that indicated they do attempt to evaluate purchasing department performance.

7. Less than 40 per cent of the respondent companies have a departmental manual with written department objectives and policies.

8. Thirty per cent of the respondent companies indicated they believed purchasing performance could not be evaluated.

9. The larger the dollar value of purchases the more likely it is that the organization attempts to evaluate purchasing department performance. Only 36 per cent of those respondent firms with purchases of less than 1 million dollars attempt to evaluate purchasing performance while 78 per cent of those with purchases in excess of 20 million dollars do so.

Summary

The objective of this section was to provide insight regarding present industrial practice of measuring purchasing performance. The survey indicates that practice varies widely in both large and small companies with roughly one-half of

the smaller firms indicating they do not even try to measure purchasing performance. (A survey by Donald F. Mulvihill of purchasing evaluation practices in Alabama in 1958 for the Small Business Administration indicated about the same percentage (48%) of firms did not try to evaluate their purchasing performance.¹) Even some of the large industrial companies have no formal program for evaluating purchasing performance.

The vast majority of techniques rely on past experience as the norm or standard. All involve the application of judgment at some stage in the evaluation and/or measurement program. The most widely utilized factor in the corporate giants appears to be dollar of savings due to cost reduction efforts. Other factors and/or techniques used include the (1) personnel rating system, (2) management audit, and (3) performance index. Most of the larger companies seem to recognize the need to establish some type of standard against which to measure actual performance. The smaller firms stress such techniques as inventory turnover, dollar value of scrap, as well as the cost of issuing a purchase order. The other factors utilized in order of importance are shown in Table 14.

¹Donald F. Mulvihill, "Purchasing Problems of the Small Manufacturers in Alabama and Some Suggestions to Solve them," Small Business Management Research Report, Small Business Administration, 1959.

CHAPTER VI

SUMMARY, CONCLUSIONS, RECOMMENDATIONS

Introduction

The recurring comments in purchasing literature regarding the difficulty and lack of information on how to measure purchasing performance aroused the author's interest in tracing the origin and development of a philosophy of evaluating purchasing performance in American business and the comparison of said philosophy with current management control theory. Specifically the writer posed the following questions as the framework for this research project:

1. Does purchasing literature reflect a generally accepted philosophy regarding the evaluation of purchasing performance? If so, what is it?
2. What conclusions regarding the stage of development of purchasing evaluation philosophy can be drawn from a comparison of it to management control theory?
3. Does this comparison of the prevailing philosophy of evaluating purchasing performance with management control theory suggest any modifications in the prevailing philosophy?
4. Does the existing philosophy of evaluating purchas-

ing performance represent an effective tool for purchasing departments to use in actual operations?

5. There is frequently a lag between theory and practice in industrial management. Does this situation exist regarding the evaluation of purchasing performance?

6. Purchasing literature for thirty years has contained comments regarding the necessity to "spend money to save money," that is money spent on such functions as materials research, vendor relations, and value engineering will result in lower total material costs. The inference is that there is a relationship between departmental operating cost and material costs in the end product. Can this concept be quantitatively substantiated? Can it be used to compare different purchasing departments?

7. If one must spend money in purchasing to save money, what is the most effective outlet for one's funds regarding the effect on end product material costs, that is what factor or combination of factors indicate the greatest correlation with end product material costs?

Chapter II was devoted to a brief synopsis of current management control theory to provide criteria against which purchasing evaluation philosophy might be compared.

The history and development of the present philosophy of measuring purchasing performance was traced and documented in Chapters III and IV and summarized in Figure 30, p. 174.

Chapter V presented the results of the linear and multiple correlation analysis performed in an attempt to substantiate the concept that one must spend money in purchasing to save money, as well as the results of the factorial or functional analysis performed in an attempt to determine which function or factor has the greatest effect in reducing material cost as a percentage of total end product costs. Chapter V also presents the results of a survey relating to industrial practice regarding methods of evaluating purchasing performance.

Findings

The findings of the study are presented below.

Development of a philosophy of evaluating purchasing performance

1. Interest in methods of evaluating purchasing performance began in the early 1920's.

2. Early references to the desirability of controlling purchasing performance are found in

John C. Dinsmore's Purchasing, Principles, and Cases, 1922.

H. B. Twyford's Purchasing, Its Economic Aspects and Proper Methods, 1924.

W. N. Mitchell's Purchasing, 1927.

3. The first comprehensive treatment of evaluating purchasing performance is found in Gushée and Boffey's Scientific Purchasing, 1928.

4. Gushée and Boffey were the first to comment on the fact that increased departmental operating costs could mean increased purchasing performance.

5. In 1931 the National Association of Purchasing Agents in conjunction with the National Association of Cost Accountants sponsored a contest to determine "Methods or Yardsticks for Measuring the Efficiency and Proving the Value of the Purchasing Department."

6. The contest produced the first statement on the objectives of evaluating purchasing performance

To enable the purchasing executive to comprehend more clearly the requirements and possibilities of his job.

To enable management to visualize with accuracy just what the purchasing department is accomplishing in the way of spending.

To secure real efficiency through the only known method, of setting a standard and measuring approach to it.

7. The majority of the proposed plans suggested by the contestants suggested that efficiency could be measured by taking the chief functions of the purchasing departments and comparing actual performance in each instance with a standard.

8. Lewis in his 1933 text, Industrial Purchasing, suggested that the ultimate measure of effective purchasing is production costs.

9. Lewis also indicated the reasons why purchasing was difficult to evaluate:

Some contributions of purchasing were intangible and do not level themselves to quantitative measurement.

The purchasing function varies widely between companies.

10. Another contribution of Lewis's are his criteria for a satisfactory standard:

It should be based on factors within control of purchasing.

It should be simple, definite and understandable.

It should not be subject to manipulation.

It should be a measure not only of prior years but also of other companies.

11. The 1945 National Association of Purchasing Agents Committee on measuring the efficiency of a purchasing department suggested that purchasing be separated into its tangible and intangible aspects prior to measurement. Regarding the measurement of intangibles the report favored a method tied in with the cost of production.

12. The 1947 National Association of Purchasing Agents Committee on "Development of Methods for Evaluating the Purchasing Function" stressed that the real measure of purchasing performance is material and production costs, and that "one must spend money in purchasing to save money."

13. The rating scale approach to measuring performance was introduced toward the end of the 1940's. It involved the

use of a work sheet listing the duties and responsibilities of the personnel in the purchasing department with a listing of the essential characteristics considered essential for acceptable performance.

14. Heinritz discussed the shortcomings of the rating scale approach in an article in Purchasing magazine in 1947. He commented that "the intangibles were just as elusive as ever" and that it attempts to measure the larger factor (proficiency in buying) in terms of the smaller factor (efficiency in department operation).

15. Heinritz in his 1947 text Purchasing stressed the fact that purchasing proficiency is far more important than purchasing efficiency. He also noted that

the ultimate measure of purchasing performance is product cost, thus

standard costs or a material purchase budget should be used as the basic measurement of purchasing performance.

16. The most comprehensive published article on evaluating purchasing performance appeared in the 1951 April and May issues of Purchasing magazine. The article, in two parts, was written by Heinritz and includes a specification of the objectives of evaluating purchasing performance as well as a specification of the important factors in evaluating purchasing performance and how to measure them.

17. The management audit or check list approach to evaluate purchasing performance began to become popular in

the early 1950's. References which discuss and recommend its use include

Howard T. Lewis, Procurement: Principles and Cases, 1953.

Albert Pleydell, Measuring the Efficiency of a Public Buying Office (pamphlet), 1959.

J. H. Westing and I. V. Fine, Industrial Purchasing, 1955.

Arthur Pearson, "Evaluation, a Purchasing Management Control" (speech), 1959.

Henry G. Hodges, Procurement, the Modern Science of Purchasing, 1961.

Air Force System Command, Procurement System Review, 1962.

18. The management audit approach stresses the need to analyze all organizational factors that effect purchasing performance. It emphasizes the need to combine qualitative measures with quantitative data to arrive at an over-all evaluation of purchasing performance.

19. The use of statistical sampling as a tool in evaluating purchasing performance was suggested in 1958 by Hodnett of the Atomic Energy Commission. She suggested statistical sampling be used in the appraisal of three areas, (1) adherence to policy and procedure, (2) utilization of purchasing personnel, and (3) price performance.

20. In 1961 Ammer discussed the use of ratio-delay or work sampling techniques to develop standards in purchasing. He commented that "work sampling can be invaluable in improving purchasing administration and planning."

21. Two sophisticated purchasing performance index programs were developed in 1960 and 1962 by the General Electric Company and the International Business Machine Corporation, respectively.

22. There is in preparation at this time a pamphlet on evaluating purchasing by a committee of the National Association of Purchasing Agents. Presumably it will recommend the Management Audit Approach.

The History and Development of a Philosophy regarding the evaluation of purchasing performance is indicated by individual contributors in Figure 30 and by concept in Figure 31.

Relationship of departmental
operating cost to end product
material cost

1. Linear correlation analysis disregarding industry classification indicated little or no relationship between purchasing department operating cost and end product material cost.

2. Linear correlation analysis on an individual industry basis produced significant correlation coefficients in four of the five industries for which there were adequate returns:

<u>Industry</u>	<u>Correlation Coefficient</u>
1	-.669
2	+.272
3	-.841
5	-.672
7	-.447

Contributor	Objectives of Evaluation	Approach and/or Necessary Steps	Recommended Techniques	Basis of Performance Standards	Other Concepts
John C. Dinomere (1924)	Control of funds		Operating budget	Past experience	
M. B. Toyford (1924)			Proper forms, methods, procedures		
William Mitchell (1927)			Management reports	Past experience	
Edward Guehen and L. F. Haffey (1928)	1) Better performance 2) Increased efficiency		Statistical Data: 1) Dept. cost 2) Volume of purchase orders 3) Cost of issuing purchase order 4) Cost to commit a dollar	Past experience	let to commit on need to spend money to save money in purchasing
B. G. Kelley (1930)			Statistical Data: 1) Inventory turnover 2) Losses 3) Dept. cost 4) Distribution of purchases 5) Cost vs market 6) Losses due to obsolescence 7) Savings 8) Salvage income	Past experience	
William M. Corsey (1931)		1) Isolate factors to be measured; Clerical operations Research work Inventory t/o Cost vs market Cost reductions	1) Office management tools 2) Good records	Past experience and Job analysis	
V. M. James (1931)			1) Budget 2) <u>Performance Index</u>	Past experience	
Donald G. Clark (1931)	1) Better knowledge of job. 2) Management visibility 3) Secure real efficiency 4) Provide a basis of comparison with non-competitors	1) Break function into factors prior to attempt to measure	Master Cost Sheet: 1) Price 2) Losses 3) Dept. expense 4) Inventory costs	Past experience	No such thing as universal standard
Howard T. Lewis (1933)			Real measure is production costs	Past experience not enough	1) Established criteria for standards 2) Some contributions not measurable

Figure 30.—Development and history of Purchasing Evaluation Theory.

Contributor	Objectives of Evaluation	Approach and/or Necessary Steps	Recommended Techniques	Basis of Performance Standards	Other Concepts
MAP Committee (1967)		Must consider two areas: 1) Tangible 2) Intangible	Best measure to production costs		1) Must spend money to save money
Scott Macmillan (1967)	1) Measure planning 2) Improve performance 3) Discover reasonable potential beyond present performance 4) Discover what purchasing job is worth	1) Define factors to be measured 2) Determine what can be measured 3) Establish standards	1) Measure efficiency by standard material cost 2) Measure efficiency by dept. operating budget	Post experience	Colored phrases: 1) Purchasing efficiency 2) Purchasing proficiency 3) Proficiency most important of the
Howard T. Lewis (1953)	Improve performance	Management audit or check list	Statistical data for various departmental costs	Post experience	
J. M. Vesting and I. V. Fine (1953)	1) Improve performance 2) Provide a basis for rating the individual	Management audit	Checklist of questions	Post experience Judgment	
Arthur Pearson (1957)	1) Control performance	1) Break into functions 2) Management audit	Brown's 12 principles of efficiency	Judgment	
Alice Madgett (1958)		Judgment plus statistics	Let to use statistical sampling	Judgment	
Brian Amner 1958 & 1961		1) Define limits 2) Determine objectives 3) Develop program 4) Compare progress	1) Success use of work measurement in 1961	Work measurement	
Henry G. Bridges (1964)	1) Improve operations 2) Evaluate personnel 3) Executive control 4) Define relationships	Management audit	Checklist of questions	Judgment	

Figure 30 --Business...Development and history of Purchasing Evaluation Theory.

Recognition of Importance of Purchasing and Recognition as Separate Function
 Years prior to 1930

Emphasis is on Efficiency--How to Measure Performance becomes of Prime Interest
 1930-1940

Emphasis begins to shift towards Purchasing proficiency Rather than Merely Efficiency
 1940-1950

Proficiency First, Efficiency second--use of Management Audit Approach
 1950-1962

1. Purchasing Function gained recognition as separate entity.
2. First textbooks on purchasing appeared
3. Interest in how to "prove worth" of purchasing spurs efforts to determine how to measure performance

1. Economic recession caused interest in cost reduction.
2. interest in cost reduction spurred interest in how to measure purchasing performance
3. Emphasis was on efficiency or cost of purchasing.
4. Great interest in proving worth of purchasing continued.
5. Approach to measuring performance developed: a. objectives specified, b. need to isolate factors to be measured is recognized,

1. Complexity of measuring purchasing performance is recognized.
2. Interest waned during war years.
3. Definite trend developed regarding a shift away from efficiency in purchasing to proficiency in purchasing
4. Need to develop performance standards on individual department basis is accepted.

