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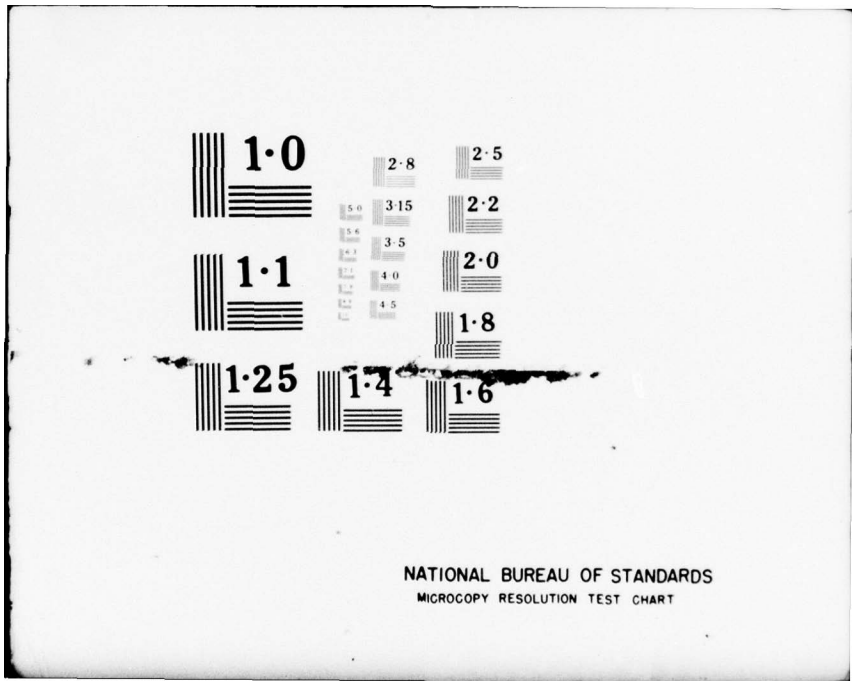
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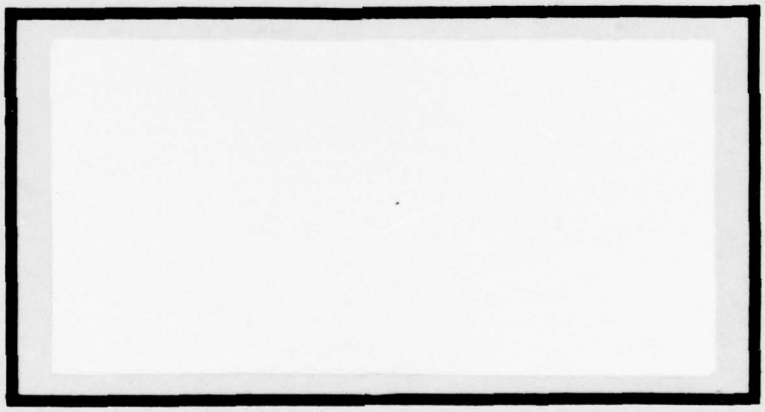

UNITED STATES AIR FORCE

AIR UNIVERSITY

AIR FORCE INSTITUTE OF TECHNOLOGY

Wright-Patterson Air Force Base, Ohio

ANALYSIS OF THE COST CENTER PERFORMANCE MEASUREMENT SYSTEM

Philip A. Covell, Captain, USAF
Finch M. Jones, Jr., Captain, USAF

LSSR 2-77A

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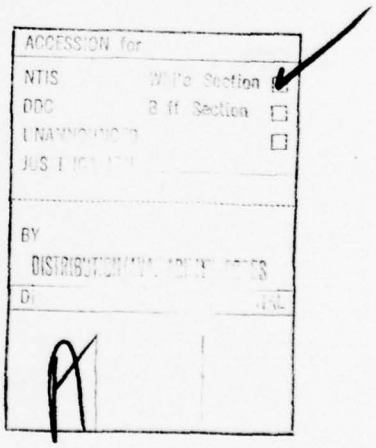

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The Air Force Cost Center Performance Measurement System (CCPMS) was implemented to provide a means for measuring the productivity of cost centers. Before all commands could fully implement the program, the Air Force made the CCPS report, the heart of the CCPMS, optional and eventually cancelled the CCPMS. This research was to determine the extent that major commands discontinued use of the CCPS when made optional, to determine why some managers did not find the CCPS useful, and to determine if managers used the CCPS for decision making. The researchers found that the majority of major commands were apparently undermotivated towards the CCPMS and dropped the optional CCPS. From the analysis of cost center manager questionnaires, the researchers concluded that cost center managers found the CCPS to be not useful because it was not meaningful at their responsibility level, the output measures (for most cost centers) were not useful descriptors of output, and many managers received other more useful reports that contained the same information. The researchers recommend that a new output measurement program be established to meet the individual needs of cost centers, reflect the actual cost center's productivity and only feedback information concerning controllable costs.

LSSR 2-77A

ANALYSIS OF THE COST CENTER PERFORMANCE MEASUREMENT SYSTEM

A Thesis

Presented to the Faculty of the School of Systems and Logistics

of the Air Force Institute of *Technology*

Air University

In Partial Fulfillment of the Requirements for the

Degree of Master of Science in Logistics Management

By

Philip A. Covell, BS
Captain, USAF

Finch M. Jones, Jr., BA
Captain, USAF

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Captain Philip A. Covell

and

Captain Finch M. Jones, Jr.

has been accepted by the undersigned on behalf of the faculty of the School of Systems and Logistics in partial fulfillment of the requirements for the degree of

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Darrell N. Fulton

COMMITTEE CHAIRMAN

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CHAPTER I

INTRODUCTION

In response to DOD Instruction 7045.11 (14), the Air Force developed AFR 178-4, Output Measurement Program (OMP) (16) and AFM 178-430, Cost Center Performance Measurement System (CCPMS) (18) to:

> . . . identify the organizations for which there is a predictable and measurable input-output relationship between resources (programmed and used) and accomplishment (planned and achieved). The analysis and proper interpretation of this relationship can be used to improve management of Air Force resources [18:Ch.1,1].

Statement of the Problem

Since the OMP was implemented, researchers found that the CCPMS was not being used as intended for management decision making. The Air Force reduced the requirement for the Cost Center Performance Summary (CCPS), the heart of the CCPMS, from mandatory to optional in November, 1975 (11). HQ USAF cancelled AFR 178-4 and AFR 178-430 in February, 1977 (13). This action thereby cancelled the CCPMS. This research investigates the reasons why the CCPMS was perceived as having only limited usefulness and to suggest ways of better meeting the objectives of the Air Force Output Measurement Program.

Background

From 1776 to 1921, financial management in the Federal Government was characterized by a lack of central control over fiscal expenses. Each government agency developed its own system of financial accounting, and congressmen were not able to comprehensively analyze expense proposals. Consequently, that period was marked with wastes of fiscal funds (4:Ch.7,1).

Following the enactment of the Budget and Accounting Act of 1921, a comprehensive and improved executive budget covering both revenues and expenditures and an improved accounting system were established (5:2). Further progress towards stronger financial management was made in 1949 and 1950 with enactment of the National Security Act Amendment and the Budget and Accounting Act, which among other things directed that a single performance type budget be established in the Department of Defense (4:Ch.9, 6-8).

In 1961, then Secretary of Defense Robert S. McNamara and Assistant Secretary of Defense (Comptroller) Charles J. Hitch developed a planning, programming and budgeting system designed to make military managers conscious of the relationships between weapons' costs and mission accomplishment (8:304). Dean summarizes the need for the then evolving Planning Programming Budgeting System (PPBS) as follows:

> . . . military planning had previously been accomplished in terms of outputs, i.e. the different kinds and types of forces and missions required to accomplish military goals and objectives. . . . Whereas the budget was formulated in functional terms such as military personnel, operations and maintenance, . . . The difficult job to be accomplished was to bring planning, programming and budgeting together. . . . [4:Ch.11,11-12].

The PPBS was assigned a high priority for implementation by Secretary McNamara. The aims of PPBS were:

> . . . the specification of objectives, the evaluation of program output as it relates to objectives, the measurement of total systems costs, multiyear program planning, the evaluation of alternative program designs, and the integration of policy and program decisions with the budgetary process [9:24].

The heart of the Planning, Programming, Budgeting System is the Five Year Defense Program (FYDP). This Department of Defense-wide program was designed to allow defense managers to

> . . . view the forces and missions in a unified format rather than unilaterally. . . . This unified format was in the form of program elements which were . . . integrated combinations of men, equipment, and installations whose effectiveness could be related to our national security objectives [4:Ch.11,13-14].

The FYDP indeed related costs to changes in the program budget, but its outputs were specified in very general terms (2:10). Furthermore, there was no system to compare actual performance with plans and programs.

The Resource Management System

In 1965, Dr. Robert N. Anthony, a professor at Harvard University and an occasional consultant to the

Department of Defense, replaced Mr. Hitch as the Assistant Secretary of Defense (Comptroller). His first task was to revise the still relatively new Department of Defense financial system to provide the performance feedback needed for defense managers to make decisions. This resulted in the Resource Management System which was intended to provide the Department of Defense with consistent financial management at all levels (4:Ch.11,25).

Responsibility Accounting

The Resource Management System clearly reflects Dr. Anthony's principles of financial management. In his book, Anthony describes a basic technique of financial management, responsibility accounting (1:301). Fundamental to responsibility accounting are responsibility centers (RC) which are those organization activities responsible for measurable inputs (resources) and outputs (production). Subordinate to responsibility centers are one or more cost centers (CC) which are those organizational activities where costs can be measured. In responsibility accounting, RC and CC managers must be able to clearly distinguish between costs which they are able to control and those which they are not able to control. The purpose of establishing responsibility accounting is to be able to associate the costs of inputs and outputs with those managers who are directly responsible for them (1:301-302).

Anthony's principles of responsibility accounting were evident in the policies that were established for the component service branches by Department of Defense Directive 7000.1 (15:i).

The Output Measurement Program

In response to DOD Instruction 7045.11, the Air Force established an Output Measurement Program (OMP) as outlined in AFR 178-4 (16:1). The OMP ". . . was established to improve operating efficiency by focusing on the cost effectiveness aspect of management [5:5]." Efficiency is simply a relationship between output and input or as Dr. Anthony stated, ". . . the amount of output per unit of input [1:323]." Efficiency can also be defined as ". . . a measurement that relates actual output, in terms of expenses, to some standard [1:323]." This definition is useful, but managers must be aware of two facts when designing measures of efficiency using this definition:

> . . . (1) recorded expenses are not a precisely accurate measure of resources consumed, and (2) standards are, at least, only approximate measures of what resource consumption should have been in the circumstances prevailing [1:323].

Effectiveness, on the other hand, is defined as the degree that organizational goals are accomplished. Two questions that might be asked are "Can an organization be efficient but not effective?" or "Can an organization be effective but not efficient?" The answer to both of these

questions is a definite yes. The Air Force recognized that little emphasis had been placed on organizational efficiency. In 1969 USAF published AFM 178-1 which focused on the efficiency aspect of management (17).

The OMP has two objectives: (1) to improve the capability to describe the output of certain Air Force units and (2) to improve the quality, availability, and utility of output measures for use in decision making (21:2). The OMP recognized three types of output: (1) organization products, e.g., number of radar sets repaired in a specific time period; (2) benefit to another organization, e.g., the adequacy and quality of the repaired radar sets; and (3) the benefit to society or contribution to a national objective (16:2). The third type of output is on a high level of abstraction and, therefore, may be difficult or even impossible to describe or measure in precise terms (16:2).

After development of the OMP, the Air Force established the Cost Center Performance Measurement System (CCPMS) as outlined in AFM 178-430 to support the OMP.

Cost Center Performance Measurement System

The Output Measurement Program (OMP) and the Cost Center Performance Measurement System (CCPMS) were developed under the general guidance of DOD Instruction 7045.11 (14:i). The OMP and CCPMS identified ". . . the

organizations for which there was a predictable and measurable input-output relationship between resources (programmed and used) and accomplishment (planned and achieved) [18:Ch.1,1]." The CCPMS provided a means for quantifying or measuring productivity of CCs in meaningful terms and gave a measurement of efficiency by relating output to input costs on a cost-per-unit basis (21:2).

The CCPMS/OMP initiation and implementation by the Major Air Commands (MAJCOMs) were to be accomplished in three phases:

> (1) Phase I--Program Design. During this phase output measures are selected using subjective criteria . . . ; data sources for the output measures are identified or developed, products are designed, programmed, and documented; training is completed, and the program is implemented.
>
> (2) Phase II--Management Development. During this phase, data generated by the program are used to validate the selected output measures; and to develop methods and techniques that demonstrate management usefulness.
>
> (3) Phase III--Management Implementation. This phase cannot begin until phases I and II have been completed. Only then can it be offered to managers and commanders to assist in their decision making [18:Ch.2,1-2].

In order to understand the Air Force's OMP/CCPMS, it is essential that an individual have an understanding of the Cost Center Performance Summary.

The Cost Center Performance Summary

The Cost Center Performance Summary (CCPS) is the heart of the Output Measurement Program/Cost Center

Performance Measurement System. The CCPS is a single-page mechanized report prepared monthly for each responsibility/ cost center and is divided into four major sections: production, expense, cost-per-unit and standard cost-per-unit (18:Ch.2,1). Figure 1 is an example of the CCPS.

The production section contains the output information for the CC. This section displays the actual monthly output, the cumulative production for the quarter to date and cumulative production year to date, and the production programmed for the quarter (18:Ch.2,1).

The expense section shows the total actual expense per month, the cumulative actual expense for the quarter, the cumulative budget program for the quarter and the program adjustments to the quarterly expense programs (18: Ch.2,3). The expenses are broken down into six groups of Element of Expense/Investment Code (EEIC). The AF Resource Manager's Handbook defines EEIC as ". . . what types of resources are being used [20:Ch.2,9]." The six EEIC groups are: military pay, civilian pay, travel and transportation, contractual services, supply and equipment and one miscellaneous category: "all other" (5:10).

