Applications of R&D in the Civil Sector: The Opportunity Provided by the Federal Grant and Cooperative Agreement Act of 1977

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Applications of R&D in the Civil Sector

The Opportunity Provided by the Federal Grant and Cooperative Agreement Act of 1977

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FOREWORD

The Federal Government now spends about $28 billion per year on research and development (R&D) activities and facilities in the United States. With another $20 billion per year from the private sector, the total national investment in R&D approaches $50 billion annually.

Large though this total is, it portrays only a small portion of the overall impact of R&D on the economy and the quality of life in our society. Research and development is the engine that drives the currents of change in our civilization. From R&D stem the inventions, techniques, and processes that propel innovations through our economic and social systems. Moreover, it has been estimated that, on the average, each person engaged in R&D eventually generates 6 to 10 other jobs throughout the economy. As a consequence, the $48 billion annual national investment in R&D has a massive multiplier effect on our entire socioeconomic system.

Therefore, it behooves Congress to consider this investment carefully and to pay close attention to the ways in which it is allocated and used, as well as to the framework of laws, regulations, incentives, and constraints whereby the fruits of scientific research and development are converted into operational results.

Furthermore, R&D and the process of innovation help to determine the options and establish many of the parameters whereby specific technologies can be assessed for their potential impacts on society. In assessing a particular technology, the Office of Technology Assessment (OTA) compares its advantages and disadvantages with those of alternative technologies and assesses its impact on economic, social, environmental, and political factors within a perspective of probable future human needs, capabilities, and values.

To carry out its assessments effectively, OTA needs a thorough understanding of the Nation's R&D effort and of the process whereby R&D results are converted into useful innovations. While helping to strengthen and integrate OTA's overall assessment activities, such understanding also enables OTA to assist the Congress in better shaping the national investment in R&D by developing more soundly based R&D policies and priorities. Thus, through such understanding, OTA can more effectively fulfill its mandate to give Congress early indication of the impacts of technological change.

In response to these needs and the urging of a number of congressional committees and individual Members, the OTA Board authorized a Program of R&D Policies and Priorities, which became operational in May 1976.

Recognizing that such an assessment cannot be carried out effectively through a single, comprehensive project which attempts to address all facets of the problem, the Program was designed to proceed through a series of manageable, interrelated studies which will help to build an understanding of how to maximize the beneficial impacts of our total R&D enterprise.

The Program has operated with the guidance of three interrelated Advisory Panels made up of distinguished leaders of science, technology, industry, labor, the professions, and the consumer, environmental, and public interest movements.

The Panel on the Health of the Scientific and Technical Enterprise, chaired by Dr. Harvey Brooks, Benjamin Peirce Professor of Technology and Public Policy at Harvard University, has been concerned with ways we can maintain and enhance the health and vitality of the entire scientific and technical enterprise.

The Panel on the Applications of Science and Technology, chaired by Dr. Lewis M. Branscomb, Vice President and Chief Scientist of the IBM Corporation, has been concerned with how we can more effectively apply science and technology to ameliorate the processes of innovation, augment America's international competitive position, solve national and social problems, and enhance the qualify of life.

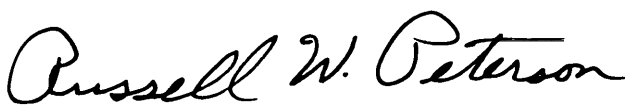
The Panel on Decisionmaking on R&D Policies and Priorities, chaired by Dr. Gilbert F. White, Director of the Institute of Behavioral Science at the University of Colorado, has been concerned with how we improve the decisionmaking processes whereby the Nation establishes policies and priorities for R&D.

During coming months, OTA will issue a series of reports on the Program all intended to inform and aid Congress in dealing with the complex issues of R&D policies and priorities.

The first of these reports is the Applications of R&D in the Civil Sector: The Opportunity Provided by the Federal Grant and Cooperative Agreement Act of 1977. This Act, which was signed into law February 3, 1978, is a major step forward in bringing greater order to the diversity of Federal assistance programs. The framework established by the Act has important implications for federally funded R&D and for the Federal impact on innovation involving private industry, the universities and nonprofit organizations, and State and local governments.

Over the next 2 years, the Office of Management and Budget (OMB) will be engaged in a major study of Federal assistance mandated by the Act. Through their oversight function, interested congressional committees have a key role to play in assuring the effective implementation of this Act.

America's scientific and technical enterprise is a powerful instrument with enormous potential for national progress. How effectively this Act is implemented will be an important factor in determining how fully we tap that potential. It is hoped this report will aid Congress in shaping the effort.



