

AD-A123 243

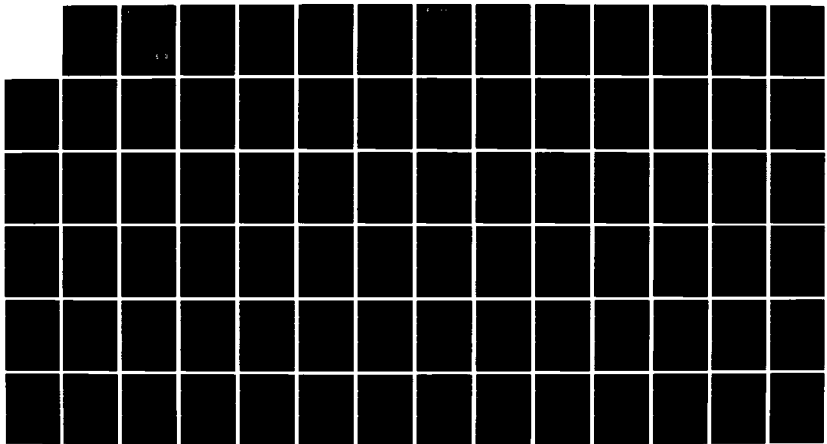
FEDERAL PROCUREMENT METRICATION APPROPRIATENESS AND
METHODS(U) SCIENCE MANAGEMENT CORP WASHINGTON DC
M A COELLA 18 SEP 82 NRC-3581-682

1/1

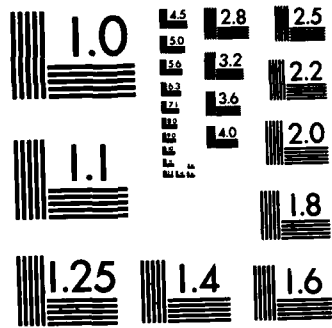
UNCLASSIFIED

F/G 15/5

NL



END
FILMED
BY
DTIC



MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

11



Science Management Corporation

AD A 123 243

FEDERAL PROCUREMENT METRICATION
APPROPRIATENESS AND METHODS
(FINAL REPORT)

DTIC
ELECTE
JAN 6 1983
S B D

DTIC FILE COPY

DISTRIBUTION STATEMENT A
Approved for public release;
Distribution Unlimited

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER None	2. GOVT. ACCESSION NO. AD-A123243	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) Federal Procurement Metrication: Appropriateness and Methods		5. TYPE OF REPORT & PERIOD COVERED Final Report
		6. PERFORMING ORG. REPORT NUMBER None
7. AUTHOR(s) Michael A. Coella, Ph.D.		8. CONTRACT OR GRANT NUMBER(s) NRC-3581-682
9. PERFORMING ORGANIZATION NAME AND ADDRESS U.S. Metric Board 1600 Wilson Blvd., Suite 400 Arlington, VA 22209		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS None
11. CONTROLLING OFFICE NAME AND ADDRESS Office of Research, U.S. Metric Board 1600 Wilson Blvd., Suite 400 Arlington, VA 22209		12. REPORT DATE
		13. NUMBER OF PAGES
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office) Same		15. SECURITY CLASS. (of this report) Unclassified
		15a. DECLASSIFICATION/DOWNGRADING SCHEDULE Not applicable
16. DISTRIBUTION STATEMENT (of this Report) Unlimited		
<div style="border: 1px solid black; padding: 5px; display: inline-block;"> DISTRIBUTION STATEMENT A Approved for public release; Distribution Unlimited </div>		
17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report) Unlimited		
<div style="border: 1px solid black; padding: 5px; display: inline-block;"> DISTRIBUTION STATEMENT A Approved for public release; Distribution Unlimited </div>		
18. SUPPLEMENTARY NOTES		
19. KEY WORDS (Continue on reverse side if necessary and identify by block number) Metrication, Metric Conversion, Federal Procurement, economic impact, mission enhancement, Metric Status, scenarios, Federal Procurement, Regulations, Medical, Dental and Veterinarian equipment and supplies, Hospital construction, ADP systems, Economic Forecasting Services		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) This study was designed to provide the USMB with a clearer understanding of the basic relationships between the Federal procurement process and private sector suppliers. This was done to gain an understanding of the ways in which Federal procurement can encourage and accommodate initiatives of the private sector and to ensure that the effects of conversion on the Federal and private sectors are understood prior to implementation of procurement decisions and actions.		

DD FORM 1 JAN 73 1473

EDITION OF 1 NOV 68 IS OBSOLETE

UNCLASSIFIED
SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE(When Data Entered)

#20 continued --

The study was accomplished through the development and evaluation of classification schemes for products and services. These schemes were based on the intrinsic characteristics of the products or services, as well as their effect and appropriateness of conversion considering both the Federal and private sectors. The intent of this study was not to examine each product or service that the Federal government procures. Rather, it was designed to classify products or groups of products by specified characteristics.

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE(When Data Entered)

**FEDERAL PROCUREMENT METRICATION
APPROPRIATENESS AND METHODS
(FINAL REPORT)**

PREPARED BY:

**SCIENCE MANAGEMENT CORPORATION
1120 Connecticut Avenue, N.W.
Washington, D.C. 20036**

PREPARED FOR:

**UNITED STATES METRIC BOARD
1600 Wilson Boulevard
Arlington, Virginia 22209**

September 18, 1982

DISCLAIMER

This material is based on research supported by the U.S. Metric Board under Contract NRC-3581-682.

Any opinions, findings, and conclusions in this publication are those of the author(s) and do not necessarily reflect the views of the U.S. Metric Board.

Accession For	
NTIS GRA&I	<input checked="" type="checkbox"/>
DTIC TAB	<input type="checkbox"/>
Unannounced	<input type="checkbox"/>
Justification	
Distribution/	
Availability Codes	
Dist	Avail and/or Special
A	

DTIC
COPY
AVAILABLE
2



Science Management Corporation

1120 Connecticut Avenue, N.W., Suite 200 • Washington, D.C. 20036 • (202) 293-5700

September 18, 1982

Mr. Stanley Parent
United States Metric Board
1600 Wilson Boulevard
Suite 400
Arlington, Virginia 22209

Reference: Contract No. NRC-3581-682

Subject: Final Report on a Study entitled "Federal Procurement Metrication:
Appropriateness and Methods"

Dear Mr. Parent:

The Science Management Corporation is pleased to submit our Final Report on "Federal Procurement Metrication: Appropriateness and Methods" in accordance with the contract captioned above.

The Report presents four metric procurement strategies which are intended to balance public and private sector interests and requirements by weighing the state and rate of supplier conversion initiatives and the impacts of procuring metricated products on government purchasers and users. Using these strategies, metric procurement is patterned after economic models of the marketplace where buyer and seller outcomes are optimized under different conditions of supply and demand.

We believe the results of the study will be of use to the U.S. Metric Board and to other organizations concerned with issues arising from conversion to and use of the metric system.

I want to thank you and the rest of the U.S. Metric Board staff for your assistance on this effort.

Sincerely,

SMC MANAGEMENT TECHNOLOGY

Michael A. Colella, Ph.D.
Project Manager

MAC:eeb

Enclosure

TABLE OF CONTENTS

	<u>PAGE</u>
<u>SUMMARY</u>	i
I. <u>INTRODUCTION</u>	I-1
II. <u>OVERVIEW OF FEDERAL PROCUREMENT</u>	II-1
1. SUMMARY OF FEDERAL PROCUREMENT ACTIVITY.....	II-1
2. FEDERAL PROCUREMENT PROCESS.....	II-2
3. FEDERAL PROCUREMENT REGULATIONS.....	II-6
4. OBSTACLES TO METRIC PROCUREMENT.....	II-10
5. FEDERAL METRIC PROCUREMENT POLICY.....	II-12
III. <u>METRIC PROCUREMENT STRATEGIES AND IMPACTS</u>	III-1
1. FOUR METRIC PROCUREMENT STRATEGIES.....	III-5
(1) TOTAL, RAPID CONVERSION TO METRIC PROCUREMENT.....	III-6
(2) TOTAL, PHASED-IN CONVERSION TO METRIC PROCUREMENT.....	III-8
(3) REMOVE OBSTACLES TO METRIC PROCUREMENT.....	III-9
(4) REACT ONLY TO INDUSTRY INITIATIVES.....	III-11
IV. <u>METRIC PROCUREMENT SCENARIOS</u>	IV-1
1. SCENARIO 1: MEDICAL, DENTAL AND VETERINARIAN EQUIPMENT AND SUPPLIES PURCHASED BY THE DEPARTMENT OF AGRICULTURE....	IV-1
2. SCENARIO 2: HOSPITAL CONSTRUCTION SERVICES PURCHASED BY THE VETERANS ADMINISTRATION.....	IV-10
3. SCENARIO 3: ADP SYSTEMS PURCHASED BY THE DEPARTMENT OF DEFENSE (DoD).....	IV-14
4. SCENARIO 4: ECONOMIC FORECAST SERVICES PURCHASED BY THE DEPARTMENT OF COMMERCE.....	IV-18

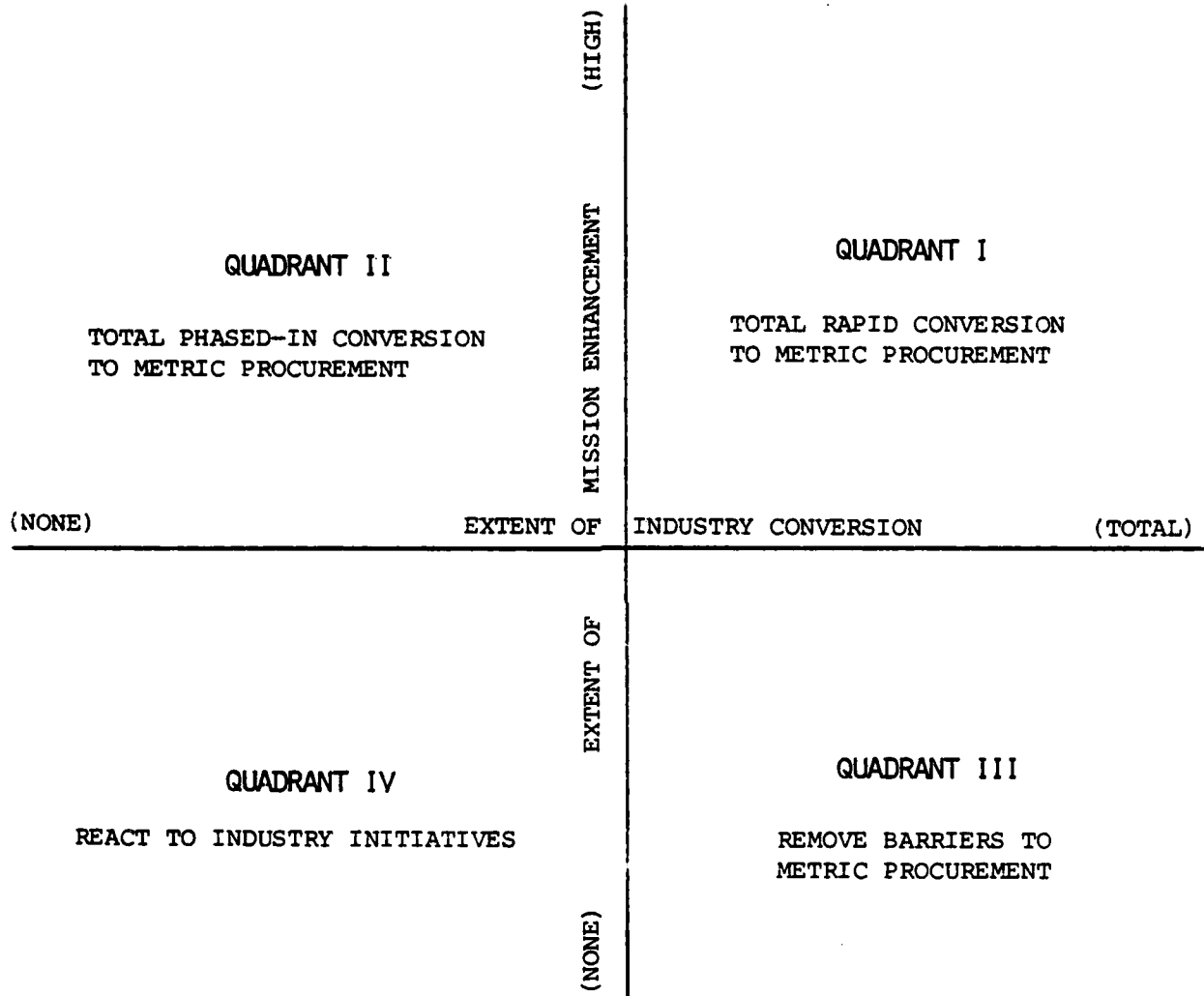
SUMMARY

SUMMARY

The overall purpose of the Federal Metric Procurement Study was to examine the relationships between government procurement, government agency operations, and private sector metrication initiatives in order to develop strategies for metric procurement consistent with supplier, purchaser, and user requirements as well as national metric policy, where metric procurement is an issue not a requirement.

Four metric procurement strategies are outlined in this report based on two major considerations: (1) the extent of metrication planning and conversion in the supplying sector; and (2) the extent to which metrication enhances the programs and operations of the purchasing agency. Figure i-1 on the following page, presents a strategic planning tool called a Decision Map which is used to array these two considerations. The horizontal axis forms a zero-to-total scale representing the extent of industry metric conversion. The vertical axis forms a zero-to-high scale representing the benefits from using metric products on agency mission accomplishment. When both are high, agencies should actively and rapidly seek to acquire goods and services in metric form. When agencies see metric procurement to be in their interest, but where supplying industries have, as yet, made little progress towards metrication, metric procurement must proceed more gradually, albeit still towards a goal of total metrication. When industry metrication is high but where purchasing metric goods and services provides little or no benefits to the purchasing agency, the procurement process should be examined to ensure that metric products can compete equally with customary products. Under this strategy, neither metric nor customary is preferred in the procurement process. Finally, when neither the supplying sector has converted nor where the purchasing agency presently sees significant benefits from metric procurement, the most appropriate action is no action except to monitor metric-related developments in both suppliers and buyers.

EXHIBIT i-1
METRIC PROCUREMENT DECISION MAP



The application of these metric procurement strategies by Federal agencies involves a range of policy decisions, implementation procedures, training requirements and other considerations which are different for each strategy. Quite logically, the more active and total the conversion goal of the procurement strategy, the greater the number and scope of the steps required to implement the strategy.

In addition, there is variation within strategies depending on the particular procurement situations they are applied to, particularly with reference to the marginal costs and the specific time frame required for implementation. Much of this "within strategy" variance is a function of product characteristics such as the level of technology of the product and whether the product is durable and maintainable or nondurable and consumable. The level of technology of the product seems to be at directly related to the time required for procurement conversion; durable and maintainable products will cost (marginally) more to convert.