The cost-per-unit section combines production and expenses into cost-per-unit. The total actual monthly expenses are divided by the total actual monthly production to give a cost-per-unit of output for that month and the quarter.

Prepared 73 Jul 16
CC 224620 Clothing Sales
OAC/OBAN 6442

As of 73 Jun 30 ACNN430004
OM 982.30 GROSS SALES

COST CENTER PERFORMANCE SUMMARY
SAMPLE AFB

Line	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	YTD	ANN
						PRODUCTION								
ACT	25566	29262	29957	26020	26273	20367							157445	
CUM	25566	54785	84785	26020	52293	72660								
PGM			87700			79300							167000	167000
ADJ														
						GROSS EXPENSE								
ACT	7.2	7.1	6.9	6.2	6.8	6.3							40.5	
CUM	7.2	14.3	21.2	6.2	13.0	19.3								
PGM						39.5							39.5	39.5
ADJ					24.3	12.1								
2XX	4.2	4.2	4.2	4.2	4.2	4.0							25.0	
3XX	0.8	0.8	0.7	0.7	0.8	0.8							4.6	
4XX	0.1	0.1	0.0	0.0	0.0	0.0							0.2	
5XX	0.1	0.1	0.1	0.1	1.0	0.1							1.5	
6XX	1.9	1.8	1.8	1.1	0.8	1.4							8.8	
OTH	0.1	0.1	0.1	0.1	0.0	0.0							0.4	
						COST-PER-UNIT								
ACT	.28	.24	.23	.24	.26	.31							.26	
AVG						.27								
PGM						.50							.25	.25
						STANDARD COST-PER-UNIT .25 (Dec)								
VAR	.03	.01-	.02-	.01-	.01	.06								

Figure 1. Cost Center Performance Summary (18:Ch.2,1)

The standard cost-per-unit section depicts the variance between the actual cost-per-unit of output and the standard cost-per-unit of output. This variance is found by subtracting the actual cost-per-unit from the standard cost-per-unit (18:Ch.2,4-5). By utilizing this section of the report, cost center managers can see when a potential problem exists and can analyze why the variance exists. The CC managers can take corrective actions, if necessary, to bring the actual cost-per-unit in line with the standard cost-per-unit of output.

Implementation of CCPMS

In July, 1972, Headquarters USAF directed all MAJCOMs to implement the Cost Center Performance Measurement System (CCPMS) as specified in AFM 178-430. MAJCOMs were slow in implementing the program. In March, 1974, no command had fully implemented the CCPMS. Only the Air Training Command (ATC) and the United States Air Force in Europe (USAFE) were well into phase III, management implementation. The Aerospace Defense Command (ADCOM), Strategic Air Command (SAC), Tactical Air Command (TAC) and the Military Airlift Command (MAC) were just entering phase III. Only two MAJCOMs were in phase II, development phase, and the rest of the MAJCOMs were still in phase I, design phase (21:16-17).

As the MAJCOMs implemented the OMP/CCPMS, problem areas evolved. The CCPMS was difficult to understand and to implement (6:80-81). "There has not been and there is no continuous, cohesive, centralized direction to sustain program motivation Air Force-wide in all functional areas [3:44]." Managers feared that the measures would be used as a rating system (21:24). Manning in the OMP/CCPMS area was not adequate to support an effective program as originally envisioned (3:44). Managers were not using the CCPMS to influence their management decisions (5).

The USAF Audit Agency performed an audit of the Air Force Data Systems Design Center (AFDSDC), 25 installations, and eight MAJCOM headquarters during the period of August to October, 1973. The primary objective of this audit was to determine whether the CCPMS provided management with useful, meaningful and timely information (19:1). The USAF audit agency's findings included: deficiency in personnel training; inconsistent and deficient system implementation; base-level managers considered the CCPS to be of little or no value; some output measures did not adequately represent the production of the cost centers or meet the criteria established in AFM 178-430; statistical procedures for analyzing output measures were not uniformly applied by participating MAJCOMs; and "MAJCOM management personnel had serious doubts as to the usefulness and meaningfulness of CCPMS data [19:2]."

Ferris and Smith attempted to determine the extent to which financial managers were using the Cost Center Performance Summary to influence their management decisions and why, in some cases, they were not (5:15). Ferris and Smith found that more than half of the respondents to their survey indicated non-utilization of the report. The researchers pointed out several possible reasons: (1) managers felt that they had little control over the costs recorded on the summary; (2) managers felt that the report was not significant at their level of cost center (however, the researchers surmised that this related to the previous reason); (3) the output measure on the summary was not representative of their cost center's output; (4) there was too little training related to implementation of the report (5:84-94).

In 1975, Headquarters USAF reevaluated the cost-effectiveness of the Air Force's OMP/CCPMS, and in November, 1975, changed the requirement for the CCPS ". . . from a mandatory monthly report to an optional on-call report [11]."

In February, 1977, Headquarters USAF cancelled AFR 178-4 and AFM 178-430 thereby cancelling the Air Force's OMP/CCPMS (13).

Scope

USAF established the CCPMS in 1972 and it was applicable to all MAJCOMs. When the CCPMS requirement was changed

from mandatory to optional in November, 1975, many of the MAJCOMs elected to discontinue the program. Documentation on the CCPMS within these commands was subsequently disposed of. The lack of available data from seven MAJCOMs necessitated concentration of the research effort on the MAJCOMs which could provide data on the CCPMS in their commands.

Objectives

1. Determine the extent to which the Major Air Commands have discontinued use of the CCPMS since its use became optional.

2. Determine why some financial managers have discontinued using the CCPMS.

3. Determine if those financial managers who are using the CCPMS find the CCPS a useful part of their managerial decision process.

4. If the CCPMS is not useful to financial managers, suggest ways of better meeting the objectives of the Air Force Output Measurement Program.

Research Questions

1. Have Major Air Commands discontinued the CCPMS as a required program?

2. Why are financial managers not using the CCPMS in their managerial decision process?

3. Do the cost center managers who are using the CCPS find it a useful part of their managerial decision process?

4. What alternative methods will meet the objectives of the Air Force's Output Measurement Program?

CHAPTER II

METHODOLOGY

The purpose of this chapter is to acquaint the reader with the data collection plan, the sampling technique and the procedures used for answering the research questions posed in Chapter I. A summary of the assumptions and limitations bearing on this research effort are included at the end of this chapter.

Description of the Population

The population for this study consists of the cost centers in each MAJCOM which were utilizing the Cost Center Performance Summary (CCPS) on or prior to November, 1975. Not all MAJCOMs could provide data on each cost center's usage of the CCPS. Therefore, the total number of cost centers for which information was available was only 1223. The number of cost centers in each MAJCOM utilizing the CCPS is shown in Table 1 on the following page.

Based on this data, the population was separated into three strata for two reasons. The first reason was that data was not available on the cost center's usage of the CCPS in every MAJCOM. Data was not available from these MAJCOMs' cost centers for a variety of reasons: MAJCOM deactivations, rotation of knowledgable personnel,

TABLE 1

TOTAL NUMBER OF COST CENTERS IN EACH MAJCOM UTILIZING THE CCPS ON OR PRIOR TO NOVEMBER 1975

MAJCOM	NUMBER OF COST CENTERS
Aerospace Defense Command (ADCOM)	22
Air Force Accounting and Finance Center (AFAFC)	25
Air Force Communications Service (AFCS)	17
Air Force Logistics Command (AFLC)	102
Air Training Command (ATC)	200
Air University (AU)	20
Military Airlift Command (MAC)	320
Strategic Air Command (SAC)	273
United States Air Force Academy (USAFA)	18
United States Air Force in Europe (USAFE)	226
Alaskan Air Command (AAC)	Data not available
Air Force Systems Command (AFSC)	Data not available
Air Force Security Service (AFSS)	Data not available
Headquarters Command (HQsCOMD)	Data not available
Pacific Air Forces (PACAF)	Data not available
Tactical Air Command (TAC)	Data not available
United States Air Force Southern Command (USAFSO)	Data not available
Total	1223

Source: MAJCOMs furnished this information via telephone 12-19 November 1976.

lack of available documented information on the CCPMS and CCPS, etc. Therefore, these MAJCOMs were placed in a separate stratum and were only contacted to obtain data to satisfy objective one of this research effort. The rest of the MAJCOMs were placed into the two strata so that the responses to the questionnaire from the cost center managers in these two strata could be analyzed to provide information which would satisfy objectives two and three of this study. Table 2 displays the stratification of the population.

Stratum I consists of those MAJCOMs which were using the CCPMS in November, 1975 and were still using the program as of November, 1976. Stratum II consists of those MAJCOMs which were using the CCPMS in November, 1975 but have subsequently discontinued the program.

As depicted in Table 2, stratum III consists of those MAJCOMs from which data on their respective cost center's usage of the CCPS was not available. Of the MAJCOMs in this stratum, USAFSS, AFSC, AAC and TAC indicated that CCPS data on their cost centers was not available. USAFSO and HQsCOMD have been deactivated and have been absorbed by TAC and MAC respectively. Telephone conversation with Headquarters MAC and TAC personnel revealed that data on the cost centers in question were not available. When the CCPS was made an optional report in November, 1975, PACAF had not fully reached the implementation phase.

TABLE 2

STRATIFICATION OF THE POPULATION

STRATUM	CHARACTERISTIC	MAJCOM
STRATUM I	MAJCOMs which are utilizing CCPMS and as of 1 Dec 1976 were still utilizing the CCPMS.*	ATC, AFAFC, USAFA
STRATUM II	MAJCOMs which were utilizing CCPMS but have discontinued the program and for which data is available.**	USAFE, MAC, SAC, ADCOM, AFLC, AFCS, AU
STRATUM III	MAJCOMs for which data is not available.	AAC, AFSC, AFSS, HQsCOMD, PACAF, TAC, USAFSO

*Information from this stratum will help to satisfy objective #3 of the study: determine if these financial managers who are using the CCPMS find the CCPS a useful and necessary part of their managerial decision process.

**Information from this stratum will help to satisfy objective #2 of the study: determine why some financial managers have discontinued using the CCPMS.

Consequently, in November, 1975, PACAF discontinued the program, thus preventing useful information bearing on this research effort from being obtained from its cost centers.

Sampling Technique

As previously indicated, the population was divided into three strata. Since CCPMS data was not available from the cost centers in stratum III, the sample consisted of the cost centers of the MAJCOMs in strata I and II.

The researchers required a response of at least 30 questionnaires from each stratum. By requiring 30, the researchers insured that the distribution of sample means would approach a normal distribution (23:146). This allowed the application to the data of a parametric statistical technique, factor analysis.

A useable response rate of 50 percent was assumed for the cost centers in stratum I. Assuming a 50 percent response rate and requiring at least 30 responses, 60 cost centers of stratum I were sampled. Since over a year had elapsed since the cost centers in stratum II had used the CCPS, the researchers assumed that useful data would be more difficult to obtain than from the cost centers in stratum II. Therefore, a 25 percent response rate was assumed for the questionnaires mailed to stratum II cost centers. To insure that at least 30 responses were received, 120 cost centers of stratum II were sampled. See Figure 2.

STRATUM I

Minimum number of responses needed	= 30
Assumed response rate	= 50%
Total number of CCs to be sampled	= 60

STRATUM II

Minimum number of responses needed	= 30
Assumed response rate	= 25%
Total number of CCs to be sampled	= 120

Figure 2. Sample Selection Plan

The random number generator program in the CREATE SL computer library was used to insure randomness in selecting the sample. The sample from stratum I was obtained by assigning a unique number of 1 to 243 to each cost center in this stratum. The random number generator was used to generate 60 different random numbers. These numbers were then matched to the unique numbers that were previously assigned to each cost center in the stratum as depicted in Figure 3. Table 3 depicts the number of CCs selected for each MAJCOM in stratum I.

STRATUM	MAJCOM	UNIQUE NUMBER
I	AFAFC	1 - 25
	USAFA	26 - 43
	ATC	44 - 243
II	ADCOM	244 - 265
	AU	266 - 285
	AFCS	286 - 302
	AFLC	303 - 404
	MAC	405 - 724
	SAC	725 - 997
	USAFE	998 - 1223

Figure 3. Cost Center's Unique Number

TABLE 3

NUMBER OF COST CENTERS SELECTED FOR EACH MAJCOM IN STRATUM I

MAJCOM	Number of CCs Selected	Population	% of Population
ATC	52	200	26.0
AFAFC	5	25	20.0
USAFA	3	18	16.7

The sample from stratum II was obtained by first assigning a unique number between 244 and 1223 to each cost center in this stratum. Figure 3 exhibits how the numbers were assigned in stratum II. The random number generator was used to generate 120 different random numbers. These numbers were then matched to the unique numbers that were previously assigned to each cost center in the stratum as depicted in Figure 3. The total number of selected cost centers of the MAJCOMs in stratum II is depicted in Table 4.

TABLE 4

NUMBER OF COST CENTERS SELECTED FOR EACH MAJCOM IN STRATUM II

MAJCOM	Number of CCs Selected	Population	% of Population
MAC	36	320	11.3
SAC	32	273	11.7
USAFE	29	226	12.8
AFLC	14	102	13.7
ADCOM	4	22	18.2
AFCS	3	17	17.6
AU	2	20	10.0

The researchers distributed the questionnaires directly to the randomly selected cost centers in the following MAJCOMs: ADCOM, AFCS, AFLC and USAFE. The Management Analysis Directorate of the following MAJCOMs was contacted by telephone for assistance in distributing the questionnaires to their respective cost centers: ATC, AU, USAFA, AFAFC and SAC. For these commands, the selected number of questionnaires were mailed to the Management Analysis Directorate. Personnel in these offices were asked to randomly select cost centers and send them the questionnaires. The procedure for sending questionnaires to the randomly selected cost centers in MAC was different from the rest of the MAJCOMs. The researchers sent the selected number of questionnaires to the Management Analysis Office (ACR) of the 16 MAC organizations which had used the CCPS. Personnel in the respective ACR office arbitrarily selected the cost centers (the number of which was randomly generated prior to the mailing) and distributed the questionnaires to the selected cost centers.