1. Purpose of Evaluating from management theory point of view gained greater recognition
2. Use of statistical sampling techniques and work measurement was introduced.
3. Use of management audit approach to evaluate purchasing performance began to gain wide acceptance.

Recognition of Im- portance of Pur- chasing and Recogn- ition as Separate Function	Emphasis is on Ef- ficiency--How to Measure Perform- ance becomes of Prime Interest	Emphasis begins to shift towards Pur- chasing proficiency Rather than Merely Efficiency	Proficiency First, Efficiency second-- use of Management Audit Approach
Years prior to 1930	1930-1940	1940-1950	1950-1962

c. recognize that
some contribu-
tions not meas-
urable, d. aim
is to develop
performance
"index"

Figure 31.--Conceptual development of philosophy of evaluating purchasing performance.

3. The regression equations for industries 1, 3, and 5 are:

<u>Industry</u>	<u>Regression Equation</u>
1	$y = 51 - 7.06x$
3	$y = 44.4 - 4.76x$
5	$y = 52.6 - 5.06x$

4. the mere performance of certain functions had a definite effect on end product material costs as shown below:

The percentage difference in end product material cost as a percentage of total end product cost for those companies who perform and/or have the function and/or factor as compared to those companies who do not have and/or perform the same factor and/or function

<u>Function/Factor</u>	
1. Membership in National Association of Purchasing Agents	-7%
2. Subscribe to <u>Purchasing Magazine</u>	-17%
3. Value Analysis	-17%
4. Separate cost analysis section	-13%
5. Methods analysis group	-15%
6. Manufacturing and engineering liaison	-9%
7. Educational reimbursement plan	-10%
8. Performance evaluation program	-17%
9. Utilize electronic data processing	-25%
10. Expeditors	+17%

5. The combination of functions which indicated the highest degree of correlation with end product material cost as a percentage of total end product cost are shown below:

Disregarding industry classification

1. value analysis
2. cost analysis
3. vendor relations
4. performance evaluation

Industry Number 1

1. Executive development
2. value analysis
3. purchasing research
4. vendor relations

Industry Number 2

1. value analysis
2. cost analysis
3. vendor relations
4. purchasing evaluation

Industry Number 5

1. cost analysis program
2. purchasing research
3. purchasing evaluation
4. electronic data processing

Industry Number 7

1. value analysis
2. cost analysis
3. vendor relations
4. purchasing evaluation

Industrial practices

1. Nearly one-half of respondent firms do not attempt to evaluate purchasing department performance.
2. Approximately 60 per cent of respondent firms do not have written performance standards.
3. Only 5 per cent of respondent companies utilize work measurement as a basis of standards development with the percentage increasing with company size and value of purchase.
4. The use of dollar incentives for increasing buyer performance is very limited with only 8 per cent of respondent companies indicating its use.

5. Less than one-third of respondent companies utilize a material budget while about 40 per cent utilize an operating budget.

6. Less than 40 per cent of the respondent companies have a departmental manual with written department objectives and policies.

7. Thirty per cent of the respondent companies indicated they believed purchasing performance could not be evaluated.

8. The larger the dollar value of purchases the more likely it is that the organization attempts to evaluate purchasing department performance. Only 36 per cent of those respondent firms with purchases of less than 1 million dollars attempt to evaluate purchasing performance while 78 per cent of those with purchases in excess of 20 million dollars do so.

9. The factor most frequently used in evaluating purchasing performance is inventory turnover, almost 90 per cent of those companies which indicate they evaluate purchasing performance indicated they utilized inventory turnover as one of the factors.

10. The next most frequently used factors in order of frequency of use are shown below.

Factor	Per Cent that Use*
Dollar of scrap	77
Dollar cost reduction due sound purchasing	68
Cost of issuing a purchase order	61
Number of late deliveries	61
Management audit techniques	58
Number purchase orders issued per buyer	52
Number of production stoppages	50
Price paid versus market price	50
Average value of purchase order	41
Number BIDS received to BIDS ISSUED	35
Buyer rating forms	24
The number bids issued by dollar category	3

*Per cent is based on the number of firms that indicated they do attempt to evaluate purchasing department performance.

Conclusions

The findings of this research project were presented in Chapters II, III, IV and V and summarized in section one of this chapter. This section presents the conclusions reached by an analysis of these findings in relation to the questions posed in Chapter I (see p. 6). The writer suggests that the findings substantiate the following conclusions:

Emerging philosophy as to evaluation of purchasing

1. A generally accepted philosophy regarding the evaluation of purchasing performance has developed. By "generally accepted" is meant that recognized authorities in purchasing generally agree on certain concepts not that these concepts are generally accepted and practiced in industry or by purchasing personnel. Figure 30 indicates the main con-

tributors to purchasing evaluation philosophy and their contributions. The concepts on which there is general agreement are:

A. Purchasing performance can be evaluated; however, the long sought "absolute" yardstick is an impractical and probably impossible goal because

- (1) no two purchasing departments are identical and
- (2) some of the contributions of purchasing cannot be quantified, as they are intangibles.

B. The evaluation of purchasing performance must, therefore, be based on performance standards developed on an individual department basis.

C. The objectives of evaluating purchasing performance are

- (1) to improve performance,
- (2) to provide a basis for evaluating personnel,
- (3) to increase efficiency,
- (4) to provide management visibility,
- (5) to determine what the purchasing job is worth,
- (6) to control performance.

D. To evaluate purchasing performance the following steps must be accomplished:

- (1) define those factors of purchasing which effect performance,
- (2) define those factors which can be measured,

- (3) establish performance standards for those factors which can be measured.

E. Evaluation of purchasing performance requires the evaluation of intangible as well as tangible factors. It requires qualitative as well as quantitative tools or techniques.

F. Purchasing proficiency and purchasing efficiency are different considerations, with purchasing proficiency being the most important consideration. An effective measure of purchasing performance should consider the two separately.

G. Various types of standards have been recommended by different authors; they generally can be grouped into one of the following:

- (1) development of an "index" of performance,
- (2) job analysis and employee rating,
- (3) use of some individual factor such as dollar of cost savings,
- (4) use of a rating check list (management audit).

H. Standards in the main are based on past experience.

I. There is a relationship between efficiency and proficiency to the extent that one must "spend money to save money." Such functions as value analysis, vendor relations, and material research increase departmental operating costs but result in reduction of over-all company costs by reducing production and material costs. The ultimate measure then

of purchasing performance is end product material and production costs.

Comparison of purchasing evaluation philosophy with control theory

2. The stated objectives of the prevailing purchasing evaluation philosophy do not reflect a complete understanding of the basic nature and purpose of the evaluation function.

Evaluation requires comparison, which is a subfunction of the organic management function of control. Comparison has as its basic purpose the determination of the degree of agreement between actual and planned performance. Performance standards are a prerequisite of the comparison function and must of necessity be provided in the planning stage. They are also a necessity for effective planning, since one cannot establish meaningful objectives without knowledge of the relationship between input, workload, and output. The present purchasing evaluation philosophy's stated objectives clearly indicate a lack of understanding of these concepts. The primary objective stressed by most writers in the purchasing field is "to improve performance." While it is unquestionably true that control of an operation generally results in better performance relative to an uncontrolled operation, better performance is not the goal of evaluation but the result of it.

This failure to understand the basic purpose and nature of the comparison function has caused the confusion which has

existed and still prevails regarding how to evaluate purchasing performance. The emphasis on "improving performance" and "proving the worth of the purchasing function" has confused the issue. As Urwick pointed out in 1943, the comments regarding the difficulty and impossibility of setting performance standards is nonsense--"It is not difficult. It is always possible to set up some kind of mark to aim at. . . . At first it may be rather an arbitrary mark. . . . The important point is that the administrator should have a mark and force himself to examine and to explain all the reasons for deviation from that mark. Whether the mark is in fact an accurate estimate of what the actual accomplishment should be is a secondary consideration, provided it is not too modest an estimate." The point is again that comparison is part of the control function and requires as a prerequisite performance standards. The function of control is to constrain and regulate action in conformance with planned action. The function of comparison is to determine the degree of conformance of actual performance to planned performance. One does not evaluate to improve performance but rather to control it.

Another factor that causes confusion is the existing philosophy's failure to clearly differentiate between operating results and the factors that affect it. Purchasing literature discusses measuring performance by using a performance index, job analysis, employee rating, work measure-

ment, and so on. It fails to define clearly what performance is being discussed. Is one evaluating purchasing policies, procedures, personnel, operating results or what? Mathematically speaking purchasing operating results may be considered a "dependent variable" dependent on the independent variables of policy, procedures, leadership, and so on. This concept is illustrated in Figure 32.

The review of purchasing literature indicated that various approaches to measuring purchasing "performance" have been suggested over the years from the absolute yardstick of the 1930's to the factor analysis or check list technique popular today. Over the years the following techniques have been suggested:

1. Development of an absolute yardstick,
2. Development of a performance index,
3. Scientific job analysis and employee evaluation,
4. Management audit--use of a "check" list of questions.

Comparing the above techniques with the independent-dependent variable concept, one notices that basically there are only two possible approaches:

1. evaluation of operating results,
2. evaluation of one or more of the independent variables affecting results.

The development of a performance index was and is an attempt to evaluate the dependent variable of results. The check list and employee rating systems attempt to evaluate the

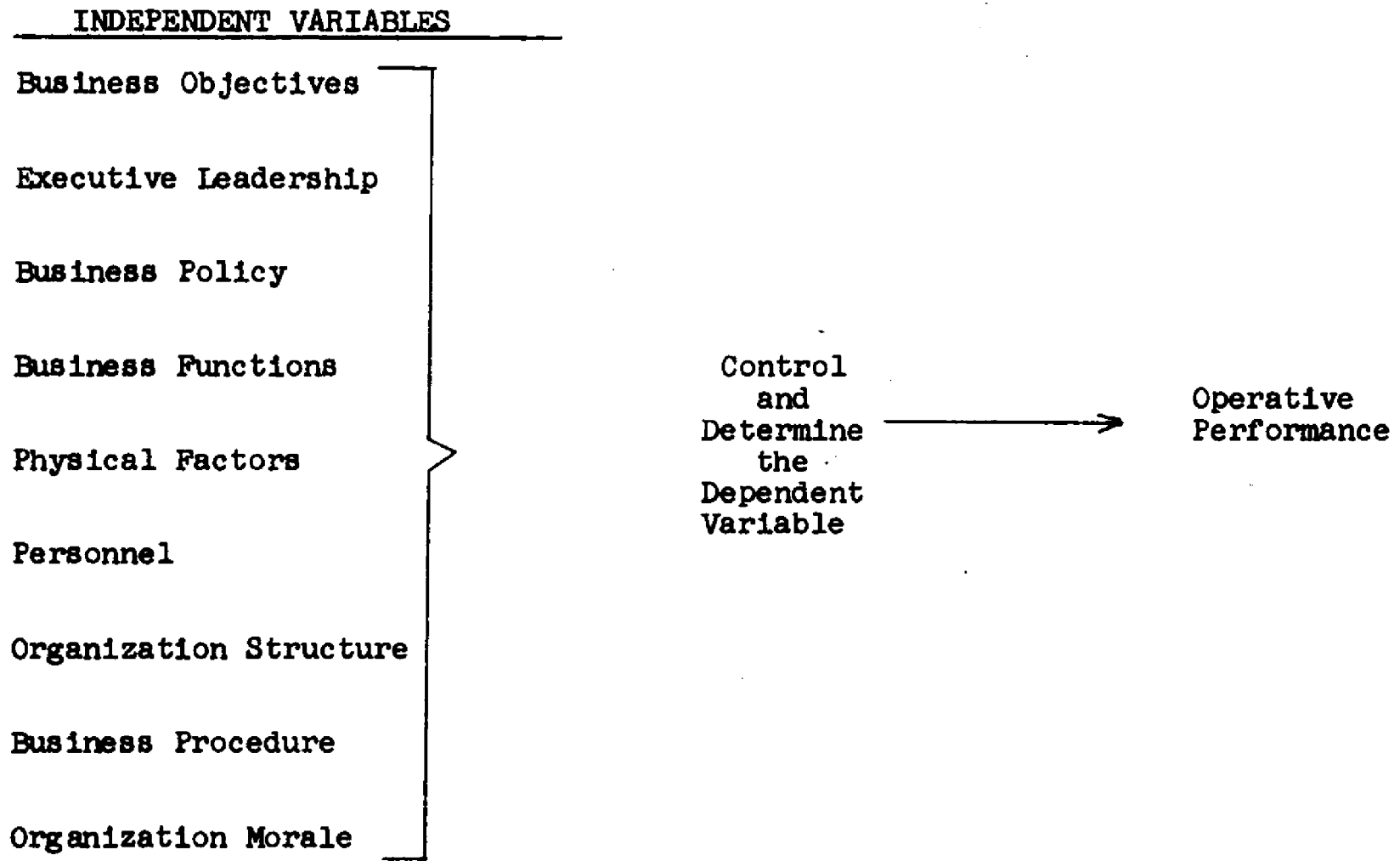


Figure 32.--Relationship of independent and dependent variable.

independent variables: personnel, policy, procedures, leadership, and so on.