Four procurement situations - the acquisition of computer systems by the Department of Defense, medical, dental and veterinary supplies by the Department of Agriculture, hospital construction by the Veteran's Administration, and economic services by the Commerce Department - are analyzed to determine which procurement strategy would seem most appropriate. In none of these cases did there seem to be any significant advantage from metric procurement. This argues against a major commitment to metric procurement either on an accelerated or phased-in schedule. At the same time, two of their supplying industries -- computer systems and veterinary supplies and equipment -- have metricated a portion of the product lines. In these cases, agencies should, through a review of procurement policies and procedures, remove any obstacles to metric goods and services which might act as a disincentive to further industry conversion. In the other two cases -- hospital construction and economic forecasting -- little metrication has occurred within these industries. In these situations, the appropriate agency response is limited to monitoring and responding to any future industry conversion initiatives.

The purpose of the Federal Metric Procurement Study was to investigate issues related to metric procurement, not to develop plans to stimulate metric procurement. Among the most important of the issues identified by the study are the following:

- Questions regarding metric procurement are non-trivial and metric procurement decisions have important consequences for both the private sector and government. Federal government procurement is a major force in the U.S. economy as well as a powerful social and political tool.
- Metric conversion among government suppliers varies greatly from sector to sector and, to date, has not been influenced to any extent by considerations of government procurement requirements.
- The procurement of metric goods and services may improve the effectiveness of some government programs as well as improve operating efficiency and productivity. However, there are several obstacles to metric procurement, the mitigation of which, requires careful analysis and planning and the expenditure of agency resources.
- Metric procurement decisions should be based on the interests and requirements of both private sector suppliers and government buyers and users. The two most important dimensions of these decisions are the state and rate of industry conversion and the benefits possible through the use of metric goods and services.
- Using these two principle dimensions of metric procurement decisions yields four procurement strategies. These strategies balance the costs/benefits to product users (government) against the costs/benefits to product suppliers (industry).
- Each strategy has generalized cost and timing implications. The variance on cost and timing within strategies may primarily be a function of product type such as the level of technology involved and product maintenance requirements.

This latter point can be elaborated further. Questions about which metric procurement strategy is most appropriate are primarily a function of conversion initiatives planned or undertaken in the private sector -- for the most part independent of government procurement requirements -- and the assessment

of costs and benefits to government agency operations resulting from procurement and use of metricated products. Embedded within these strategies are general cost and timing requirements, i.e., the "total rapid conversion" strategy will typically cost more (both to government and industry) and occur over a shorter time frame than the "react to industry initiatives" strategy.

However, there are variations of cost and timing within strategies as well. That is, the application "total phased-in conversion" strategy will be different depending on the agency implementing the strategy. This variance may well be a function of the types of products being procured by each agency (and therefore being metricated). Two product characteristics seem to be most important in this regard: (1) the level of technology of the product; and (2) whether the product is durable and maintainable or non-durable and consumable.

The technology of the product seems to be most directly related to the time required for conversion to metric procurement. High technology products typically involve numerous, complex procurement regulations which must be revised, are more difficult to integrate into existing systems, and require greater user training. In addition, high technology products require extensive conversion time for producers. Thus, no matter which metric procurement strategy is appropriate and employed in a particular procurement situation, a portion of the time period required to implement that strategy is related to the level of technology of the product and will likely increase as the level of technology increases. The time frame for applying a total phased in conversion strategy to the procurement of airplanes by DoD will be greater than the time frame for applying the same strategy for the procurement of military uniforms.

The maintainability of products seems to be most directly related to the marginal costs of metric procurement. Consumable products are purchased, used, and exhausted or discarded. Maintainable products, on the other hand,

may require extensive inventories of parts and supplies as well as servicing capabilities. The overall relationship between product type and marginal costs and time resulting from metric procurement is shown as Exhibit i-2.

Exhibit i-2

RELATIONSHIP OF PRODUCT TYPE ON METRIC PROCUREMENT CONVERSION

		COST	
		LOW	HIGH
TIME	HIGH	<p>HIGH TECHNOLOGY</p> <p>CONSUMABLE</p>	<p>HIGH TECHNOLOGY</p> <p>MAINTAINABLE</p>
	LOW	<p>LOW TECHNOLOGY</p> <p>CONSUMABLE</p>	<p>LOW TECHNOLOGY</p> <p>MAINTAINABLE</p>

I. INTRODUCTION

I. INTRODUCTION

On September 1, 1981, the United States Metric Board awarded a contract to the Science Management Corporation to conduct a study entitled "Federal Procurement Metrication: Appropriateness and Methods". The purpose of this study was to examine the relationship between Federal government procurement, government agency operations, and private sector metrication initiatives in order to develop recommendations for metric procurement strategies consistent with supplier, purchaser, and user requirements as well as national metric policy.

Two a priori assumptions underlie the conduct of this study. The first of these assumptions is that there are elements of the Federal procurement process which materially inhibit the purchasing and use of metric goods and services by the Federal government. Among the most tangible of these elements are physical characteristics included in design specifications, inspection and acceptance procedures and criteria, and requirements for items standardization, comparability, and compatibility.

The Office of Specifications of the General Services Administration estimates that there are from 4,500 to 5,000 government-wide specifications governing the procurement of goods and services applicable to all Federal civilian agencies. The Naval Publications and Forms Center (which maintains military specifications) estimates that there are approximately 3,000 Department of Defense-wide procurement specifications. (It is important to note these are government-wide specifications only; no count is kept of agency-specific specifications employed in the procurement process). Of the General Services Administration specifications, the General Accounting Office estimated in 1978 that approximately 1,200 to 1,300 were expressed in metric measurement.¹ Due to high cost (\$3,500 to \$7,000 per specification) and low demand, the General Services Administration does not plan to routinely add

¹General Accounting Office, Getting a Better Understanding of the Metric System (CED-78-128).

metric specifications; the Defense Department, on the other hand, has committed to examining the feasibility of metricating mission-related procurement specifications over the next 10 years.

The other a priori assumption of this study is that no single procurement wide metrication strategy can adequately satisfy government and business needs and interests and, consequently, a range of strategies appropriate to different categories of procurement should be defined. Plural strategies intuitively seem to permit a more sensitive consideration of the good or service being procured, characteristics of private sector suppliers, including the state and rate of their metric conversion activities, the procurement process (actors and actions) itself, and the use and users of the procured item. The interaction of these (and other) factors should determine the parameters and procedures by which the Federal government can most appropriately -- i.e., efficiently, effectively, cost-effectively, and legally -- develop the capability to procure metric goods and services as such goods and services become available through industry conversion.

The Federal procurement process is exceedingly complex. The Commission on Government Procurement in its report to Congress characterized the Federal procurement regulatory framework as "a burdensome mass and maze of procurement and procurement-related regulations"; including "numerous levels of supplementing and implementing regulations;" and "numerous collateral procurement-related regulations, issued independently of, but nevertheless affecting, the procurement process and organization."²

In a survey of the procurement process of 19 Federal government agencies, the Office of Federal Procurement Policy identified 877 different procurement regulation issuances totaling over 64,000 pages of rules, procedures, and requirements governing the procurement process. It is further found that these agencies were adding or revising procurement regulations at the rate of

²Commission on Government Procurement (Vol. 1, Chap. 4) 1972.

over 21,000 pages of rules, procedures, and requirements per year. Within these 19 agencies, 485 different offices shared responsibility for developing procurement policy, issuing procurement regulations, and conducting procurement activities.³

Given this state of affairs, questions of "appropriateness" and "methods" of metric procurement are also complex and this complexity is exacerbated by several exogenous factors related to metric conversion generally. These factors include:

- o The voluntary nature of metric conversion in the United States where conversion decisions and actions are primarily the prerogatives of the private sector. Thus, while the existing procurement process -- which is designed to support government operations -- generally involves a dynamic of purchaser (government) initiatives and supplier (business) response, the metrication process involves producer initiatives and government response.
- o The severe downturn in the American economy which has caused the postponement of many business decisions including those related to metric conversion. Many businesses -- most notably "financially strapped" small businesses and those in the construction industry -- are presently unwilling to take the risks they believe might be associated with metric conversion. Unless there is an adequate and growing supply of metric goods and services, government agencies have little incentive to accommodate metric procurement except in circumstances where obtaining metric products clearly enhances mission accomplishment.
- o The decision of the Reagan Administration to eliminate the United States Metric Board may negatively impact metric conversion activities and government metric procurement in two ways: by eliminating an important source of metric-related information and point of coordination and by sending a signal both to government agencies and the private sector that the government will play a lesser role in U.S. metrication activities.

³Office of Federal Procurement Policy, Survey and Study of Executive Agency Procurement Regulations, 1979.

The task of developing strategies which provide for Federal metric procurement can be operationally expressed in terms of four questions:

- o What types of obstacles presently exist which potentially or actually inhibit metric procurement?
- o Under what circumstances can and should these obstacles be removed or mitigated?
- o What is the best approach to removing these obstacles?
- o What would be the impact of taking such actions on suppliers, purchasing organizations, and product users?

During the course of this study, it became apparent that there was no single answer to these questions, thus verifying our initial assumption that no one single metric procurement strategy was "most appropriate" to all procurement situations. Rather, it became increasingly clear that almost every procurement action -- item-supplier-user combination -- had unique aspects. This required the formulation of flexible, generic metric procurement strategies which, rather than resulting in the "quick fix" had the capability of being adopted to meet different procurement requirements.

To analyze issues of and strategies for metric procurement, the study began with an examination of Federal procurement policies, Federal procurement actions, Federal metric policies, and metrication activities, both in industry and in government. Based on these examinations, a set of metric procurement strategies were formulated and a set of specific procurement actions were selected for further analysis. Among the procurement actions selected for indepth study were: procurement that involves a large percentage of small and/or minority suppliers; procurement that involves one major supplier; procurement that involves numerous subcontractors; procurement that represents the major portion of a purchasing agency's buying activity; and procurement

that represents only a small portion of an agency's buying activity. Metrication strategies were applied to each procurement type to determine the effects on the supplying sector and firms, the effects on the purchasing agency, and the effects on product use and user.

This report is organized to systematically present our analyses and findings. Section II presents an overview of the Federal procurement process and procurement actions and identifies metric-related factors in this process. Section III analyzes the range of variables which impact on Federal metric procurement and which must be accommodated in developing metric procurement strategies and delineates four recommended strategies. Section IV presents four metric procurement scenarios where the appropriate metrication strategy is determined for specific procurement actions.

II. OVERVIEW OF FEDERAL PROCUREMENT

II. OVERVIEW OF FEDERAL PROCUREMENT

The United States Government is by far and away the most acquisitive "shopper" in the world. In 1980, the Federal government purchased goods and services from the private sector (as well as other units of general and special government) costing in excess of \$110,000,000,000.

1. SUMMARY OF FEDERAL PROCUREMENT ACTIVITY

Exhibit II-1 provides a breakdown of 1980 Federal government procurement activity by number of contract actions and dollar totals for major procuring agencies. As the exhibit indicates, the Department of Defense accounted for approximately 75 percent of the total procurement dollars spent by the Federal government. The top nine agencies (including DoD) accounted for approximately 91 percent of total Federal procurement dollars. Exhibit II-1 also indicates that approximately 90 percent of the total procurement dollars (but only 2 percent of the total procurement actions) were for purchases of \$10,000 or greater.

Exhibit II-2, disaggregates Federal procurement into three major procurement categories: research and development, other services and construction, and supplies and equipment. For each category, the Department of Defense accounts for well over 60 percent of total government procurement dollars and actions. The ranks of other agencies shift depending on which of the three major categories is under consideration. Exhibit II-3 shows the respective ranks in each category by major procuring agency. Exhibits II-4, II-5 and II-6 provide a listing of the major types of products and services included in each procurement category.

Exhibits II-7, II-8 and II-9 categorize 1980 Federal procurement activity by number of contract actions and dollar totals with small businesses for major procuring agencies and Federal contract action and dollar totals with small business by state. While all businesses must deal with government regulations (procurement and non-procurement), the small firm has fewer

MAJOR PROCURERS
FEDERAL CONTRACT ACTIONS AND DOLLARS

SOURCE: FPDS ANNUAL REPORT FY 1980
TABLE O.1

AGENCY	TOTAL		AWARDS OVER \$10,000		AWARDS \$10,000 OR LESS	
	ACTIONS	\$(000)	ACTIONS	\$(000)	ACTIONS	\$(000)
TOTAL	17,484,782	\$110,246,822	433,778	\$99,661,412	17,051,004	\$10,585,410
DoD	12,067,610	\$82,897,220	320,974	76,018,037	11,746,636	\$6,879,183
PERCENTAGE - DoD	69.0%	75.2%	74.0%	76.3%	68.9%	65.0%
DOE	42,835	\$8,047,111	5,746	\$7,883,483	7,089	\$163,628
NASA	141,929	4,455,218	24,473	4,324,019	117,456	131,199
GSA	299,093	2,068,419	10,619	1,213,410	288,474	855,009
AG	661,506	2,301,681	11,278	2,030,293	650,228	271,388
HEW	345,402	1,297,709	7,212	1,108,242	338,190	189,467
DOI	578,936	1,701,975	7,411	1,353,790	571,525	348,185
DOT	293,243	1,499,031	8,514	1,221,388	284,729	277,633
VA	1,848,204	1,858,593	15,099	993,456	1,833,105	865,137
SUB-TOTAL EXCLUDING DoD	4,211,148	\$23,229,727	90,352	\$20,128,081	4,120,796	\$3,101,646
PERCENTAGE	24.1%	21.1%	20.8%	20.2%	24.2%	29.3%
ALL OTHER AGENCIES*	1,206,024	\$4,119,875	22,452	\$3,515,294	1,183,572	\$604,581
PERCENTAGE	6.9%	3.7%	5.2%	3.5%	6.9%	5.7%

*Those required to report to the (FPDC) only

MAJOR PROCUREMENTS BY CATEGORY
(SELECTED 'TOP' AGENCIES)
(DOLLARS IN \$000s)