Four weeks after the original questionnaires were mailed to the selected cost centers, the researchers determined whether to resample the non-respondents. Since the initial response rates at that point were only 36.7 percent for stratum I and 33.3 percent for stratum II, the researchers decided to resample all non-respondents to the original questionnaire.

Thirty-eight questionnaires were sent to the non-respondents in stratum I and eighty questionnaires were sent to the non-respondents in stratum II.

Data Gathering Process

The data gathering process included two steps: first, a phone call to each of the major commands, and in some cases to major Air Force installations; second, a questionnaire that was sent to selected cost centers.

Command Survey

Personnel from each major command were contacted by telephone for two reasons. The first reason was to satisfy objective 1: determine to what extent MAJCOMs have discontinued use of the CCPS since Air Force made its use optional. The second reason for contacting them was to determine which cost centers could provide the information necessary to satisfy objectives 2 and 3. Specifically, the sought-after information was: which MAJCOMs are using the CCPMS; which MAJCOMs have discontinued its use but still have data available; and which MAJCOMs have no data available for analysis. Having determined the population, the researchers knew which MAJCOMs had cost centers who could respond to the questionnaires.

Cost Center Survey

Selected cost centers were sent a copy of the questionnaire (see Appendix A) with a cover letter explaining its purpose. Using this questionnaire, the researchers obtained information on the respondent's CCPMS background, on the respondent's perceived usefulness of the CCPS, and on any CCPS improvements.

Operational Definitions

The researchers defined the following to aid them in analyzing their questionnaire responses:

1. *Respondent*--A cost center manager was classified as a respondent to the questionnaire if the CC manager returned the questionnaire.

2. *Non-useable questionnaire data*--The response from a CC manager to the questionnaire (original or follow-up) was deemed non-useable if the respondent returned the questionnaire with only question #1 answered or if the respondent returned the questionnaire without answering any questions.

3. *Experienced*--The cost center manager indicated a response to question #3 of one year or more.

4. *Adequate training*--A response of greater than 4 on either question #4 or #5. *Inadequate training* was a response of less than 4 on question #4 or #5. A response of 4 indicated the respondent was undecided. Both formal

training and on-the-job training (OJT) were included to determine if training was adequate. For the purpose of this research it was sufficient to know not necessarily the type of training but primarily that training was adequate for the respondent.

5. *Consistently received*--A response of "monthly" to question #8.

6. *Useful*--A response of greater than 4 on question #9. *Not useful* was a response of less than 4 on question #9. A response of 4 indicated the respondent was undecided.

7. *Significant control of expenses*--A response of yes to question #10. *Lack of control* was indicated by a response of no.

8. *Timely receipt of CCPS*--A response of greater than 4 on question #11. *Not timely* was a response of less than 4 on question #11. A response of 4 indicated the respondent was undecided.

9. *Meaningful*--A response of yes to question #12.

10. *Helps pinpoint problems*--A response of greater than 4 on question #13. *Not helpful* was a response of less than 4. A response of 4 indicated undecided.

11. *Helps forecast impact of changes*--A response of greater than 4 on question #14. *Not helpful* was a response of less than 4. A response of 4 indicated undecided.

12. *Useful descriptor of output*--A response of yes to question #15.

13. *Controllable cost element*--A response of greater than 4 to a specific cost element of the six contained in question #16. *Not controllable cost element* was a response of less than 4. A response of 4 indicated undecided.

14. *Adequate cost elements*--A response of greater than 4 to question #17. *Inadequate* was a response of less than 4 on question #17. A response of 4 indicated the respondent was undecided.

15. *Accurate CCPS information*--A response of greater than 4 to question #18. *Not accurate* was a response of less than 4 on question #18. A response of 4 indicated the respondent was undecided.

Questionnaire Validity

Questions 1 through 16 and question 20 were validated by a pilot test during a previous research effort (5:27). These questions were also used by Ferris and Smith to survey the usefulness of the CCPS to financial managers within SAC and USAFE. The questions were modified to adapt them to the objectives of this research effort. Questions 17, 18, and 19 relate to adequacy of the cost elements, accuracy of the CCPS information and usefulness of the CCPS compared to other financial manager reports. These three questions were added to the questionnaire

because the review of the literature for this research effort indicated that research objectives two and three may be partly satisfied through the information from questions 17 through 19.

The researchers tested the questionnaire by administering it to twenty-five AFIT Systems and Logistics graduate students. The selected students were asked to fill out the questionnaire from the perspective of any actual experience as financial managers. If they had no experience, they were asked to answer the questions as best they could. All were invited to comment on the questionnaire. Twenty-two questionnaires were returned. Three of the questionnaires were not returned because the respondees had no experience with the CCPMS and they felt that they couldn't contribute any useful information. Those who had experience responded to the questions with no difficulty and offered suggested improvements in the instructions for question 20. This question was then modified to its present form. The response from those financial managers who indicated they had experience were similar to the expected responses that resulted from reviewing the literature on this research topic. The responses from the respondents who had no experience with the CCPMS were erratic and did not support the literature. Questions 17 through 19 were not included in this test since they were added after the test was conducted.

The researchers used factor analysis to test the responses to all questions having a seven-point Likert scale. The fixed-end-point scale measured the degree of the respondent's attitude toward the concept in question (12:248). By using a Likert scale, the assumptions of interval level data necessary to apply parametric statistical analysis were met (12:117). Hence, the researchers were able to apply factor analysis to determine if the responses to the questions could be grouped into identifiable factors which would indicate that respondents were consistent in their answers; i.e., that they understood what the question was asking and that they would systematically agree in their responses. If factor analysis did not reveal factors representing groupings of questions on which respondents were consistent, the researchers would have concluded that the questionnaire was ambiguous and the data not useful (12:255). See Appendix G. However, SPSS subroutine FACTOR identified four significant factors into which the questions were grouped. These factors related to: (1) usefulness, (2) noncontrollable cost elements, (3) controllable cost elements, and (4) knowledge of the CCPS.

The researchers concluded that the questionnaire provided valid data to analyze the Cost Center Performance Summary.

Questionnaire Analysis

The data from the questionnaire responses provided the researchers with the information required to answer research questions two, three, and four.

The responses to each question of the original and follow-up questionnaires for each stratum were compared to determine if both the original and follow-up responses came from the same population. The follow-up questionnaire was designed to obtain additional data from the population, but it was necessary to ensure that the use of the follow-up did not introduce any bias into follow-up responses. If the follow-up respondents differed significantly from respondents to the original questionnaire, the researchers would be unable to combine the responses to the original questionnaires with the responses to follow-up questionnaires for each stratum to facilitate the analysis of the data. Statistical tests for dependency were applied to each question of the original and follow-up questionnaires to determine if the responses to the questionnaires were dependent on the mailing.

For purposes of answering research questions two, three, and four, the questions in the questionnaire were grouped into three parts. The questions in Part I of the questionnaire asked for background information about the respondent and his cost center. Part II questions were designed to determine the respondent's perceived usefulness

of the CCPS in terms of the variables defined in a previous section of this chapter. Only one question was included in Part III and it gave the respondent an opportunity to provide suggestions for improving the usefulness of the CCPS.

In order to answer the second research question, the Statistical Package for Social Sciences (SPSS) routine CROSSTABS was used to establish contingency tables, chi square (χ^2) or Fisher's statistics, and significance levels on pairs of variables for which the literature suggests a dependency relationship exists. The purpose of these tests for independence was to determine why financial managers are not using the CCPMS in the decision process. The researchers based their decisions on a significance level of $\alpha = .05$ in all statistical tests. The researchers thus compared the variable *usefulness* with the variables *adequate training*, *timely receipt of CCPS*, and *consistently received*. *Useful* was also compared to the variables that describe attributes of the information from the CCPS, the variables *meaningful*, *accurate CCPS information*, *adequate cost elements*, and *useful descriptor of output*. Factor analysis was also applied to these variables using the SPSS routine FACTOR, to determine if additional relationships might exist between the variables that affect usefulness.

In order to answer the third research question, SPSS routine TABLES was used to obtain the frequencies of

response to questions one through eighteen. The researchers analyzed the frequency of response to questions of those using the CCPS to identify which aspects of "usefulness" and which attributes of the CCPS rendered the report useful to financial managers, and which aspects of usefulness and attributes of the CCPS detracted from the reports usefulness or necessity in the decision process. The variable *useful* also was compared to *helps pinpoint problems* and *helps forecast impact of change* through the use of contingency tables. In this way, the researchers statistically determined the significant ways the respondents found the CCPS useful.

The response to question nineteen was analyzed to determine if there were more useful reports than the CCPS. The researchers would use the information that there was a more useful report to conclude that in some cases the CCPS was not necessary.

Part III of the questionnaire was designed to acquire information to suggest ways of better meeting the objectives of the Output Measurement Program. By asking financial managers to rank order their suggested improvements, the researchers planned to test for significant ways of improving the present Output Measurement Program.

A Summary List of Assumptions

1. Sufficient personnel with CCPMS experience exist in the AF to provide relevant information on the CCPMS.

2. Cost center managers will answer a questionnaire concerning their opinions on the usefulness of the CCPMS.

3. The respondents will provide honest answers to the questionnaire based on their opinions and experience.

4. The response rate to the questionnaire for the respondents in stratum I will be 50 percent.

5. The response rate to the questionnaire for the respondents in stratum II will be 25 percent.

A Summary List of Limitations

1. Time available for this study is limited.

2. Due to deactivation of the United States Air Force Southern Command and Headquarters Command, information on the CCPMS for those commands is not available.

3. Due to an extended period of time since USAFSS and AAC have utilized the CCPMS, information is not available from these commands.

4. Since PACAF never reached the implementation phase of the CCPMS before the program was discontinued, useful information cannot be obtained from PACAF's CCs.

5. Since questionnaires were not sent to the cost centers in stratum III, conclusions based upon the analysis of the questionnaires can be limited or generalized only to the cost centers of the MAJCOMs included in strata I and II.

CHAPTER III

ANALYSIS

This chapter presents the analysis of the data collected from the questionnaire responses. The distribution of the data for each question of the questionnaire can be found in the tables of Appendix E. The data analysis provides the information necessary to satisfy the objectives of this research effort.

Original versus Follow-up Questionnaire

The responses to each question of the original and follow-up questionnaires for each stratum were compared to determine if the responses to the original and follow-up questionnaires came from the same population. If the follow-up respondents differed significantly from the respondents to the original questionnaire, the researchers would be unable to combine the responses to the two questionnaires for each stratum to facilitate the analysis of the data.

A Chi Square (χ^2) statistical test was performed to determine if a relationship existed between the responses to the original mailing and the responses to the identical questions in the follow-up mailing. Each stratum was analyzed separately. Except for question #1, the researchers

could not conclude that there was a significant difference between the responses to the original mailing and the responses to the follow-up questionnaires for each stratum. (See Table 29.) Therefore, the data from the original questionnaires were combined with the data from the follow-up questionnaires, except for question #1, for all further analysis.

The χ^2 statistical test for question #1 revealed that a significant difference existed between the responses to the question in the original questionnaire and the responses in the follow-up questionnaire for each stratum. The researchers concluded, with a 98 percent confidence level, that in both stratum I and stratum II the response to question #1 (Is your cost center under the CCPMS?) depended on whether the CC manager was responding to the original or to the follow-up questionnaire.

The researchers believed that the time frame in which the original and follow-up questionnaires were received by the CC managers had a direct bearing on how the respondent answered question #1. The original questionnaire was received by the respondents just prior to the release of the USAF message which cancelled the CCPMS (13), whereas, the follow-up questionnaire was received by the respondents one month after the referenced message had been released. The researchers could find no reason why the difference in the response to question one of the

original versus the follow-up mailing would indicate biases in the data from the remaining questions of the questionnaire. Since there was no significant difference in the data of the original and follow-up questionnaires for all other questions, the data was grouped by stratum for all further analysis.

Questionnaire Response Rates

As indicated in Chapter II, the questionnaire was mailed to 60 cost centers in stratum I and 120 cost centers in stratum II. The initial response rates to the questionnaire were 37 percent for stratum I and 33 percent for stratum II. The response rates are exhibited in Table 5.

The researchers resampled all non-respondents to the original questionnaire as discussed in Chapter II. As might be expected, the follow-up response rates were lower than those for the original questionnaire. Stratum I had a response rate of 34 percent while stratum II had a response rate of 16 percent on the follow-up.

After mailing the follow-up questionnaires, two additional responses to the original mailing were received from stratum I and 15 additional responses were received from stratum II CC managers. The additional responses from each stratum increased the response rates to 40 percent for stratum I and to 46 percent for stratum II to the original questionnaire.

TABLE 5

RESPONSE RATES TO QUESTIONNAIRE

	Stratum I	Stratum II	Total
Original			
Mailed	60	120	180
Responses	24*	55**	79
Response Rate	40%	46%	44%
Follow-up			
Mailed	38	80	118
Responses	13	13	26
Response Rate	34%	16%	22%
Total (Original + Follow-up)			
No. Cost Centers Surveyed	60	120	180
Responses	37	68	105
Response Rate	57%	62%	58%
Useable Questionnaires			
Useable Responses	30	49	79
Usage Rate	81%	72%	75%

*Two of these responses received after mailing follow-up.

**Fifteen of these responses received after mailing follow-up.

The total response rates for stratum I and stratum II were 62 percent and 57 percent respectively. The total response rates were found by combining the number of responses to the original mailing with the number of responses to the follow-up mailing and dividing this number by the number of cost centers sampled for each stratum. (See Table 5.)

To allow sufficient time for data analysis and subsequent conclusions of this research effort, the researchers allowed two months from the date the original questionnaires were mailed for receipt of responses (original and follow-up). After this time period, questionnaire responses were not accepted. Only four responses were received after the designated time period.

In an effort to determine why the non-respondents did not answer the original questionnaire, all CC managers who were resampled were asked to provide the reason for not answering the original questionnaire. The cover letter for the follow-up questionnaire is contained in Appendix C. Only seven CC managers provided the reason they did not answer the original questionnaire. Table 6 is a summary of the CC managers' reasons for not answering the original questionnaire.