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• • • •

NOTE: While the Applications of Science and Technology Advisory Panel (listed on previous page) served as the principal advisory group for this report, the Decisionmaking on R&D Policies and Priorities Advisory Panel also provided advice, critique, and assistance during the project for which OTA is deeply grateful. Although these advisory panels recommended release of the report, OTA assumes full responsibility for the report and the accuracy of its contents.

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Federal efforts to foster technological change in the civil sector through the support of R&D have met with only limited success. In contrast, the Federal Government has been very successful in bringing about technological change in areas such as national security and space exploration, where it is the end user of the products of R&D. Bringing about technological change in the civil sector, however, requires that those non-Federal parties who produce, deliver, and use goods and services accept risk and commit resources. Consequently, the Federal Government's R&D role in the civil sector should differ in fundamental ways from its role in areas where it is the end user of the products of R&D.

Approximately one-third of the Federal budget is disbursed through procurement or assistance transactions between the Federal Government and non-Federal parties. As an initial step toward eliminating confusion over appropriate Federal and non-Federal roles and responsibilities in this major area of Federal spending, the Federal Grant and Cooperative Agreement Act of 1977:

- Requires that assistance relationships be distinguished as a class from procurement relationships;
- Establishes uniform, Government-wide criteria for the use of contracts, grants, and cooperative agreements; and
- Mandates a comprehensive, 2-year study of Federal assistance to be conducted by 'the Office of Management and Budget (OMB).

This report shows how the requirements of the Act provide an opportunity to address in a comprehensive, Government-wide manner the appropriate Federal and non-Federal roles in cooperative efforts to foster technological change in the civil sector. Chapters 11 and 111 show how the assistance perspective and the framework of Federal/non-Federal relationships established by the Act could be used to incorporate into Federal R&D management the considerations that guide the actions of non-Federal users of the products of that R&D.

Chapter IV shows how this framework of relationships could facilitate congressional oversiqht of Federal efforts to foster technological innovation through revealing patterns of management practices that determine effectiveness.

Topics of particular interest included in the report are:

- Issues important to consider in the OMB Study (pp. 22-24) ;
- The issue of accountability and its relationship to effectiveness in stimulating technological change (p. 27);
- Background necessary for understanding the full significance of distinguishing assistance relationships as a class from procurement relationships (pp. 7-13);
- The issue of balancing public benefits and private gain in assistance relationships with commercial firms, and the role of openly competitive assistance awards (pp. 13-15);
- The characterization of Federal/non-Federal relationships reflected by the alternative legal instruments of grants, contracts, and cooperative agreements (pp. 19-20);
- The "joint business venture" character of the cooperative agreement and issues such as costsharing and patent rights associated with its use (pp. 20-22);
- Key questions with brief discussion to assist the Congress in overseeing Federal efforts to foster technological change (pp. 27-29); and
- A hypothetical scenario, dealing with innovation to meet a local government problem, to illustrate the approach to civil sector problems from an assistance perspective (appendix B).

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Chapter I

Introduction

Chapter I

Introduction

Federal expenditures for civilian-oriented R&D have risen rapidly over the past two decades. In authorizing programs and appropriating funds for civilian-oriented R&D, Congress clearly intends that the benefits from this public investment will be widely distributed throughout society. However, Federal efforts to harness the potential of science and technology to meet social and economic needs have met with only limited success. As recently noted by Presidential Science Advisor Frank Press and Governor George Busbee of Georgia:

> In recent years, Federal funding of R&D for the Civil sector has been growing rapidly [t is now in excess of **$7** billion annually But lts impact on meeting public expectations --on filling the everyday needs of the people – often seems disappo]nting.

A central problem is that for Federal efforts to be successful in fostering technological change, such efforts must be effectively linked to the considerations of those non-Federal parties who produce, deliver, and use goods and services in the civil sector. Incorporating the considerations that guide the actions of these non-Federal decisionmakers into the management decision processes of Federal R&D programs poses a major challenge. in R&D programs where the Federal Government is not the end user of the products of R&D, such factors as

- problem definition,
- choosing among alternative technological solutions,
- bearing of costs and risks,
- criteria for making awards,
- testing and evaluation, and
- introduction to use

should all be dealt with very differently than in areas such as national security and space exploration, where the Federal Government is the end user,

The requirements of the Federal Grant and Cooperative Agreement Act of 1977 provide an opportunity to address in a comprehensive, Government-wide manner this whole range of R&D management issues—both at the conceptual and at the operational levels.[2]

At the conceptual level, the Act requires that in transactions between the Federal Government and non-Federal parties, assistance relationships be distinguished as a class from procurement relationships. Since civilian-oriented R&D is generally not for the Federal Government's own use, transactions for its support fall into the category of assistance relationships. The far-reaching implications of distinguishing assistance from procurement relationships for the conceptualization of the Federal role and responsibilities are developed in chapter II.