EXHIBIT II-2

AGENCY	CATEGORY I		CATEGORY II		CATEGORY III		TOTAL	
	RESEARCH AND DEVELOPMENT		OTHER SERVICES AND CONSTRUCTION		SUPPLIES AND EQUIPMENT		# ACTIONS	DOLLARS
	# ACTIONS	DOLLARS	# ACTIONS	DOLLARS	# ACTIONS	DOLLARS		
TOTAL (57 DEPTS AND AGENCIES)	37,859	\$14,318,089	161,386	\$33,838,278	234,533	\$51,505,045	433,778	\$99,661,412
DOD	22,706	\$ 9,372,258	97,193	20,193,944	201,075	46,451,835	320,974	76,018,037
PCT OF TOTAL	59.9%	65.5%	60.2%	59.7%	85.7%	90.2%	73.9%	76.3%
DOE	2,569	1,341,078	2,837	5,792,872	340	749,533	5,746	7,833,483
NASA	5,631	2,438,718	14,226	1,558,537	4,616	326,764	24,473	4,324,019
GSA	1	16	8,543	808,034	2,075	405,360	10,619	1,213,410
AG	88	4,403	5,369	415,394	5,821	1,610,495	11,278	2,030,293
HEW	2,330	537,918	4,062	496,881	820	73,543	7,212	1,108,242
TVA	18	1,812	1,208	254,084	5,311	546,303	6,537	802,199
DOI	896	128,501	4,781	1,103,324	1,734	121,965	7,411	1,353,790
DOT	1,366	146,465	4,900	526,487	2,248	548,436	8,514	1,221,388
VA	55	3,603	8,941	703,897	6,103	285,596	15,099	993,456
OPM	1	455	145	575,207	44	822	190	576,954
OTHER AGENCIES OF INTEREST	EPA 1,611	226,553	DOL 903	\$320,667	TREASURY 617	203,654	EPA 2,937 DOL 979 TREASURY 1,770	358,867 332,208 262,044
TOP AGENCIES	(TOP 5)	4,544,167	(TOP 10)	\$11,980,633	(TOP 10)	\$4,798,467	(TOP 13)	22,460,353
DOLLARS		31.7%		35.4%		9.3%		22.5%
PCT.		97.2%		95.1%		99.5%		98.8%
PCT WITH DOD								

*EXCLUDING DOD

FY 1980
SA 2

AGENCY RANKING BY CONTRACT
DOLLARS BY MAJOR PROCUREMENT CATEGORY
(PROCUREMENTS OVER \$10,000 ONLY)

AGENCY	OVERALL RANK BASED ON PROCUREMENT DOLLARS	R&D	OTHER SERVICES AND CONSTRUCTION	SUPPLIES AND EQUIPMENT
DoD	1	1	1	1
DOE	2	3	2	3
NASA	3	2	3	7
AG	4	-	10	2
DOI	5	-	4	10
DOT	6	-	8	4
GSA	7	-	5	6
HEW	8	4	9	-
VA	9	-	6	8
TVA	10	-	-	5
OPM	11	-	7	-
EPA	12	-	-	-
DOL	13	5	-	-
TREASURY	14	-	-	9
	TOP 14 REPRESENT 98.8% OF TOTAL DOLLARS	TOP 5 REPRESENT 97.2% OF TOTAL DOLLARS	TOP 10 REPRESENT 95.1% OF TOTAL DOLLARS	TOP 10 REPRESENT 99.5% OF TOTAL DOLLARS

FY 1980

PROCUREMENTS BY MAJOR CATEGORY AND GROUPING

CATEGORY I: R&D

<u>RANK</u>	<u>CODE</u>	<u>DESCRIPTION</u>	<u>ACTIONS</u>	<u>\$(000'S)</u>	<u>PERCENT OF DOLLARS</u>
1	AC	DEFENSE SYSTEMS	10,895	\$ 6,636,924	46.4%
2	AR	SPACE	6,501	3,158,142	22.1
3	AZ	OTHER R&D (NO DETAIL)	4,480	1,220,690	8.5
4	AD	DEFENSE (OTHER)	6,656	1,205,142	8.4
5	AG	ENERGY	2,105	967,631	6.8
6	AN	MEDICAL	<u>2,381</u>	<u>456,226</u>	<u>3.2</u>
		SUBTOTAL	33,018	13,644,755	95.3%
		ALL OTHER	<u>4,841</u>	<u>673,334</u>	<u>4.7%</u>
		TOTAL R&D	<u>37,859</u>	<u>14,318,089</u>	<u>100%</u>

PROCUREMENTS BY MAJOR CATEGORY AND GROUPING

CATEGORY II: OTHER SERVICES AND CONSTRUCTION

<u>RANK</u>	<u>CODE</u>	<u>DESCRIPTION</u>	<u>ACTIONS</u>	<u>\$(000'S)</u>	<u>PERCENT OF DOLLARS</u>
1	M	OPERATION OF GOVERNMENT-OWNED FACILITIES	3,738	6,953,751	20.5
2	Y	CONSTRUCTION OF STRUCTURES AND FACILITIES	14,312	5,963,851	17.6
3	R	PROFESSIONAL, TECHNICAL, AND MANAGEMENT SERVICES (INCLUDES A&Es)	35,053	5,733,344	16.9
4	S	UTILITIES AND HOUSEKEEPING SERVICES	25,404	3,650,090	10.8
5	J	MAINTENANCE, REPAIR, REBUILDING OF EQUIPMENT	24,828	3,142,145	9.3
6	Z	MAINTENANCE, REPAIR OR ALTERATIONS OF REAL PROPERTY	17,656	2,258,169	6.7
7	V	TRANSPORTATION AND TRAVEL	3,804	1,401,277	4.1
8	K	MODIFICATION OF EQUIPMENT	<u>2,344</u>	<u>949,906</u>	<u>2.8</u>
		SUBTOTAL	127,139	30,052,533	88.8%
		ALL OTHER	<u>34,247</u>	<u>3,785,745</u>	<u>11.2</u>
		TOTAL	<u>161,386</u>	<u>\$33,838,278</u>	<u>100%</u>

PROCUREMENT BY MAJOR CATEGORY AND GROUPING

FY 1980

CATEGORY III: SUPPLIES AND EQUIPMENT

<u>RANK</u>	<u>CODE</u>	<u>DESCRIPTION</u>	<u>ACTIONS</u>	<u>\$(000's)</u>	<u>PERCENT OF DOLLARS</u>
1	15	AIRCRAFT & AIRFRAME STRUCTURE	11,697	\$ 7,328,865	14.2%
2	91	FUEL, LUBRICANT, OILS, & WAXES	5,000	7,041,866	13.7
3	58	COMM., DETECTION & COHERENT RAD. EQUIPMENT	15,300	5,538,713	10.8
4	14	GUIDED MISSILES	4,397	3,951,918	7.7
5	28	ENGINES, TURBINES & COMPONENTS	9,938	3,932,546	7.6
6	19	SHIPS, SMALL CRAFT, PONTOONS AND FLOATING DOCKS	2,532	3,307,877	6.4
7	89	SUBSISTENCE	47,100	3,059,460	5.9
8	13	AMMO. & EXPLOSIVES	1,946	1,529,871	3.0
9	23	GROUND EFFECT & MOTOR VEHICLES, TRAILERS & CYCLES	1,195	1,283,467	2.4
10	66	INSTRUMENTS & LAB EQUIPMENT	12,311	987,108	1.9
11	59	ELECTRICAL/ELECTRONIC EQUIPMENT COMPONENTS	10,953	872,481	1.7
12	12	FIRE CONTROL EQUIPMENT	2,117	774,861	1.5
13	16	AIRCRAFT COMPONENTS & ACCESORIES	9,046	766,118	1.5
14	70	GENERAL PURPOSE ADP EQUIPMENT, SOFTWARE, SUPPLIES AND SUPPORT	7,965	760,767	1.5
15	10	WEAPONS	1,930	710,845	1.4
16	69	TRAINING AIDS & DEVICES	1,439	632,270	1.2
17	29	ENGINE ACCESSORIES	5,049	620,521	1.2
18	11	NUCLEAR ORDNANCE	139	614,571	1.2
19	61	ELECTRIC WIRE & POWER DISTRI- BUTION EQUIPMENT	5,424	612,738	1.2
20	34	CLOTHING	1,904	610,813	1.2
21	18	SPACE VEHICLES	<u>573</u>	<u>600,226</u>	<u>1.2</u>
		SUB-TOTAL	157,955	45,537,901	88.4%
		OTHER	<u>76,578</u>	<u>5,967,144</u>	<u>11.6</u>
		TOTAL	<u>234,533</u>	<u>\$51,505,045</u>	<u>100%</u>

SOURCE: FPDS
SPECIAL ANALYSIS 4.1FEDERAL CONTRACT ACTIONS INCLUDING SUB CONTRACTS WITH
SMALL BUSINESS BY TOP 10 EXECUTIVE DEPARTMENTS AND AGENCIES

FY 1980

- AGGREGATE -

<u>AGENCY</u>	<u>TOTAL AGENCY DOLLARS</u>	<u>TOTAL SMALL BUSINESS DOLLARS</u>	
	<u>\$(000)</u>	<u>\$(000)</u>	<u>% OF TOTAL AGENCY DOLLARS</u>
TOTAL	110,246,822	23,587,423	21.4
* * * * *			
DoD	82,897,220	16,275,278	19.6
PERCENTAGE-DoD	75	69	--
* * * * *			
DEPARTMENT OF AGRICULTURE	2,301,681	1,359,257	59.1
GENERAL SERVICES ADMINISTRATION	2,068,419	1,047,477	50.6
DEPARTMENT OF ENERGY	8,047,111	859,588	10.7
VETERANS ADMINISTRATION	1,858,593	770,574	41.5
NASA	4,455,218	704,541	15.8
DEPARTMENT OF INTERIOR	1,701,975	659,582	40.9
DEPARTMENT OF TRANSPORTATION	1,499,021	551,133	36.8
DEPARTMENT OF HUMAN & HEALTH SERVICES	1,297,709	335,453	25.8
T.V.A.	969,367	257,301	26.5
* * * * *			
SUBTOTAL EXCLUDING DoD	24,199,094	6,544,906	27.0
PERCENTAGE WITHOUT DoD	22	28	--
PERCENTAGE WITH DoD	97	97	--

FEDERAL CONTRACT ACTIONS INCLUDING SUBCONTRACTS WITH
SMALL BUSINESS BY TOP 10 EXECUTIVE DEPARTMENTS AND AGENCIES

-- DETAIL --

AGENCY	TOTAL SMALL BUSINESS ACTIONS		SMALL BUSINESS ACTIONS OVER \$10,000		SMALL BUSINESS ACTIONS UNDER \$10,000		SMALL BUSINESS SET ASIDES		SMALL BUSINESS SUBCONTRACTS	
	\$(000)	%	\$(000)	%	\$(000)	%	\$(000)	%	\$(000)	%
TOTAL	23,587,423	40.4	9,523,059	40.4	1,598,785	6.8	6,331,625	26.8	6,133,954	26.0
DoD	16,275,278	40.1	6,524,180	40.1	0	.0	4,751,254	29.2	4,999,844	30.7
PERCENTAGE - DoD	69	--	69	--	.0	--	75	--	82	--
DEPARTMENT OF AGRICULTURE	1,359,257	67.4	915,598	67.4	136,750	10.1	294,734	21.7	12,175	.9
GENERAL SERVICES ADMINISTRATION	1,047,477	18.5	193,814	18.5	582,108	55.6	271,532	29.5	23	.0
DEPARTMENT OF ENERGY	859,588	27.4	235,549	27.4	20,348	2.4	76,651	8.9	527,040	63.3
VETERANS ADMINISTRATION	770,574	28.1	216,605	28.1	269,391	35.0	240,673	31.2	43,905	5.7
NASA	704,541	27.5	194,001	27.5	37,399	5.3	142,218	20.2	330,923	47.0
DEPARTMENT OF INTERIOR	659,582	39.0	271,058	39.0	193,267	27.8	181,127	26.0	50,130	7.2
DEPARTMENT OF TRANSPORTATION	551,133	42.9	236,553	42.9	74,082	13.4	116,677	21.2	123,821	22.5
DEPARTMENT OF HEALTH & HUMAN SERVICES	335,453	54.2	181,736	54.2	49,311	14.7	99,505	29.7	4,901	1.5
TVA	257,301	56.1	144,391	56.1	44,931	17.5	66,142	25.7	1,837	.7
SUBTOTAL EXCLUDING DoD	6,544,906	39	2,589,305	39	1,407,587	21	1,489,259	23	1,094,755	17
PERCENTAGE WITHOUT DoD	28	--	27	--	88	--	24	--	18	--
PERCENTAGE WITH DoD	97	--	96	--	88	--	99	--	99	--

*Percentage of Total Small Business Actions

SOURCE: FPDS
SPECIAL ANALYSIS 4.28

FY 1980

FEDERAL CONTRACT ACTIONS OVER
\$10,000 WITH SMALL BUSINESS BY STATE

<u>RANK</u>	<u>STATE</u>	<u>ACTIONS</u>	<u>\$(000)</u>	<u>PERCENTAGE OF DOLLARS</u>
1	CALIFORNIA	25,227	2,236,730	15.4
2	NEW YORK	9,260	989,293	6.8
3	VIRGINIA	9,752	815,688	5.6
4	TEXAS	6,649	691,721	4.8
5	MARYLAND	7,026	595,995	4.1
6	PENNSYLVANIA	6,293	531,255	3.7
7	MASSACHUSETTS	5,298	494,052	3.3
8	FLORIDA	5,713	481,927	3.3
9	NEW JERSEY	6,368	442,363	3.0
10	D.C.	3,436	417,726	2.9
11	WASHINGTON	4,424	413,395	2.8
12	MICHIGAN	3,462	391,191	2.7
13	ALABAMA	3,643	390,318	2.7
14	OHIO	6,813	377,999	2.6
15	GEORGIA	3,164	325,976	2.2
16	ILLINOIS	4,188	325,692	2.2
17	WISCONSIN	2,227	307,441	2.1
18	NORTH CAROLINA	2,373	277,266	1.9
19	MISSOURI	2,309	272,294	1.9
20	OKLAHOMA	1,924	266,067	1.8
	SUBTOTAL	119,549	11,044,389	76%
	OTHER	<u>35,135</u>	<u>3,489,016</u>	<u>24%</u>
	TOTAL	<u>154,684</u>	<u>14,533,405</u>	<u>100%</u>

resources to cope with the effort of keeping up-to-date with the latest developments and demands of the procurement process.

All of these exhibits suggest that Federal procurement is highly concentrated within a few government departments and agencies -- especially the Department of Defense -- and that relatively few types of procurement account for a major portion of all procurement actions. It must be noted, however, that these data are still highly aggregated. Within each listed department and agency are numerous organizational elements engaged in procurement activity. For example, procurement shown for the Department of Defense actually represents procurement for 27 different DoD organizations, and these 27 can be further disaggregated into over 200 smaller organizational elements. Similarly, each procurement type is actually an aggregate of numerous related products and items.

2. FEDERAL PROCUREMENT PROCESS

The means by which the Federal government buys the goods and services it needs to operate can be conceptualized as a process involving seven (7) stages:

- (1) A determination of requirements
- (2) The development of inspection and acceptance criteria and procedures
- (3) Contracting for goods or services
- (4) Inspection, acceptance, and first article approval
- (5) The delivery and receipt of goods or services
- (6) Use
- (7) Storage and/or disposal.

The idea of a process rather than an event is critical to understanding government procurement. Each stage of the procurement process involves

different sets of actors, different sets of considerations, and different sets of regulations. For any particular procurement action, obstacles to metric procurement may exist in any or all of these stages and metrication strategies which address and redress some, but not all of these, will be ineffective.