The third reason listed in Table 6 is as might be expected since the cost centers in stratum II had, in some cases, not used the CCPS for well over one year and the

TABLE 6

REASONS FOR NOT RESPONDING TO ORIGINAL QUESTIONNAIRE

Reason For Not Responding	Number of CC Managers
Never received the original questionnaire	3
Because responding was voluntary	2
No experience with the CCPS	2

experienced personnel may have been transferred to other organizations.

Although there were 37 responses from stratum I CC managers and 68 responses from stratum II CC managers, not all of the questionnaire responses contained useable data. Seven responses from stratum I and nineteen from stratum II were "non-useable." (See Table 5.) A questionnaire was deemed "non-useable" for either of the two reasons previously discussed in Chapter II. After eliminating the non-useable responses from each stratum, the researchers had 30 and 49 questionnaire responses for strata I and II respectively which provided useable data.

Since the researchers established 30 responses as the minimum acceptable number of responses from each stratum, the resulting useable responses from each stratum were adequate to meet the design assumptions. The useable responses therefore provided sufficient data for the data analysis phase of this research.

Analysis of Individual Question Responses

This section provides an analysis of the responses to the individual questions in the questionnaire. The analysis is divided into three parts: Part I--Background and Training, Part II--Usefulness of the Cost Center Performance Summary, and Part III--Suggestions for Improvement. Part II is further divided into the following subject areas: timeliness, aid to decisions, control, accuracy/appropriateness, and other reports.

The data from the questionnaire responses which was used in the analysis is exhibited in tabular form in Appendix E. Except for questions 6, 19 and 20, the data is presented as distribution of responses and percentages *for each question per stratum.* The data for questions 6, 19 and 20 is presented in summary form since the respondents provided essay type answers to these questions.

Part I--Background and Training

Background. Questions #1, 2, 3 and 7 provided background information about the respondent. An analysis of question #1 revealed some unexpected results. Based upon the stratification of the population depicted in Table 2, respondents in stratum I should have answered yes to question #1 (Is your cost center presently under the CCPMS?) and respondents from stratum II should have answered no to the question. However, 11 respondents from stratum I

reported no to question #1 and 15 respondents from stratum II reported yes to question #1.

Many reasons for this apparent discrepancy are possible. The MAJCOMs could have provided erroneous information as depicted in Table 2. The respondents could have misinterpreted the question.

The researchers believed that the MAJCOMs were knowledgeable on the CCPMS in their commands and therefore, didn't provide erroneous information as depicted in Table 2. Based on this assumption, the possibility that the MAJCOMs provided erroneous information was discounted. The conclusion reached by the researchers is that the discrepancy exists due to a combination of the following possibilities: confusion created by USAF cancelling the CCPMS at approximately the same time as the respondents received the original questionnaire, and misinterpretation of the question by some respondents.

A review of the responses to questions #2 and #3 revealed that lack of experience with the CCPMS was not characteristic of the respondents. The respondents' cost centers had been under the CCPMS long enough to develop substantial experience on the system. Eighty-four percent of the respondents' cost centers in stratum I and 75 percent of the respondents' cost centers in stratum II were under the CCPMS for 24 months or longer. (See Table 10.) A majority of the respondents had substantial experience

with the CCPMS. The researchers categorized a respondent as *experienced* if he reported a response of 12 months or greater to question #3.

Although the experience levels were high for both strata, stratum II respondents had a slightly higher average experience level than stratum I respondents--26.7 months versus 22.7 months. (These averages were found by totaling the answers provided to question #3 and dividing by the total number of respondents in each stratum.) The researchers concluded that the difference is accounted for by the fact that the MAJCOMs in stratum II implemented the system quicker than the MAJCOMs in stratum I and thus were under the CCPMS longer in stratum II (21:16-17).

Since there was little difference in the experience levels for the two strata, the researchers concluded that experience levels of the respondents had little impact on the findings of this research effort.

Question #7 was designed to see if there was a difference in the size of the annual budgets managed by the cost center managers in each stratum. Table 15 depicts the distribution of the responses to this question. Analysis of the responses revealed that little difference existed in the size of the annual budgets managed by the CC managers in each stratum. This is consistent with what would be expected since each MAJCOM will have cost centers of varying sizes. There should be little difference

between commands in the size of cost centers in any stratification method which might be arbitrarily selected.

Training. Questions #4, 5 and 6 provided information on the quality of training (formal and OJT) received by the CC managers on the CCPS and information regarding improvements in the training program on the CCPS. (See Tables 12, 13 and 14.)

Since the researchers were concerned with the adequacy of training (formal or OJT) received by the respondents on the CCPS, not the type of training received, the responses to questions #4 and #5 were combined as shown in Table 7.

As indicated in Chapter II, *adequate training* was defined as a response of greater than 4 to either question #4 or #5; *inadequate training* was defined as a response of less than 4 to either question; and a response of 4 was defined as undecided. Therefore, for each respondent the greater value given for questions #4 and #5 was used to product Table 7.

As evident by Table 7, a majority of the respondents felt that the training they had received on the CCPS was adequate, using the definition of *adequate training* in Chapter II. This finding is consistent with the prior research of Ferris and Smith (5:56-57).

Question #6 was an essay type question which gave the respondent an opportunity to provide suggestions for

TABLE 7

COMBINATION OF RESPONSES TO QUESTIONS #4 and #5

	Adequate				Inadequate		
	7	6	5	4	3	2	1
Number of Respondents	17	6	9	9	7	2	7

Percentages

Adequate	Inadequate	Undecided
56.1	15.8	28.1

designing an adequate training program to assist CC managers in analyzing the CCPS. Table 14 contains a summary of the responses. Twelve recommendations were received as responses to this question. Two-thirds of the recommendations were related to improving the quality of training and the remaining third felt that the training had been developed and given to the wrong people.

Part II--Usefulness of the Cost Center Performance Summary

Timeliness. Questions #8 and #11 provided information concerning the timeliness of the receipt of the CCPS. Since the CCPS was defined as a monthly report, it should have been received monthly and consistently in order to be useful to the CC managers. The data in Table 16 shows that approximately three-fourths of the respondents in the two strata were receiving the CCPS monthly. However, the data

in Table 19 shows that a large percentage (37.5 percent for stratum I and 41.7 percent for stratum II) of respondents were not receiving the report in sufficient time to allow the CC manager to take effective management action to correct an undesirable situation. This result closely parallels the findings of Ferris and Smith with regard to the timely receipt of the CCPS (5:69-70). The CCPS reported the cost figures "as of" the last day of the month. Therefore, based on the suggestion provided by two respondents to make the report more timely (See Table 28) and on the researchers' experience with other control reports, the researchers believed that the CC managers were often receiving the report late in the next month. Therefore, the researchers concluded that although a majority of the respondents were receiving the report monthly, they received the report too late in the next month to allow them sufficient time to take effective management action to correct an undesirable situation before the cutoff date for the next report.

Aid to Decisions. Questions #9, #12, #13 and #14 provided information regarding how much the CCPS aided the CC manager in his managerial decision process. The data for these questions (Tables 17, 20, 21 and 22) revealed that the majority of respondents felt that the CCPS did not aid them in their managerial decision process.

Question #9 measured the usefulness of the CCPS to the CC managers in their managerial decision process. The respondents, 88 percent for stratum I and 62 percent for stratum II, were strongly in agreement that the CCPS was not useful to them in their managerial decision process. This finding is consistent with the results of the audit performed in 1973 on the CCPMS (19:2). However, it is inconsistent with the results of the analysis of the USAFE responses to this same question in the Ferris and Smith research effort (5:61-64). The majority of the USAFE respondents in the Ferris and Smith study indicated that the CCPS was useful to them in their managerial decision process. The researchers suggest that this inconsistency is due to the fact that at the time that Ferris and Smith conducted their research, the CCPMS was an active program and thus was receiving more top-level management support. Whereas at the time this research effort was accomplished, the CCPMS had been made optional and eventually cancelled indicating very little if any top-level management support. Without support from upper managers, the CC managers would not be expected to use the report or even perceive it as a useful one.

Questions #12, #13 and #14 provided further support for the findings of question #9. The majority of respondents indicated that the information provided to them by the CCPS was not meaningful at their level of management

responsibility; that the CCPS was not helpful in pinpointing problem areas regarding the efficient use of resources; and that it was not helpful in forecasting the financial impact that mission changes have on their organizations. Since all of these qualities or characteristics were viewed as not contributing to the usefulness of the CCPS in the respondents' managerial decision process, the researchers concluded that the majority of respondents did not use the CCPS as an aid in their managerial decision process. This conclusion is consistent with the findings of Ferris and Smith and the audit report in 1973 (5:84; 19:7-9).

Accuracy/Appropriateness. Question #15 provided information regarding the appropriateness of the output measures developed for each cost center. Question #18 provided information regarding the accuracy of the data reported in the CCPS.

The data exhibited in Table 23 indicates that 73 percent of the respondents for stratum I and 61 percent of the respondents for stratum II did not feel that the output measures developed for their cost centers were useful descriptors of the tasks or functions of their organizations. Previous researchers have also found that the output measures which were developed under the CCPMS were not useful descriptors of the cost centers' tasks or functions (19:10-11; 21:16-24). Ferris and Smith found a

smaller percentage of USAFE respondents who reported the output measures were not useful descriptors of the cost center's tasks or function; but, their findings for SAC respondents were consistent with the findings of this research effort (5:74-75). The researchers suggest that the reason for the inconsistency in USAFE responses is due to effect created by the fact that the USAFE was conducting a special test program on the CCPMS (5:17-22)* and, by the difference in emphasis and guidance found in USAFE by top-level management (21:16-22).

One of the criteria for establishing an output measure is that it must be meaningful to the CC manager or user (18:Ch.4,5; 16:1). Since the majority of respondents indicated that their cost centers' output measures were not useful descriptors of the cost centers' tasks, the output measures were not meaningful to the CC manager or user. Therefore, since the output measures were not meaningful to the majority of respondents, the researchers suggest that the CC manager would not use a report which reported data on a meaningless measure of performance. This conclusion further supports the explanation as to why the

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*This is similar to the Hawthorne effect. The Hawthorne experiments concerned the measurement of varying conditions of illumination on output of factory workers. The Hawthorne effect is that *the fact of being observed* can in itself increase the output of personnel.

majority of respondents reported that the CCPS did not aid them in their managerial decision process.

Question #18 responses indicated that a majority of respondents (63 percent for stratum I and 69 percent for stratum II) felt that the information reported in the CCPS was accurate for their cost centers. (See Table 26.) The finding to this question initially appears confusing. Why should meaningless information be perceived as being accurate? This question differed slightly from most of the other questions on the questionnaire in that it related to information about both inputs and outputs whereas most of the questions involved only one aspect, either input or output.

The researchers suggest that the cost (input) information was accurate but the output information was ignored, due to its being meaningless, without considering its accuracy.

Control. Questions #10, #16 and #17 provided data regarding the CC manager's ability to control the expenses incurred by his cost center. The analysis of these questions revealed that a majority of the respondents felt they had significant control over the expenses incurred by their cost centers. (See Table 24.) They agreed on which EEICs were controllable and which EEICs weren't controllable. Also, the majority of respondents indicated that the cost

elements reported on the CCPS were not adequate to allow them to control costs. (Table 25.)

Since a Chi Square statistical test revealed that no relationship existed between a CC manager's stratum and how he responded to question #16 (see Table 30), the researchers summarized the responses as shown in Table 8.

In accordance with the definitions stated in Chapter II, a response of greater than 4 was coded as a *controllable cost element* and a response of less than 4 as *not controllable*. A response of 4 was coded as undecided. The totals for each stratum for each EEIC were then added together to produce Table 8. As evident by the data, a majority of respondents agreed as to which EEICs were not controllable: Military Pay and Civilian Pay. This is consistent with the findings of the audit report and with the findings of Ferris and Smith (5:64-66; 19:8). Also, since the CC manager does not budget for or pay for either of these two EEICs, the expected response would be not controllable for the EEICs, Military Pay and Civilian Pay.

The respondents were in agreement as to the degree of controllability they had over the two EEICs: Supplies and Equipment. The majority of respondents reported these two EEICs as definitely controllable. The data in Table 8 makes this fact readily apparent. Again this is consistent with the findings of Ferris and Smith (5:64-66). The respondents were split as to the degree of controllability

TABLE 8

SUMMARY OF RESPONSES TO QUESTION #16

EEIC	Controllable	Not Controllable	Undecided
Military Pay	1	66	0
Civilian Pay	7	52	8
Supplies	53	12	8
Equipment	53	13	7
Travel and Transportation	30	27	10
Contractual Services	26	25	9
		Percentages	
Military Pay	1.5	98.5	0.0
Civilian Pay	10.4	77.6	12.0
Supplies	72.6	16.4	11.0
Equipment	72.6	17.8	9.6
Travel and Transportation	44.8	40.3	14.9
Contractual Services	43.3	41.7	15.0

they had over the remaining two EEICs: Travel and Transportion and Contractual Services. The researchers suggest that the reason that the respondents reported that they had definite or some control over the four EEICs (Supplies, Equipment, Travel and Transportation, and Contractual Services) is that the CC managers were required to budget for these EEICs and they had a say as to how the expenses in these four EEICs were expended. Therefore, they had a degree of control over these EEICs.

Since the personnel costs are a significant portion of the CC manager's budget and since almost all of the respondents (100 percent for stratum I and 98 percent for stratum II) reported Military Pay as *not controllable*, the researchers suggest that when the respondents were considering the degree of controllability they had over the expenses of their cost center, the CC managers did not think of personnel costs when they thought of "total expenses." This helps to explain why a majority (53 percent) of the respondents indicated that they had significant control over the expenses of their cost centers. (Table 18.)

Other Reports. Question #19 was included in the questionnaire so that the researchers could determine if other reports existed in the Air Force which were viewed as containing the same information as the CCPS and were

more or less useful than the CCPS. Since the responses to this question were provided in a narrative form, the responses were summarized and can be found in Table 27.