At the operational level, the Act establishes uniform, Government-wide criteria for the use of grafits, contracts, and cooperative agreements so that these alternative legal instruments accurately reflect the underlying Federal 'non-Federal relationships. This framework of Federal/non-Federal relationships requires a clear delineation of Federal and non-Federal roles and responsibilities at the level of individual transactions.

The Act also mandates a 2-year, comprehensive study of Federal assistance to be conducted by the Director of the Office of Management and Budget (OMB). This study provides an excellent opportunity to identify, develop, and promote those administrative practices most effective in stimulating technological change in the civil sec-

'Frank Press and George Busbee, "Intergovernmental Science and Technology, " Science 196, May 27. 1977, (editorial).

[2]The text of the Act is presented in appendix^

tor. These operational issues are treated in chapter III.

Chapter IV summarizes the implications of the Act for congressional oversight of Federal efforts to stimulate technological change.

The scope of the Grant and Cooperative Agreement Act is far broader than R&D alone. Approximately one-third of the Federal budget is disbursed through procurement and assistance transactions. The Act is intended as an initial step toward eliminating the waste and ineffectiveness in this major area of Federal spending resulting from confusion over appropriate roles and responsibilities in Federal/non-Federal relationships. The framework established for such relationships is to bring greater order to Federal assistance processes, on the one hand, and preserve the integrity of the procurement system on the other.

In its comprehensive study of Federal procurement practices, the U.S. Commission on Government Procurement conducted a preliminary study of Federal grant-type assistance programs.[3] The Grant and Cooperative Agreement Act embodies the recommendations of that study. The Procurement Commission found that Federal grant-type activities constitute a vast and complex collection of assistance programs that function with little central guidance and in ways often inconsistent even for similar programs. The growth of assistance expenditures to State and local governments, colleges, universities, and other nonprofit institutions has accelerated to the point where outlays for FY 1978 are estimated to total about $80 billion. ' Not only the dollar volume but the diversity of such programs is enormous—the Catalog of Federal Domestic Assistance contains descriptions of approximately 1,000 programs.'

This report considers the relationship between two major streams of activity: (1) Federal efforts to apply the products of R&D to the resolution of social and economic problems, and (2) Federal assistance to State and local governments and other non-Federal recipients for the support or stimulation of a broad range of activities in the public interest. The confluence of these two streams of activity is largely an unfamiliar area—even to those separately familiar with Federal R&D policy or with Federal assistance policy. Nonetheless, the difficulties encountered in more fully realizing the public benefits from Federal support of R&D, together with the recent enactment of the Grant and Cooperative Agreement Act, require that this particular area be thoroughly explored and understood.

Definitions and Scope

For the sake of precision, it is useful at this point to offer two definitions. The term ***technology*** is used here to denote knowledge required for the production and delivery of goods and services. This definition encompasses both physical and social technologies. ***Technological innovation*** refers here to the process by which knowledge is developed and transformed into specific products, processes, and services. The innovation process includes the whole sequence of steps in the development, testing, production, implementation, adoption, diffusion, and use of a technology.

The scope of this report is limited to programs where innovation goals are appropriate. This includes research for specific applications, advanced development, and demonstrations. Basic research, applied research of a broad generic character, and exploratory development, whose purpose is the generation of new scientific and technical knowledge, are not considered.

[3] U.S. Commission on Government Procurement, Report *of* the Commission on Government Procurement, Vol. 3, Part F, Washington, D. C., U.S. Government Printing Office, 1972.

'Executive Office of the President, *Budget of* the United *States* Government: Fiscal Year 1978, Special Analyses I and O, U.S. Government Printing Office, Washington, D. C., 1977.

'Executive Office of the President, 1977 Catalog *of* Federal Domestic *Assistance*, U.S. Government printing Office, Washington, D. C., 1977.

Chapter II

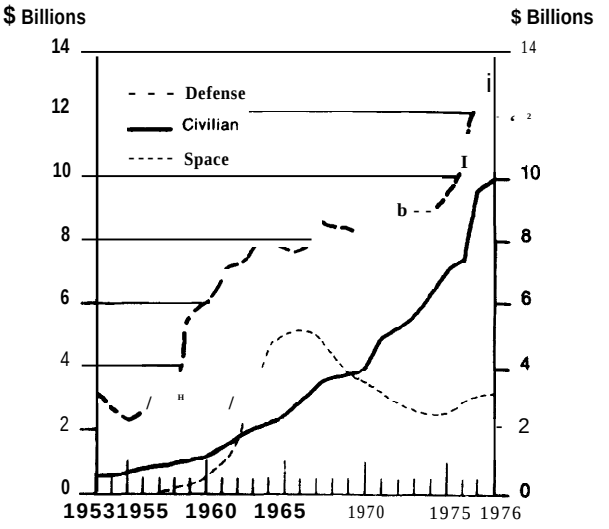
Assistance and Procurement Relationships