In the first stage of the procurement process, the need for a good or service is identified and the specific good or service which satisfies that requirement is defined. This stage of the procurement process includes an assessment of program or organizational requirements; the decision to procure a good or service; a determination of applicable item design and performance specifications; the discovery of whether such specifications presently exist within government or industry or whether the required design and performance parameters are new; a decision regarding item availability "off-the-shelf" as opposed to custom-made (and, if off-the-shelf, brand name versus generic); and finally, a survey to determine if there is only one (or few) source of the item or are there multiple sources of supply. In essence, the first stage of the procurement process involves making the decision to purchase a good or service, defining the item to be purchased, and developing information regarding item availability.

In the second stage of the procurement process, criteria and procedures are established to permit a determination by the procuring organization that the good or service it receives after purchase is the same as the good or service it set out to buy. Included in inspection and acceptance procedures are tests and tolerances to measure performance characteristics; physical characteristics; constituent characteristics; environmental operating characteristics; standardization, comparability, or compatibility characteristics; and preservation and packaging instructions. Specifications of the characteristics to be determined as a condition to purchasing a good or service establishes the "ground rule" between buyer and seller before procurement bids are made or accepted. This is particularly important where different inspection and acceptance methodologies can yield different results and/or where purchaser and supplier utilize different methodologies for quality control purposes.

In the third stage of procurement, the purchasing organization contracts to buy the good or service it requires. The form this contracting takes varies depending on such factors as type of item required, number and type of potential suppliers, and the time available to complete the procurement. Contracting can be advertised and competitive, restricted and negotiated, or a variety of hybrid combinations which determine how buyer and seller get together and agree on the terms -- type of item, price of item, etc., -- of the procurement. What is important (in the context of this study) is not an inventory of the various forms this transaction can take, but the recognition that each of the forms is strictly prescribed by rules, regulations, and even customs. These prescriptions are designed to achieve -- either for each transaction or over a number of transactions -- economy, efficiency, and effectiveness in the acquisition process; innovation and the application of new technologies; advancement of national social and economic objectives; and an equal opportunity for suppliers to compete for government business. Contracting, which is often misconceived as encompassing procurement, is only one stage, albeit important, in the procurement process.

In the fourth stage of the procurement process, the goods or services contracted for are inspected and accepted according to the procedures and criteria previously established and agreed to. This may be accomplished through a process of "first article approval" where a prototype of the good or service is evaluated, through multiple evaluations of a sample of the item, or some other selection procedure which allows the purchasing agent to ensure that the characteristics of the item meet item specifications.

Procurement actions typically involve a defined schedule and place of delivery, when and where, the purchasing organization takes receipt, i.e., physical possession, of the item. Conditions and requirements governing delivery and receipt of procured items are always specified by the contractual agreement between buyer and seller and, in some circumstances, may be predetermined by government and/or agency procurement regulations.

A characteristic of all organizations is specialization of functions. Within the Federal government, procurement is a specialized function and consequently, the organizational elements and personnel that perform most procurement activities are typically not the users of the goods or services purchased. Procurement organizations and personnel are essentially the "middlemen" between item suppliers and item users.

This is not to suggest that users are passive participants in the procurement process up to the point purchased items are delivered to them. Rather, they may play key roles throughout the process, particularly in the definition of item specifications and in the evaluation of item acceptability. Most importantly, while the procurement function, like many ancillary functions, has developed programmatic characteristics, it ultimately exists to support user requirements.

Goods and services purchased by the Federal government are used for three general purposes: to support government operations (i.e., office supplies); to provide public services (i.e., V.A. hospitals); and for distribution to other sectors of society (i.e., surplus food). For the purposes of this study, it is important to recognize that conditions surrounding the use of procured items -- how the items are used, where, when, by whom -- are important, but are not the only factors, in determining the characteristics of procured items. A great number of other factors (some of which are discussed later) enter into the government decisions of what to buy.

The final stage of the procurement process involves the storage and ultimate disposal of purchased goods and services. Storage here refers to more than simple warehousing; it also involves items maintained in inventory to meet anticipated future requirements and/or as replacements for existing in-use items. The fact that the Federal government engages in considerable advance purchasing and maintains extensive inventories has significant implications for metric procurement, especially as such practices are complicated by requirements for item compatibility and/or the need for dual inventories.

The procurement process also encompasses the disposal of purchased goods and services, a considerable portion of which are sold or donated by the Federal government when government requirements have been satisfied. The utility of surplus items for re-use or reprocessing is an important, albeit secondary, consideration in procurement decisions.

3. FEDERAL PROCUREMENT REGULATIONS

As previously mentioned, Federal procurement is governed by a vast body of policies, rules, and procedures which recognize and prescribe the various stages of the procurement process. In actuality, there are numerous sets of regulations: one established by the General Services Administration (GSA) covering all civilian agencies; one established by the Department of Defense (DoD) covering all military agencies; and an undetermined number of regulations applicable to specific agencies or organizational elements within agencies.

The Federal Procurement Regulations System (FPR System) is prescribed by the Administrator of General Services, under the authority of the Federal Property and Administrative Services Act, as amended (40 U.S.C. 471 et. seq.). The purpose of the system is to codify and publish uniform policies and procedures applicable to Federal agencies in the procurement of personal property and nonpersonal services, and the procurement of real property by lease, (FPR 1-1.002). The system encompasses the Federal Procurement Regulations (FPR) prescribed by the Administrator of General Services, and individual agency FPR's. The FPR is used by all Federal executive agencies, except the Department of Defense (DoD), the National Aeronautics and Space Administration (NASA), the Coast Guard (within the Department of Transportation), the Veteran's Administration, and to a limited extent, the Central Intelligence Agency. These agencies are governed by the Armed Services Procurement Act, and their procurement regulations are not part of the FPR system. The Tennessee Valley Authority (TVA) uses the FPR as a procurement "guide", though it has separate statutory procurement authority and is, therefore, not legally bound by it.

For the purpose of advising and assisting the GSA in the development of government-wide procurement policies and procedures, an "Interagency Procurement Policy Committee" has been established (FPR 1-1.010). This committee is chaired by GSA and includes representatives from some 33 different agencies. While this committee seldom meets as a group, its members provide input for FPR coverage and official agency views on proposed FPR provisions developed by GSA. In addition to the FPR, GSA issues government-wide procurement regulations in the form of GSA Bulletins, some portions of the Federal Property Management Regulations (FPMR), and in separate issuances generated by the Automated Data and Telecommunications Service.

The FPR system provides an organized regulatory structure for those executive agencies subject to the Federal Property and Administrative Services Act. To the extent that implementing agency regulations are published in the Code of Federal Regulations using the FPR format and arrangement, the private sector can easily relate FPR subject coverage to agency operating procedures. However, the FPR requires publication of only those implementing regulations "deemed necessary" by the agency for private sector understanding of "significant" agency procurement policies and procedures (FPR 1-1.008). The determinations of what is necessary or significant is left to the individual agencies, the result being that some agencies publish little or nothing in the CFR while others publish rather extensive regulatory coverage.

While most of the civilian agencies do publish an agency-wide procurement regulation conforming with the FPR arrangement and numbering system, numerous other procurement regulatory documents are also published at the agency level and at lower levels within the agencies. The FPR system lacks any effective mechanism requiring agencies to oversee or control lower level regulations. Without an effective oversight mechanism, regulations tend to proliferate in direct proportion to the number of organizational layers between the primary regulation and the contracting officer. Proliferation of procurement regulations is a significant problem within GSA itself, as well as within other agencies under the FPR system.

The procurement function within the Department of Defense (DoD), is governed by the Armed Services Procurement Act (ASPA). This Act also applies to the Coast Guard, the National Aeronautics and Space Administration, and to a limited extent, the Central Intelligence Agency.

The primary procurement regulation within DoD is the Defense Acquisition Regulation (DAR) formerly known as the Armed Services Procurement Regulation (ASPR). This regulation is approximately 3,000 pages in length and prescribes policies and procedures governing virtually all DoD procurement actions.

The DAR is maintained by the DAR Council. The DAR Council consists of one "legal" and one "policy" representative from each of the Military Departments and the Defense Logistics Agency (DLA), with the Council Chairman and Executive Secretary appointed by the Deputy Undersecretary of Defense for Research Engineering (Acquisition Policy). The DAR Council develops policies and procedures for the DAR based upon input from the Military Departments and DLA, changes in statutes, court cases, GAO decisions, etc. The DAR Council may establish working groups to deal with specialized areas, or designate a Military Department or DLA to be the lead agency in developing a specific policy or procedure for the DAR. The DAR Council issues approximately 1,000 pages of new material and revisions to the DAR annually. In addition, urgent requirements may be implemented directly by OUSD/R&E through memoranda to the Military Departments or DLA.

The principal regulations issued by the major components of DoD which implement and supplement the DAR are: the "Army Procurement Procedure", the "Navy Procurement Directives", the "Air Force ASPR Supplement", and the "Defense Logistics Procurement Regulations". These documents parallel the DAR format, arrangement, and numbering system.

At the next level below headquarters the Army has 25 major commands issuing direct procurement regulations, the Navy, 5 major commands, the Air Force, 13 major commands, and DLA, 19 major suborganizations including Supply

Centers, Depots, and DCAS Regions. Together, those suborganizations have in effect over 19,000 pages of direct procurement regulations in addition to regulations issued at higher levels.

Procurement regulations are issued in a wide variety of different forms within DoD, including instructions, directives, manuals, memoranda, supplements, procedures, etc.; two different regulatory issuances at the DoD level, 22 at the Army, Navy, Air Force, DLA levels, and 128 at the major command level.

Federal procurement regulations are more than voluminous, they are also detailed with regard to almost every aspect of procurement activity. This scope of coverage of procurement regulations ranges from sections dealing with general procurement policies to the mandatory use of specifications to detailed procedural guidance. A sample of procurement regulations discloses requirements for:

- o Qualified products
- o Preservation, packaging, packing and marking
- o Preproduction samples
- o Allocation of costs
- o Materials and workmanship
- o Shop drawings
- o Taxes
- o Raw materials
- o Components
- o Subassemblies
- o Special tooling and special test equipment costs
- o Transportation.

The intent and effect of most of these regulations is to achieve a fair and cost-effective procurement system for the Federal government by creating a stable, predictable, and non-discretionary environment.

A fundamental operating principle of the Federal procurement system is that government personnel should not, as much as possible, make quantitative decisions among competing goods and services (. . . is a General Electric television better than a R.C.A. television?) but rather make quantitative and

procedural decisions about which competing firm best satisfies the rules and requirements applicable to a particular procurement. Procurement regulations are intended to eliminate or reduce "noise" in the system by strictly constraining procurement decisions.

4. OBSTACLES TO METRIC PROCUREMENT

The translation of procurement decisions from qualitative to quantitative and procedural is accomplished through the mandatory use of detailed design, performance, constituent, environmental and other product specifications. These specifications operationalize the intrinsic and comparative qualities of product and services in terms of measurable characteristics. To use the television example, judgments regarding picture quality and audio fidelity are replaced by specifications regarding height, weight, and other physical dimensions, tube life, energy consumption, impact resistance, temperature operating range, harmonic distortion, etc.

As discussed above, there are approximately 8,000 such specifications applicable to all government agencies and an unknown number in use by specific agencies or organizational elements within agencies. The use of these specifications creates the most immediately apparent obstacle to metric procurement within the Federal government.

Product specifications utilized in the procurement process are of two types: types developed by the Federal government and those developed by private industry and industry associations such as the American Society for Mechanical Engineering (ASME) and Underwriters Laboratory (UL). Both types typically incorporate physical measurements into the specification and, typically, these measurements are expressed in customary form. For example, building design requirements are stated in terms of "square footage"; taxes referenced from Internal Revenue Service codes are expressed in "cents per pound"; packaging requirements for petroleum products specify "55 gallon containers". Customary measurements are embedded in product specifications both for purposes of product comparisons and for cost-value comparisons.

Only an estimated 25 percent of existing product specifications utilize metric measurements. Either to convert existing specifications from customary to metric measurement or to write new metric specifications as acceptable alternatives to customary specifications can be an expensive undertaking. According to the General Services Administration, if the Federal government writes the entire specification, the total cost averages about \$7,000 per specification. If the specification is developed in the private sector and incorporated by reference into government specifications, the cost is approximately \$3,500 per specification. However, if the conversions are done when the specifications are routinely reviewed and updated, the marginal costs can be minimized.

In addition to total cost, which is, for the most part, direct and indirect labor costs, the interdependence of specifications also creates problems vis a vis metric procurement. Many specifications, in addition to defining some measurement-related requirement, reference other specifications -- which may also reference other specifications. Revising one specification to accommodate metric products may have two consequences: referenced specifications may still preclude metric procurement and since the same specifications are often used in different combinations to describe and proscribe different products, the procurement of some other good or service may be inadvertently affected.

Considerable attention has been focused on using performance specifications in place of physical specifications. This approach has only limited utility in terms of removing obstacles to Federal metric procurement. Although physical specifications may be most explicit in the use of the customary measurement, many performance specifications -- "miles per gallon highway; miles per gallon city" -- also utilize customary measurement to establish performance parameters.

The proliferation and wide spread use of measurement dependent specifications is not the only major obstacle to Federal metric procurement. Another,

and perhaps more difficult to resolve issue, is the requirement that many products must be compatible, and often interchangeable, with other items. Replacement parts held in inventory must fit existing equipment (or new equipment must utilize existing inventories of spare parts). Desks need to fit through door openings, files need to fit filing cabinets, peripherals need to fit computer mainframes. Very few products are used in isolation and the compatibility of each item affects the entire system. Even if the effect of integrating metric and customary products is minor, there is considerable reluctance to attempt this accommodation until all of the possible consequences can be evaluated.

A third obstacle to metric procurement exists because product and service users are often resistant to making real or perceived adjustments to metric. Often times this resistance is based on measurement dependent operating guides -- the painter who knows from experience how many gallon cans of paint it will take to cover a certain square footage -- and often simply from an unwillingness to adopt a new system with new terminology in the absence of evidence that metric conversion will provide positive benefits. Resistance by users to metric goods and services leads to inaction on the part of procurement personnel to obtain metric items.

A final factor, external to the procurement system but limiting metric procurement, is uncertainty regarding the availability of metric goods and services. Government personnel involved in procurement are hesitant to expend resources to accommodate metric goods and services until they are confident that there is a sufficient supply of metricated products comparable in cost and quality to the customary products currently purchased.

5. FEDERAL METRIC PROCUREMENT POLICY

The United States Metric Board and the Interagency Committee on Metric Policy, which was chartered by the Metric Board to provide consistent policies among Federal agencies, have established a Metric Conversion Policy for Federal agencies, together with guidelines for its implementation, consistent

with GAO's recommendation. Key points of this policy, which was approved in February 1981, are that Federal government agencies shall:

"Conduct their metrication activities in a coordinated manner consistent with the objectives of the Metric Conversion Act and compatible with metric conversion trends in the nation ...