The respondents reported that many reports existed in the Air Force which contained information similar to the CCPS and which were more useful than the CCPS. The researchers concluded that since many reports existed in the Air Force which contained similar information to the CCPS and were more useful, the CCPS was viewed as a redundant and superfluous report and therefore not used by the CC managers. This was also found to be true in the latter part of 1973 when the USAF Audit Agency conducted its audit on the Cost Center Performance Measurement System. "All the information available on the CCPS was available to the cost center managers in other reports on a more current basis [19:8]." The researchers suggest that this helps to explain the low percentage of respondents who indicated that the CCPS aided them in their managerial decision process. CC managers would hardly be expected to use a redundant or superfluous report when a more useful report is available.

Part III--Suggestions for Improvement

Question #20 allowed the respondents to provide narrative suggestions for improving the usefulness of the CCPS. The respondents were also asked to rank the suggestions in the order of most needed improvements. Forty

responses were received; however, very few CC managers provided more than one suggested improvement. Most of the respondents who provided more than one suggestion didn't rank the suggestions in the order of most needed improvements. Therefore, the researchers summarized the responses based on the content of the suggestion as depicted in Table 28.

The majority of the respondents provided suggestions for improving the usefulness of the CCPS in the general area of control. The improvements in this area would give the CC manager and his superiors a more realistic indication of the expenses incurred by the cost center and how these expenses were related to the output or performance of the cost center.

Many of the suggestions for improving the usefulness of the CCPS provided by the respondents are consistent with suggestions found by previous researchers. Separating or eliminating noncontrollable costs have been previously suggested for improving the usefulness of the CCPS (5:78; 19:8). Ferris and Smith found that ". . . data needs to be more accurate and timely [5:78]" was their second most frequent suggestion for improving the usefulness of the CCPS. Improvement of output measures has been found to be a significant suggested improvement so that the CCPS would be more useful to CC managers (5:75; 19:33; 21:16).

In summary, as evident by the large number of suggested improvements, the researchers concluded that the CCPS had room for improvement. The suggested improvements found by the researchers were not new suggestions. Many of the suggestions for improving the usefulness of the CCPS were suggested as far back as early 1974. However, since many of these suggestions were still valid at the conclusion of the program, the researchers question whether anyone attempted to act on the suggestions that were provided in 1974 for improving the usefulness of the CCPS.

Dependency Analysis

The researchers established contingency tables from the data provided by the responses to the questionnaires from each stratum. These tables were established so that dependency relationships could be tested using the χ^2 statistical test. The tests were grouped into three areas of concern: (1) A test to determine if the responses to the original questionnaire and the responses to the follow-up questionnaires came from the same population. If the responses came from the same population, the researchers could group the data from the original mailing with data from the follow-up mailing for all further analysis; (2) A test to determine if there was a significant difference in the responses from stratum I CC managers and the responses from stratum II CC managers. By determining that

the responses from stratum I did not differ significantly from the responses of stratum II, the researchers could combine the data from both strata for all further analysis; and (3) A test to determine the variables which significantly affected the usefulness of the CCPS to the CC manager. Appendix F contains the results of the individual χ^2 tests.

The researchers found that due to the relatively small number of useable responses from each stratum, it was necessary to collapse the data into 2 x 2 contingency tables. These tables were appropriate for either the χ^2 test or Fisher's exact test. The seven-point scale questions were collapsed by recoding a response of 1 to 3 as a 1; a response of 5 to 7 as a 2; a response of 4, N/A or no response as missing values. The response of 4 was classified a missing value because a response of 4 meant that the respondent was undecided. Hence, the 4 response didn't add meaningful information to either the recoded responses of 1 or 2. Question #8 was collapsed by recoding a response of "quarterly," "intermittently" and "never" as a 1 and a response of "monthly" as a 2. The resulting 2 x 2 contingency tables were then statistically tested. (See Tables 29 through 31.)

The first χ^2 statistical test performed was to determine if there was a significant difference between the responses to the original questionnaire and the responses

to the follow-up questionnaire for each stratum. The results of this test were previously discussed in the section of this chapter headed "Original versus Follow-up Questionnaire."

A χ^2 statistical test was performed to determine if the responses from stratum I CC managers were significantly different from the responses from stratum II CC managers. (See Appendix F.) If the test showed that the responses from the two strata were not statistically different, the researchers could then combine the responses from the two strata and generalize the results to both strata instead of for each stratum alone.

The findings for the individual questions revealed that there was only one question, #13, for which the difference between the stratum responses was statistically significant. The researchers concluded that whether the CCPS helps the CC manager to pinpoint problems is dependent upon whether the manager is in stratum I or II. Recall that stratum I represents those CC managers who were under the CCPMS at the time the sample was taken, whereas stratum II managers were no longer under the CCPMS but represented experience at varied periods of time and of varied lengths and under various commands within the CCPMS' history. In stratum I only one of 26 respondents indicated that the CCPS helped pinpoint problems. In stratum II 13 of a total of 37 respondents indicated that the CCPS helped them to

pinpoint problems. Since stratum I represents the CC managers with the most recent experience, the researchers concluded that the CCPS as of the time the sample was taken was not useful to CC managers to help them pinpoint problems regarding the efficient use of resources. The researchers could not identify any one reason that more stratum II than stratum I managers found the CCPS helped pinpoint problems. Possible reasons include the relative enthusiasm with which some stratum II managers may have approached the relatively new CCPMS compared to the waning enthusiasm of stratum I managers who were working with a program that was obviously on the decline in command emphasis (19:10). The difference may also be explained as resulting from a difference in top management support. "There has not been and there is no continuous, cohesive, centralized direction to sustain motivation Air Force-wide in all functional areas [3:44]."

Since the response rate to all other questions was not found to differ significantly by stratum, the data from both strata, with the exception of question #13 was grouped and considered as a single sample from the population of CC managers for all further analysis. (See Table 30.)

Contingency table analysis was conducted to determine the variables which are related to the variable *usefulness*. Since stratum I and II data except for question #13 was not significantly different, the researchers

considered the statistical significance of both strata grouped as one stratum in drawing conclusions concerning the CCPS' usefulness. The researchers concluded that whether the CC manager found the CCPS useful for making decisions depended upon: (1) whether the CCPS was received in sufficient time to allow the respondent to take effective management action to correct an undesirable situation (question 11), (2) whether the CCPS was meaningful at the respondent's level of management responsibility (question 12), (3) whether the CCPS helped the respondent forecast the financial impact that mission changes would have on his organization (question 14), (4) whether the output measures developed for the respondent's cost center were useful descriptors of the functions or tasks of his organization (question 15), and (5) finally, on whether the CCPS' cost elements were adequate to allow the respondent to control costs (question 17).

Question #13 was tested with usefulness by a Fisher's exact test in stratum I and by a χ^2 test in stratum II. (See Table 31.) The researchers were not able to conclude that usefulness in stratum I depends on whether the CCPS helped pinpoint problems. In analyzing the joint frequencies of *usefulness* and *helps pinpoint problems*, of 25 respondents to the question, 22 indicated that the CCPS was neither useful, nor did it help pinpoint problems, two indicated that it was useful but did not help

pinpoint problems and one indicated that it was both useful and helped pinpoint problems. The researchers concluded that the CCPS was in fact not useful nor did it help pinpoint problems for stratum I CC managers.

In stratum II the researchers were able to conclude significantly that *usefulness* depended on whether the CCPS helped the respondents to pinpoint problem areas regarding the efficient use of resources. In stratum II those who considered the CCPS useful also believed that the report helped them to pinpoint problems and those who did not consider the CCPS useful believed that the report did not help them pinpoint problems.

The researchers tested six other variables with *usefulness*: *experienced*, *adequate training*, *consistently received*, *significant control of expenses*, *controllable cost elements*, and *accurate CCPS information*. The researchers were not able to significantly conclude that *usefulness* depends on these six variables.

The literature supported the findings concerning usefulness of the CCPS in most areas. Ferris and Smith concluded at the 95 percent and greater confidence level that *usefulness* depends on *timely receipt* of the CCPS, *helps pinpoint problems*, *helps forecast the impact of change*, *meaningful* CCPS information, *useful descriptor of output*, and whether the cost elements of the CCPS were adequate to allow the respondent to control

costs (5:81-82). Furthermore, Boyd wrote that if a manager possesses "valid cost-per-unit data" and can predict his production, he can build an accurate budget (3:41). The Air Force audit reported that usefulness was a function of the meaningfulness of the information on the CCPS, on whether the report permitted the manager to forecast changes and whether the managers were able to control costs at base level (19:2-11).

The researchers concluded that usefulness of the CCPS depends on: (1) The timely receipt of the CCPS. If the report was not received on time to allow the manager to take effective management action to correct undesirable situations, the report would not be very useful to him. On the other hand, if the report were timely, the manager could find it useful despite other imperfections; (2) The meaningfulness of the CCPS' information. If the information were not meaningful at the managers' level of responsibility, it was not likely to be useful to him; (3) Helps pinpoint problems; and (4) Helps forecast change versus impact of change. Whether the CCPS helps the manager pinpoint problem areas regarding the efficient use of materials and to forecast the impact of change are fundamental to the very purpose of the Output Measurement Program: to give managers the information they need to perform efficient as well as effective operations; (5) Useful descriptor of output; and (6) adequate cost elements. No

amount of timeliness or control can make a report useful if it does not measure or reflect the units' outputs.

Of the six variables that the researchers showed were independent of *usefulness*, there was in some cases an apparent conflict with the literature. However, close analysis of the response to the questions from which the data for those variables came resolves the conflicts. Boyd wrote that the frequency of transfers of experienced people from one assignment to another has affected the validity of the CCPMS (5:45). The researchers found that although the respondents were evenly grouped between experienced and inexperienced under the CCPMS, the majority indicated that the CCPS was not useful and that the two were not related. The researchers concluded that if more respondents had indicated that the CCPS were useful, then experience may have become a significant factor bearing on *usefulness*.

Similarly, analysis of the response to *adequate training* revealed that *usefulness* and *adequate training* were not dependent. This is logical. If the CCPS was not *useful* to the respondents, it didn't matter if they were adequately trained or not. The literature did not support this conclusion. Ferris and Smith were able to conclude at the 95 percent confidence level that *usefulness* was dependent on *adequate training* (5:81). This is no doubt true, but the prerequisite is that the report is useful to

begin with. A similar argument was made for *consistently received, significant control of expenses, controllable cost elements,* and *accurate CCPS information.*

The researchers could not conclude from this analysis that usefulness is dependent on *experience, adequate training, consistently received, significant control of expenses, controllable cost elements,* and *accurate CCPS information,* but rather the report must be useful to the CCPS manager first for each of these to be significant factors.

Factor Analysis

The researchers used factor analysis to identify which variables were highly correlated with *usefulness.* Appendix G explains the procedures used in this analysis. The researchers concluded that factor analysis supported the results of the dependency analysis. Four factors were identified; these were labeled as: "usefulness of the CCPS," "non-controllable expense elements," "controllable expense elements," and "knowledge of CCPS."

The factor "usefulness of the CCPS" was shown to be significantly affected determined by the variables: *useful, timely receipt of CCPS, helps forecast impact of changes,* and *adequate cost elements.* The other three factors ("non-controllable expense elements," "controllable expense elements," and "knowledge of CCPS") were not

determinants of the factor, "usefulness of the CCPS." The variables within these three factors were also found through dependency analysis to not significantly affect the usefulness of the CCPS. The researchers concluded that factor analysis further supported the results of dependency analysis in determining why CC managers were not using the CCPS in their managerial decision process.

CHAPTER IV

CONCLUSIONS AND RECOMMENDATIONS

The Output Measurement Program and the Cost Center Performance Measurement System (CCPMS) were implemented by the Air Force in 1972 to provide a means for quantifying or measuring the productivity of cost centers in meaningful terms and to provide a means for relating output to input costs on a cost-per-unit basis. The goal of the CCPMS was to enhance efficiency as well as effectiveness in financial management within the USAF.

At the heart of the CCPMS was the CCPS. This single page report was to include meaningful information to the cost center manager in terms of his expenses related to measures of his output. The CCPS reported the variance between actual and standard unit costs and reported the month-by-month and cumulative progress to enable the CC manager to control costs and to take corrective measures when necessary. The information was to help him pinpoint problem areas regarding the efficient use of resources, to help him forecast the financial cost that mission changes would have on his cost center, to help him make decisions involving fund expenditures and to give him the basis to take effective management action to correct an undesirable situation.

This research attempted to determine why the CCPMS was not successful in achieving its purpose. The results are presented in detail in Chapter III, Analysis; this chapter summarizes those results. The researchers follow the discussion of their conclusions by recommendations of alternative methods of meeting the objectives of the Air Force Output Measurement Program and a recommendation for further research.

Conclusions

Research Question #1

Research question #1 asked "Have Major Air Commands discontinued the CCPMS as a required program?" The researchers identified the commands that had continued the CCPMS after the Air Force made the program optional in November 1975. These commands were the Air Training Command (ATC), the Air Force Accounting and Finance Center (AFAFC), and the USAF Academy (USAFA). All other commands had either discontinued the system when it became optional, or were not able to provide information concerning their status.

Two of the three commands which continued the use of the system, USAF Academy and the Air Training Command, admitted that even though they had not as yet dropped the program, cost center managers below the Major Command level did not find the CCPMS useful. This was supported by the

results of the survey of cost center managers. Eighty-eight percent of the cost center managers in stratum I (represented by ATC, AFAFC and USAFA) indicated that the CCPS was not useful to them in making decisions involving fund expenditures. The other Major Commands reflected their belief that the CCPMS was not a useful program by dropping the CCPMS as soon as USAF made it an optional program. This was supported by an Air Force audit of the CCPMS in 1974, prior to the program becoming optional.

> Findings . . . a. MAJCOM management personnel had serious doubts as to the usefulness and meaningfulness of CCPMS data. . . . b. Base level managers considered the Cost Center Performance Summary to be of little or no value [19:2].