Assistance and Procurement Relationships

Since World War 11, the great bulk of the transactions the Federal Government has entered into with non-Federal parties for performing **R&D** has been for national security and space exploration. Over the past two decades, however, the Federal Government increasingly has sought to apply scientific and technical knowledge to the solution of social and economic problems. This reorientation of national priorities is clearly illustrated in figure 1 by the continued increase in the civilian R&D budget relative to the space and defense R&D budgets. Efforts to more effectively harness the power of science and technology to meet civil sector needs have led to the creation of R&D programs in such diverse fields as energy, environment, health, housing, transportation, education, manpower training, and law enforcement.

We wish to review the evolution of the R&D system in light of the requirement of the Grant and Cooperative Agreement Act to distinguish between assistance and procurement relationships. Therefore, we first examine the different objectives, expectations, and administrative practices associated with these two classes of Federal/non-Federal relationships. We then consider how the procurement system has evolved into a very effective instrument for drawing upon the scientific and technical resources of the Nation to meet national needs in the areas of national security and space exploration. We also consider the limitations of that system for drawing upon these same resources to meet national needs in the civil sector, and the extent to which these limitations might be overcome by an assistance perspective. Finally, we consider the issue of balancing public benefits and private gain in assistance relationships with commercial firms, and the role of openly competitive assistance awards.

Figure 1.—Obligations for Defense, Civilian, and Space R&D



SOURCE: Special Analy8is P, 1978 Budget.

Characteristics of Assistance and Procurement

The Grant and Cooperative Agreement Act differentiates between procurement and assistance relationships by restricting the use of alternative legal instruments to specified types of relationships. For example, contracts are to be used for procurement relationships, whereas grants and cooperative agreements are to be used for specified types of assistance relationships. Before considering the specific criteria established for the use of these alternative legal instruments, it is instructive to focus just on the implications of distinguishing **assistance relationships** as a class from **procurement relationships.** It is the difference between these two relationships which affects the conceptualization of the Federal role in applying the results of R&D to civil sector needs.

For Federal procurement, the basic need to acquire goods and services at fair value for the Government's sake has led to a set of highly developed procedures. To protect the Government's interest and to provide fair and equitable treatment of alternative suppliers, the Government maintains the usual buyer-seller, arm's-length relationship and relies principally upon competitive bidding for making awards. Sole source awards can be made only in special circumstances and with sufficient justification. The operational rules for guiding procurement transactions which are embodied in the Federal Procurement Regulations and the Armed Services Procurement Regulations,* include procedures for formal advertising, reviewing bids, making awards, conducting negotiations, and ensuring adequate and timely performance on the part of contractors. The rights and liabilities of the respective parties in procurement transactions are well defined by established legal precedents.

Assistance, on the other hand, has neither a precise, well-defined meaning nor uniform, widely understood administrative practices associated with it. The term *assistance* generally is taken to connote the provision of money, services, or property to a non-Federal party to accomplish a broad public purpose. The provision of Federal assistance implies a cooperative or partnership-type relationship between executive agencies and the non-Federal recipients with regard to the attainment of public policy objectives. However, the development of an analytical basis for Federal assistance, explicitly delineating those properties shared in common by assistance programs, and distinguishing between operationally significant categories of assistance programs, has not been carried very far. Consequently, the administrative practices based on such distinctions are not well developed. The Procurement Commission found that in the absence of central guidance, the administration of assistance programs has varied widely among different agencies in ways that often were inconsistent. The Commission believed this situation to be not only wasteful and ineffective but also to create unnecessary confusion and frustration for the recipients of Federal assistance.

In particular, questions of responsibility and accountability need to be clarified. In the absence of clearly defining the respective roles and responsibilities of executive agencies and non-Federal parties, questions of who does what and why at the operating level are left ambiguous.[3] The Commission noted that when there is uncertainty regarding the capabilities of recipients to adequately perform the assisted activity, Federal administrators tend to develop more and tighter rules, procedures, and standards. This response to uncertainty on the part of Federal administrators may provide a sense of security in the face of possible scrutiny. However, the unfortunate consequence of this response is that assistance programs lose the flexibility necessary for optimum performance in achieving policy objectives. Recipients cannot become routine appliers of Federal rules and regulations without a consequent stifling of initiative and responsibility. The problem created for the management of assistance relationships is well expressed by the Commission in its report:

> Assuring adequate contractor project management in a procurement context is difficult enough. We have yet to understand the need for, much less provide, guidance on assuring adequate project management in the different, supposedly cooperative, and admittedly more delicate, assistance relationship.[4]

The similarity between the management problem described here for assistance relationships generally and that posed in the procurement of R&D is noted shortly.