Encourage and support an environment which can accommodate metrication and when taking initiatives, will act in consideration for metrication in the state and local governments and the private sector ..."

A general policy with respect to Federal metric procurement has also been established:

"The Federal sector is to accommodate metrication when initiated by the private sector.

The Federal sector is to initiate conversion only after due consideration of the effects of doing so on the private sector.

When the private sector has a capability to provide metric products or services at reasonable or competitive cost, the agency will, at the earliest possible time, consider the acquisition and use of such products or services to the maximum extent permitted by existing law and policy."

In addition to procurement, the range of Federal metrication activities includes an increased use of metric measurement in the conduct of internal agency operations and communications and the incorporation of metric references in Federal regulations. As with procurement, the overall thrust of Federal government metrication activities has been to support or coincide with private sector initiatives and requirements.

One indication of metric activity in the Federal government is the existence of a formal metric policy. Eighteen of the 38 Federal agencies represented on the Interagency Committee on Metric Policy have formal metric policies, four additional agencies are in the process of developing policies. The agencies with policies include: Agriculture, Commerce, Defense, Energy, Interior, Labor, Transportation, Central Intelligence Agency,

Environmental Protection Agency, Federal Communications Commission, General Services Administration, Government Printing Office, Interstate Commerce Commission, Library of Congress, National Aeronautics and Space Administration, Postal Service, Veterans Administration and the Smithsonian Institute. Those agencies developing policies include: State, Small Business Administration, Tennessee Valley Authority and Health and Human Services.⁴

⁴American National Metric Council, Federal Metric Information Reference Kit, 1980.

III. METRIC PROCUREMENT STRATEGIES AND IMPACTS

III. METRIC PROCUREMENT STRATEGIES AND IMPACTS

National metric policy, as established by the Metric Conversion Act of 1975 and elaborated by the U.S. Metric Board and the Interagency Committee on Metric Policy, clearly establishes the general parameters of "appropriateness" of Federal metric procurement. Metric procurement is appropriate when it:

- o Provides for enhanced agency mission accomplishment
- o Supports conversion initiatives taken by the private sector.

The first of these conditions depends on the extent to which the procurement of metric products result in more effective government programs and/or more efficient government operations. The best example of this situation is represented by the Department of Defense where, primarily due to requirements for interface with NATO, the decision has been made to consider metricating major new weapons systems. The DoD has further instructed Program Managers to consider the effects of metrication to achieve standardization, rationalization, and interchangeability of parts and products and thus make substantive enhancements to the accomplishment of its military mission.

Corresponding situations in the civilian side of government are more difficult to identify. In its 1978 metric study, the General Accounting Office stated that:

"Federal agencies have not determined what it would cost to convert their operations. Officials expect that the Government will gain no special benefits from metrication; however, it is generally believed that if U.S. industry benefited, the Government would benefit."

The GAO study notwithstanding, there are several areas where metrication -- including metric procurement -- clearly might enhance agency effectiveness, efficiency, or productivity. For example, like the Defense Department, a number of civilian agencies engage in international operations where metrication could result in more effective coordination and interaction.

Additionally, a number of government agencies function as part of a more general scientific or technical community where the use of metric equipment, measurement, and terminology are often standard practice. Exhibit III-1, following this page, provides a general classification framework for the effects of metric procurement on agency mission accomplishment.

Calculating the potential costs and benefits of metrication on mission accomplishment begins with a top-down policy review of a number of factors including:

- o Enabling legislation and related statutes
- o Legislative intent
- o Executive policy
- o Agency mission
- o Program goals
- o Management objectives
- o Operating requirements
- o Administrative rules and regulations
- o Applicable standards and specifications
- o Procurement and contracting procedures
- o Personnel development.

Based on the results of this review, operation procedures must be established as appropriate to review or expand applicable statutes; executive orders; government regulations; administrative policy guidance, rules and regulations; and procurement procedures, specifications and standards. Required metric training programs for procurement personnel and product users must be developed and conducted. A mechanism is required for communicating and coordinating agency metrication activities with supplying sectors and non-agency product and service users. Finally, an evaluation system to measure the impact of agency metrication on operations should be installed.

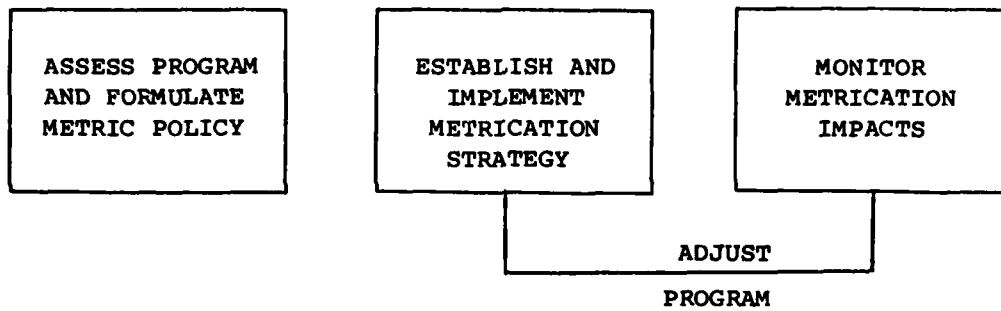
A simple model of this process is shown as Exhibit III-2 below.

TYPOLGY OF IMPACTS ON GOVERNMENT AGENCIES FROM METRIC PROCUREMENT

CLASSIFICATION OF MISSION ENHANCEMENTS	DEFINITION OF CATEGORY	REPRESENTATIVE EXAMPLES
INCREASED PROGRAMMATIC EFFECTIVENESS	USE OF METRIC GOODS AND SERVICES RESULTS IN AN INCREASE IN PROGRAM SCOPE AND/OR GREATER PUBLIC BENEFITS.	<ul style="list-style-type: none"> • INTERNATIONAL PROGRAMS • SCIENTIFIC/TECHNICAL RESEARCH AND DEVELOPMENT, IMPLEMENTATION, AND SUPPORT
INCREASED OPERATING EFFICIENCY	USE OF METRIC GOODS AND SERVICES PROVIDES FOR STANDARDIZATION, RATIONALIZATION, AND SIMPLIFICATION OF OPERATIONAL REQUIREMENTS AND PROCEDURES INCLUDING IMPROVED LOGISTICS AND MAINTENANCE	<ul style="list-style-type: none"> • BUILDING AND CONSTRUCTION - MODULAR DESIGN • RATIONALIZATION AND STANDARDIZATION OF INDUSTRIAL CHEMICAL PRODUCT SIZES
NO ENHANCEMENTS	USE OF METRIC GOODS AND SERVICES DOES NOT RESULT IN ANY SIGNIFICANT BENEFITS AND MAY ACTUALLY HAVE NEGATIVE PROGRAMMATIC/OPERATING IMPLICATIONS	<ul style="list-style-type: none"> • HIGHWAY TRAFFIC SIGNS AND OTHER PUBLIC INTERFACES

EXHIBIT III-2

METRICATION DECISION PROCESS



The second condition of appropriateness relates to using Federal procurement to respond to and encourage metrication activities initiated and carried out by the private sectors. Metric Conversion Policy by the Interagency Committee on Metric Policy states, in part:

"...When the private sector has a capacity to provide metric products or services at a reasonable or competitive cost, the agency will, at the earliest possible time, consider the acquisition and use of such products or services."

Metric conversion in the automotive industry provides an example of an area where procurement, as well as existing legislation and regulatory actions, should, under current national metric policy, be revised in response to industry initiatives. Led by General Motors, all major U.S. automobile manufacturers (G.M., Ford, Chrysler, AMC) now produce metric "world cars", i.e., cars or assemblies that are produced and sold in numerous countries around the world. These and other conversion activities now underway within the automobile industry will certainly impact Federal government procurement of automobiles along with the regulation of automobile safety, emissions, noise, and energy conservation. Another area of government activity which must recognize an increasing number of metric automobiles on the road is state (and local) dealing with taxes and registration fees which are often based on car weight and expressed in customary measurement.

One of the issues not addressed in the ICMP policy statement is the means by which government identifies businesses and business sectors willing and

able to provide metric goods and services through the Federal procurement process. Although there is a tendency to personify businesses ("when industry expresses a desire to convert ...") and while some major industries (such as the automobile industry) have the resources and access to communicate metrication decisions to government, it would seem for the most part that government must play the major role in monitoring industry metric conversion activity. This assessment function, which most recently was performed by the U.S. Metric Board, may be assumed by one of several agencies including the Department of Commerce, Small Business Administration, and/or the Office of Federal Procurement Policy although this is uncertain. As part of its overall metrication program, the Department of Defense is monitoring the metrication activities of its major suppliers. In order to be responsive to industry metrication activities, civilian agencies will need to similarly monitor metrication plans and progress in their major areas of procurement. This assessment will involve monitoring on an on-going fashion: the current extent of industry conversion; plans and programs for future conversion; time frame for conversion; estimated conversion costs; and perhaps most importantly, substantive product changes resulting from metrication.

A 1980 survey of large U.S. manufacturing and mining firms indicated that approximately 33% of private industry surveyed was engaged in some type of metric conversion planning or changeover.¹ Table III-3, following this page, provides and defines four categories of industry conversion activity and includes a list of representative industries falling into each category. One of the most interesting aspects of Table III-3 is the seeming lack of any pattern in terms of which industries fall into each category. The present extent and rate of metric conversion does not seem to be associated with product characteristic such as durable or nondurable goods, high technology, etc., or with industry characteristics such as the relative number and size of firms within a sector. Analyses conducted by the U.S. Metric Board suggest

¹United States Metric Board, Five Years After the Metric Conversion Act - Where Do We Stand, 1980.

TYPOLOGY OF INDUSTRY METRIC CONVERSION

INDUSTRY CLASSIFICATION BY EXTENT OF CONVERSION ACTIVITY	DEFINITION OF CATEGORY	REPRESENTATIVE INDUSTRIES
<p>Extensive Conversion Within Industry</p>	<p>These industries are recognized by extensive planning activities and extensive conversion activities in all stages of development and production. They may have initiated conversion on their own or have been required to convert because they are a supplier to a larger industry that has initiated conversion</p>	<ul style="list-style-type: none"> . Automobile Industry . Pharmaceutical . Tire and Rubber . Fastener . Distilled Spirits
<p>Mixed Conversion Within Industry</p>	<p>The industries in this category are generally self-contained in the sense that the products and services provided are not used in conjunction with other major products. These industries are also characterized by the ability to make metric conversions, either hard or soft with relative ease and limited costs. There is, however, a need for various planning and research activities to allow for conversion activities to proceed smoothly and to achieve the most benefit out of conversion.</p>	<ul style="list-style-type: none"> . Scale Industry . Machine Tools Industry . Fruits and Vegetables . Medical Equipment and Supplies
<p>Conversion Proceeding at a Slow Rate</p>	<p>The industry is fragmented and complex. There is much interaction within the industry and among associated sectors. Time frame for conversion is long with extensive planning required. The construction industry is an example of this industry categorization. The industry is diverse and no firm is large enough to lead.</p>	<ul style="list-style-type: none"> . Construction Industry . Computer Industry . Business Paper
<p>Little or No Conversion Activity</p>	<p>The industries which fall into this category are marked by perceived high conversion costs with little or no benefits. The industries may also already be standardized worldwide to a large extent on the U.S. customary system of weights and measures due to the widespread acceptability and use of U.S. technology.</p>	<ul style="list-style-type: none"> . Petroleum Industry . Aerospace Industry

that what has emerged is a pattern of large multinational firms making individual firm decisions to convert which creates a "push/pull effect" on suppliers and customers.

1. FOUR METRIC PROCUREMENT STRATEGIES

In combination, mission enhancement and response to industry initiatives provide a sound basis for defining four metric procurement decisions and four metric procurement strategies. In Figure III-4 on the following page, a Decision Map (an effective albeit simple strategic planning tool) is used to array these two considerations. The horizontal axis forms a zero-to-total scale representing the extent of industry metric conversion. The vertical axis forms a zero-to-high scale representing the effect of metrication on agency mission accomplishment.

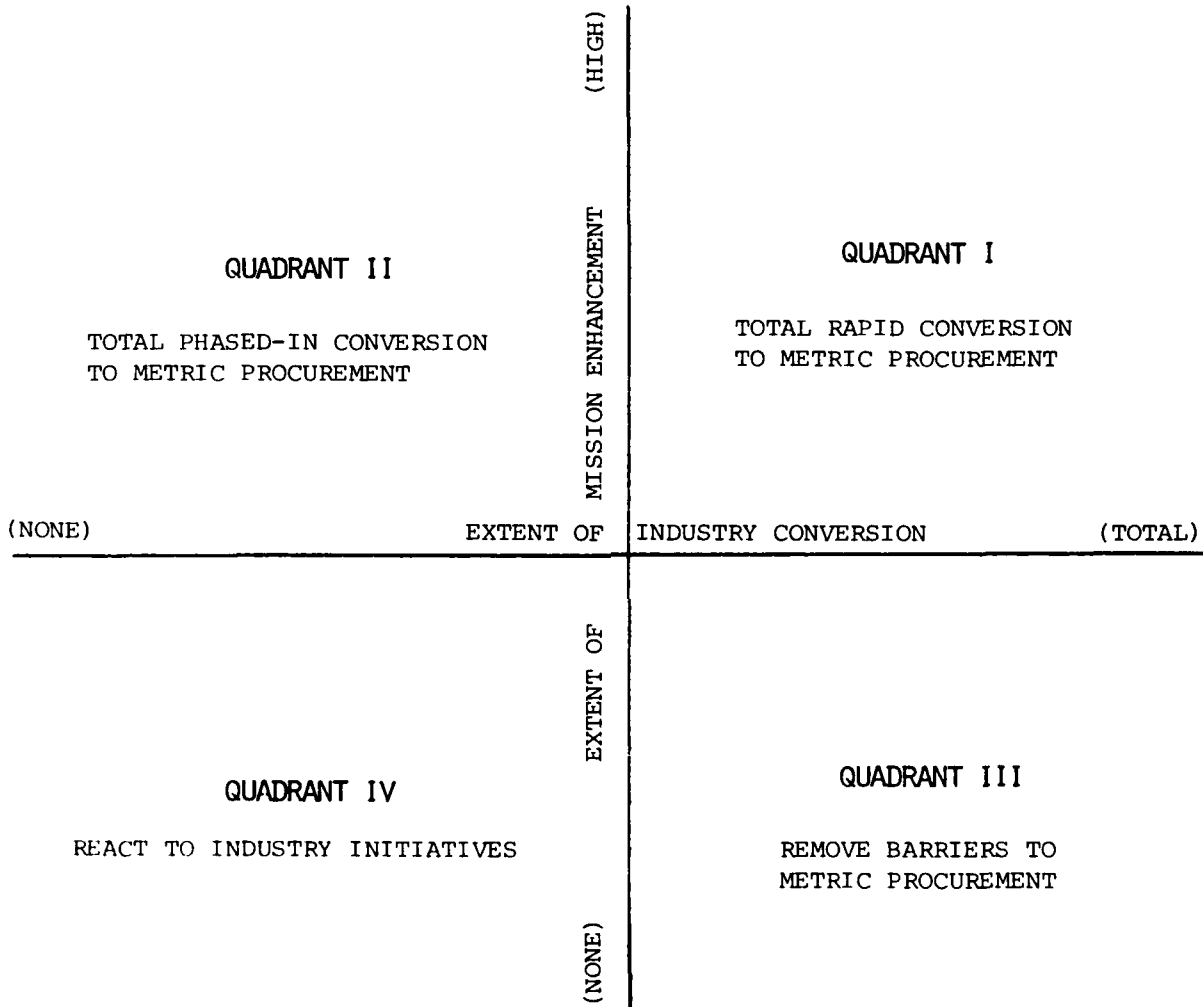
Each quadrant on the "map" represents a different combination of conditions for metric procurement:

- o Quadrant I represents situations where there is moderate to high levels of industry conversion activity and moderate to high enhancements to mission accomplishment possible through metrication.
- o Quadrant II represents situations where industry conversion activity ranges from none to moderate but where moderate to high enhancements to mission accomplishment would be possible through agency metrication.
- o Quadrant III represents situations where there is moderate to high levels of industry conversion activity but where impacts on mission accomplishment are moderate to none.
- o Quadrant IV represents situations where there is little or no industry conversion activity and little or no benefits to agencies from metrication.