Lewis commented that standards based on past experience alone were inadequate because the standard could conceivably be based on less than optimum operating conditions. A rational if not absolute answer is to analyze the various independent variables to insure their adequacy (procedural analysis, job analysis, organization analysis) then use work measurement to determine the relationship between workload and manpower thus having a basis for controlling manpower, and then develop performance standards for results.

3. An absolute yardstick of purchasing performance has not been found because it does not exist.

As present purchasing evaluation philosophy points out, no two purchasing organizations are the same regarding organization structure, responsibilities, nature of material purchased, sources of supply, personnel capabilities, and so on. As Lewis points out it ought to be possible to compare companies within similar industries, but even here reason dictates that no two companies are identical; they may be similar, but never identical. It may be possible to develop broad guides to performance within a specific industry or segments thereof; however, the very nature of the situational factors dictates that standards of performance for control purposes must be developed on an individual department basis.

4. The necessity of performing certain specific steps prior to the comparison and evaluation phase of control is recognized.

The philosophy, however, is rather vague regarding just what these steps are. If one compares the steps noted in the delineation of present purchasing evaluation theory with that of management control theory one notices again a lack of appreciation for the basic nature and requirements of management control.

5. An analysis of the existing state of purchasing standards indicates that they are in the early part of Davis's third stage--development of rational standards with the development of a technical staff function.

The primary basis of present purchasing standards is past operating experience. A few firms utilize work measurement techniques, but they are by far in the minority. This substantiates the comments of Rathe relative to the tendency of the various measuring techniques to remain in their original habitat, namely manufacturing.

STEPS IN PREVAILING THEORY	STEPS SPECIFIED BY MANAGEMENT CONTROL THEORY
1. Define factors of purchasing which affect performance	1. Select specific control points
2. Define those factors which can be measured	2. Select countable, representative control units
3. Establish performance standards for those factors which can be measured	3. Select applicable yardsticks
	4. Prepare reporting system
	5. Compare actual performance with planned performance

Figure. 33.--Comparison of purchasing evaluation philosophy with management control theory.

Modifications suggested by control theory--purchasing philosophy comparison

6. Purchasing evaluation philosophy should stress the following concept: The basic objective of comparing and evaluating purchasing performance is to control it so that project and program objectives may be attained.

It was mentioned previously that the prevailing stated objectives of evaluating purchasing performance indicate a misconception or misunderstanding regarding the objective or purpose of the comparison-evaluation function from a management control viewpoint. This misconception, in the opinion of the writer, has caused the apparent confusion that has plagued the purchasing profession regarding how to evaluate purchasing performance. The acceptance of the above referenced basic objective should reduce, if not eliminate, this confusion.

There is no absolute yardstick but standards can be and, as illustrated in the industrial examples, have been developed to meet the needs of the individual purchasing organization. Every purchasing department can measure its performance, but no one is going to provide a magic yardstick. It is necessary to establish goals and to set up an information and reporting system to gauge the degree to which these goals are being met. Performance then is evaluated on the basis of the degree of attainment of these pre-established standards.

End product material costs as an index

7. A relationship apparently exists between purchasing department operating costs and end product material costs.

This conclusion substantiates the long held concept that one must spend money in purchasing to save money or as Gushée and Boffee commented in 1928 "increased overhead properly applied means increased performance." It also substantiates Heinritz's concept that purchasing proficiency is far more important than purchasing department efficiency. Over emphasis of the efficiency aspect could easily adversely effect total performance.

The fact that substantial contributions to over-all company profits can be made by the purchasing department is also supported by the above conclusion. Effective purchasing can

reduce total material costs thereby increasing profits. The quantified relationship helps illustrate the "worth" of purchasing, which has been a goal of purchasing people for some time.

It also appears that this ratio could be utilized to compare different purchasing departments within the same industry or segments thereof. It at least could provide a guide for comparison. The ratio for the purpose of this study was defined as linear. The actual relationship is probably a hyperbolic parabola because of the law of diminishing returns. A more sophisticated study might provide results with higher reliability--higher correlation coefficients and smaller standard deviation. It conceivably could provide a partial answer to the long sought universal measure of purchasing performance.

The significance of this conclusion is better appreciated when it recognized that this "ratio" could conceivably provide an objective basis for answering such questions as posed below:

1. Does a particular purchasing department appear to be "penny wise and pound foolish"? Is it sacrificing performance for efficiency? This could be checked by comparing its "ratio" with its industry's curve.
2. How much increased performance may be expected by the expenditure of additional funds? Again could this be estimated by reference to the industry curve?

The "ratio" compares favorably with the criteria for a purchasing performance standard specified by Lewis in 1933.

It should be

1. based on factors over which purchasing has control,
2. simple, definite, understandable,
3. not subject to manipulation,
4. a measure of the efficiency not only of prior years but also of other companies.

8. Certain functions and/or factors have greater effect on reducing end product material costs than do others.

The analysis of the effect of various functions on end product material costs clearly illustrated that certain functions are more effective than others in reducing end product material costs. The factors and functions that have the greatest effect vary somewhat by industry. The most effective functions in general appear to be value analysis and cost analysis. This finding apparently justifies the ever increasing interest in value analysis or value engineering as some call it. The findings also substantiate Gushée and Boffee's 1928 comment that "increased overhead properly applied means increased performance." It is extremely important where and/or how the increased overhead is applied. Increased costs do not necessarily mean increased performance.

The most effective combination of functions also varies somewhat by industry. This is a logical result as it is

evident that the importance of the value engineering or value analysis function would tend to vary with the technical complexity of the product produced. Conceivably it should be possible to determine the contribution of different functions for any industry which contained similar companies.

The significance of this conclusion is better appreciated when it is recognized that it conceivably means it is possible to provide an objective basis to answer such questions as posed below:

1. What functions are most effective in reducing end product material costs by industry?
2. What "return" can a particular company expect in the introduction of a particular function?

A broader and more extensive study could provide purchasing management with an extremely useful management tool which could serve as an objective basis for internal management decisions relating to organization structure. It could also provide purchasing management with an objective basis for "proving the worth" of the purchasing function.

9. Wide variances exist in practice as to concepts and approaches to evaluating purchasing performance

Certain companies definitely indicate a knowledge of management control theory in the programs they have developed to measure purchasing performance; they are, however, in the minority. Considering that 30 per cent of the questionnaire

respondents indicated they did not believe that purchasing performance could be evaluated, one is led to conclude that except for a minority of large industrial firms, industrial practice of evaluating purchasing performance reflects the confusion that is portrayed in the historically evolved purchasing evaluation philosophy documented from purchasing literature.

Recommendations

The writer believes that the research accomplished in this study has unquestionably laid the groundwork for additional research. In addition it has suggested the need for certain action on the part of the purchasing profession. Specifically, the writer believes that

1. There is a definite need for the education of purchasing management in the fundamentals of management, particularly in the area of management control theory.

2. There is an apparent void of published consolidated reference material regarding the approach to and the techniques and philosophy of evaluating purchasing performance. It is, therefore, recommended that a comprehensive text be prepared dealing with evaluation and disseminated to purchasing people.

3. The high degree of correlation found to exist between the analyzed variables, namely purchasing department operating cost as a percentage of purchased material and end product

material cost as a percentage of total end product cost suggests further research in this area. The writer believes that with sophistication the standard deviation can be substantially reduced, thereby providing a meaningful gauge for comparing companies in the same industry or segments thereof. By more restrictive samples and sophisticated analysis a series of curves for each industry can perhaps be developed. It appears that the research could prove most interesting and profitable for the purchasing profession.

4. The obvious effects of the mere performance of certain functions also suggests further research. It would be very useful to the purchasing profession if one could develop curves which indicated the effect of certain functions on end product material costs on a wider industry basis. It conceivably is possible, for example, that one could develop criteria which would permit the forecasting of the effectiveness of a particular function under specified conditions. In other words, it may be possible to determine those factors which govern the effectiveness of a particular function.

5. Finally, the approach or research philosophy regarding the relation of and correlation between business functions and/or factors certainly is not limited to the purchasing area--research in other functional areas should prove fruitful.

APPENDIX A

SAMPLE OF QUESTIONNAIRE

George T. Kennedy, Jr.
Doctoral Candidate
College of Commerce
The Ohio State University

Dear Sir:

Would you help me HELP YOU! You can do this by filling out the attached questionnaire which is part of a Research Project I am performing as a Doctoral Candidate at The Ohio State University under a grant sponsored by the National Association of Purchasing Agents. The basic purpose of the Research Project is to help you by determining how certain business factors affect purchasing department performance, as well as to ascertain how effective certain techniques are in evaluating or measuring purchasing department performance.

Do Not Sign Your Name -

The name of your company is not necessary as the data is being gathered for statistical analysis. However, your cooperation is necessary, indeed, it is essential, for without it this Research Project will fail.

Take the time to help yourself - fill out the attached questionnaire and return it in the enclosed self-addressed stamped envelope. Please do it now lest you forget!

Support the NAPA and the Research it Sponsors

The results of this study will be available to all participants. Thank you for your cooperation.

Sincerely,

George T. Kennedy, Jr.

QUESTIONNAIRE

Complete each statement by filling in the blank or circling the appropriate answer.

If your organization is a division of a company, base your answers on your division only.

Questions No. 6 and No. 7 are of major interest and of extreme importance to the success of this Research Project. Please be sure to answer them thoroughly.

1. Our company is in the following industry:

a. Ceramic wall & floor tile	e. Laundry equipment
b. Ball bearings	f. Vending machines
c. Matches	g. Air tanks
d. Sewing machines	h. Other (specify)
2. The sales volume of our company last year was \$_____.
3. The average employment of our company last year was _____.
4. Total purchases of company last year was \$_____.
5. The average employment of our purchasing department last year was _____.
6. The total annual cost of operating our purchasing department last year was \$_____.
7. The per cent of total end product(s) cost constituted by material costs = _____%
8. Of our total purchases last year, approximately _____% was spent for raw materials.
9. Of our total purchases last year, approximately _____% was for capital equipment items.
10. Of our total purchases last year, approximately _____% was spent for equipment items. (Purchase parts that go into end product without further fabrication such as motors, gauges, etc.)
11. Of our total purchases last year, approximately _____% was spent for supplies.

12. Of our total purchases last year, approximately _____% was spent for hardware (standard items such as nuts, bolts, washers, etc.).
13. The average number of buyers in our purchasing department last year was _____.
14. The average monthly salary of buyers in our purchasing department last year was \$_____.
15. Of the buyers in our purchasing department, _____ are college graduates.
16. Last year, our purchasing department issued _____ (no.) purchase orders.
17. Last year, our purchasing department bought approximately _____% of total company purchases.
18. The average years of formal education of our buyers last year was _____. (Through grammar school = 8, through high school = 12, through college = 16.)
19. Our chief purchasing agent has _____ years of formal education.
20. Do your organization's buyers belong to the National Association of Purchasing Agents?
A. Yes B. No
21. Does your organization subscribe to Purchasing Magazine?
A. Yes B. No
22. Does your organization have a formal management development program and/or does it send its executives to formal executive development programs such as those run by various Universities and the American Management Association?
A. Yes B. No
23. The average number of years of experience of our buyers is _____ years.
24. Does your organization have a formal "value analysis" program?
A. Yes B. No
(Formal meaning that there is an organization established with clear definition of responsibility and authority for performance of this function on a continuing basis.)