The remedy proposed by the Commission and embodied in the Grant and Cooperative Agreement Act is to establish a process whereby the roles and responsibilities of executive agencies

[1] U.S. General Services Administration, Federal Procurement Regulations, Washington, D. C., U.S. Government Printing Office, looseleaf services.

[2] U.S. Department of Defense, Armed Services Procurement Regulations, Washington, D. C., U.S. Government Printing Office, issued annually.

[3] Robert D. Newton, in Hearings before the Ad Hoc Subcommittee on Federal Procurement and the Subcommittee on Intergovernmental Relations of the Committee on Government Operations, U.S. Senate, on S.3514, Federal Grant and Cooperative Agreement Act of 1974, 93d Congress, U.S. Government Printing Office, Washington, D. C., 1974, pp.72-79.

[4] Report of Commission on Government Procurement, op. cit., Vol. 3, p. 137.

and non-Federal parties become more clearly delineated on a transaction-by-transaction basis. Thus, the Act requires that assistance relationships be distinguished as a class from procurement relationships, and it establishes broad guidelines for the use of contracts, grants, and cooperative agreements so that these alternative legal instruments more accurately reflect the underlying relationship between executive agencies and non-Federal parties. Recognizing that these measures provide only a first step in organizing the administration of Federal assistance programs, the Act also mandates a study to be undertaken by the Director of OMB:

> to develop a better understanding of alternative means of implementing Federal assistance programs, and to determine the feasibility of developing a comprehensive system of guidance for Federal assistance programs. [6]

It is not yet clear whether it is either feasible or desirable to develop a system of guidance for assistance programs as comprehensive as that for procurement. What the Act attempts to do is to force the complex issues involved to be effectively addressed on a Government-wide basis. Thus, it establishes a process whereby the Government as a whole can systematically learn from its experience in administering assistance programs.

As previously noted, the principal motivation for the Act is to bring greater discipline to the diversity of Federal assistance programs. Nonetheless, the importance for Federal R&D policy of the requirement to distinguish between assistance and procurement relationships becomes apparent as we trace the evolution of the R&D system from an almost exclusive orientation toward meeting Federal Government needs to an increasing orientation toward meeting civil sector needs.

Evolution of the R&D System

World War II provided dramatic examples of impacts that can result from a vigorous scientific and technical enterprise. Such examples include nuclear fission, penicillin, electronics, and aeronautics. These wartime experiences led to the adoption of policies supporting the generation of new knowledge and skills. An effective means for mobilizing the necessary intellectual resources has been the contract system for research and development. [6] The Federal *Government* was faced with the need to develop complex new technologies at, and even beyond, the existing limits of scientific understanding. In meeting this need, the Government turned to private institutions, and even created new institutions rather than rely exclusively, or even primarily, on its own civil service laboratories. Such institutions bring with them their own internal management. It is this technical management capability, as much as the scientific and technical knowledge and skills themselves, that is engaged through the contract system.

The unique demands of procuring new knowledge and complex technological systems have caused a considerable transformation in Government procurement regulations. The rather mechanical manner of contractor selection, based upon price for an item that can be specified in great detail, is simply not applicable for R&D. The first departure from sealed-bid procurement was authorized by the First War Powers Act of 1941. [7] Shortly after the end of the War, the flexibility to negotiate contracts for military R&D in peacetime was authorized by the Armed Services Procurement Act of 1947. [8] The departure from traditional procurement practices was clearly recognized by President Truman who upon signing this Act into law wrote:

> The bill grants unprecedented freedom from specific procurement restrictions during peacetime. That freedom is given to permit the flexibility and latitude needed in present day national defense activities . . . . There is danger that the natural desire for flexibility and speed in procurement will lead to excessive placement of contracts by negotiation and undue reliance upon large concerns, and this must not occur. [9]

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[6] Federal Grant and Cooperative Agreement Act of 1977, Section 8.

[6] Clarence H. Danhof, Government Contracting and Technological Change, The Brookings Institution, Washington, D. C., 1968.

[7] 50 Appendix U.S.C. 601-622.

[8] 10 U.S. C. 22o2, 2303-2314, 2381, 8012a; 19 U.S.C. 1202.

[9] Report Pursuant to Section 4, Public Law 86-89, H. Rept. 1959, 86th Congress, 2d Sess. (1960), p. 11.

Despite the danger of abuse, authority to negotiate contracts for R&D was extended to the civilian agencies by the Federal Property and Administrative Services Act of 1949.10 Thus, the growing importance of science and technology to agency missions and the inherent uncertainty of R&D led to the abandonment of the more objective, traditional procurement practices in favor of the subjective selection procedures based on the perceived scientific and technical merits of a potential performer's capabilities and approach to a problem.