Each of these four situations represented by the "map" calls for a different procurement strategy establishing policies and procedures for conversion planning, industry coordination, removal of procurement obstacles

EXHIBIT III-4

METRIC PROCUREMENT DECISION MAP



to metric goods and services, and user training in revised products and new terminologies. Descriptively (in terms of scope and range), these strategies are:

- o Total, rapid conversion to metric procurement
- o Total, phased-in conversion to metric procurement
- o Remove obstacles to metric procurement
- o React only to industry initiatives.

(1) Total, Rapid Conversion to Metric Procurement

This procurement strategy is appropriate when two conditions apply:

- o When metrication will result in moderate to major enhancements to mission accomplishment
- o When supplying sectors of industries have already committed to and attained moderate to high levels of metric conversion.

This strategy constitutes the use of the Federal procurement process to its fullest to both accommodate private sector metrication initiatives already underway and to encourage and stimulate additional industry conversion. This strategy in its generalized form can only be adopted following a top-down program and operational review and would require a senior management policy decision to metricate agency operations, including procurement. While the decision to metricate requires a top-down review, the development of the specific procedures required to implement the strategy result from a bottom-up analysis of: product use and users; supply, inventory, and maintenance requirements; applicable procurement regulations, specifications, standards, and contracting provisions; and management and resource allocations needed to support conversion. Thus, while the initial decision to convert to metric procurement and the parameters of timing and scope of conversion are determined by degree of industry metrication and agency benefit/cost factors, the details of the conversion strategy are shaped by product, procurement, and management factors.

Prominent features of a strategy for total, rapid conversion to metric procurement includes:

- o A timetable for conversion established by the agency which (most likely) provides for a compromise of both government and industry conversion requirements
- o The designation of a dedicated, high level conversion program manager and program staff
- o The priority allocation of personnel and resources to review and revise applicable procurement regulations, specifications and standards
- o The development and application of metric training programs for program and organizational managers, procurement specialists, and program personnel
- o Advanced logistics planning and arrangements to accommodate dual inventories, maintenance, and the phase-out and/or replacement of existing equipment and supplies
- o An on-going evaluation of the effects of metrication on agency programs, operations, supply pipeline, and supplying sectors in order to adopt (or terminate) the conversion program as required.

The application of a strategy for total rapid conversion to metric procurement is liable to cause temporary disruptions to both the procuring agency and suppliers. In addition, both may incur costs above those required by more gradual conversion, due to an accelerated conversion schedule. Although the general conversion philosophy calls for conversion costs to be absorbed where they occur, government procurement, like most commercial transactions, usually results in the buyer paying for most, if not all, cost increases. This would be especially true when an agency had committed to total metrication since metric-customary product price comparisons would not apply. The critical factor for a government agency applying a total rapid conversion strategy is that the benefits of conversion must outweigh the costs.

(2) Total, Phased-In Conversion to Metric Procurement

A total, phased-in conversion to metric procurement is the appropriate strategy where:

- o Metric conversion will provide significant benefits in terms of agency mission accomplishment
- o Conversion activity in supplying sectors is low and the present availability of metric goods and services is limited.

Like the total, rapid strategy for converting to metric procurement, this strategy represents the use of Federal procurement to actively encourage and facilitate metrication by the private sector. The primary differences from the total, rapid strategy are:

- o The changeover period for metric procurement may be relatively long-term and is scheduled more in accordance with industry than government requirements
- o While the overall goal is conversion to total metric procurement, there is an implicit recognition that some types of procurement may not be converted.

The strategy of total, phased-in conversion to metric procurement best approximates the conversion strategy adopted by the Department of Defense. The strategy is characterized by:

- o A high-level policy commitment to metrication
- o Careful conversion planning including a before-the-fact assessment and on-going monitoring of conversion impacts
- o The description of conversion program managers and staff
- o Priority allocation of resources to conversion activities
- o A thorough review and revision of applicable procurement regulations, specifications, and standards

- o A recognition that there may be an extended period requiring dual inventories, maintenance systems, and in-use products and services
- o The development and application of metric training programs to affected personnel
- o Close coordination with and monitoring of industry conversion plans and activities.

Although the conversion schedule is established and adjusted primarily based on industry conversion requirements, a total, phase-in conversion strategy is adopted through government initiative and is pursued through government leadership. The strategy recognizes, however, that while there is a clear mission justification for deciding to convert to metric procurement, lack of conversion within affected industry requires a cautious, gradual, and well-planned approach prior to demanding metric goods and services.

Application of this strategy may create significant short-term disruption among private sector suppliers as they metricate their operations to meet changing government requirements. While metrication costs to government may be less (or at least spread out over an extended period), costs to industry may be high. Agencies need to recognize and accept a portion of the conversion costs as part of the price for improved agency programs and operations; however, benefits (tangible and intangible) should outweigh conversion costs.

(3) Remove Obstacles to Metric Procurement

Unlike the first two, this strategy calls for industry rather than government to take the primary, active role in metrication decisions. A strategy of removing obstacles to metric procurement is appropriate where:

- o Industry conversion activities are underway and there is a moderate to high level of available metric goods and services

- o There are not inherent advantages or disadvantages for government agencies to procure metric products.

By adopting this strategy, the government facilitates marketplace decisions made by industry to convert products to metric units but does not commit to buy metric goods and services either primarily or exclusively. The decision to buy customary or metric items is based on conventional business practices, i.e., obtaining the highest quality item available at the most favorable price. At the same time, the removal of obstacles to metric procurement prevents government from acting as a disincentive to industry conversion decisions and activities.

The decision to remove obstacles to metric procurement does not have the same policy implications as the decision to deliberately metricate procurement. Nevertheless, it can be a relatively complex process, the accomplishment of which requires the expenditure of resources to modify the procurement process, train personnel, maintain dual inventories and maintenance systems, and monitor the impact of metrication on agency programs and operations.

Key features of this strategy include:

- o A survey of supplying sectors and firms to determine the state of metric conversion activities
- o A policy decision to review agency procurement (and possibly some facets of agency operations) to accommodate metric goods and services
- o The allocation of personnel and resources to accomplish conversion tasks
- o The review and revision of procurement regulations, specifications, and standards to accommodate metric products and services
- o The development and application of metric training programs for agency personnel.

Since this strategy is utilized to respond to industry initiatives, it does not have negative cost of production implications for the private sector. On the other hand, government agencies will likely experience some conversion costs and operating problems in removing obstacles to metric procurement. The major benefit to government is the capability to obtain and utilize metric items as such items constitute an increasing (or the total) portion of available supply.

(4) React Only to Industry Initiatives

This strategy is the least action-oriented and is appropriate where neither industry nor government presently see any inherent advantages to metrication. That is, this strategy applies to procurement situations where:

- o There is little or no industry conversion activity underway thus creating a situation where there is very limited supply of metric products
- o There are no inherent advantages or disadvantages for government agencies to procure metric products.

While existing obstacles to Federal metric procurement may serve as a disincentive to industry conversion, it is unlikely that they are a primary factor in industry's decision not to metricate or to move slowly. In any event, the costs which government would incur in removing obstacles are difficult to justify when the government would receive little or no benefits from metrication and when opportunities for metric procurement are limited.

This primary responsibility of government agencies adopting this strategy is to continue to monitor industry conversion plans and coordinate with conversion activities when they occur. Since this is a normal procurement function, it does not require special policy or procedure to implement.

The four metric procurement strategies outlined above provide a practical spectrum of actions to be used by the Federal government to encourage and facilitate metric conversion in the private sector. The strategies are not designed to promote metric conversion either in government or industry but rather to balance government and industry metrication requirements and interests in a relatively equal manner.

The impact of each strategy on a particular business or product sector depends on supplier-purchaser-user procurement requirements and relationships and cannot be generalized on any subset of these factors except in trivial cases. In the following section, specific procurement situations are examined and the appropriate metrication strategy is applied. These scenarios provide the basis to examine the effects of metric procurement actions on the supplying sector and firms, the procurement process, and the purchasing agency.

IV. METRIC PROCUREMENT SCENARIOS

IV. METRIC PROCUREMENT SCENARIOS

The logic of the procurement strategies presented in Section III is that metric procurement should be based on both government and industry requirements and interests and not simply a function of what procurement regulations can be most easily revised or what customary products can be most easily converted. If the latter were the case, government agencies might be overflowing with metric pencils, but major weapons systems would always be customary -- much to the confusion of our military allies. The strategies expand the question: "What will happen if we convert to metric procurement?" to "Should we procure metric goods and services and what will happen if we do?" Thus, the strategies provide general guidance concerning what types of metric procurement strategies ought to be employed under different circumstances as well as what actions need to be taken to implement the strategies.

In this section we examine four procurement situations in order to assess:

- o The nature of the supplying sector and the current state of metrication activity
- o Government agency procurement activity, customary and metric
- o Agency requirements for and benefits from metrication
- o The appropriate metric procurement strategy considering both industry and agency operations
- o An estimate of the impacts of the appropriate metric procurement strategy on the supplying sector, the procurement process, and agency programs, operations, and product/service users.

The procurement situations were not selected randomly; rather they were selected at the initiation of the study to encompass a wide variety of procurement types in terms of procurement volume, business and product type, agency operations, and government marketshare. Based on combinations of these variables, the four procurement situations selected were:

- (1) Medical, dental, and veterinarian equipment and supplies purchased by the Department of Agriculture
- (2) Hospital construction services purchased by the Veterans Administration
- (3) Data processing systems purchased by the Department of Defense
- (4) Econometric forecasting services purchased by the Department of Commerce.

The metric procurement strategies outlined in this report are based on two major dimensions: (1) the extent of metrication planning and conversion in the supplying sector; and (2) the extent to which metrication enhances the programs and operations of the purchasing agency. When both are high, agencies should actively and rapidly seek to acquire goods and services in metric form. When agencies see metric procurement to be in their interest, but where supplying industries have, as yet, made little progress towards metrication, metric procurement must proceed more gradually, albeit still towards a goal of total metrication. When industry metrication is high but where purchasing metric goods and services provide little or no benefits to the purchasing agency, the procurement process should be examined to ensure that metric products can compete equally with customary products. Under this strategy, neither metric nor customary is preferred in the procurement process. Finally, when neither the supplying sector has converted nor where the purchasing agency presently sees significant benefits from metric procurement, the most appropriate action is no action except to monitor metric related developments in both suppliers and buyers.

In the procurement situations presented below, none of the agencies involved have identified any advantage to the procurement of metric goods and services. This fact argues against a major commitment to metric procurement either on an accelerated or phased-in schedule. At the same time, two of the supplying industries -- computer systems and veterinary supplies and equipment -- have metricated a portion of the product lines. In these cases, agencies should, through a review of procurement policies and procedures, remove any

barriers to metric goods and services which might act as a disincentive to future industry conversion. In the other two cases -- hospital construction and economic forecasting -- little metrication has occurred within these industries. In these situations, the appropriate agency response is limited to monitoring and responding to any future industry conversion initiatives. Thus, when we array these four procurement situations on our decision map (Exhibit IV-1 on the following page), two of them, Computer Systems and Veterinary Supplies and Equipment fall into Quadrant III, "Remove Barriers to Metric Procurement." Two others, Hospital Construction and Economic Forecasting, fall into Quadrant IV, "React Only to Future Industry Initiatives."