Apparently, there was little or no improvement in the attitude of financial managers toward the CCPMS between 1974 and 1975. As a result, when given the opportunity, the majority of commands dropped the CCPMS. The researchers' phone contacts with MAJCOM personnel revealed that the MAJCOM personnel were not motivated to use the CCPMS because of their apparent belief that there was little support at the HQ USAF level that the program had value. The researchers concluded that a lack of motivation at HQ USAF and MAJCOM level was one reason that the CCPMS was not a successful program and was not used by the CC managers.

Research Question #2

Research question #2 asked "Why are financial managers not using the CCPMS in their managerial decision process?" In answering this question, the researchers first identified from the literature 12 variables that had been shown to affect usefulness of the CCPS, the heart of the CCPMS. The questionnaire which was used to survey cost center managers concerning their experience with the CCPMS asked the respondents questions regarding these variables. An analysis of the responses in Chapter III showed that only six of the twelve variables affected the usefulness of the CCPS. *Usefulness* was shown to depend on (1) whether the CCPS was received in sufficient time to allow the respondent to take effective management action to correct an undesirable situation, (2) whether the information provided by the CCPS was meaningful to the respondent at his level of management responsibility, (3) whether the CCPS helped the respondent pinpoint problem areas regarding the efficient use of resources, (4) whether the CCPS helped the respondent forecast the financial impact that mission changes would have on his organization, (5) whether the output measures developed for the respondent's cost center were useful descriptors of the tasks of his organization, and (6) whether the cost elements reported on the CCPS were adequate to allow the respondent to control costs. Usefulness of the CCPS in allowing the respondent to make

decisions involving fund expenditures did not depend on the other six variables. The researchers compared the experience of the cost center managers under the CCPMS to whether or not the managers found the CCPS useful. Experience did not affect usefulness. Usefulness was also compared to whether the cost center manager had received either adequate formal or on-the-job training in the use of the CCPS. The researchers were not able to conclude that usefulness was dependent on adequate training. Ferris and Smith found that usefulness did depend on adequate training (5:81). However, the CCPMS was relatively a new system at the time their research was conducted and more than half the respondents to their questionnaire indicated that the CCPS was at least sometimes useful in making decisions. For training and experience to bear on usefulness, the researchers suggest that the report must first be useful. Since a majority of respondents felt that the training they had on the CCPS was adequate, and a majority felt that the CCPS was not useful, then the researchers concluded that in this case usefulness did not depend on adequate training (or lack of it).

The researchers compared whether the CC manager consistently received the CCPS on a monthly basis to whether he perceived the report to be useful in making decisions. The researchers were not able to conclude that usefulness depended on consistent receipt of the CCPS.

Even though in the majority of cases the CCPS was consistently received on a monthly basis, it was not useful for decisions. The researchers concluded that the CCPS must first be useful for its usefulness to be affected by whether the CC manager consistently received the report on a monthly basis.

The other variables which were compared to usefulness all dealt primarily with the amount of control the CC manager had over his expenses. In all cases involving control of expenses, the researchers could not find that usefulness of the CCPS for aiding decisions depended on whether the manager had control over expenses. This appeared inconsistent with the literature since Ferris and Smith concluded that *control of expenses* was the most significant factor bearing on usefulness (5:82). The analysis of the data revealed that respondents were consistent in which EEICs they felt they could control. In fact control had two factors--controllable expenses and non-controllable expenses. The fact that there were non-controllable expenses on the CCPS did not hamper a majority of the respondents to the questionnaire from indicating that they in fact felt that they had significant control over the expenses of their cost centers. Nevertheless, *usefulness* did not depend on *significant control of expenses*. The researchers concluded that for the variable *significant*

control to bear on *usefulness*, the report first had to be useful.

As previously discussed, the questionnaire data analysis indicated that there were six variables which affected *usefulness* and six which did not. The literature had indicated that all twelve of these variables would directly affect *usefulness*. In other words, increasing or decreasing a variable would increase or decrease usefulness. However, varying these latter six variables, e.g., increasing or decreasing the training, including or excluding only controllable cost elements, etc., could affect usefulness only if the report was first useful. The research indicated that it was not. The other six variables are significant factors bearing on usefulness because it is they which either directly affected or resulted from the usefulness of the CCPS in decision making. This was discussed in Chapter III, Analysis. For example, the fact that the respondents perceived that the information provided by the CCPS was not meaningful at their level of management responsibility had a direct bearing on usefulness; and the fact that a majority of respondents felt that the CCPS was not helpful in pinpointing problems shows the results of the report being not useful to those respondents.

The researchers found several factors which may help explain why financial managers were not using the

CCPMS in their managerial decision process. First, the information provided by the CCPS was not meaningful to cost center managers at their level of management responsibility. Second, the output measures developed for individual cost centers were not useful descriptors of the functions and tasks of that organization. Third, there were other reports that contained the same information as the CCPS and were more useful than the CCPS.

Research Question #3

Research question #3 asked "Do the cost center managers who are using the CCPS find it a useful part of their managerial decision process?" In answering this question, the researchers analyzed the responses to questions #9, #11, #12, #13 and #14. See Chapter III, Timeliness and Aid to Decisions. The researchers concluded that: (1) the CCPS was not useful to the CC managers in making decisions involving fund expenditures, (2) CC managers were not receiving the CCPS in sufficient time to allow them to take effective management action to correct an undesirable situation, (3) the information provided by the CCPS was not meaningful at the CC manager's level of responsibility, (4) the CCPS did not help CC managers pinpoint problem areas regarding the efficient use of resources, and (5) the CCPS did not help financial managers forecast the financial impact that mission changes would

have on their organization. Therefore, the researchers concluded that the CCPS was not a useful part of the managerial decision process for the cost center managers.

Research Question #4

Research question #4 asked "What alternative methods will meet the objectives of the Air Force's Output Measurement Program?" Since the Air Force has cancelled the Output Measurement Program and the CCPMS (13), the information provided for this question should be considered when and if the Air Force revises the Output Measurement Program and develops a performance control system similar to the CCPMS.

The CCPMS was basically a theoretically sound program which (in theory) met the objectives of the Air Force's Output Measurement Program outlined in AFR 178-4. However, for various reasons, the program was not well received nor used by Air Force personnel at the various levels of management responsibility. The CCPMS never really became a viable program in most of the MAJCOMs and was cancelled in February 1977 after a relatively short existence (13).

Prior to the CCPMS the Air Force did not have a performance control system. The basic idea of the CCPMS that managers should be concerned with the efficient as well as effective use of their resources in producing

their output is an important concept. The researchers believe that managers should be very concerned with both the efficient and effective accomplishment of their mission. The importance of efficiency has become paramount considering the limited and scarce resources available to today's managers. Therefore, although the CCPMS apparently failed, the researchers suggest that a system needs to be developed which will improve the quality of the output measures and be a useful management tool to aid CC managers in their managerial decision process. The new system should measure or evaluate both the efficiency and the effectiveness of the manager's cost center production. The manager's performance evaluation therefore should include both the efficiency and effectiveness aspects. If the CC manager knows that his performance evaluation entails both efficiency and effectiveness, he should be motivated to improve his efficiency.

The recently cancelled Output Measurement Program had two specific objectives:

> 1. To improve the capability to describe the output of selected Air Force organizations in terms that are related to the structure of the Force and Financial Plan (F&FP).
> 2. To improve the quality, availability, and utility of output measures/management indicators to support and influence management decisions that affect the employment of forces and the acquisition, allocation, and management of resources [16:1].

The new system proposed by the researchers will satisfy these objectives.

Top level management support is essential for the successful implementation of any management system. Support for a new program must start at the highest level of management and must continue down through the various levels of management to the cost center manager. The user, CC manager, must perceive that top-level management believes in the program and believes that it will work. If the manager doesn't have this perception, he will think that the program is just another square-filling exercise with little meaning.

Before a new program can be implemented, all participating personnel have to receive adequate training on all aspects of the program. CC managers as well as management analysis personnel have to have a thorough understanding of how the program works and how to read and use the management products produced by the new program. Top- and middle-level management must be sufficiently trained on the program to provide support for the systems and to be able to appreciate the problems in using the new program. The training should stress that the new program will definitely aid the manager in his managerial decision process and should provide tangible examples of how it will do so.

There are several areas of concern which must be considered in developing the new output measurement program for Air Force financial managers. The prime concern

is that the new program must be useful to the CC manager in aiding his managerial decision process. If it isn't, the program will be meaningless and will not be used by the CC managers. In order for the program to be useful, the output measures have to be meaningful or useful descriptors of the organization's production, and the CC manager should have control over the expenses incurred by his cost center to produce the output. If all expenses can't be controlled by the CC manager (personnel costs) then the expenses should be broken down into controllable and non-controllable with only the controllable costs being used in the computation of the cost-per-unit and the standard. This will enable the CC manager to affect the efficiency of his organization.

Every effort should be exerted to make the output measure meaningful and an adequate representation of the production of the cost center. If at all possible, a single quantifiable output measure should be developed for the selected cost centers. If more than one output measure is needed to adequately represent a particular CC's production, the costs associated with each measure should be weighted based on the percent of time that the cost center manager spends producing that output. The percentages developed would determine how much was expended in producing each output. Thus, a CC manager would have more than one

measure of efficiency when more than one output measure had been developed for his cost center.

The reporting system for the new program should be a modification of an already existing report, such as the RC Manager's Cost Center Report, instead of creating a new report as was done with the CCPS. The existing report will already be familiar to most CC managers and therefore easier to accept. The existing report should also be modified so that the CC manager receives the report not later than the third workday of the following month. This would allow the manager to identify potential trouble areas in time to initiate the appropriate corrective action thus preventing a problem from developing.

The researchers suggest that the new program be implemented by selected Air Force organizations as was specified by AFR 178-4 (16:1). The program should not be implemented immediately by all cost centers in the Air Force. The authors also suggest that the program be implemented gradually by like functions with quantifiable outputs in the MAJCOMs. By this the authors mean, for example, that all dining halls be required to implement the program, since their outputs (meals served) are readily measurable. Once these cost centers have successfully implemented the program, then it can be expanded to other CCs. The authors realize that this will limit the

organizations under the program; however, they feel that this is necessary if the program is to succeed.

Recommendations

The researchers recommend that the Air Force develop a new Output Measurement Program. Financial managers should be concerned with the efficient as well as effective use of the resources available to them. The findings of this research effort and previous research efforts concerning the usefulness of the CCPMS should provide the foundation for the development of an effective output measurement program.

The researchers recommend that further research be performed to develop a viable Output Measurement Program for the Air Force. The researchers should investigate the programs being used by other organizations such as the U.S. Navy, U.S. Army, and Canada. Then using those findings and the lessons learned from the implementation of the CCPMS, an effective Output Measurement Program can be developed for use in the United States Air Force.

APPENDICES

APPENDIX A

ORIGINAL COVER LETTER

DEPARTMENT OF THE AIR FORCE
AIR FORCE INSTITUTE OF TECHNOLOGY (AU)
WRIGHT-PATTERSON AIR FORCE BASE, OHIO 45433

REPLY TO ATTN OF: SLGR (SLSR 2-77A/Capt Covell/Capt Jones/AUTOVON 78-72527)

SUBJECT: A Survey of the Use of the Cost Center Performance Measurement System

TO:

1. The attached questionnaire was prepared by a research team at the Air Force Institute of Technology, Wright-Patterson AFB, Ohio. The purpose of the questionnaire is to determine why some financial managers do not find the Cost Center Performance Measurement System (CCPMS) a useful program in their managerial decision-making process; to determine if those financial managers who were using the Cost Center Performance Summary (CCPS) find the CCPS a useful and necessary part of their managerial decision-making process; and to determine alternative ways of meeting the objectives of the Air Force Output Measurement Program.

2. You are requested to provide an answer or comment for each question. Please answer the questions based on an as of date of 1 December 1976. Headquarters USAF Survey Control Number 77-42 has been assigned to this questionnaire. Your participation in this research is strictly voluntary.

3. Your responses to the questions will be held in strict confidence. Please remove this cover sheet before returning the completed questionnaire. Your cooperation in providing this data will be appreciated and will be very beneficial in evaluating why the CCPS is or is not a useful management tool. Please return the completed questionnaire in the attached envelope within one week after receipt.

HENRY W. PARLETT, Colonel, USAF
Associate Dean for Graduate Education
School of Systems and Logistics

3 Atch
1. Privacy Act Statement
2. Questionnaire
3. Return Envelope

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ANALYSIS OF THE COST CENTER PERFORMANCE MEASUREMENT SYSTEM.(U)
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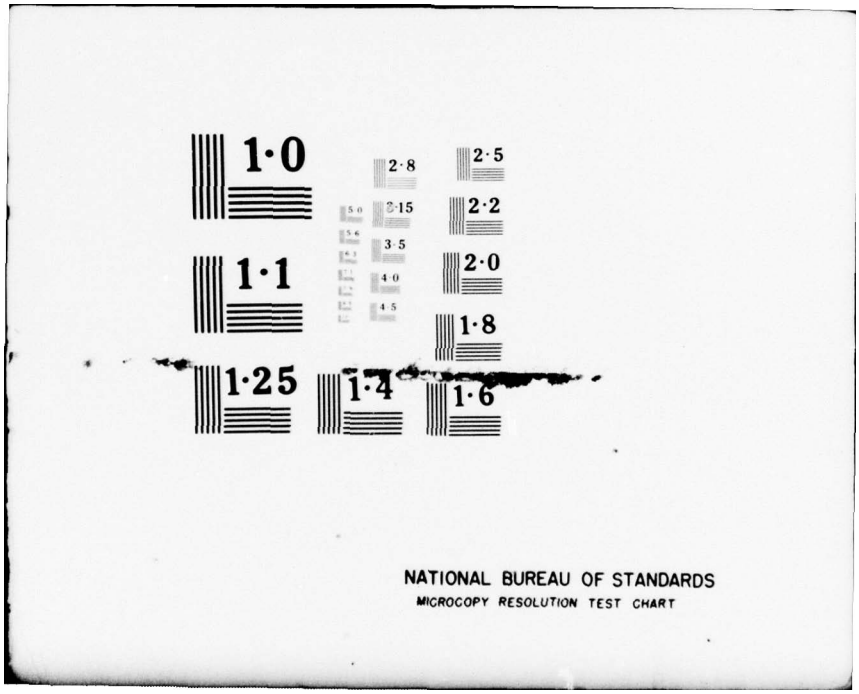
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NATIONAL BUREAU OF STANDARDS
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APPENDIX B

PRIVACY ACT STATEMENT

PRIVACY ACT STATEMENT

In accordance with paragraph 30, AFR 12-35, the following information is provided as required by the Privacy Act of 1974:

a. Authority:

(1) 10 U.S.C., 8012; Secretary of the Air Force, Powers, Duties, Delegation by Compensation; and/or

(2) 5 U.S.C. 301, Departmental Regulations, and/or

(3) DOD Instruction 1100.13, 17 Apr 68, Surveys of Department of Defense Personnel; and/or

(4) AFR 30-23, 22 Sep 76, Air Force Personnel Survey Program.

b. Principal purposes. The survey is being conducted to collect information to be used in research aimed at illuminating and providing inputs to the solution of problems of interest to the Air Force and/or DOD.

c. Routine uses. The survey data will be converted to information for use in research of management related problems. Results of the research, based on the data provided, will be included in written master's theses and may also be included in published articles, reports, or texts. Distribution of the results of the research, based on the survey data, whether in written form or presented orally, will be unlimited.

d. Participation in this survey is entirely voluntary.

e. No adverse action of any kind may be taken against any individual who elects not to participate in any or all of this survey.