25. Does your purchasing department have a separate cost analysis section?
A. Yes B. No
26. Does your purchasing department have a purchasing research group?
A. Yes B. No
27. Does your purchasing department have a formal program of vendor relations?
A. Yes B. No
28. Does your purchasing department have a methods analysis group for procedural analysis and work simplification?
A. Yes B. No
29. Does your purchasing department have a designated group or individual to perform manufacturing and/or engineering liaison?
A. Yes B. No
30. Does your purchasing department foster employee development by reimbursing employees for educational expenses?
A. Yes B. No
31. Does your purchasing organization attempt to evaluate departmental performance?
A. Yes B. No
32. Does your purchasing department have written standards of performance?
A. Yes B. No
33. Does your organization utilize work measurement as a tool in developing performance standards?
A. Yes B. No
34. Does your purchasing department have an incentive program for its buyers based on performance ratings?
A. Yes B. No
35. Check the following statistical tools which your purchasing department utilizes to gauge its performance:
- a. Material budget
 - b. Operating budget
 - c. Average value of purchase order
 - d. Number of purchase orders issued per buyer

- e. Dollar cost of issuing a purchase order
 - f. Number of bids received to bids issued
 - g. Number of bids issued by dollar category
 - h. Inventory turnover
 - i. Dollar value of scrap
 - j. Price paid vs. market price
 - k. Dollar cost reduction due to sound purchasing
 - l. Number of production stoppages
 - m. Number of late deliveries
36. Does your purchasing department utilize performance rating forms for buyers?
 A. Yes B. No
37. Does your organization utilize "Management Audits" either by outside consultants or an internal staff to evaluate purchasing department performance?
 A. Yes B. No
38. Does your organization utilize electronic data processing equipment for such things as purchase order preparation, order quantity determination (EOQ) and material control?
 A. Yes B. No
39. Does your purchasing organization utilize expeditors?
 A. Yes B. No
40. Does your purchasing department have a department manual with written objectives, policies, and procedures?
 A. Yes B. No
41. Do you feel that purchasing performance can be evaluated?
 A. Yes B. No
42. Indicate the number of products produced by your company (number of different lines--not grade or quality differentiated):
- | | |
|------|----------------|
| a. 1 | d. 4 |
| b. 2 | e. 5 |
| c. 3 | f. More than 5 |

43. Please give a breakdown of your purchasing department's yearly operating cost:

_____% _____

_____% _____

_____% _____

_____% _____

_____% _____

_____% _____

_____% _____

APPENDIX B

EXAMPLES OF FIVE STATISTICAL TECHNIQUES FOR
MEASURING THE EFFICIENCY OF A BUYING
OFFICE BY ALBERT PLEYDELL

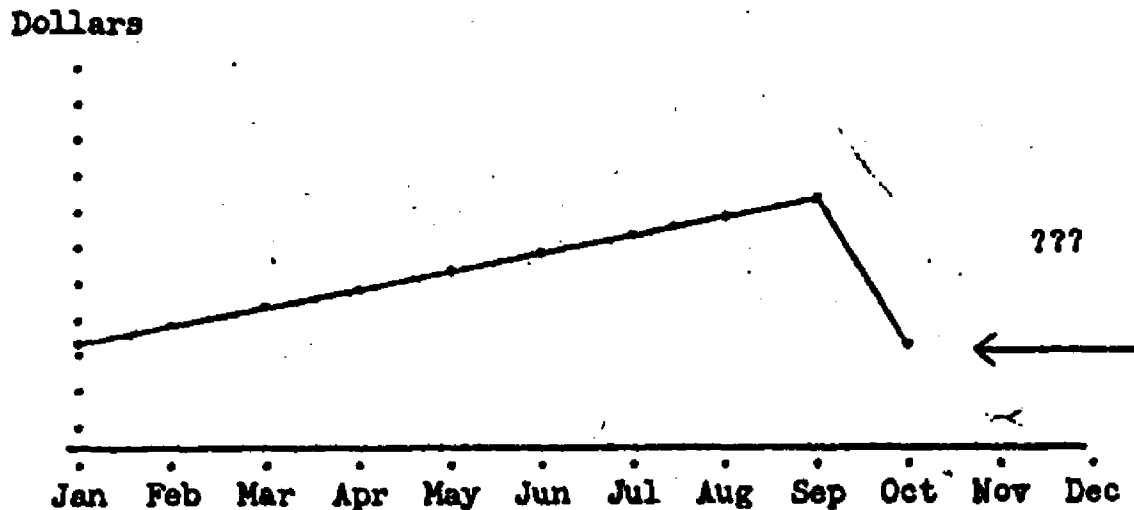
MEASURING THE EFFICIENCY OF A PURCHASING DEPARTMENTTECHNIQUE #1THE AVERAGE VALUE OF A PURCHASE ORDER

The number of purchase orders should be kept at a minimum for the buying that has to be done. There are two chief reasons for this:

1. Fewer purchase orders (in relation to the volume of buying) mean that requirements are being consolidated to obtain better prices for larger quantities
2. Paper work is reduced.

Hence the average value of the purchase orders is a significant figure in measuring the efficiency of a purchasing office. A graph made by plotting this figure for each regular calendar period (week, month, or quarter) is one measure of the extent to which progress is being made in attaining and maintaining buying efficiency. A rising curve indicates successful efforts; falling, less successful.

For example, in the imaginary situation portrayed by the graph below, it is apparent that good progress was being made, and commendations were in order, until something happened in October:



Why the sudden drop? Perhaps there is an obvious reason - such as new and untrained personnel, or an unusual situation requiring a number of low-value purchase orders. It could, however, be a warning that things are slipping and need to be tightened up.

TECHNIQUE #2THE NUMBER OF BIDS SOUGHT IN RELATION TO THE VALUE OF EACH PURCHASE

Every good Purchasing Agent knows that the best prices usually result from wide competition - the worst from monopolistic practices. Therefore, even though not legally required to do so, alert Purchasing Agents aggressively seek competitive bids.

A good general rule to follow is, "The greater the expenditure, the more bids should be sought." If this rule is to be followed, then the Purchasing Agent needs to have some simple way of checking on the job his assistants are doing.

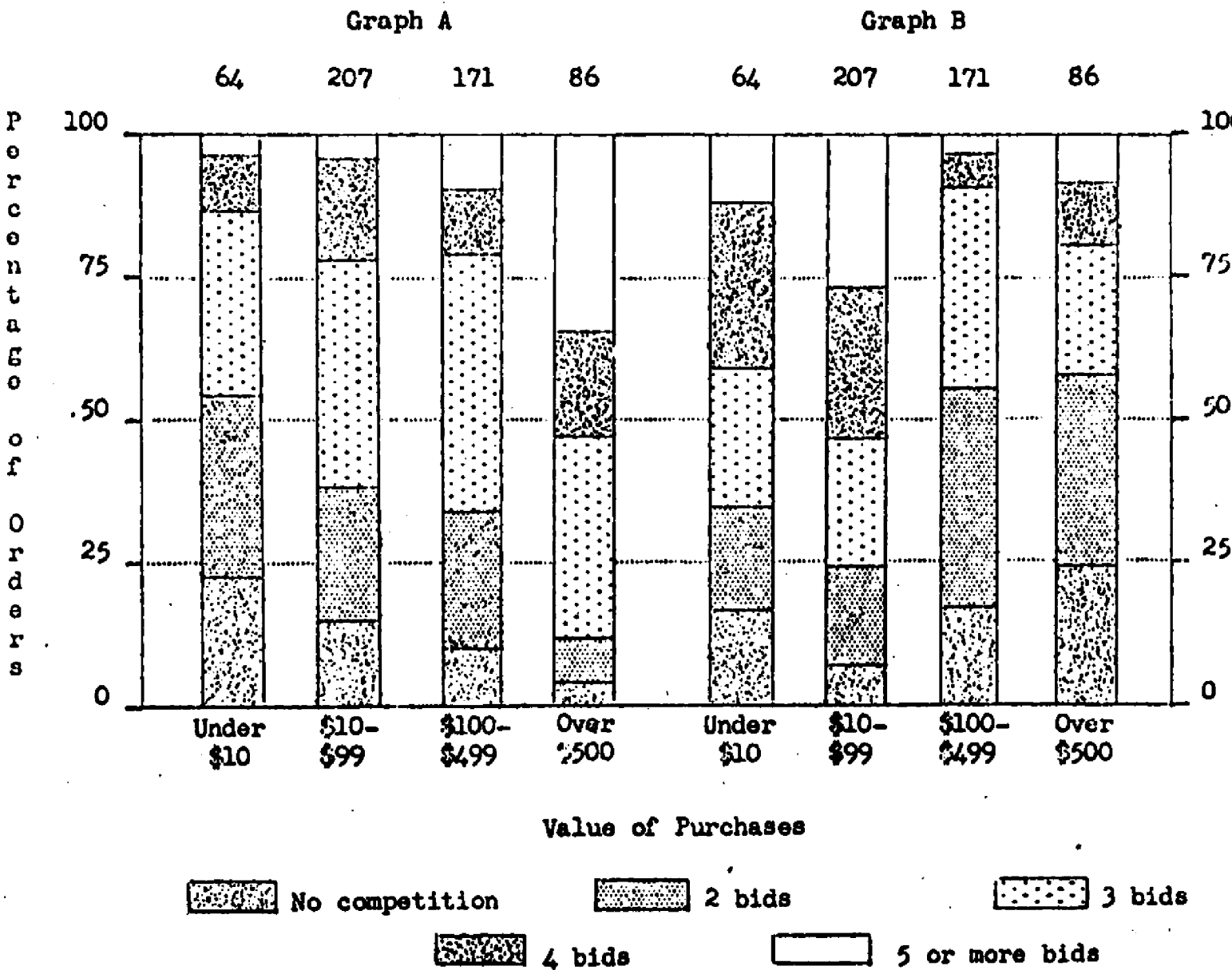
To help him check, we suggest using the bar chart technique illustrated on the accompanying page. Charts might be prepared monthly, quarterly, or at irregular intervals. They could include all orders, or be based on careful sampling.

Two composite charts are shown as samples. In actual practice, a Purchasing Agent may also want to work out a separate chart for each major commodity group. Over-all averages are helpful, but they may sometimes conceal situations that commodity analyses would reveal.

Graph A, below, indicates a situation where competition tends to follow a normal pattern. The greater the value of the purchase, the more bids sought. Few awards in the higher value groups are made without competition. Little competition is sought for awards under \$10. Graph B (which is based on an actual situation), however, prompts several questions.

Why, proportionately, were five bids or more sought so infrequently in the higher value groups? Similarly, why were there so many awards with no competition in these same groups? Why were more bids of four or five or more sought within the lowest value groups than in the two highest groups?

The answers to these questions are of greatest importance to the Purchasing Agent who finds he has a situation like that shown in Graph B. The picture is incomplete, of course, without a consideration of the number of bids received in relation to the number sought, which will be the next topic in this series.



NOTE: Since percentages can be misleading without a knowledge of the actual numbers involved, it is wise to show the number of purchase orders at the head of each bar for purposes of comparison.

TECHNIQUE #3THE NUMBER OF BIDS RECEIVED IN RELATION TO THE NUMBER SOUGHT

In Technique #2, we suggested that, as a general rule, "The greater the expenditure, the more bids should be sought," and discussed a method by which the Purchasing Agent might check on the situation from time to time. We also cautioned that the results of such an analysis would not be completely significant without a consideration of the number of bids actually received in relation to the number sought. In general, if competition has been sought in proportion to value, the number of bids received, in relation to those sent out, should be higher in the higher value groups. Technique #3 offers a quick, rule-of-thumb method to help the Purchasing Agent determine whether the competition pattern in his office is normal, and discusses the possible implications of deviation from the normal trend. (To pin-point difficulties, separate analyses may have to be made for each major commodity group as well as for the over-all picture.)

In Graph A, below, the competition sought follows a normal pattern. The greater the value of the purchase, the more bids sought. The arrows indicate the total number of bids received, in each dollar group, as a percentage of the total number of bids sought in the same group. Once again the situation is normal the percentage of bids received increasing with the dollar value of the purchase.

Graph B, however, reveals a different situation. The picture of the competition sought is exactly the same as in Graph A. But the arrows show that the percentage of bids received has not tended to increase with the value of the purchase.

Why is this? There are several possible answers and the Purchasing Agent faced with such a situation is advised to look further into the matter and find out which one applies. The most common causes of such a condition are:

1. Invitations are not actually reaching suppliers in the number indicated by the office records.
2. Bids are being sought, intentionally or unintentionally, from "inactive" suppliers.
3. There may be collusion among suppliers.

MEASURING THE EFFICIENCY OF A PURCHASING DEPARTMENTTECHNIQUE #4THE COST OF DOING THE PURCHASING JOB

One method of measuring the cost of doing the purchasing job is to determine the cost per purchase order issued by dividing the total relevant costs by the total number of purchase orders. This method, although widely used, is not a reliable yardstick, since it is necessary to increase the number of purchase orders (at the expense of consolidation of requirements, for example) to arrive at a "better" cost per purchase order.

A more significant ratio is the administrative and clerical cost per dollar spent, both over-all and by major commodity group. Here again, there is a weakness, since the payment of higher prices would result in a "better" cost figure. In the absence of more exact production figures, however, this method may be used to good purpose, provided that:

1. It is combined with a continuing price review, and
2. Purchases that are likely to distort the picture are excluded. By this we mean intermittent purchases where the value of the purchase is disproportionate to the buying effort involved--fuel might be such an item.

A simple, line graph can be used to record progress from period to period.

MEASURING THE EFFICIENCY OF A PURCHASING DEPARTMENTTECHNIQUE #5CONFIRMING ORDERS

In measuring the efficiency of any buying office, demerits for issuing too many confirming orders can outweigh meritorious citations for good work. Why? Because, so often, the confirmatory picture is one that indicates serious weaknesses of organization and procedures.

Some confirmatories reveal the existence of a regular system of unofficial decentralized buying. Others may be just pieces of paper issued to conform to an obsolete accounting system that badly needs to be brought up to date.

Look over all purchase orders your office issued over the past twelve months. How many of them were for the purchases you really made? How many were confirmatories? What is the ratio?

Here is a good place to start. Go after those confirmatories. Set a better ratio as this year's goal. Check your progress each month.

APPENDIX C

OUTLINE FORTHCOMING PURCHASING EVALUATION HANDBOOK
OF NATIONAL ASSOCIATION OF PURCHASING AGENTS
BY ARTHUR PEARSON

OUTLINE FOR BOOKLET ON EVALUATING PURCHASING PERFORMANCE

To be published by the Development Committee on Evaluating Purchasing Performance - a Project Committee of the Professional Development Committee N.A.P.A.