1. SCENARIO 1: MEDICAL, DENTAL AND VETERINARIAN EQUIPMENT AND SUPPLIES PURCHASED BY THE DEPARTMENT OF AGRICULTURE

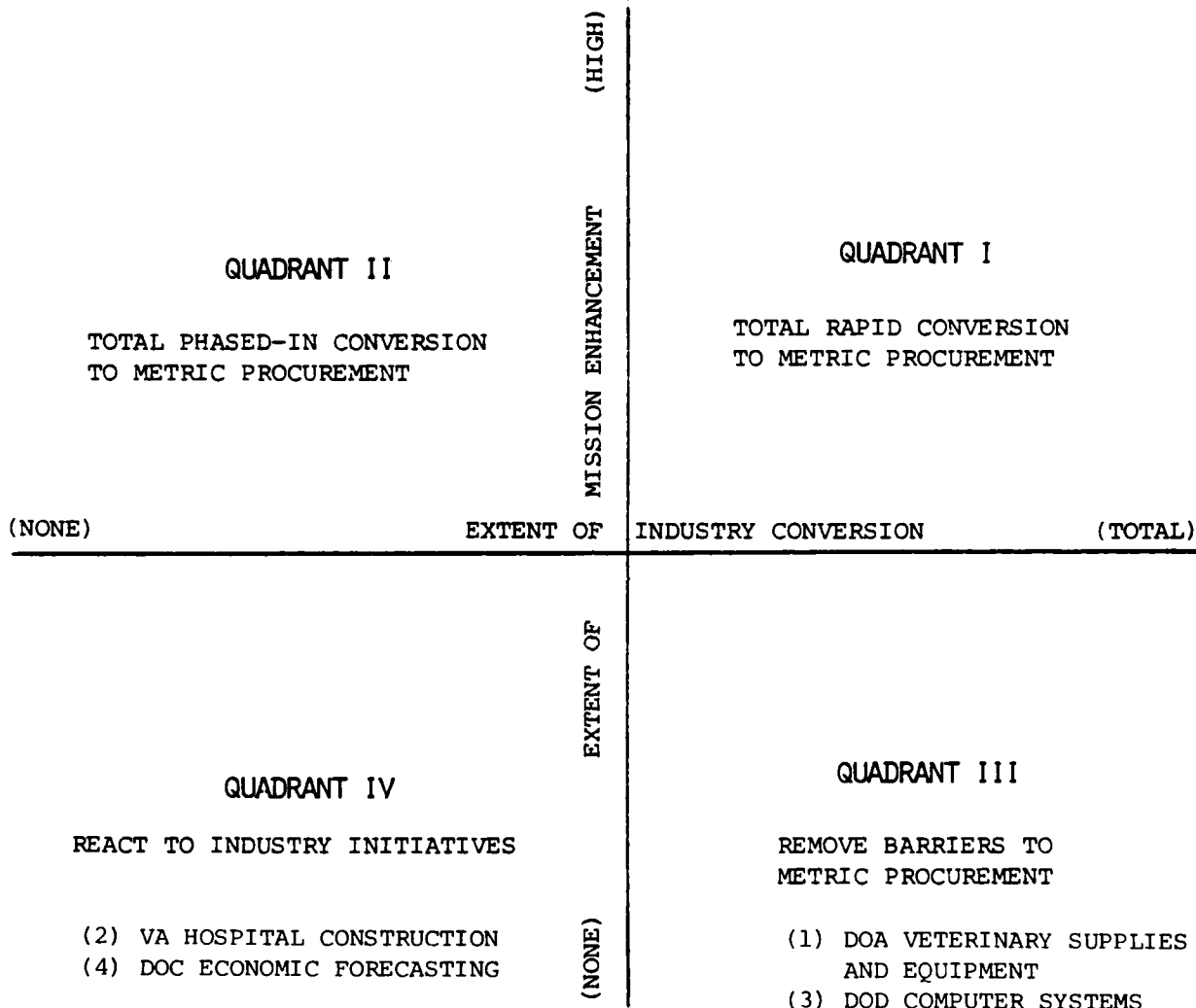
The extent of industry conversion in medicine and related fields must be characterized as a "mixed bag" of activity. In some areas, the metric system is used exclusively because of its suitability to small measurements. In other areas, particularly those that interface with the public, customary (inch/pound) or a combination of customary and metric units are used.

1.1 American Pharmaceutical Manufacturers Have Essentially Converted Their Internal Operations -- Formulation, Production, and Testing

Since the early 1930's, pharmaceutical companies have changed their internal operations to metric. It was possible to limit the scope of the change because the industry deals primarily with volumes and weights of substances, hardly at all with lengths. Thus, only scales and volume measuring devices were modified while most process machinery did not need to be changed at all. A majority of workers were familiar with the metric measurement system as the industry was already using metric units for selected products. Users, pharmacists, veterinarians, physicians had no problems with conversion as they had already been extensively educated in the metric system. Industry-wide coordination was not needed so each firm could deal independently with its own problems.

EXHIBIT IV-1

METRIC PROCUREMENT STRATEGIES FOR FOUR AREAS OF PROCUREMENT



1.2 The American Pharmaceutical Manufacturers will not "Hard" Convert Their Over-the-Counter Packages Unless Mandated

Nonprescription, or over-the-counter drugs are packaged in customary sizes for sale to the public. Often those packages have a dual label, showing both the customary size and the metric equivalent. Pharmaceutical manufacturers believe that conversion would have to be mandatory before the industry would move to a hard conversion. Converting the packaging of over-the-counter drugs to hard metric sizes would require the manufacturers to adjust, modify, or replace equipment to fill metric containers. Additional problems would be faced in the acquisition of new "hard converted" metric containers. As the industry represents only a small part of the market for containers, costs would be high for special orders of new metric containers although industry representatives could give no firm estimate of what these costs might be.

1.3 The Medical Profession Uses Both the Metric and the Customary Measurement System

The metric system is used exclusively in the medical profession in research and in the presentation of findings in technical literature. Communications and documentation within the profession is primarily metric. Pharmacies, laboratories, surgical service, dentistry, and radiology are additional areas that are extensively metric.

Where the profession interfaces with the public, however, customary measurements are typically used; for example, in recording and discussing body weight, height, and temperature. There has been little conversion activity in this area because it is felt that conversion would hamper communication between physician and patient.

1.4 Medical Equipment and Supplies are Designed in Both Metric and Customary Units

As in the pharmaceutical industry and in the general medical profession, the extent of metrication varies between the area of medical equipment and supplies. Catheters are designed in gauges and inch lengths; syringes are calibrated in metric units; and measurement cups show millimeters, drams and ounces.

1.5 The Department of Defense and Veterans Administration are the Largest Purchasers of Medical, Dental, and Veterinary Equipment and Supplies Within the Federal Government

The Department of Defense and Veterans Administration purchase 91.7 percent of the medical, dental, and veterinary equipment and supplies used by the Federal government. The top three products purchased by the Federal government are: (1) drugs and biologicals -- 46.1 percent; (2) medical and surgical instruments -- 27.2 percent; and (3) x-ray equipment and supplies -- 13.0 percent.

A breakdown of the Federal agencies that procure medical, dental and veterinary equipment and a breakdown of specific products procured by the Federal government is represented on the following page in Exhibits IV-2 and IV-3 respectively.

Our review of the medical, dental and veterinary equipment and supply industry and the medical profession in general suggests the following facts:

- o The industry has converted its operations to metric whenever good business practices have so dictated
- o The use of the customary (inch/pound) measurement system predominates in those areas that interface with the public
- o The current major metric conversion thrust within the medical profession is to standardize the use of the metric system within professional research and publications

EXHIBIT IV-2

FEDERAL PROCUREMENT OF MEDICAL, DENTAL
AND VETERINARY EQUIPMENT BY FEDERAL AGENCY

<u>Rank</u>	<u>Agency</u>	<u>\$(000's)</u>	<u>% of Dollars</u>
1	DoD	328,216	55.6%
2	VA	212,751	36.1
3	GSA	30,637	5.2
4	HHS	17,276	3.0
5	USDA	533	.1

EXHIBIT IV-3

FEDERAL PROCUREMENT OF MEDICAL, DENTAL
AND VETERINARY SUPPLIES AND EQUIPMENT
BY SPECIFIC PRODUCT CODE

<u>Rank</u>	<u>Code</u>	<u>Description</u>	<u>Actions</u>	<u>\$(000's)</u>	<u>% of Dollars</u>
1	6505	Drugs, biologicals	3,797	265,426	46.1%
2	6515	Medical and surgical instruments	2,946	127,749	22.2
3	6525	X-ray equipment and supplies	1,431	74,789	13.0
4	6530	Hospital furniture	878	40,409	7.0
5	6510	Surgical dressings	370	29,119	5.1
6	6532	Hospital and surgical clothing	164	14,391	2.5
7	6520	Dental instruments	402	11,970	2.1
8	6545	Medical sets and kits	139	11,425	2.0

- o Although metric units are used to a great extent, the units are not necessarily SI metric units
- o Standardization of SI units within the medical field can be done, but at some cost and with the recognition that errors will arise from the confusion that is introduced in using a new set of units
- o Total conversion to the metric system must wait until the public learns and actively uses the metric system.

1.6 Metric Conversion in Veterinary Medicine has Kept Pace with Conversion in the Broad Medical Arena

There is little to no apparent difference between conversion activity in the general field of "human" medicine and veterinarian medicine. The veterinarian, as with the physician, would face little difficulty in adjusting to conversion activity within the profession. A spokesperson from the American Veterinarian Medical Association indicated that a major area of conversion activity in veterinarian medicine has been in standardization of the use of the metric system in the conduct and reporting of scientific/technical research. It was pointed out that any acceptance of a standard measurement unit would clearly improve communications among the scientific community, but there would be no apparent advantage to the practicing veterinarian in the field.

1.7 Efforts to Convene an ANMC Sector Committee on Veterinary Medicine have been Postponed

The American Veterinary Medical Association (AVMA) was requested by the American National Metric Council to consider taking the lead in the formation of a Sector Committee to coordinate conversion activities within the profession.

According to AVMA, the formation of a Sector Committee to coordinate and plan for metric conversion within the industry has been postponed. AVMA indicated that at this time, they saw more benefit in attempting to

standardize the use of the metric measurement system within their professional publications. Efforts will be geared to standardize professional literature to be "reasonably consistent with other medical sectors." The current AVMA metric policy as reported in the Journal of AVMA states:

"Abbreviations for weights and measures as given in standard dictionaries are usually accepted, but some are determined by AVMA editorial preference: e.g., g (not gm), kg (not Kg), ml (not cc), mm³ (not cu. mm), mg/100 ml (not mg %), Metric measurements are preferred. Ideally, dosages should be expressed entirely in metric units, e.g., mg/kg, not mg/lb. ..."

1.8 Customary Units are Used Where the Profession Directly Interfaces with the Public

Often pharmaceutical biologicals are sold to the lay user directly from the manufacturer without any involvement of the veterinarian. For example, 80 percent to 90 percent of the pharmaceutical antibiotics used in treating livestock are sold directly to the farmer. These large animal drugs are currently sold with dosage directions based on a weight measurement in lb's. It was felt by a spokesperson from AVMA that a conversion to dosage directions in kilograms would cause confusion and risks for the lay user.

1.9 The Role of the Veterinarian in the Federal Government is Varied

The veterinarian in the Federal sector plays a varied role. Currently, there are approximately 3,000 veterinarians employed by the Federal government as compared to 390,000 veterinarians nationwide.

The listing below identifies the major veterinary medical functions within the Federal government and the agency in which the function is most likely to be performed.

<u>FUNCTION</u>	<u>AGENCY</u>
Food Inspection	USDA
Control and Eradication of Animal Diseases	USDA
Biomedical Research	DoD, VA, HHS, EPA, FDA
Veterinarian Medical Services	DoD

1.10 The Department of Agriculture Acquired Less Than 1 Percent of All Medical, Dental, and Veterinary Equipment and Supplies Used by the Federal Government

Contracts awarded by the Department of Agriculture for the purchase of medical, dental, and veterinary equipment and supplies represent a minor procurement by a civilian agency. The procurement action is characterized by a few large corporate suppliers, limited subcontracting and extensive specifications.

A review of the Federal Procurement Data System's (FPDS) data bank for FY 1980 indicated that procurement of medical, dental, and veterinary equipment and supplies constituted less than 1 percent of the purchases within the Department of Agriculture. Furthermore, the Department of Agriculture acquired less than 1 percent of all medical, dental and veterinary equipment and supplies used by the Federal government.

1.11 The Department of Agriculture is Procuring Metric Products

A special report generated from the FPDS data bank for FY 1981 listed procurement actions for medical, dental and veterinary equipment and supplies within the Department of Agriculture. (It should be noted that the data generated listed only those contract awards consisting of actions of over \$10,000.) Nine procurement actions were identified and after consultation with the affected purchasing offices within the Department of Agriculture and the industry suppliers, it was determined that these nine actions represented the acquisition of four distinct procurement items as follows:

- o Antibiotic Residue Testing Assay Plates
- o Medilog Recorder
- o Spectroradiometer
- o Bleeding Tubes and Needles.

A total of \$553,000 was spent for the acquisition of the four procurement items with 40 percent or \$211,000 of the purchases allocated to small business concerns.

The antibiotic residue testing assay plates and bleeding tubes are designed and manufactured using the metric system. The medilog recorder and the spectroradiometer, two highly sophisticated recording instruments are hybrid units. The readout components of both of these recording instruments are based on the metric system.

The government procurement process has had no trouble in adjusting its procurement process to metric conversion. For example, the procurement specifications for the antibiotic residue assay testing plates and the bleeding tubes are metric specifications, whereas the specifications for the procurement of the medilog recorder and the spectroradiometer are based on performance, rather than size.

1.12 Metric Policy and Sound Agency Management Both Dictate Against the Department of Agriculture Taking Active Steps to Accommodate Metric Procurement Beyond that Already Taking Place

The most appropriate metric procurement strategy for the Department of Agriculture in the area of medical, dental and veterinary equipment and supplies is to react only to industry initiatives. This is based primarily on the lack of any evidence that the Department's effectiveness would in any measure be enhanced by the increased use of the metric system in the purchase and use of medical, dental and veterinary equipment and supplies. Selection of this strategy is further reinforced by the recognition that the industry is currently using the metric system

whenever good business practices so dictate, but has no plans to metricate further and, indeed, has categorically decided against additional metric conversion.

Given this situation, metric policy and sound agency management both dictate against the Department of Agriculture taking active steps to accommodate metric procurement beyond that already taking place. Since the Department is an extremely small purchaser of medical, dental, and veterinary supplies (<1 percent), industry would likely not respond to requirements that customary products be supplied in metric. To do so would require the industry to set up dual packaging and labeling capabilities; a customary system for 99+ percent of its production and a metric system for the Federal government.

Finally, it should be noted that the major obstacle to total metrication of medical, dental, and veterinary supplies and equipment is, at least from the industry viewpoint, the lack of public acceptance and familiarity with the metric system. This suggests that the most important strategy the Federal government could pursue to facilitate metric conversion is one of metric education.

2. SCENARIO 2: HOSPITAL CONSTRUCTION SERVICES PURCHASED BY THE VETERANS ADMINISTRATION

The building and construction industry is large, diversified, fragmented yet highly interdependent. This complexity requires careful coordination and planning in order to minimize problems in an attempt at metric conversion.

Many products must come together to produce the final product. The range of participants in the construction process includes architects, engineers, surveyors, plumbers, manufacturers, laborers, electricians, etc. The range of materials includes lumber and wood products, concrete block, glass products, construction assemblies, and fasteners. More broadly, the impact of metric conversion would be felt by realtors, financial institutions, lumber

and hardware stores, building code and standards organizations, and the offices of county and state land records among others.

2.1 Efforts to Convert to the Metric System have been Progressing Slowly

The conversion to the metric system within the building and construction industry has been marked by little activity. The lack of conversion activities has been attributed to many factors, including:

- o The industry is primarily domestic
- o The industry has no difficulty in obtaining customary materials
- o The industry's customers are not demanding metric construction
- o The industry is uncertain of the national policy and Federal commitment to conversion
- o The industry is concerned about the costs and uncertain of the benefits
- o The industry is diversified and no one firm is large enough to lead.