APPENDIX C

FOLLOW-UP COVER LETTER

DEPARTMENT OF THE AIR FORCE
AIR FORCE INSTITUTE OF TECHNOLOGY (AU)
WRIGHT-PATTERSON AIR FORCE BASE, OHIO 45433

REPLY TO ATTN OF: AFIT/SLGR (SLSR 2-77A/Capt Covell/Capt Jones AUTOVON 737-2527)

MAR 2 1977

SUBJECT: A Survey of the Use of the Cost Center Performance Measurement System

TO:

1. The attached questionnaire, HQ USAF Survey Control Number 77-42, was prepared by a research team at the Air Force Institute of Technology, Wright-Patterson AFB, Ohio. The purpose of the questionnaire is to provide information for determining why the Cost Center Performance Summary (CCPS) was not a useful system and to determine alternative ways of meeting the objectives of the Air Force Output Measurement Program.

2. Reference: AF/ACMI message 091330Z February 1977, subject: Air Force Output Measurement/Management Indicator Systems. Since HQ USAF has cancelled the CCPMS, the need to determine why the CCPMS was not a useful system has become even greater.

3. This questionnaire is being sent as a follow-up to all cost center managers for which responses were not received by 1 March 1977. If the response for your cost center has been returned, please disregard this letter. In addition to your questionnaire responses, the researchers are interested in the reasons why the first questionnaire was not returned. This information will be used in validating the questionnaire as a method of data collection.

4. Your responses to the questions will be held in strict confidence. Your cooperation in providing this data will be appreciated and will be very beneficial in evaluating why the CCPS was or was not a useful management tool. Please return the completed questionnaire in the attached envelope within one week after receipt.

Henry W. Parlett

HENRY W. PARLETT, Colonel, USAF
Associate Dean for Graduate Education
School of Systems and Logistics

3 Atch
1. Privacy Act Statement
2. Questionnaire
3. Return Envelope

APPENDIX D

QUESTIONNAIRE

A SURVEY OF THE USE OF THE COST CENTER
PERFORMANCE MEASUREMENT SYSTEM

Directions

Please answer the following questions to the best of your ability. Some questions can be answered by simply placing a check mark in the appropriate block, drawing a circle around what you feel is the most appropriate answer, or by providing a brief explanation of your ideas in the space provided.

PART I--BACKGROUND AND TRAINING

1. Is your cost center presently under the Cost Center Performance Measurement System?

_____Yes _____No

2. If your answer to #1 was YES, approximately how long has your cost center been under the Cost Center Performance Measurement System?

0 to 6 Months	6 to 12 Months	1 to 2 Years	2 to 3 Years	Longer Than 3 Years

3. What is the total time you have functioned as a cost center manager under the Cost Center Performance Measurement System (both in your present job and in previous assignments)?

Present major command _____, Months _____

Previous major command _____, Months _____

4. How do you view any formal training (class room lecture or group discussion) you received in the use of the Cost Center Performance Summary.

Definitely Inadequate	○ 1	○ 2	○ 3	○ 4	○ 5	○ 6	○ 7	Definitely Adequate	○ N/A

5. How do you view any on-the-job training either prior to or after assuming duties as cost center manager?

Definitely Inadequate	○ 1	○ 2	○ 3	○ 4	○ 5	○ 6	○ 7	Definitely Adequate	○ N/A

USAF SCN 77-42 (Expires 30 September 1977)

6. What suggestions should be incorporated into a training program designed to assist cost center managers in analyzing the Cost Center Performance Summary? (If you have no suggestions, write NONE.)

_____

_____

_____

7. What is the total dollar amount of your cost center's annual budget (Operations and Maintenance (O&M) only)?

_____$0 - $50,000 _____$50,000 - $150,000 _____ $150,000 or more

PART II--USEFULNESS OF THE COST CENTER PERFORMANCE SUMMARY

Note: If your answer to question #1 was NO, answer the remaining questions from the viewpoint of your last experience using the CCPMS. If your answer was YES, answer the questions from your present viewpoint.

8. How often do (did) you receive the Cost Center Performance Summary?

_____Quarterly _____Intermittently _____Monthly _____Never

9. Is the Cost Center Performance Summary useful to you in making decisions involving fund expenditures?

Never Useful ○ ○ ○ ○ ○ ○ ○ Always Useful ○ N/A
1 2 3 4 5 6 7

10. Do you have a significant degree of control over the total amount of expenses incurred by your cost center?

_____Yes _____No

11. Is (was) the Cost Center Performance Summary received in sufficient time to allow you to take effective management action to correct an undesirable situation?

Never Timely ○ ○ ○ ○ ○ ○ ○ Always Timely ○ N/A
1 2 3 4 5 6 7

12. Is the information provided by the Cost Center Performance Summary meaningful to you at your level of management responsibility?

_____Yes _____No

13. Does (did) the Cost Center Performance Summary help you to pinpoint problem areas regarding the efficient use of resources?

Never Helpful	○ 1	○ 2	○ 3	○ 4	○ 5	○ 6	○ 7	Always Helpful	○ N/A

14. Does (did) the Cost Center Performance Summary help you to forecast the financial impact that mission changes would have on your organization?

Never Helpful	○ 1	○ 2	○ 3	○ 4	○ 5	○ 6	○ 7	Always Helpful	○ N/A

15. Are (were) the output measures developed for your cost center a useful descriptor of the functions or tasks of your organization?

_____Yes _____No

16. The following are cost elements listed on the Cost Center Performance Summary. Indicate by circling one number in each line the amount of control you feel you have (at your management level) over each type of expense. For example, if you can significantly control the amount of military pay expense incurred by your cost center, circle the 7; if you have little control over the amount of military pay, circle 1. If your cost center does not incur a particular expense, circle N/A.

EEIC (Expense)	DEGREE OF CONTROLLABILITY							
	Controllable					Not Controllable		
Military Pay	7	6	5	4	3	2	1	N/A
Civilian Pay	7	6	5	4	3	2	1	N/A
Supplies	7	6	5	4	3	2	1	N/A
Equipment	7	6	5	4	3	2	1	N/A
Travel & Transportation	7	6	5	4	3	2	1	N/A
Contractual Services	7	6	5	4	3	2	1	N/A

17. Are (were) the cost elements reported on the Cost Center Performance Summary adequate to allow you to control costs?

Definitely Inadequate	○ 1	○ 2	○ 3	○ 4	○ 5	○ 6	○ 7	Definitely Adequate	○ N/A

18. Is (was) the information reported on the Cost Center Performance Summary accurate for your cost center?

Never Accurate	○ 1	○ 2	○ 3	○ 4	○ 5	○ 6	○ 7	Always Accurate	○ N/A

19. What other reports contain(ed) the same information as the Cost Center Performance Summary? Indicate whether more or less useful than the CCPS.

	More Useful	Less Useful
_____	○	○
_____	○	○

PART III--SUGGESTIONS FOR IMPROVEMENT

20. How would you improve the usefulness of the Cost Center Performance Summary? List your suggestions in the order of most needed improvements.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

APPENDIX E

DISTRIBUTION OF RESPONSES TO INDIVIDUAL QUESTIONS

The tables in this appendix exhibit the responses to the individual questions in the questionnaire. The data is displayed in three ways: (1) the distribution of responses for each question by stratum, (2) the percent distribution of the responses by stratum, and (3) a summary of responses for questions 6, 19 and 20.

The number of useable questionnaires were 30 for stratum I and 49 for stratum II. When reviewing the tables, the reader will find that the total responses for each stratum for the individual questions do not always total to 30 and 49 respectively. The reason for this is that the missing values are respondents who either answered "not applicable" to the question or failed to provide an answer to the question.

The percentages listed in the tables were found by dividing the total respondents who provided a useable answer to that particular question into the number of respondents who provided that particular answer for each stratum.

TABLE 9

RESPONSES TO QUESTION #1 (IS YOUR COST CENTER PRESENTLY UNDER THE COST CENTER PERFORMANCE MEASUREMENT SYSTEM?)

Stratum I	Yes	No
Original	16	4
Follow-up	3	7
	Percentages	
Original	80.0	20.0
Follow-up	30.0	70.0
Stratum II		
Original	14	30
Follow-up	1	4
	Percentages	
Original	31.8	68.2
Follow-up	20.0	80.0

TABLE 10

RESPONSES TO QUESTION #2

Stratum	0-6 Months	6-12 Months	12-24 Months	24-36 Months	Longer Than 36 Months
I	1	0	2	5	11
II	0	1	4	4	11
			Percentages		
I	5.3	0.0	10.6	26.2	57.9
II	0.0	5.0	20.0	20.0	55.0

TABLE 11

RESPONSES TO QUESTION #3

Stratum	Inexperienced: Less than 12 Months	Experienced: 12 Months or Greater
I	11	14
II	8	28
	Percentages	
I	44.0	56.0
II	22.2	77.8

TABLE 12

RESPONSES TO QUESTION #4

Stratum	Inadequate 1	2	3	4	Adequate 5	6	7
I	3	1	5	5	4	1	3
II	10	2	2	6	1	4	7

	Percentages: Inadequate	Adequate	Undecided
I	39.1	39.1	21.8
II	37.5	43.8	18.7

TABLE 13

RESPONSES TO QUESTION #5

Stratum	Inadequate 1	2	3	4	Adequate 5	6	7
I	3	1	5	2	2	4	4
II	5	4	2	6	5	2	10

Percentages

	Inadequate	Adequate	Undecided
I	47.6	42.9	9.5
II	50.0	32.4	17.6

TABLE 14

RESPONSES TO QUESTION #6

Recommendation	Number of CC Managers
More in-depth training	4
Make training more applicable to individual CC manager	3
Better quality trainers	2
Give training to appropriate people	2
More emphasis on monthly variation and updates	1

TABLE 15

RESPONSES TO QUESTION #7

Stratum	$0-$50,000	$50,000-$150,000	$150,000 or more
I	11	3	15
II	14	6	21
		Percentages	
I	37.9	10.3	51.8
II	34.1	14.6	51.3

TABLE 16

RESPONSES TO QUESTION #8

	Inconsistently Received			Consistently Received
Stratum	Quarterly	Intermittently	Never	Monthly
I	2	3	3	20
II	6	3	3	34

Percentages

	Inconsistently Received	Consistently Received
I	28.6	71.4
II	26.1	73.9

TABLE 17

RESPONSES TO QUESTION #9

Stratum	Not Useful 1	2	3	4	Useful 5	6	7
I	17	3	2	0	1	0	2
II	20	6	0	3	3	4	6

Percentages

	Not Useful	Useful	Undecided
I	88.0	12.0	0.0
II	61.9	31.0	7.1

TABLE 18

RESPONSES TO QUESTION #10

	Significant Control	Lack of Control
Stratum	Yes	No
I	14	14
II	25	21

Percentages

	Significant Control	Lack of Control
I	50.0	50.0
II	54.3	45.7

TABLE 19

RESPONSES TO QUESTION #11

	Not Timely				Timely		
Stratum	1	2	3	4	5	6	7
I	4	0	2	1	1	1	7
II	7	3	5	6	5	3	7

Percentages

	Not Timely	Timely	Undecided
I	37.5	56.2	6.3
II	41.7	41.7	16.6

TABLE 20

RESPONSES TO QUESTION #12

	Meaningful	Not Meaningful
Stratum	Yes	No
I	5	22
II	19	27

Percentages

	Meaningful	Not Meaningful
I	18.5	81.5
II	41.3	58.7

TABLE 21

RESPONSES TO QUESTION #13

	Not Helpful				Helps		
Stratum	1	2	3	4	5	6	7
I	18	4	3	0	1	0	0
II	15	4	5	4	2	6	5

Percentages

	Not Helpful	Helps	Undecided
I	96.2	3.8	0.0
II	58.5	31.7	9.8

TABLE 22

RESPONSES TO QUESTION #14

	Not Helpful				Helps		
Stratum	1	2	3	4	5	6	7
I	18	2	2	1	0	1	1
II	21	4	4	3	4	2	4

Percentages

	Not Helpful	Helps	Undecided
I	88.0	8.0	4.0
II	69.0	23.8	7.2

TABLE 23

RESPONSES TO QUESTION #15

Stratum	Useful Descriptor: Yes	Not Useful Descriptor: No
I	7	19
II	18	28

Percentages

	Useful Descriptor	Not Useful Descriptor
I	26.9	73.1
II	39.1	60.9

TABLE 24

RESPONSES TO QUESTION #16

Stratum I

EEIC	Controllable 7	6	5	4	Not Controllable 3	2	1
Military Pay	0	0	0	0	0	0	26
Civilian Pay	2	1	0	4	0	1	18
Supplies	12	5	2	3	3	0	3
Equipment	12	6	1	5	0	1	3
Travel & Transportation	7	3	4	3	1	3	6
Contractual Services	6	3	1	2	0	2	7