Such an approach places a responsibility upon executive agencies to develop the necessary expertise to select among the many technological alternatives that present themselves and to ensure that the work funded meets Government needs at a favorable price. Despite the need for the executive agency to exercise effective control, sufficient latitude must be given the performer if creative work that meets mission objectives is to be attained. Thus, a delicate balance requiring a high degree of judgment must be struck in the relationships between executive agencies and performing institutions in the procurement of R&D.

The management problems posed by such procurement relationships are strikingly similar to those posed for assistance relationships generally, as described in the previous subsection. Despite their different purposes, both relationships share in common a measure of latitude for initiative and creativity; both involve an effective sharing of responsibility; and both require Federal/non-Federal cooperation to sustain the delicate balance. These aspects reflect the uncertainty and risk in striving for a national policy objective that requires the joint efforts of the Federal Government and a non-Federal party, whether in the public or private sector. It is pertinent to note that such relationships, which were initiated for procurement in time of war and authorized only with great reluctance in peacetime, have become accepted as commonplace. It is not surprising, therefore, that for both relationships there is an inevitable tension between the provision of latitude and efforts to ensure accountability .1'

[10]40 U.S.C. 471 et seq.

'*Bruce L.R. Smith and D.C. Hague, *The* Dilemma *of* Accountability in *Modern* Government, St. Martin's Press, New York, 1971; Bruce L. R. Smith, The *New* Political Economy, Halstead Press, New York, 1975.

The adaptation of the procurement system to mobilize the Nation's scientific and technical talents has produced a whole series of remarkable technological accomplishments in the military and space areas. The question for present purposes is whether this same system can simply be redirected toward meeting civil sector needs or whether more fundamental changes are required. The performance capabilities developed in various technologies for military and space applications provided the basis for well-known civil sector innovations in electronics, computers, and commercial jet aircraft. However, the adaptation of these technologies for civil sector applications was carried out entirely by the private sector and was unplanned and unintended by the Federal Government. If stimulating technological change in a particular part of the civil sector is a public policy objective, it presumably would be more efficient, as well as more effective, to attack that problem directly rather than rely on "spinoffs" h-em military and space programs.

A wide variety of such efforts have been launched. Before World War II, Federal efforts to apply science and technology to civil sector needs were concentrated mainly in the areas of agriculture, health, mining, and civil aviation. These efforts depended largely on civil service laboratories, and in the case of agriculture, upon the land-grant colleges as well. The first major Federal effort to draw upon the contract system of research to meet a civil sector objective was that of the Atomic Energy Commission (AEC) .[12] The AEC had its roots in the wartime Manhattan Project and after the war was charged with the mission of developing peaceful uses of atomic energy. Its Power Reactor Demonstration Project in the mid-1950's was instrumental in the adoption of nuclear power. [13] In the latter part of the 1960's, a number of new agencies were created, such as the Department of Transportation, the Department of Housing and Urban Development, the Environmental Protection Agency, and the Law Enforcement Assistance Administration—all of which utilize the contract system in their research, development, and demonstration

"Harold Orlans, Contracting *for* Atoms, The Brookings Institution, Washington, D. C., 1967.

[13]Arthur D. Little, Inc., Federal Funding *of Civilian* Research and Development, Vol. 2, Part 1 (prepared for the Experimental Technology Incentives Program, National Bureau of Standards), February 1976.

efforts. With the advent of the energy crisis, the AEC was absorbed into the Energy Research and Development Administration, which subsequently was absorbed into the Department of Energy (DOE). There is an especially strong focus on commercialization in DOE. However, all of the above-mentioned agencies, as well as a number of others throughout the Federal Government, are involved in efforts to foster the adoption and use of the technologies they develop.

Nonetheless, there is a fundamental difference in the role these agencies can have in the process of technological innovation and in the roles of the Department of Defense (DOD) or the National Aeronautics and Space Administration (NASA). DOD and NASA not only procure R&D, they also procure and use the products of that R&D. Thus, in these agencies; the innovation process—from the conception of an idea through deployment and use—is under an integrated management control. Not only are technological goals set and met, but they are set and critically evaluated within the context of specific operating conditions. This measure of control over the innovation process is not available to agencies attempting to foster technological change in the civil sector.

From R&D to Use

For agencies whose mission includes the support of certain activities in the civil sector, the use of procurement to perform the R&D necessary to carry out this mission should be clearly distinguished from procurement to provide for internal needs. The use of the Federal procurement system to meet what are essentially non-Federal needs appears, in this regard, to be a mismatch between ends and means. Since an agency has no control over the adoption and use of the products of its R&D, its responsibilities might be envisioned as being limited to setting and meeting scientific and technological goals.