Art Pearson, Northrop Corporation, Chairman

OUTLINE

INTRODUCTION:

1. Must be very general and broad.
2. No simple answer to evaluation.
3. Of these ideas only a few will apply to any one department.
4. Evaluation Programs must be built less on tradition and more by theory and experimentation. This means the extracting and formulating of principles from experience and test and then the refining of these principles.

EVALUATION:

1. Part of the Planning and Control Function of Management.
2. Distinguish between Audit, Measurement and Evaluation.
3. Part of the maturing of Purchasing as a part of Management.
4. In most business an increasing percentage of the cost of finished article is covered by purchasing function.
5. What we do tomorrow is based on what we do today and today we can only build on what we did yesterday.

A. PURCHASING CLIMATE:

1. A true evaluation can only be made against the background of the purchasing climate in which the function is performed.
2. Management is essentially responsible for this climate.
 - 2.1 Thru Management policies and Purchasing's policies.

- 2.2 Assignment of Responsibilities and Authority.
- 2.3 Extent of facilities and personnel (i.e., budget) to carry out the assigned responsibilities.
- 2.4 Lateral relations with other management elements.
- 2.5 Requirements of other departments that help or detract from Purchasing's performance.

A good purchasing climate is something more than just having a Purchasing Department to place orders. This something more is a change in thinking, a better way of looking at the purchasing problem. When thinking is right the actions and devices take their proper places without much difficulty.

The first step in right thinking is the asking of the right questions. Let's try a few questions or you will want to develop your own:

1. What are all of the procurement functions in your specific organization?
2. Are these functions of purchasing encompassed within the Purchasing Department or Materiel Division?
3. Do vendors representatives get what they consider a satisfactory hearing at the Purchasing Department or is there back door selling to bypass Purchasing?
4. Do requisitions specify sole source materials and/or specific vendors? Or asked another way, do using departments and engineers have faith in the competence and ability of purchasing to do their job?
5. Are requirements made known to purchasing at the earliest possible time to give purchasing the opportunity to use it's ability and resources?
6. Does the Purchasing Department have the personnel to do the job?
7. What do the managers of other departments think of purchasing's ability?
8. Is there "breathing space" to take the time and do the things that develop better profit making purchasing practices? To develop profit making purchasing an organization must have enough people, enough resources and enough flexibility to do the right things with the right people at the right time.

9. Does Purchasing have the stature to sit in on the management planning so that it can properly discharge it's responsibilities?
10. Does purchasing contribute to cost reductions and profit improvement? Is the work organized so that procurement research includes value analysis, standardization, vendor product improvement conferences and preproduction planning to contribute to company development? This work should give broad enough scope so that the employee can feel responsible for results and have the satisfaction of achievement when he is successful.

MANAGEMENT THINKING

DEFINITION OF MANAGEMENT, by Larry Apply
of American Management Association

PLANNING

CONTROL

ORGANIZING

STAFFING

DIRECTING (LEADING)

Planning without CONTROL is Merely
Wishful Thinking

Control without PLANNING is Merely
Repression for Repression's Sake

- B. PROCUREMENT PLANNING GOALS: Question yourself on these 10 goals.

The answers should provide some basis for specific planning by management in establishing purchasing goals. They suggest the breadth of thinking required if the potential and resources of purchasing are to be fully and effectively used in the commitment of the company's liquid assets.

For a business that sees its future achievement in terms of development more and better products with consistent and adequate profits the following criteria are suggested:

Review these goals each year, you may want to change a few.

1. Coordination - Extensive communication laterally throughout the Engineering, Quality Control, Production and Finance Departments to bring all elements of the

organization to bear intelligently on the procurement. Likewise communication with vendors should bring their abilities and experience to our use as well as complete understanding of the requirements of each purchase.

2. Mature Purchasing Organization - Proper preplanning for the long pull to eliminate constant emergency action. Concentration on big problems. On schedule deliveries of proper quality materials. Purchasing effort in relation to dollars committed rather than on the basis of pieces of paper handled.
3. Price Targets for Procurement - Fifteen percent of items account for 80% of the money. Price Indices established.
4. Value - Long term. Low over-all costs in the final product.

Procurement Research, Value Analysis

5. Quality - Proper establishment of and the negotiation of quality into the product.
6. Negotiation - Complete investigation of all aspects of produrement.
7. Proficiency in performance - Professional Development - N.A.P.A.
8. Operating cost of the function - What costs should be used?
9. Work Load Index - Which figures should be used and how?
10. Management Contribution - Tangible & Intangible - By Management to Purchasing and from Purchasing to Management.

C. CONTROLLING TO THESE GOALS:

We have indicated that the envelope of the purchasing climate must be established.

Within this envelope the goals have been suggested.

Now for the controls part of management's planning and control function.

Technique for evaluation of progress toward each goal.
 Much of this evaluation must be in the area of opinion because its intangible factors elude factual measurement.

1. Coordination
2. Mature Organization
3. Price targets
4. Value
5. Quality
6. Negotiation
7. Proficiency
8. Operating costs
9. Work load index
10. Management contribution

1. COORDINATION - Opinion evaluation

1.1 Interdivisional

1.11 Does purchasing sit in on Management Planning?

1.12 Does purchasing work closely with the Sales Department

1.13 Engineering - Product conferences

1.14 Quality Control - Reliability - Super competition

1.15 Manufacturing

1.16 How do the other departments feel about purchasing

1.2 Vendor Relations - Opinion Evaluation

1.21 Purchasing Agent is a specialist in Vendor Relations

1.22 What do the vendors think about the purchasing department

1.23 Salesmen traffic

1.24 Bidding and negotiation practices

1.25 Vendor product improvement meeting

2. MATURE ORGANIZATION - EVALUATION BY APPRAISAL

2.1 Learning to operate less by tradition and more by theory and experiment: this means the extracting and formulating of principles from experience and test and then refining these principles.

2.2 Adequate procurement preplanning all the way up stream to the sales as well as the engineering department.

2.3 How much time is spent putting out fires and taking emergency short term action.

2.4 Do they have the facts on which to make adequate long range plans. See work load statistics.

2.5 Management by teamwork.

3. PRICE TARGETS - EVALUATION BY APPRAISAL AND FACTUAL
 - 3.1 Price Indices on major items
 - 3.2 Evaluation of cost of major components and raw materials
 - 3.3 Coordination of major cost factors with Sales or Marketing Department
 - 3.4 Price studies and forecasts
 - 3.5 Annual contract and pricing agreements
 - 3.6 Substitution
 - 3.7 Relating price index changes to market changes

4. VALUE - APPRAISAL EVALUATION
 - 4.1 Value analysis of materials, procedures and vendors
 - 4.2 Vendors Product Improvement Meetings. Product preproduction analysis
 - 4.3 Procurement preplanning generally. Does purchasing request requisition and/or have price agreements ready before requisition is received.
 - 4.4 E.D.Q. How is this procurement tool used - tables or formula
 - 4.5 Specification review to cover all cost from vendor production to final sale of end product. Inspection problem. Handling.
 - 4.6 Standardization

5. QUALITY - APPRAISAL AND FACTUAL
 - 5.1 Can we tell how well we are buying quality
 - 5.2 Coordinated understanding by Engineering Q.C. Purchasing and vendor
 - 5.3 Vendor understands quality needs
 - 5.4 Receiving rejection rate - can be charted
 - 5.5 What is done about each vendors problem
 - 5.6 Vendor Certification Program to increase receipt of good material and reduce inspection costs.

6. NEGOTIATION - APPRAISAL EVALUATION - SAMPLING OF ACTIVITY
 - 6.1 Thorough detailing of all factors in a procurement and proper consideration of these facts.
 - 6.2 First article procurement program
 - 6.3 Evidence of planning for negotiation
 - 6.4 Use of learning curves
 - 6.5 Adequate vendor and material data
 - 6.6 Percentage of buyers time spent in actual negotiations
 - 6.7 Does Buyer have time to negotiate - late requisition program with charts
 - 6.8 Historical pricing data immediately available
 - 6.9 Historical product data immediately available.

7. PROFICIENCY - APPRAISAL AND FACTUAL

- 7.1 Personal evaluation - Buyer Evaluation - Chet Ogden, V. Pres. Detroit Electric Co. PACE PROGRAM
- 7.2 Internal Audit Techniques
- 7.3 Professional Development - Active Membership in N.A.P.A. Participation in College instructions.

Effective formal classroom training where needed. Such training should not be allowed to become static.

7.4 Mr. Heinritz sounds the warning that the greatest danger in any process of job evaluation is that the measuring stick will concern itself with the minor aspect of efficiency - with invoices, prices and with buyers administrative ability as an office manager - while the larger factors of proficiency in administering a materials program are neglected. Proficient purchasing should contain the following personal qualifications:

1. Resourcefulness and insight to maintain a functional approach to the job.
2. Knowledge of ones company - its facilities, operation and basic requirements.
3. Knowledge of materials purchased and how they are produced.
4. Knowledge of suppliers.
5. Knowledge of costs - primary and end.
6. Command of the respect and confidence of other departments and cooperation with them.

For every dollar saved in efficiency, there are thousands of dollars to be saved by proficiency in procurement.

8. OPERATING COSTS - FACTUAL

- 8.1 What is the cost of performing each operation
- 8.2 How do these costs change from time to time
- 8.3 Cost of each operation or function, i.e., as a percentage of total cost
 1. Material Release
 2. Purchasing
 3. Follow-up
 4. Receiving
 5. Clerical
 6. Inspection
 7. Procurement Research
 8. Rejection
 9. Warehousing
- 8.4 Breakout of buyer time spent on each basic function
- 8.5 Purchasing budget tied to the cost to commit a dollar effectively

8.6 N.A.P.A. has in preparation a booklet on measurement of the purchasing function.

9. WORK LOAD INDEX

- 9.1 Cost to spend a dollar - care in using this tool
 - 9.2 Work load per purchase order - measure of effective technique for preplanning
 - 9.3 Incidence of order placement
 - 9.4 Work load on a - P.O. per buyer basis
 - Open orders per expeditor
 - Backlog of requisition in average day's work
 - 9.5 Total dollars per vendor
 - 9.6 Your dollars as a percent of total vendors sales
 - 9.7 Vendor performance - Quality and delivery
 - 9.8 Bidding program - Bid sought and received
 - 9.9 Percent of confirmation orders
 - 9.(10) Man hours per purchase transaction
 - Mentioned before
 - Rejections, charted
 - Late Requisition curve of requisition received
 - 9.(11) Average Lead time curve
 - Arithmetical means of all lead time as stated in purchasing department lead time list
 - 9.(12) Late deliveries curve
 - Number of late deliveries as a percent of the total deliveries
 - 9.(13) Savings as a percentage of goods purchased (use 12 mo. moving average)
 - 9.(14) Private price index for products purchased by your company
 - 9.(15) Purchasing expense
 - We have previously mentioned
 - 9.(16) Rejections charted
 - 9.(17) Late requisitions curve. Requisitions without adequate procurement time.
- 10.1 Management Contribution by Management - Appraisal
 - 10.11 Procurement climate thru policies and organizations
 - 10.12 Adequate responsibility and authority
 - 10.13 Proper personnel budget
 - 10.14 Proper procedure
 - 10.2 Management Contribution by Purchasing
 - 10.21 Management Reports
 - 10.22 New idea

- 10.23 Profit making operation from the over-all company view
- 10.24 Review these goals and evaluate the planning each year and the controls used to achieve the successful accomplishment of these plans.

* * * * *

APPENDIX D

EXAMPLES OF VARIOUS INDUSTRIAL FORMS INCLUDING

1. General Electric Purchasing Measurement Work Sheets
2. The Boeing Company's Management Audit Outline, and
3. Worthington Corporation's Department and Manager Rating Forms

MATERIALS SUBSECTION
PURCHASING MEASUREMENT

Work Sheet - Fiscal Month of _____

FUNCTIONAL RESPONSIBILITY	FACTORS	AMOUNT	RATIO
	Price		
Cost - Standard Input	Standard Cost of Items Ordered		
----- A -----			
Cost - Standard Input	Actual Price of Items Purchased		
Purchasing	Budgeted Buying Expense		
----- B -----			
Purchasing	Actual Buying Expense		
Cost - Standard Input	Price Achievements (\$ Variance)		
----- C -----			
Purchasing	Total Purchasing Expense		
Buyers Performance Report	Number Items Purchased		
----- D -----			
Purchasing	Number Buying Hours		
	Time		
Vendor Perf. Report (Select V.)	Number of items Scheduled		
----- A -----			
Vendor Perf. Report (Select V.)	Number of Items Delivered on Time		
Purchasing	Budgeted Expediting Expense		
----- B -----			
Purchasing	Actual Expediting Expense		

<u>FUNCTIONAL RESPONSIBILITY</u>	<u>FACTORS</u>	<u>AMOUNT</u>	<u>RATIO</u>
Accounts Payable	C	Premium Trans. Cost	
Accounts Payable		Total Price of Items Paid for	
Purchasing		Number of Items Expedited	
Purchasing	D	Number of Expediting Hours	
Quality			
Q. C.-Shipping - Cost	A	Purchased Material Quality Cost	
Accounts Payable		Total Price of Items Paid for	
Std. Input - Quality - Misc.	B	Purchased Material Quality Cost	
Data Processing - PURAC		Number Items De- livered to Q.C.	
Quality Cost Report		Incoming Insp. Quality Cost	
Quality Control	C	Number of Items Rejected	
Quality Cost Report		Incoming Insp. Quality Cost	
Purchasing	D	Total Price of Items Rejected	
Quantity			
Load Cont. A-B-C Items		Number of Items Understocked	
Load Cont. A-B-C Items	A	Total Number of A-B-C Items	
Accounts Payable		Total Transporta- tion Cost	
Accounts Payable	B	Total Price of Items Paid for	

<u>FUNCTIONAL RESPONSIBILITY</u>	<u>FACTORS</u>	<u>AMOUNT</u>	<u>RATIO</u>
Load Cont. A-B Items	Number of Items Overstocked		
----- C -----			
Load Cont. A-B Items	Total Number of A-B Items		
----- D -----			
Inventory Control Spe.	Budgeted Material Input		
----- D -----			
Inventory Control. Spe.	Actual Material Input		

EVALUATION OF SUBCONTRACTOR PURCHASING SYSTEM

The survey team must be objective in its evaluation. It should consider only "Does the company have an adequate system." Comparison with The Boeing Company system should be avoided. This outline is to be used as a guide in conducting the survey and writing the report, but the team should feel free to deviate from it when to do so will result in a more effective evaluation of the particular situation. Reports should be clear and concise, but conclusions must be supported by facts and logic.