Percentages

	Controllable	Not Controllable	Undecided
Military Pay	0.0	100.0	0.0
Civilian Pay	11.5	73.1	15.4
Supplies	67.9	21.4	10.7
Equipment	67.8	14.3	17.9
Travel & Trans.	51.9	37.0	11.1
Contr. Services	47.6	42.9	9.5

TABLE 24--Continued

	Stratum II						
	Controllable				Not Controllable		
EEIC	7	6	5	4	3	2	1
Military Pay	0	0	1	0	0	2	38
Civilian Pay	3	0	1	4	3	3	27
Supplies	15	5	14	5	2	0	4
Equipment	20	8	6	2	3	2	4
Travel & Transportation	9	3	4	7	3	2	12
Contractual Services	12	2	3	7	3	3	0

	Percentages		
	Controllable	Not Controllable	Undecided
Military Pay	2.4	87.6	0.0
Civilian Pay	9.8	80.4	9.8
Supplies	75.6	13.3	11.1
Equipment	75.6	4.4	20.0
Travel & Trans.	40.0	42.5	17.5
Contractual Services	47.5	37.2	15.3

TABLE 25

RESPONSES TO QUESTION #17

	Inadequate				Adequate		
Stratum	1	2	3	4	5	6	7
I	9	2	2	2	2	1	2
II	15	3	5	4	5	7	3

	Percentages		
	Inadequate	Adequate	Undecided
I	65.0	25.0	10.0
II	54.8	35.7	9.5

TABLE 26

RESPONSES TO QUESTION #18

Stratum	Not Accurate 1	2	3	4	Accurate 5	6	7
I	2	1	3	4	5	5	7
II	4	2	1	5	6	10	11

Percentages

	Not Accurate	Accurate	Undecided
I	22.2	63.0	14.8
II	17.9	69.2	12.9

TABLE 27

RESPONSES TO QUESTION #19

Report	Number of CC Managers who Reported it
Fund Control	38
RC Manager Monthly Report	12
RC Manager Cost Center Report	11
Operating Budget Status Report	6
RC Manager Inquiry Report	5
Supply	34
D11-PFMR/OCRR Update and Reconciliation	15
D04-Daily Document Register	5
M05-PFMR Report	3
R07/M03-Orgn. Cost Center List	8
Miscellaneous	8

The responses to question #19 were summarized as shown in Table 27. The reports that the respondents felt were more useful than the CCPS were grouped into the three groups shown in the table. The researchers listed a specific report if three or more of the respondents felt the report was more useful than the CCPS.

TABLE 28

SUMMARY OF RESPONSES TO QUESTION #20

Suggested Improvement	Number of CC Managers
Control	20
Make the output measure a more useful descriptor of the organization's performance	7
Give CC manager control over all expenses of his cost center	5
The system would be more useful at a higher level of management responsibility	5
Delete personnel and equipment costs from EEICs reported and controlled	1
Improve measurement standards	1
Let appropriate people manage the system	1
Report Content/Format	12
Make the system simpler so that inexperienced CC managers can use it	4
Make the report a more timely report	2
Make the report more accurate, detailed and frequent	1
Change report to an "as requested" report	1
CCPS needs to be more responsive to CC manager's needs	1
Make the system more compatible with the supply 1050-II reports and Burroughs 3500 reports	1

TABLE 28--Continued

Suggested Improvement	Number of CC Managers
Simplify cost and analysis aspects of the system so that the CC manager can use it	1
Make the report more useful to avionics maintenance	1
Training	3
Provide better training for CC managers	2
Provide better training for management analysis technicians	1
Miscellaneous	5
Give each CC manager a copy of the CCPS	1
Get commanders more involved in the system	1
Make missions and operations more stable thus increasing the usefulness of the CCPS	1
Improve communication between the CC managers and the budget personnel	1
Establish realistic acceptable deviations so that CC managers won't have to provide rationale to higher management for all deviations	1

APPENDIX F

CONTINGENCY TABLES

Contingency tables were established from the responses to questionnaires to determine if there was a systematic relationship between pairs of variables.

The Chi Square (χ^2) statistic was computed by the SPSS subroutine CROSSTABS. This statistic represents the deviation within each contingency table of the actual cell frequencies from the expected cell frequencies. Generally, small values of χ^2 represent an absence of relationship between the two variables and large values represent statistical dependence. The CROSSTABS subroutine also gives the significance of the χ^2 statistic. Significance is the probability of obtaining from the contingency tables that value of χ^2 or a larger one, given that there is no relationship between the variables (7:224-225).

The researchers established a significance of .05 or smaller as necessary to represent dependence between two variables. Thus in the cases where significance was .05 or smaller, the researchers rejected the null hypothesis that the two variables were independent and concluded that they were dependent at a 95 percent confidence level (1-significance) or greater.

In order to accomplish the contingency test using a χ^2 statistic, no more than 20 percent of the cells can

have an expected value* less than 5. Due to the cell size criteria limitation, the researchers in some cases were unable to use the χ^2 test for dependence. This criterion was not always met due to the relatively few cases in the analysis. However, for 2 x 2 contingency tables with relatively fewer cases than are necessary for χ^2 application, the Fisher's exact test was applied to test for statistical dependence between variables (10:97).

The Fisher's exact test was automatically applied by the SPSS subroutine CROSSTABS to 2 x 2 contingency tables which were comprised of 40 or fewer cases and which failed to meet the χ^2 cell-size criteria. The Fisher's test was also applied to all contingency tables comprised of fewer than 20 cases (7:225).

The Fisher's test determines whether the two variables have similar proportions or not. The Fisher's statistic is an exact probability that the respondents to one question differ in their responses to the other question which comprises the 2 x 2 contingency table (10:97). Hence, the smaller values of probability reflect greater dependence between the questions and the variables they represent. As in the χ^2 test, the researchers chose a significance level of .05 or smaller to reject the null

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*The expected size of each cell is found by multiplying its marginal totals together and dividing by the number of cases.

hypothesis that the two variables showed no relationship and to accept the alternate hypothesis that a relationship existed.

Summary of Contingency Tables

The first test determined if there was a significant difference in the response to questions in the original sample versus responses to questions in the follow-up sample (Table 29). This test was conducted to provide information for the researchers to determine if there was reason to believe that the data from both samples could not be grouped and considered as one sample. On the other hand, if the responses to the questionnaires differed significantly when comparing the original to the follow-up sample, then the researchers would conclude that the samples were drawn from different populations in terms of questionnaire response.

The second test determined if there was a difference in the response from the sample drawn from stratum I versus the sample drawn from stratum II. The researchers needed to determine if stratum I and II were similar samples from the same population. By determining that the samples were similar (Table 30), the researchers could group all data to form one sample from which to draw conclusions about the population of cost center managers with CCPMS experience.

TABLE 29

COMPARISON OF ORIGINAL RESPONSES WITH FOLLOW-UP RESPONSES[1]

Variable Name	Significance Level[2]	
	Stratum I	Stratum II
Now Under CCPMS	.0116[3]	.0010[3]
Experienced	.1904	.2461
Adequate Training	.1441	.6520
Consistently Received	.3134	.2812
Useful	.3392	.7974
Significant Control of Expenses	.3473	.8362
Timely Receipt of CCPS	.3462	.9999
Meaningful	.2495	.6757
Helps Pinpoint Problems	.3461	.9164
Helps Forecast Change	.5652	.8111
Useful Descriptor	.2300	.5978
Controllable Expense Elements	.2193	.2421
Adequate Expense Elements	.6176	.6419
Accurate CCPS Information	.6662	.6702

[1]The hypotheses tested were:

H_0: The data came from the same population.
H_1: The data came from two different populations.

[2]The Fisher exact probability was used to test for dependence between samples in stratum I; the χ^2 test was used to test for dependence in stratum II.

[3]In both stratum I and II only question #1 was significant at the .05 level. Therefore, the researchers concluded that with the exception of the cost center managers response to whether they are now under the CCPMS, the samples represent the same population.

TABLE 30

COMPARISON OF STRATUM I WITH STRATUM II[1]

Variable Name	Significance Level[2]
Experienced	.1272
Adequate Training	.7809
Consistently Received	.8262
Usefulness	.1037
Control of Expenses	.9019
Timely Receipt of CCPS	.7513
Meaningful	.0814
Helps Pinpoint Problems	.0085[3]
Helps Forecast Impact of Change	.1711
Useful Descriptor of Output	.4311
Controllable Expense Elements	.8710
Adequate Expense Elements	.5792
Accurate CCPS Information	.8700

[1]The Hypotheses tested were:

H_0: The data came from the same population.
H_1: The data depended on the stratum from which the sample was drawn.

[2]The χ^2 test was used to determine statistical significance of dependence between the two strata.

[3]The variable *helps pinpoint problems* was dependent upon which stratum the sample was drawn at the 99 percent level of confidence.

The third test determined on which variables usefulness of the CCPS depended (Table 31). By establishing contingency tables of the variable *usefulness* and all the variables affecting *usefulness*, the researchers could identify significant relationships to help determine why financial managers were not using the CCPMS in their managerial decision process. Table 31 displays *usefulness* as the results of testing the data from both strata combined.

TABLE 31

USEFULNESS COMPARED TO OTHER VARIABLES[1]

Variable Name	Significance Level[2]		
	Stratum I	Stratum II	Both Strata
Experienced	-	-	.3192
Adequate Training	-	-	.1167
Consistently Received	-	-	.7360
Control of Expenses	-	-	.7034
Timely Receipt of CCPS	-	-	.0033[3]
Meaningful	-	-	.0000[3]
Helps Pinpoint Problems[4]	.1200	.0001[3]	-
Helps Forecast Impact of Change	-	-	.0000[3]
Useful Descriptor of Output	-	-	.0205[3]
Controllable Expense Elements[5]	-	-	.5602
Adequate Expense Elements	-	-	.0002[3]
Accurate CCPS Information	-	-	.0913

See next page for notes.

TABLE 31--Notes

[1]The hypotheses tested were:

H_0: Whether a cost center manager used the CCPS for decisions is not dependent on the variable.

H_1: Whether a cost center manager used the CCPS for decisions is dependent on the variable.

[2]The χ^2 test was used in the combination, "both strata."

[3]The researchers concluded at a 95 percent level of confidence or greater that whether a cost center manager used the CCPS for decisions depended on the variable named.

[4]*Helps pinpoint problems* was tested separately for each stratum because the researchers concluded that the response to question #13 depended on the stratum from which the questionnaire was received.

[5]Since whether the CCPS was used for decisions did not depend significantly on whether the manager had control of his expense elements, the researchers displayed only the most significant case.

APPENDIX G

FACTOR ANALYSIS

To accomplish factor analysis, the researchers used the SPSS subroutine FACTOR (7:469). The variables used represented the response to questions #4 or #5 (whichever was higher), #9, #11, #14 #16 (all EEIC elements), #17 and #18 respectively. The remaining questions of the questionnaire were omitted. There was no reason to include background questions because the researchers were only interested in identifying those factors that grouped with usefulness and the literature did not suggest that background was a factor bearing on usefulness. The data from questions #8, #10, #12, and #19 was not considered in factor analysis because it was not from interval scale questions. Therefore the assumptions necessary for factor analysis to include these questions were not met (7:469). The variable represented by question #13 was omitted because contingency tables and dependency analysis of stratum I versus stratum II showed that question #13 response significantly depended upon which stratum the sample was taken. Therefore, unlike the other questions included in factor analysis, the data from question #13 could not be combined and considered a sample from a single population.

Four factors were selected as significant using Cattell's scree test (Table 32). Cattell says that the

TABLE 32

CATTELL'S SCREE TEST

Factor	Percent of Variance	
1	32.7	
2	21.1	
3	12.0	
4	7.7	Scree
5	6.6	
6	5.7	
7	4.9	
8	3.2	
9	2.4	

scree occurs when the plot of the factor contributions for each factor becomes horizontal. Factors to the left of the scree are real factors; those to the right are error or residual. The relatively low percent of contribution of the fifth factor indicates that more than four factors would represent error factors and lend nothing to explaining the data.

After deciding that four factors were significant, the principal factor matrix was rotated using the Kaiser varimax solution (22:90), resulting in a matrix comprised of variables and their factor loadings on each of the four factors. The loadings (Table 33) represent the regression coefficients of each variable to describe each factor (7:475).

The researchers selected the highest absolute value factor loading for each variable and grouped the variables

TABLE 33

VARIMAX ROTATED FACTOR MATRIX

Variable	Factor 1	Factor 2	Factor 3	Factor 4
Q23	.12018	-.06274	.15754	.37034
Q9	.81949	.01233	-.02237	.19331
Q11	.36605	.28066	.09262	.35077
Q14	.83352	.06781	-.02024	.09200
Q16M	.30543	.41067	-.06474	.04236
Q16C	.04751	.62844	.17945	-.14250
Q16S	.01814	.22636	.85776	.20669
Q16E	.12899	.31760	.86443	.12838
Q16T	-.10818	.70557	.51441	.13736
Q16CS	.00468	.81925	.27138	.02856
Q17	.67313	.02669	.28112	.29364
Q18	.23900	.01121	.07033	.96166

[1]Q23 was *adequate training* described in Chapter III.

Comment: Underlining indicates highest loading per each question.

with the factors in which the highest loadings occurred. Thus the researchers determined which variables were the most important determinants of each factor as indicated in Table 34 (7:475).

TABLE 34

FACTOR STRUCTURE

Factor	Question #	Significant Variables
1. Usefulness of the CCPS	9	Is CCPS used for decisions
	11	Is CCPS received in time to correct problems
	14	Does CCPS help forecast change versus impact
	17	Were cost elements adequate
2. Non-controllable expense elements	16M	Control of military pay
	16C	Control of civilian pay
	16T	Control of travel and transportation
	16CS	Control of contractual services
3. Controllable expense elements	16S	Control of supplies expense
	16E	Control of equipment expense
4. Knowledge of CCPS	23	Was training adequate
	18	Was CCPS accurate

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