Transactions with non-Federal parties–the purpose of which is to meet civil sector needs through the support of R&D—would fall under the heading of assistance relationships. It is obviously desirable to accurately designate Federal/non-Federal relationships in terms of the purpose of such relationships. However, whether there is a deeper significance in the requirement to distinguish between assistance and procurement relationships depends on whether this distinction is likely to affect the conceptualization of the Federal role and responsibilities in meeting specific civil sector needs through the support of R&D. To try to answer this question, it is useful to review the record of Federal efforts to meet civil sector needs through R&D.

Experiences with demonstration projects are particularly pertinent in this regard—they serve as policy instruments for bridging the transition from R&D to use. In a companion report, OTA reviews this experience. [14] That report covers demonstrations of both social and physical technologies to compare their similarities and differences and thereby develop a better understanding of the criteria and conditions for their successful use. For demonstrations aimed at implementing policy objectives, diffusion of the technology from the site of demonstration is the measure of success. In this regard, the record of demonstration projects has been very disappointing because of only a limited number of successes in stimulating the diffusion of a technology.

The companion study concludes there are two principal factors that determine the scope of opportunity for policy implementing demonstrations: 1) the nature of the technology, and 2) the nature of the institutional environment into which the technology is introduced. In general, when a technology is sufficiently well developed to be reliably reproduced from site to site, the opportunities for diffusion are enhanced. Similarly, opportunities for the diffusion of new technologies are enhanced when the institutional participants in a given policy sector have a tradition of using the results of R&D. In such cases, the necessary means of moving new technologies from R&D into use are in place and functioning in an effective manner. A well-developed institutional environment implies a certain measure of consensus among the key participants in a policy sector as to the criteria for desirable innovations. It further im-

[14] Office of Technology Assessment, *The Role Of Demonstrations* in Federal R&D Policy, U.S. *Government* Printing *Office,* Washington, D. C., *1978* (in press).

plies an acceptance of the Federal role in that policy sector with regard to fostering technological innovations to meet national policy objectives. These factors impose certain basic constraints which determine the scope of opportunity for effectively bridging the transition from R&D to use. The distinction between assistance and procurement relationships obviously will not affect these fundamental constraints.

The potential importance of this distinction lies in its effect upon exploiting those opportunities that do exist. In this regard, the companion study reveals further factors that influence the success of demonstration projects. These include:

1. participation in the demonstration project by representatives of various segments of an institutional environment who understand the requirements for success in that policy sector,
2. initiative for a project coming from non-Federal parties, and
3. willingness of non-Federal parties to share a substantial fraction of the costs and risks of a demonstration.

These factors emphasize the need to effectively engage in Federal efforts to meet civil sector needs of the appropriate non-Federal representatives in a given policy sector. It is these non-Federal decisionmakers who ultimately determine the success or failure of technological innovation.

However, in procurement it is clearly a Federal responsibility to set the criteria for acceptable performance and to judge whether those criteria are met, Yet, Federal officials can hardly be expected to possess detailed knowledge of non-Federal users' needs. Without such knowledge, the definition of the problem at the Federal level is likely to be fundamentally deficient. Furthermore, in the absence of such knowledge, the technological pathways pursued can easily diverge from those which would meet the intended objective. Thus, the Federal responsibility to assure adequate project management in procurement is inadequate to assure critical evaluation of a technology's capacity to meet specific civil sector needs. It is therefore not surprising that the products of federally supported R&D frequently encounter difficulty in bridging the transition from R&D to use in the civil sector.

One response to the concern about getting the results of Federal R&D out of the laboratory and into use in the civil sector has been the formation of a large number of technology transfer programs. A recent directory of such programs includes descriptions of 43 different Federal technology transfer programs .15 The methods employed in these programs to promote technology transfer or research utilization include demonstration projects, colloquia, distributing reports, and field agents. The effectiveness of these programs is still problematical, inasmuch as there is little adequate evaluation of their effectiveness. 16 For R&D undertaken against a backdrop of national need, it is natural that an effort be made to promote its utilization. However, the formation of special technology transfer programs is itself symptomatic of the difficulties encountered by federally supported technologies in making the transition from R&D to use.

The approach indicated by the requirement to distinguish between assistance and procurement relationships is fundamentally different. Fostering technological innovation in the civil sector should be carefully distinguished from promoting the utilization of R&D or the transfer of technology. The latter emphasizes finding uses for the products of R&D already in hand. The former emphasizes supporting the process whereby unmet social needs are satisfied through technological change. That is, it focuses first on needs and on the overall process of the adoption and diffusion of a new technology to meet those needs. Only secondarily does it focus on the R&D required as part of that larger process.