Section I - General

1. Firm name
Division or plant
Address
2. Annual Sales (last full year)
Number of employees
3. Principal products
4. Summary of recent Boeing procurements
(Date, division, product, dollar amount)
5. Dates of survey
6. Team members (name and organization)
7. Contacts (Names and Titles)
8. Current business--list major contracts, indicating product, customer, buyer or contracting officer, dollar value and type of contract.
9. Has there been a recent purchase methods survey?
By whom? Date? Results?

SECTION II - Conclusions and General Evaluation

1. State overall conclusions using the headings of Sections III through X as a guide, pointing out notable strengths and weaknesses.

2. Considering the nature of Boeing subcontracts presently in effect or contemplated, is this a satisfactory purchasing system? List any specific defects which team considers as requiring correction in order to be acceptable, with recommendations as to corrective action needed.

3. Evaluate attitude and company management toward the purchasing function and the survey, and apparent willingness to consider recommended improvements.

Section III - Organization and Personnel

1. Position of procurement in company organization
 - a) Obtain or draw up organization chart showing relationship of purchasing to other functions.
 - b) What are the Review Team's conclusions on the adequacy of the procurement function's position in the organization? Does it appear to be in balance with the overall operation?
2. Organization of Materiel
 - a) Scope
 1. Obtain or draw up organization chart; identify functions.
 2. What purchasing-related functions are performed by organizations other than Materiel?
 3. What non-purchasing functions are assigned to the Materiel organization--e.g., receiving,

storekeeping, traffic, surplus disposal?

- | | | |
|---|-------------------|------------------------|
| b) Size | <u>Purchasing</u> | <u>Other Functions</u> |
| 1. No. of supervisors | | XXX |
| 2. No. of buyers | | |
| 3. No. of staff specialists | | |
| 4. No. of clerical employees | | |
| 5. Annual dollar value of purchases* | | XXXX |
| 6. Annual no. of purchase transactions* | | XXXX |
- *If available, segregate by major classification such as MRO, raw material, outside production.
- c) Discuss the general background of key Materiel personnel, including present position, age, education and experience.
- d) Evaluate organization and staffing in relation to the mission of the department.

Section IV - Purchasing Policies, Procedures and Forms

1. Scope of procurement authority
 - a) How is the authority of the purchasing organization defined?
 - b) Discuss any unusual restrictions placed on purchasing by other organizations.
 - c) Evaluate "Make or Buy" policies.
 - d) How are interdivisional orders handled?
2. Is there a written purchasing manual, buyer's guide or set of operating instructions? Evaluate coverage, adequacy and clarity.
3. Purchasing forms and contract clauses
 - a) Are quotation form, purchase order forms, standard terms and conditions and special clauses

adequate for their purpose? Obtain copies.

b) How are legal aspects of procurement handled?
(i.e., terms and conditions, overriding agreements,
supplier exceptions to terms and conditions, etc.)

Section V - Material Control

1. Do material controllers have adequate authority with respect to requirements, and is it clearly defined?
2. Does material control have satisfactory inputs to assure timely and accurate determination of quantity and schedule requirements?
3. Discuss handling of requirement changes.
4. Discuss procedures for grouping of requirements to assure economical buying and scheduling.
5. Discuss surplus procedures: identification, screening against anticipated requirements and disposal.
6. What problems are recognized in relations with releasing organizations (e.g., late releases, inadequate specification, excessive changes)?

Section VI - Selecting the Source

1. What sources of supplier information are used?
Describe supplier rating plan, if any.
2. How are bid lists developed? What management approvals are required?
3. Evaluate source survey practices.

4. Evaluate policies and procedures in relation to maximum use of effective competition. Under what conditions is non-competitive procurement permitted? What documentation and approvals are required?
5. Evaluate procedures for bid evaluation and approvals required for award.
6. Is there a Small Business Program? Evaluate.
7. What consideration is given to Labor Surplus Areas?

Section VII - Pricing

1. Price/Cost Analysis

- a) What conditions require price/cost analysis? What methods are used?
- b) Who performs price/cost analysis? Discuss both position in the organization and the capabilities available for the function.
- c) Do requests for quotations and purchase order terms provide for adequate data to support effective bid analysis, and negotiation of changes, follow-ons and termination claims?

2. Negotiations

- a) Who conducts negotiations? What advance preparations are made? Are negotiations documented? Where are they filed?
- b) Evaluate negotiation procedures and practices with respect to:
 - 1) initial procurement

- 2) follow-on procurement
- 3) changes and terminations, including timeliness

3. Contract types

- a) How is contract type determined?
 - b) What types of contracts are being used?
 - c) What makes and approves decisions as to contract types?
- ### 4) Other pricing considerations
- a) Are cash discounts requested and taken? What control is exercised?
 - b) Are quantity price breaks considered in establishing order quantities?
 - c) Are "advise price" or "price to be negotiated" orders held to a minimum, and is there adequate control on timely definitization?

Section VIII - Subcontract and Purchase Order Administration

1. How are expediting and follow-up of routine purchase orders accomplished?
2. Discuss management of major procurements.
 - a) What types of liaison are used? Evaluate use of prescribed reports, resident representatives, and field representatives.
 - b) Areas of control. Evaluate extent and methods of monitoring schedules, production methods, and costs (especially overtime and other premium charges).

- c) Evaluate control of quality and reliability.
 - d) Discuss methods of configuration control.
3. Review accountability procedures for tooling and buyer-furnished materials.

Section IX - Standardization and Value Analysis

- 1. Evaluate the company's standardization program.
- 2. Evaluate the Value Analysis/Value Engineering program with particular reference to:
 - a) organization
 - b) type and method of studies
 - c) cost reductions achieved as compared with program cost
 - d) Buyer participation and support provided to buyers.
 - e) Use of Value incentive clauses in major purchases.

Section X - Purchasing Management

- 1. Standards of Purchasing Performance
 - a) How is Job Analysis and Evaluation accomplished?
 - b) What standards, if any, are established as the basis for evaluating the cost of the procurement function?
- 2. Evaluate reports and controls related to:
 - a) schedules
 - b) commitments
 - c) procurement expenditures
- 3. What methods are used to monitor conformance with policies and procedures, and insure adequate documentation of procurement transactions?
- 4. How does purchasing department contribute to company's
 - a) project or program planning?

b) contract proposals?

c) production planning?

5. Supplier relations

a) Are buyers acquainted with management of major suppliers, their facilities, capabilities and policies?

b) What are the policies on gratuities and purchasing ethics? Are they in writing?

EVALUATION OF XYZ DIVISION PURCHASING AND TRAFFICE PERFORMANCE

By the Division Manager

Ratings:

Outstanding	-10
Superior	- 8
Good	- 6
Satisfactory	- 4
Min. of Acceptance	- 2
Unsatisfactory	- 0

		<u>Rating</u>
1. Dollars spent for purchased materials and services excluding capital expenditures and traff	\$ _____	
Budget variance	\$ _____	
2. Dollars spent for capital expenditures	\$ _____	
Budget variance	\$ _____	
3. Dollars spent for traffic	\$ _____	
Budget variance	\$ _____	
4. Number of people in the Purchasing Dept.	\$ _____	
Budget variance	_____	
5. Number of people in the Traffic Dept.	_____	
Budget variance	_____	
6. Expense budget dollars spent for operating the Division Purchasing Dept.	\$ _____	
Budget variance	\$ _____	
7. Budget dollars spent for running the Division Traffic Department	\$ _____	
Budget variance	\$ _____	
8. Dollars saved by the Division Purchasing Department under Profit Improvement Program	\$ _____	
Budget variance	\$ _____	
9. Dollars saved by the Division Traffic Department under the Profit Improvement Program	\$ _____	
Budget variance	\$ _____	

Rating

10. Number of suggestions adopted resulting from the Division Purchasing Department Value Analysis Program and were the savings reported under PIP? # _____
Yes ___ No ___
11. How many changes have been adopted resulting from the Standardization Program of purchased items and were they reported under PIP? # _____
Yes ___ No ___
12. How many items were switched by the Division Purchasing Department Make or Buy Program and were they reported under PIP? # _____
Yes ___ No ___
13. Does the Division Purchasing Department Manager and Traffic Manager participate on all Product Teams and/or Cost Reduction teams? # _____
Yes ___ No ___
14. Do you have a yearly appraisal meeting with your Division Purchasing Manager and your Traffic Manager advising them regarding their job performance? # _____
Yes ___ No ___
15. Does the Division Purchasing Department adhere to the Corporation's purchasing policies as outlined in the Corporation Purchasing Manual? Yes ___ No ___
16. Does the Division Purchasing Department follow the suggested purchasing procedures outlined in the Corporation purchasing Manual? Yes ___ No ___
17. Is there an active training program under way in the Division Purchasing Department and your Traffic Department? Yes ___ No ___
18. Is the proper use made of lead time reports prepared by the Division of Purchasing Department? Yes ___ No ___

Rating

19. Does the Division Auditor occasionally check the Division Purchasing Department and Traffic Department's cash commitment reports? Yes ___ No ___ _____
20. Has the Division Purchasing Department and Traffic Department each established their 1960 objectives and target dates Yes ___ No ___ _____
21. General comments and opinions:-

EVALUATION OF XYZ DIVISION PURCHASING DEPARTMENT MANAGER'S PROFESSIONAL MANAGERIAL PERFORMANCE

Ratings:-

Outstanding	- 10
Superior	- 8
Good	- 6
Satisfactory	- 4
Min. of Acceptance	- 2
Unsatisfactory	- 0

Rating

A. MANAGEMENT LEADERSHIP

1. Making management decisions.

Does he take the responsibility and make decisions, or does he pass the buck by telling his problems to someone else for them to make the decisions. Does he have solutions rather than questions?

2. Initiating activities.

Is he a doer, a man of action--a self starter?

3. Communicating.

Does he clearly communicate up, down, and sideways in the organization and with proper timing?

4. Motivating purchasing people.

Does he create a good working atmosphere by being kind and understanding so as to inspire and encourage people to do a better job?

5. Selecting good purchasing people.

Has his judgment been good in staffing his department with people qualified for the jobs to be performed?

6. Developing purchasing people.

Has he taken the initiative to develop and upgrade by training and educational courses, himself and his subordinates?

B. PURCHASING MANAGEMENT PLANNING.

Rating

1. Forecasting.

Has he forecasted purchases, cash required, manpower needed, etc.?

2. Developing a Purchasing Program.

How well has he developed long range and short range objectives with target dates for accomplishing them?

3. Proposing Improved Purchasing Policies.

How effectively has he proposed any new company policies in purchasing which would strengthen our present position?

4. Proposing New Purchasing Procedures.

Although standard procedures suggested in the Corporation's purchasing manual should be used when possible, how effectively has he instituted any better procedures?

5. Budget Controlling.

How well has he operated within his expense budget and other budget quotas for manpower, profit improvement, value analysis, expenditures for materials, etc.

C. MANAGEMENT ORGANIZATION.

1. How well has he developed a streamlined purchasing organization structure?

2. How well has he developed position guides for his purchasing department personnel?

This would also cover delegated authority, responsibility and accountability of delegated work.