2.2 Conversion to the Metric System has Wide Ranging Implications for the Building and Construction Industry

The practical and technical implications of metric conversion are wide ranging and vary depending upon the industry sector under consideration. The following list summarizes some of the practical and technical implications of metric conversion:

- o The design of the metric system would enhance productivity in mathematical processes involving measurement decisions
- o A conversion to the metric system would require a generation of a new data bank of learned names, relationships and magnitudes for the assessment of physical factors

- o Descriptive information such as standards and textbook drawings would necessarily have to be converted
- o Comparison of physical quantities with international standards would be facilitated
- o Increase in measurement precision would result from the use of the metric system
- o Engineering standards would need to be revised
- o Building codes would need to be revised (although the total number of codes might be reduced)
- o Obstacles imposed by laws and regulations would need to be revised
- o New metric measurement devices would need to be purchased
- o A change to the metric system would require the review of the dimensions and physical properties of most building materials, components and assemblies.

2.3 A Ten-Year Time Frame for Conversion is Generally Accepted by the Industry

As part of the U.S. Metric Study conducted by the National Bureau of Standards, construction industries were queried as to a reasonable time period for conversion. The responses indicated that 76.4 percent felt that a timeframe within 10 years would be acceptable. Additionally, the GAO Metric Report concurred that conversion could be accomplished within a ten-year time frame.

2.4 The Federal Government is the Building and Construction Industry's Largest Single Customer

The Federal government, in 1976, accounted for about 5 percent of total new construction. It exerts additional influence on the industry through grants for construction of highways, hospitals, and airports and home mortgage loan guarantee programs. The Federal agencies involved in the building and construction industry include:

- o Army Corps of Engineers
- o Bureau of Reclamation
- o Naval Facilities Engineering Command
- o Tennessee Valley Authority
- o Veterans Administration
- o Department of Housing and Development
- o General Services Administration - Public Building Service.

2.5 The Veterans Administration will Follow Industry's Lead in Metric Conversion

Contracts awarded for the construction of new and/or renovation of existing Veterans Administration hospitals (not including maintenance) represents a major procurement activity by a civilian agency. These contracts are characterized by extensive subcontracting, extensive minority business involvement and extensive specifications. The Veterans Administration's contracts for hospital construction and renovation amounted to 52 percent of the total Federal government contracts for hospital construction/renovation in FY 1981. Approximately 40 percent of contracts awarded for over \$10,000 by the Veterans Administration for hospital construction/renovation were to small business concerns.

Discussion with various staff personnel within the Veterans Administration's Office Contract Administration were conducted on the general topic of conversion within the building and construction industry. The major points that surfaced were as follows:

- o The costs of conversion would far outweigh the benefits derived
- o The industry is in no position to begin a major conversion undertaking at this time
- o A conversion within the industry would do little of anything to enhance Veterans Administration operations
- o Metric conversion would require significant revisions to the government contract administration and procurement process.

2.6 The Appropriate Role of the Federal Government Should be to React to Industry Initiatives and Assist in the Coordination and Planning of Conversion Activities Within the Industry

Conversion activities within the building and construction industry are proceeding slowly. A general agreement to embark on a voluntary conversion plan has not been reached. There appears to be no overriding need for the Veterans Administration to convert its hospital construction activities to metric.

It is clear that the construction industry cannot accomplish an effective or efficient conversion to the metric system without the cooperation and involvement of the key sectors and parties that together make up the industry. Our analysis suggests that the appropriate role of the Federal government, at this time, would be to provide a national advisory mechanism to assist in the consideration of and planning for metric conversion within the building and construction industry rather than embark on a program of encouraging metric conversion through the procurement process.

In point of fact, neither the Veterans Administration, specifically, nor the Federal government generally, could likely muster the expertise required to convert procurement of construction services from customary to metric. Most of the specifications used by the Federal government are expressed in customary measurement and to revise these specifications to accommodate metric construction would entail an extensive and expensive mobilization of specialized personnel and other technical resources which the VA's Office of Construction candidly admits it does not have.

3. SCENARIO 3: ADP SYSTEMS PURCHASED BY THE DEPARTMENT OF DEFENSE (DoD)

The computer industry is represented by some of the largest and best known corporations in the United States including IBM, Hewlett-Packard, Control Data Corporation, and Sperry-Univac. The range of products offered by these com-

panies includes large mainframe computers, minicomputers, business computers, related input, storage and output equipment, plus software systems. The industry is characterized by technological innovation, business growth, and high profits.

According to the Computer and Business Equipment Manufacturers Association, the trade association representing the largest firms in this sector, there is no consensus at present to initiate metric conversion industry-wide. Similarly, the American National Metric Council reports that its Data Processing and Office Equipment Sector Committee is presently inactive.

At the same time, several large computer firms have attempted or are currently engaged in product metrication. Most of these firms are multinational companies with production, sales, and service operations ongoing in metric-based countries. In addition to world-wide production requirements, other motivating factors in the decision to metricate include enhanced marketing opportunities and the capacity for total system integration.

3.1 DoD Accounts for 82 Percent of the Purchase of Automatic Data Processing Equipment Within the Federal Government

The Federal government is clearly the largest single purchaser of ADP systems (about 2 percent of total market) and the Department of Defense is the largest single buyer within the Federal government. In FY 1981, the Federal government purchased \$230,000,000 of automatic data processing equipment. This product category (as defined by the Federal Procurement Data System's Product and Service Codes Manual) includes all hybrid electromagnetic devices that are interconnected to operate as a system. It normally consists of an assembly of devices including a central processing unit and the necessary input/output devices (terminal, drives, printers) required to perform data processing functions.

The Department of Defense accounted for the largest percentage of procurement actions (66 percent) and dollars (82 percent) for this procurement category in FY 1981. The top five suppliers to DoD are as follows:

<u>SUPPLIER</u>	<u>PROCUREMENT DOLLARS</u>	<u>PERCENT OF TOTAL</u>
International Business Machines	18,692,000	10%
Astronautics	9,832,000	5%
Bunker Ramo	6,751,000	4%
Hewlett-Packard	5,000,000	3%
Digital Equipment	4,451,000	2%

Under current policy, the Department of Defense has committed to consider metricating all mission related systems, and where beneficial, initiate metric procurement over the next ten years. ADP systems are not considered mission related and consequently, not included as part of this metric conversion program. In addition, DoD is also examining aspects of its support operations of which ADP systems are a part to determine potential advantages and/or disadvantages from metrication. As yet, DoD has not made any decisions regarding metricating all ADP procurement, although approximately 33 percent of the computer systems currently purchased by DoD are built (at least in part) to metric specifications and use metric components.

3.2 Metric Conversion in the Computer Industry Poses Many Problems and Promises Few Benefits

In its 1978 metric study, the General Accounting Office surveyed the computer field to try to assess the impacts of metrication in terms of costs and benefits to the industry. As part of the study, conversion cost estimates were provided by three companies: one estimate ranged from "several hundred thousand to several million dollars if conversion was completed in a 3 to 5 year period"; a second firm estimated 1.1 million

dollars over 10 years; and a third "estimated that the costs would amount to many millions."

While industry estimates of conversion costs are significant, the benefits from metrication are less obvious. Typically, the most frequently cited benefit is system standardization which would allow for product interchangeability. At present, components produced by one manufacturer are not compatible with products produced by others and some believe that metrication would mitigate this situation. Metrication and standardization, however, are actually two separate issues and accomplishing the former would not automatically result in the latter without additional coordination and planning.

3.3 The Department of Defense Should Continue to Support Conversion Activities Within the Computer Industry

The Department of Defense is the largest single purchaser of computer systems and, consequently, its purchasing policies could have an important bearing on industry conversion decisions and activities. If the DoD decides to purchase metric systems exclusively (or primarily) its decision would have cost, production, and supply impacts both on the industry and on other purchasers of computer systems. A certain portion -- perhaps all -- of the marginal costs of metrication would be passed on to all purchasers of computer systems, not just DoD. In addition, since some companies have already partially metricated, competition for DoD business might, in the short term, be reduced.

Given the lack of a coordinated metrication policy within the industry together with estimates that conversion costs would be high and production and servicing problems extensive, the DoD should continue its policy of purchasing the best available systems -- conventional or metric -- at least until there is evidence that totally or predominately metricated systems enhance DoD mission accomplishment.

The Department of Defense has already established the capability to procure metric computer systems. It has not decided to pursue metric or conventional at the expense of the other. This strategy will help assure that industry business practices dictate the rate and extent of metric conversion within the industry.

4. SCENARIO 4: ECONOMIC FORECAST SERVICES PURCHASED BY THE DEPARTMENT OF COMMERCE

Economic forecast services differ from the other categories of procurement discussed above in that the government here purchases a service -- for the most part, information -- rather than a product. Nevertheless, the implications of metrication are perhaps as far reaching for this industry as any other.

Major economic forecasting and consulting firms such as Data Resources Incorporated, Chase Econometrics, Wharton Econometric Forecasting Associates, and Strategic Information actually provide government and commercial clients with four types of services:

- o Economic Data Bases
- o Economic Forecast Models
- o Information Services
- o Computer Access and Time.

One of the ironies of the economic forecasting industry is that the United States government is the largest single purchaser of services and the most important source of raw economic data. That is, the Federal government collects and publishes almost all of the data which the major companies use -- free of charge -- in their systems and models and sell back to the government in the form of descriptive analyses and short- and long-term forecasts. This is not to suggest that the industry gets a "free ride" from government; economic forecast companies use government collected data to create extensive longitudinal and cross-sectional data bases which are manipulated and output

through very complex forecast models. In addition to economic reports, the companies provide user-friendly software, data bases, and computer access to allow clients to manipulate data and generate analyses themselves.

4.1 U.S. Economic Data is Expressed in Customary Measurement

Almost all of the U.S. economic data collected and published by both government and private sector sources are expressed in customary measurement. These data include energy production, farm production, industrial production, imports and exports, personal consumption, inventories, prices of goods per unit, and hundreds more which together define and describe the U.S. economy. Economic forecasting companies analyze and output these data in customary measurement. Economic planners, government officials, business executives, and consumers interpret these data in customary measurement. Almost the entire system of data reporting, collection, analysis, interpretation, and action is based on the inch-pound system.

These data are the "raw materials" of the economic forecasting industry; "production" is accomplished through complex, multivariate models which trace and measure economic trends and project future economic conditions. The contents and the structure of both the data bases and the models, like the raw data, are based on customary measurement.

4.2 The Economic Forecast Industry has no Plans to Convert Data Bases and Models to Use Metric Measurement

At the present time, none of the economic forecasting companies contacted have any plans to convert to the metric system. In fact, a manager at the largest U.S. firm stated that our inquiry was the first time he has ever heard the notion of conversion mentioned, either at his company or in discussions with personnel from other firms. Among the problems resulting from metric conversion are:

- o The existence of large, highly structured data bases -- some extending back over 75 years -- all expressed in customary measurement
- o The use of customary measurement for data collected and reported by government and commercial sources
- o The logic and structure of the forecasting models which are built on relationships among customary measurement
- o Uses familiarity with customary terms.

Economic forecasting companies have invested considerable resources in constructing and maintaining proprietary capabilities to archive, analyze, and forecast U.S. economic activity. In addition, users of the data, systems, and information have not expressed a need or interest in metrication. Given the highly competitive nature of the industry, no firm appears ready to take the risks or incur the costs which might result from metrication.

At the same time, a number of companies do use metric data or soft converted customary data in their international data bases and models. Data Resources, Inc., has, for example, expended considerable effort over the past ten years developing a "Planned Economies Model" which provides economic analyses of Eastern European Nations. A number of firms in the industry produce analyses and market services in Europe, the Middle East, and South America.

4.3 The Department of Commerce is Reported to be the Largest Single Purchaser of Economic Forecasting Services

No firm estimates of the total volume of business procured by the Department of Commerce appears to be readily available. Only five contract awards (over \$20,000) were listed in the Federal Procurement Data System for FY 1981 -- totalling 1.6 million dollars. However, the Federal Contracts Manager for a large forecasting firm, not listed as a supplier to Commerce by FPDS, reported that their 1981 business with the Department alone totalled over one million dollars. Respondents from other firms

also expressed the opinions that the Department of Commerce makes extensive purchases of economic forecast services to a much greater extent than reported by FPDS. These awards may be multi-year contracts reported in earlier years or reported under an FPDS category other than "economic studies."

4.4 Metrication of Economic Forecast Services is Feasible, but would Provide Little Benefit

Technically, the problem of converting economic data bases, models, and forecasts from customary to metric measurements can be accomplished in at least two ways. The most difficult (and costly) would be to "hard convert" the entire forecasting systems. This would require reconstruction of the data bases using metric measures and rewriting the model and report generator software to process these data in metric form. Cost estimates for this vary according to the size of the existing data bases and the complexity of the models and report software, but would certainly total several millions of dollars industry-wide. Even if the data bases and computer programs were converted, the problem of new data in customary measurement and lack of user familiarity with metric-based information would remain.

The second method of accommodating metrication involves developing "metric translator" software which soft-converts customary measurements to metric when reports are generated. This approach does not require revision to the data bases or the models, and allows users to select reports expressed in either customary or metric. Estimates for the cost of such software -- which would have to be tailored to the requirements of each company -- run from \$20,000 to \$30,000.

Although economic forecast companies could accommodate metric requirements through use of metric translators, the Department of Commerce sees little benefit from and does not plan to initiate metric procurement for economic forecasting services. The lack of demand from service users

constitutes the only major, identifiable barrier to metric procurement; there are no standards and specifications currently in place which prevent metrication. Economic forecast companies could respond to soft metric output requirement at relatively low cost and without disruption to other clients. Companies could not respond to requirements for hard metric data and models without incurring extensive costs and almost total disruption of their in-place capabilities.

It is unlikely that the economic forecast industry will consider metrication until the Federal government both begins collecting and publishing economic data and analyzing economic information in metric form. It seems clear that the Federal government must take the lead if the metric system is to play a significant role in the U.S. economic planning and analysis.

The most appropriate metric procurement strategy for the Department of Commerce to follow is, in the absence of any significant requirement for metric-based economic information, to monitor any industry movement toward metrication. At the present time, such a development seems unlikely given the content of government and private sector economic planning and is more likely to come about only as individual economic forecasting firms attempt to broaden their international markets and forecasting capabilities.

IMPORTANT NOTE

There is some confusion about the role of the U.S. Metric Board and the national policy on metric conversion.

Congress established the Board to plan and coordinate the voluntary increasing use of the metric system. It is not, however, the role of the Board to promote metric usage.

The Board is an independent Federal agency responsible for conducting public information and education programs and appropriate research, coordination and planning activities.

Metric Conversion in this country is voluntary. When Congress passed the Metric Conversion Act in 1975 it did not make conversion mandatory; nor did it establish a target date or deadline for conversion.

The Board has no compulsory power. It is a public service agency consisting of citizen representatives from all walks of American life. Its 17 members are appointed by the President and confirmed by the Senate. Members are nominated to represent labor, retailing, small business, industry, construction, state and local governments, science, engineering, consumer groups and the public at large.

Please contact us if you have any questions about the role of the Board or the national policy on metric conversion.



UNITED STATES METRIC BOARD

Suite 400
1800 Wilson Boulevard
Arlington, Virginia 22208

END

FILMED

2-83

DTIC