3. How well has he developed good relationships with all other departments and divisions?

D. MANAGEMENT FUNCTION OF CONTROLLING.

Rating

1. How well has he established standards of performance, based on job responsibility, authority and accountability of work delegated? _____
2. How well and how promptly has he made concise, informative purchasing department reports to Division and Staff management? _____
3. How well has he evaluated job performance of all members in his purchasing department? _____
4. How well does he take prompt, corrective action--firm but fair--in obtaining better future purchasing performance? _____

E. GENERAL COMMENTS:-

APPENDIX E

PURCHASING EVALUATION FORMS
FOR SMALL BUSINESS

PURCHASING EVALUATION CHART

Percentage of Efficiency	Immediate Attention						Point of Danger						Room for Improvement					Excellent		
	5'	10'	15'	20'	25'	30'	35'	40'	45'	50'	55'	60'	65'	70'	75'	80'	85'	90'	95'	100'
Organization																				
Inter. dept. relation																				
Budget																				
Cost accounting																				
Reports																				
Office procedure																				
Clerical perf.																				
Inspection control																				
Purch. controls																				
Inventory control																				
Market analysis																				
Specification writing																				
Vendor relation																				
Personnel relation																				
Employee training																				
Job evaluation																				
Expense control																				
Files & records																				
Equipment																				
Policies & procedures																				
Flow of paper																				
Flow of material																				
Quality control																				
Salvage control																				
Material standards																				
Expediting																				
Stores control																				
Receiving																				
Scheduling																				
Key personnel																				
Other																				
Your overall rating																				

TANGIBLE PURCHASING FACTORS

		Foot At Least Three Periods - Use Dollars Only			
		19__	19__	19__	19__
Total production cost	\$				
Total number of employees	#				
Number of purchase orders					
Total volume of pur.	\$				
Total number of employees					
Purchasing	#				
Receiving	#				
Inspection	#				
Stores	#				
Overtime salaries	\$				
Total salaries	\$				
Other adm. costs	\$				
Total adm. costs	\$				
Cash discounts					
Secured	\$				
Lost	\$				
Less through deprec.					
shrinkage, obsolescence,					
and pilferage					
Purchase budget	\$				
% over					
% under					
Average INV. turnover					

From "Judging Your Purchasing Efficiency" by Alfred W. Sutter, Management Aide for Small Business, No. 45, March 1954, Small Business Administration.

APPENDIX F

"T" TEST FOR SIGNIFICANT FACTORS, TABLES 8 THRU 12
AS WELL AS SIGNIFICANCE TEST OF MULTIPLE
CORRELATION COEFFICIENTS

TOTAL DATA BASIS

Identification, Total $t_{.95} = 1.665$
 No. of OBS = 92

Multiple hypothesis that $B(I) = 0$ for
 $I = 1, 4, 7, 8$
 $S = 4$

Degrees of freedom = 87
 Dependent variable, Y(1)

	Regression Coeff	Sigma of B	T Sub B
B(2)	4.984961E 00	4.398372E 00	1.133365E 00
B(3)	5.500905E 00	4.668994E 00	1.178178E 00
B(5)	-4.684538E 00	3.933308E 00	-1.190992E 00
B(6)	6.958541E 00	3.603318E 00	1.931148E 00
B(0)	2.213956E 01	1.145246E 01	1.932471E 00

Identification, Total
 No. of OBS = 92

Multiple hypothesis that $B(I) = 0$ for
 $I = 1, 3, 5, 8$
 $S = 4$

Degrees of freedom = 87
 Dependent variable, Y(1)

	Regression Coeff	Sigma of B	T Sub B
B(2)	4.408283E 00	4.376450E 00	1.007274E 00
B(4)	-6.835950E 00	6.599347E 00	-1.035852E 00
B(6)	5.569810E 00	3.609385E 00	1.543146E 00
B(7)	3.477290E 00	5.062274E 00	6.869028E-01
B(0)	3.411361E 01	1.299119E 01	2.625904E 00

Identification, Total
 No. of OBS = 92

Multiple Hypothesis that $B(I) = 0$ for
 $I = 1, 3, 7, 8$
 $S = 4$

Degrees of freedom = 87
 Dependent variable, Y(1)

	Regression Coeff	Sigma of B	T Sub B
B(2)	5.051959E 00	4.434037E 00	1.139359E 00
B(4)	-4.356262E 00	5.882167E 00	-7.405880E-01
B(5)	-3.331935E 00	3.846959E 00	-8.661216E-01
B(6)	7.061388E 00	3.624910E 00	1.948017E 00
B(0)	3.806800E 01	1.309313E 01	2.907479E 00

Identification, Total
No. of OBS = 92

Multiple Hypothesis that $B(I) = 0$ for
I = 1,2,7,8
S = 4

Degrees of Freedom = 87
Dependent Variable, Y(1)

	Regression Coeff	Sigma of B	T Sub B
B(3)	5.438962E 00	4.692354E 00	1.159112E 00
B(4)	-4.108314E 00	5.864046E 00	-7.005937E-01
B(5)	-3.635889E 00	3.896562E 00	-9.331018E-01
B(6)	8.181982E 00	3.511688E 00	2.329929E 00
B(0)	3.556649E 01	1.395064E 01	2,549452E 00

Identification, Total
No. of OBS = 92

Multiple hypothesis that $B(I) = 0$ for
I = 1,5,7,8
S = 4

Degrees of Freedom = 87
Dependent Variable, Y(1)

	Regression Coeff	Sigma of B	T Sub B
B(2)	4.441978E 00	4.364480E 00	1.017756E 00
B(3)	4.468502E 00	4.559959E 00	9.799456E-01
B(4)	-5.214928E 00	5.873735E 00	-8.878385E-01
B(6)	6.002635E 00	3.487188E 00	1.721340E 00
B(0)	2.842354E 01	1.473030E 01	1.929598E 00

Industry 1 $t_{.95} = 1.81$

Identification, IND = 1
No. of OBS = 14

Multiple hypothesis that $B(I) = 0$ for
I = 3,4,6,7
S = 4

Degrees of Freedom = 0
Dependent Variable, Y(1)

	Regression Coeff	Sigma of B	T Sub B
B(1)	-2.607547E 01	1.035706E 01	-2.517651E 00
B(2)	3.401887E 01	8.945720E 00	3.802809E 00
B(5)	-1.195283E 01	8.456507E 00	-1.413448E 00
B(0)	3.271698E 01	1.510493E 01	2.165980E 00

Identification, IND = 1
No. of OBS = 14

Multiple Hypothesis that $B(I) = 0$ for
I = 3,5,6,7
S = 4

Degrees of Freedom = 10
Dependent Variable, Y(1)

	Regression Coeff	Sigma of B	T Sub B
B(1)	-2.172464E 01	1.088374E 01	-1.996064E 00
B(2)	3.278261E 01	9.198435E 00	3.563933E 00
B(4)	-9.434783E 00	8.886533E 00	-1.061694E 00
B(0)	2.942029E 01	1.530003E 01	1.922890E 00

Identification, IND = 1
No. of OBS = 14

Multiple Hypothesis that $B(I) = 0$ for
I = 4,5,6,7
S = 4

Degrees of Freedom = 10
Dependent Variable, Y(1)

	Regression Coeff	Sigma of B	T Sub B
B(1)	-2.40833E 01	1.121176E 01	-2.148043E 00
B(2)	3.02500E 01	9.475663E 00	3.192389E 00
B(3)	-3.50000E 00	1.585582E 01	-2.207392E-01
B(0)	2.73333E 01	3.055809E 01	8.944711E-01

Identification, IND = 1
No. of OBS = 14

Multiple Hypothesis that $B(I) = 0$ for
I = 3,4,5,6
S = 4

Degrees of Freedom = 10
Dependent variable, Y(1)

	Regression Coeff	Sigma of B	T Sub B
B(1)	-2.623497E 01	1.344312E 01	-1.951554E 00
B(2)	2.985246E 01	9.191913E 00	3.247687E 00
B(7)	2.868853E 00	9.928401E 00	2.889542E-01
B(0)	1.969399E 01	1.504937E 01	1.308625E 00

Identification, IND = 1
No. of OBS = 14

Multiple hypothesis that $B(I) = 0$ for
I = 3,4,5,7
S = 4

Degrees of Freedom = 10
Dependent Variable, Y(1)

	Regression Coeff	Sigma of B	T Sub B
B(1)	-2.365909E 01	1.312180E 01	-1.803037E 00
B(2)	2.956818E 01	9.667988E 00	3.058359E 00
B(6)	6.363634E-01	1.016410E 01	6.260893E-02
B(0)	2.000000E 01	2.548275E 01	7.848447E-01

Industry 2 $t_{.95} = 1.75$

Identification, IND = 2
No. of OBS = 20

Multiple Hypothesis that $B(I) = 0$ for
I = 1,4,7,8
S = 4

Degrees of Freedom = 15
Dependent Variable, Y(1)

	Regression Coeff	Sigma of B	T Sub B
B(2)	-1.549754E 01	1.042585E 01	-1.486453E 00
B(3)	-7.605911E 00	7.145301E 00	-1.064463E 00
B(5)	-1.418719E 00	7.344214E 00	-1.931751E 00
B(6)	7.317734E 00	6.448673E 00	1.134766E 00
B(0)	9.676601E 01	3.024696E 01	3.199198E 00

Identification, IND = 2

No. of OBS = 20

Multiple Hypothesis that $B(I) = 0$ for

$I = 1,3,4,8$

$S = 4$

Degrees of Freedom = 15

Dependent Variable, Y(1)

	Regression Coeff	Sigma of B	T Sub B
B(2)	-1.705116E 01	1.081384E 01	-1.576791E 00
B(5)	-1.438140E 01	7.410394E 00	-1.940706E 00
B(6)	1.056512E 01	6.316763E 00	1.672552E 00
B(7)	-6.548837E 00	6.999141E 00	-9.356630E-01
B(0)	9.334651E 01	2.970814E 01	3.142119E 00

Identification, IND = 2

No. of OBS = 20

Multiple Hypothesis that $B(I) = 0$ for

$I = 1,3,7,8$

$S = 4$

	Regression Coeff	Sigma of B	T Sub B
B(2)	-1.602000E 01	1.092318E 01	-1.466605E 00
B(4)	-5.180000E 00	8.516184E 00	-6.082536E-01
B(5)	-1.231000E 01	8.057414E 00	-1.527785E 00
B(6)	1.074000E 01	6.667162E 00	1.610880E 00
B(0)	8.526000E 01	2.784877E 01	3.061536E 00

Identification, IND = 2

No. of OBS = 20

Multiple Hypothesis that $B(I) = 0$ for

$I = 4,6,7,8$

$S = 4$

Degrees of Freedom = 15

Dependent Variable, Y(1)

	Regression Coeff	Sigma of B	T Sub B
B(1)	2.607634E 00	7.451544E 00	3.499454E-01
B(2)	-1.244580E 01	1.041344E 01	-1.195167E 00
B(3)	-9.604580E 00	7.188686E 00	-1.336069E 00
B(5)	-1.299084E 01	7.916588E 00	-1.640965E 00
B(0)	1.000290E 02	3.329544E 01	3.004286E 00

Identification, IND = 2
No. of OBS = 20

Multiple Hypothesis that $B(I) = 0$ for
I = 1, 4, 6, 7
S = 4

Degrees of Freedom = 15
Dependent Variable, Y(1)

	Regression Coeff	Sigma of B	T Sub B
B(2)	-1.348296E 01	1.117854E 01	-1.206147E 00
B(3)	-1.011398E 01	7.066934E 00	-1.431170E 00
B(5)	-1.407638E 01	7.670036E 00	-1.835243E 00
B(8)	2.256169E 00	6.538087E 00	3.450809E-01
B(0)	1.046075E 02	3.055227E 01	3.423886E 00

Industry 5 $t_{.95} = 1.78$

Identification, IND = 5
No. of OBS = 17

Multiple Hypothesis that $B(I) = 0$ for
I = 1, 2, 5, 8
S = 4

Degrees of Freedom = 12
Dependent Variable, Y(1)

	Regression Coeff	Sigma of B	T Sub B
B(3)	1.046667E 01	2.123589E 00	4.928764E 00
B(4)	3.000000E 00	3.140830E 00	9.551615E-01
B(6)	-7.800000E 00	1.760787E 00	-4.429838E 00
B(7)	1.580000E 01	2.432876E 00	6.494370E 00
B(0)	6.666613E-02	9.025251E 00	7.386623E-03

Identification, IND = 5
No. of OBS = 17

Multiple Hypothesis that $B(I) = 0$ for
I = 2,4,5,8
S = 4

Degrees of Freedom = 12
Dependent Variable, Y(1)

	Regression Coeff	Sigma of B	T Sub B
B(1)	-3.500000E 00	3.217480E 00	-1.087808E 00
B(3)	1.116667E 01	2.197957E 00	5.080475E 00
B(6)	-8.928572E 00	1.803758E 00	-4.949984E 00
B(7)	1.650000E 01	2.492249E 00	6.620525E 00
B(0)	8.595237E 00	6.256285E 00	1.373856E 00

Identification, IND = 5
No. of OBS = 17

Multiple Hypothesis that $B(I) = 0$ for
I = 1,2,4,8
S = 4

Degrees of Freedom = 12
Dependent Variable, Y(1)

	Regression Coeff	Sigma of B	T Sub B
B(3)	1.166667E 01	2.337864E 00	4.990311E 00
B(5)	-3.000000E 00	2.613811E 00	-1.147749E 00
B(6)	-6.428572E 00	2.295737E 00	-2.800222E 00
B(7)	1.400000E 01	2.863287E 00	4.889486E 00
B(0)	1.009524E 01	6.700452E 00	1.506650E 00

Identification, IND = 5
No. of OBS = 17

Multiple Hypothesis that $B(I) = 0$ for
I = 1,4,5,8
S = 4

Degrees of Freedom = 12
Dependent Variable, Y(1)

	Regression Coeff	Sigma of B	T Sub B
B(2)	1.454546E 00	2.455026E 00	5.924766E-01
B(3)	1.027273E 01	2.195842E 00	4.678263E 00
B(6)	-8.519481E 00	1.808835E 00	-4.709928E 00
B(7)	1.609091E 01	2.535540E 00	6.346147E 00
B(0)	3.974024E 00	7.477233E 00	5.314832E-01

Identification, IND = 5
No. of OBS = 17

Multiple Hypothesis that $B(I) = 0$ for
I = 1,2,4,5
S = 4

Degrees of Freedom = 12
Dependent Variable, Y(1)

	Regression Coeff	Sigma of B	T Sub B
B(3)	1.130000E 01	2.709705E 00	4.170197E 00
B(6)	-9.300001E 00	2.709705E 00	-3.432109E 00
B(7)	1.705000E 01	3.474280E 00	4.907492E 00
B(8)	1.250001E 00	2.416783E 00	5.172265E-01
B(0)	2.149995E 00	1.042284E 01	2.062772E-01

Industry 7 $t_{.95} = 1.70$

Identification, IND = 7
No. of OBS = 32

Multiple Hypothesis that $B(I) = 0$ for
I = 1,4,7,8
S = 4

Degrees of Freedom = 27
Dependent Variable, Y(1)

	Regression Coeff	Sigma of B	T SUB b
B(2)	8.199413E-01	1.048737E 01	7.818361E-02
B(3)	9.672141E 00	9.312936E 00	1.038571E 00
B(5)	5.713783E 00	8.617995E 00	6.630061E-01
B(6)	1.017830E 01	6.728258E 00	1.512769E 00
B(0)	2.638710E 00	2.283662E 01	1.155473E-01

Identification, IND = 7
No. of OBS = 32

Multiple Hypothesis that $B(I) = 0$ for
I = 2,4,7,8
S = 4

Degrees of Freedom = 27
Dependent Variable, Y(1)

	Regression Coeff	Sigma of B	T Sub B
B(1)	4.665158E 00	7.338244E 00	6.343694E-01
B(3)	8.493444E 00	9.381181E 00	9.053704E-01
B(5)	5.507430E 00	7.866480E 00	7.001136E-01
B(6)	8.753496E 00	7.042890E 00	1.242884E 00
B(0)	2.636801E 00	1.800041E 01	1.464856E-01

Identification, IND = 7
No. of OBS = 32

Multiple Hypothesis that $B(I) = 0$ for
I = 2,4,5,8
S = 4

Degrees of Freedom = 27
Dependent Variable, Y(1)

	Regression Coeff	Sigma of B	T Sub B
B(1)	5.087601E 00	7.365572E 00	6.907272E-01
B(3)	1.114016E 01	9.892437E 00	1.126129E 00
B(6)	9.919137E 00	6.975221E 00	1.422053E 00
B(7)	-4.979784E 00	1.968858E 01	-2.529276E-01
B(0)	1.483288E 01	3.550066E 01	4.178199E-01

Identification, IND = 7
No. of OBS = 32

Multiple Hypothesis that $B(I) = 0$ for
I = 1,2,7,8
S = 4

Degrees of Freedom = 27
Dependent Variable, Y(1)

	Regression Coeff	Sigma of B	T Sub B
B(3)	9.760807E 00	1.046420E 01	9.327814E-01
B(4)	-6.397696E-01	2.079462E 01	-3.076611E-02
B(5)	5.902017E 00	8.339336E 00	7.077323E-01
B(6)	1.026513E 01	6.793843E 00	1.510946E 00
B(0)	4.809799E 00	3.939030E 01	1.221062E-01

Identification, IND = 7
No. of OBS = 32

Multiple Hypothesis that $B(I) = 0$ for
I = 1,2,4,7
S = 4

Degrees of Freedom = 27
Dependent Variable, Y(1)

	Regression Coeff	Sigma of B	T Sub B
B(3)	8.513480E 00	1.153207E 01	7.382440E-01
B(5)	6.837624E 00	9.508015E 00	7.191432E-01
B(6)	1.100851E 01	8.268138E 00	1.331438E 00
B(8)	-1.977397E 00	1.232668E 01	-1.604161E-01
B(0)	6.658423E 00	2.565456E 01	2.595415E-01

Significance Test of Multiple
Correlation Coefficients

		Correlation Coeff.	T.05
Total Data Basis	Table 8, page 156	.285	<u>.315</u>
Industry 1	Table 9, page 157	.77	.726
Industry 3	Table 10, page 157	.57	<u>.983</u>
Industry 5	Table 11, page 157	.904	.683
Industry 7	Table 12, page 158	.47	<u>.498</u>

The null hypothesis is accepted in those industries where the "T" factor is underlined.

BIBLIOGRAPHY

Books

- Alford, J. P. Cost and Production Handbook. New York: Ronald Press, 1934.
- Aljian, George W. Purchasing Handbook. New York: McGraw-Hill, 1958.
- Ammer, Dean S. Materials Management. Homewood, Ill.: Richard D. Irwin, Inc., 1962.
- Balderson, Brecht, Karabasy, and Riddle. Management of an Enterprise. Englewood Cliffs, N.J.: Prentice Hall, Inc., 1949.
- Cartmell, Madison. Stores and Material Control. New York: Ronald Press, 1922.
- Cornell, W. B. Organization and Management in Industry and Business. New York: Ronald Press, 1947.
- Davis, Ralph Currier. The Fundamentals of Top Management. New York: Harper and Brothers, Publishers, 1951.
- _____. Purchasing and Storing. New York: Alexander Hamilton Institute, 1931.
- Dinsmore, John. Purchasing, Principles and Cases. New York: Prentice Hall, 1922.
- Dutton, H. P. Purchasing. New York: Systems Magazine, 1927.
- England, Wilbur B. Procurement, Principles and Cases. Homewood, Ill.: Richard D. Irwin, Inc., 1962.
- Farquhar, H. H. Factory Storekeeping. New York: McGraw-Hill Book Company, 1920.
- Fayol, H. Industrial and General Administration. London: Pittman Publishing Company, 1949.
- Farrel, Paul V. Fifty Years of Purchasing. New York: National Association of Purchasing Agents, 1954.

- Heinritz, Stuart. Purchasing. New York: Prentice-Hall, 1947.
- Hodges, Henry G. Procurement, The Modern Science of Purchasing. New York: Harper and Brothers, 1961.
- Jeffers, Donald L. "Measuring Procurement Effectiveness." Unpublished Master's thesis, The Ohio State University, 1960.
- Jones, Edward D. Business Administration. New York: The Engineering Magazine Company, 1941.
- Kilduff, Frederick W. Inventory Practice and Material Control. New York: McGraw-Hill, 1925.
- Kimball, Dexter S. Principles of Industrial Organization. New York: McGraw-Hill, 1913.
- Lewis, Howard T. Industrial Purchasing. New York: Prentice-Hall, 1933.
- _____. Procurement, Principles and Cases. Homewood, Ill.: Richard D. Irwin, Inc., 1953.
- Mee, John F. "A History of 20th Century Management Thought." Unpublished Ph.D. dissertation, The Ohio State University, 1959.
- McMillan, A. L. The Art of Purchasing. New York: Exposition Press, 1959.
- Mitchell, William. Purchasing. New York: Ronald Press, 1927.
- Moore, Franklin G. Manufacturing Management. Homewood, Ill.: Richard D. Irwin, Inc., 1961.
- Nisonger, William. "Evaluating Performance of the Procurement Function in Industrial Enterprises." Unpublished Master's thesis, The Ohio State University, 1957.
- Petersen, E., Plowman, E. G. Business Organization and Management. Homewood, Ill.: Richard D. Irwin, Inc., 1958.
- Rindsfoos, Charles S. Purchasing. New York: McGraw-Hill, 1915.
- Tead, Ordway. Administration: Its Purpose and Performance. New York: Harper and Brothers, 1959.

- Terry, George R. Principles of Management. Homewood, Ill.: Richard D. Irwin, 1960.
- Twynford, H. B. Purchasing, Its Economic Aspects and Proper Methods. New York: Van Nostrand, 1924.
- Urwick, L. The Elements of Administration. New York: Harper and Brothers, 1943.
- Westing, S. H., Fine, I. V. Industrial Purchasing. New York: John Wiley and Sons, 1955.
- _____. Encyclopedia of Social Science. New York: Macmillan Co., 1933, Vol. X, p. 76.

Periodicals

- Ammer, D. "How to Measure Purchasing Activity," Purchasing (September 25, 1961), p. 72.
- _____. "How to Measure Purchasing Performance," Purchasing (October 27, 1958), p. 59.
- Appley, Lawrence A. "Management the Simple Way," Personnel (January, 1943), p. 34.
- Basil, Douglas. "Make an Audit of Purchasing Procedure," Purchasing (November, 1954).
- Bergqvist, Ivar. "Measures of Purchasing Performance," Purchasing Journal (June, 1958).
- Heinritz, Stuart. "Can't Measure Purchasing Performance," Purchasing (April-May, 1951), p. 73.
- Hodnett, Alice. "A Simple Way to Measure Purchasing Efficiency," Purchasing (October 27, 1958), p. 62.
- Kelley, Philip. "What's Wrong with Performance Appraisals," Purchasing (December 19, 1960), p. 80.
- Lewis, Howard T. "Industrial Procurement and Marketing," Harvard Business Review (September, 1950).
- Limberg, H. "Analyzing Purchasing Management," Purchasing (December, 1951).
- McGregor, Douglas. "An Uneasy Look at Performance Appraisals," Harvard Business Review (May-June, 1957).

- McVicar, Warner C. "Cost Reductions are Important Yardsticks of Purchasing Department Efficiency," Purchasing (May, 1952).
- Moffit, Ralph C. "Procurement Auditing," Canadian Purchasor (April, 1957).
- Pearson, Arthur G. "16 Ways to Evaluate Purchasing Performance," Purchasing (December, 1957).
- Petersen, "Work Sampling Gauges Purchasing Performance," Purchasing (May 4, 1959), p. 65.
- Pleydell, Albert. "A Management Consultant Looks at the Purchasing Department," Purchasing (June, 1953).
- Pooler, Victor. "Indicators of Purchasing Efficiency," Purchasing (January 18, 1960).
- Prentice, H. W., Jr. "Liberal Education for Business and Industry," Bulletin of the American Association of University Professors, XXXVIII (Autumn, 1952).
- Snow, R. P. "Measures of Performance for Purchasing," Purchasing (December, 1952).
- Spivack, J. "Measure Purchasing Performance in Terms of Profits," Purchasing (February, 1955).
- Sutter, A. W. "Measuring the Performance of Materials Management," Purchasing (July, 1954).
- _____. "Key to Purchasing Efficiency," Kentuckian Purchasor (May, 1954).
- _____. "Twenty Ways to More Efficient Purchasing," Mid-Continent Purchaser (September, 1954).
- _____. "Measuring Purchasing Costs," Bulletin of the National Association of Purchasing Agents (October 1, 1947).

Pamphlets

- Carney, W. H., Jones, V. W., and Clark, D. G. Methods or Yardsticks for Measuring the Efficiency and Proving the Value of the Purchasing Department. National Association of Purchasing Agents, New York, Pamphlet 12, 1931.

- Cook, Arthur. A New Look at Purchasing Measurement. General Electric, Purchasing Service Division, December, 1960.
- Davidson, W. R., Healy, J. H. and Associates. Power Management, The Handbook of West Penn Power Company. West Penn Power Company, 1957.
- Heinritz, Stuart. Measuring the Efficiency of the Purchasing Department. Bulletin No. 13 of National Association of Purchasing Agents. New York: National Association of Purchasing Agents, 1931.
- Mulvihill, Donald F. Purchasing Problems of the Small Manufacturer in Alabama and Some Suggestions to Solve them. Washington: Small Business Administration Research Report, 1959.
- Pleydell, Albert. Measuring the Efficiency of a Public Buying Office. New York: Management Service Association, 1959.
- Sutter, Alfred W. Judging Your Purchasing Efficiency, Management Aid for Small Business No. 45. Small Business Administration, 1954.
- _____. Curriculum, Senior Officers Military Management Course. Air University, 1950.
- _____. Internal Audit and Control of a Purchasing Department. The Institute of Internal Auditors, 120 Wall Street, New York.
- _____. Measuring Purchasing Performance. Bulletin of National Association of Purchasing Agents, October, 1947.
- _____. Purchase Order System and Management Controls, IBM Technical Manual 20:0054 GPD Purchasing Function. Endicott, New York, August, 1962.
- _____. Proceedings of Management Control Symposium Held at Systems Development Corporation, Santa Monica, California, July 29-31, 1959.
- _____. Purchase System Review. Air Force System Command Manual 70-3, dated January 2, 1962.

Speeches

Clark, Donald G. "Measuring Purchasing Efficiency," an address before a joint meeting of the Purchasing Agents Association of New York and the New York Chapter of Cost Accountants Association, October 20, 1931.

Gibson, David S. "Measuring Purchasing Performance," an address before a purchasing Seminar at University of Tennessee, March 25, 1960.

Kelley, R. C. "Measurement of Purchasing Efficiency," presentation at the 15th Annual Convention of the National Association of Purchasing Agents, June 17, 1930 in Chicago.

Pearson, Arthur. "Evaluation, a Purchasing Management Control," a presentation at the Air Force School of Logistics, Wright-Patterson AFB, Ohio, 1 August 1959.