Thus, the requirement to distinguish between assistance and procurement relationships establishes a broader context for Federal efforts to

"Federal Council for Science and Technology, ***Directory of Federal Technology Transfer,*** U.S. Government Printing Office, Washington, D. C., 1975.

[16]National Science Foundation, ***Federal*** Technology ***Transfer:*** An Analysis ***of*** Current Program Characteristics and Practices, prepared for the Federal Council for Science and Technology, 1975.

meet specific civil sector needs through R&D. It thereby provides a Government-wide, institutional means of broadening the scope of concern of Federal R&D program managers to the entire process of technological innovation, rather than just the setting and meeting of technological goals.

This is not to suggest that the use of procurement methods precludes a focus on technological innovation and the specific requirements that federally supported technologies must satisfy if they are to be adopted and used in the civil sector. Individual program managers can and have recognized such requirements. However, the designation of assistance provides an institutional rather than an individual recognition that such requirements are to be met. Consequently, it facilitates the conceptualization of the Federal role appropriate for meeting these requirements. It further allows for a systematic, rather than ad hoc, delineation of the Federal and non-Federal responsibilities most effective for meeting these requirements. The delineation of responsibilities in the procurement system is for the express purpose of meeting Federal, not non-Federal needs, and the system admits of only limited flexibility in this regard.

It should also be noted that a focus on scientific and technological goals is entirely appropriate when the principal objective is the generation of new knowledge. Insofar as such knowledge is not for the Government's own use, it would be designated assistance rather than procurement. Nonetheless, a principal focus on innovation is appropriate only when specific needs are being addressed.

It might also be noted that in its discussion of civil sector R&D, the Commission on Government Procurement focused primarily on the role of the Federal Government in building a science and technology knowledge base for innovation. In this regard, the Commission considered the important role that technological advances in military and space programs had in stimulating well-known civil sector innovations. Correspondingly, most of the Commissions discussion of the Federal role in supporting civil sector innovation was under the heading of procurement of R&D. " However, insofar as the principal purpose of individual transactions is for broad public purposes rather than the Government's own use, the recommendations of the Commission embodied in the Grant and Cooperative Agreement Act would require that such transactions be labelled assistance rather than procurement.

Before proceeding to the specific means provided by the Act for more clearly delineating Federal and non-Federal roles and responsibilities in assistance relationships, it is useful to consider the issue of assistance relationships with commercial firms.

Profitmaking Organizations

As already noted, the term *assistance* encompasses a wide variety of meanings, most of which refer to grant-type programs for State and local governments and nonprofit institutions. For example, the Grants Act of 1958[18] authorized all agencies which possessed the authority to support basic scientific research through contracts to also support such research through grants. However, it restricted the recipients of such grants to institutions of higher education and nonprofit institutions whose primary purpose is the conduct of scientific research. The Grant and Cooperative Agreement Act places no restrictions whatsoever upon candidates for assistance awards. Unless authorizing statutes exclude profitmaking organizations, they are therefore eligible for assistance awards. In view of their central role in technological change, they are clearly important candidates.

Insofar as innovation entails the deployment of commercial technologies, private gain is a prerequisite for the realization of public benefits. However, when the award of public funds entails private gain, care must be taken that such awards are made in a recognized and impartial manner. Furthermore, the connotation of assistance is generally to support and stimulate activities that provide widely distributed public benefits without

"Report of the Commission on Government Procurement, op. cit., Vol. 1, Part B.

"42 U.S.C. 1891-1893.

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direct private gain. The use of the term *assistance* in this context, therefore, has the potential for creating serious confusion and deserves further attention.

It is important to distinguish between assisting ongoing functions in the civil sector and assisting the process of technological innovation. In assisting the activities of State and local governments and nonprofit institutions, aid often is awarded on the basis of need or geographical distribution. The connotation of subsidy is perfectly consistent with public policy objectives. The recipients of such assistance awards provide a clear locus of responsibility for carrying out the reasonably well-defined functions and activities being assisted.

However, no one can be responsible for technological change per se. Executive agencies may be charged by Congress with supporting and fostering innovation in various policy sectors, but they exercise no administrative control over the process itself. Innovation involves a variety of participants having different roles and being driven by their own particular motivations.

Regarding State and local governments, there is little need to distinguish between assisting their ongoing delivery of services and assisting improvements in the delivery of those services through technological innovation. Regarding commercial firms, however, it is essential to distinguish between assisting the process of technological innovation and assisting a particular firm. The purpose of the assistance is clearly a widespread distribution of public benefits, not the welfare of a particular firm.

The Government's objectives and those of the firm may be in agreement as far as achieving the production, use, and widespread diffusion of a socially beneficial technology. Insofar as market incentives are deemed inadequate to bring about such a technology without Federal assistance, there is a common objective shared by the Government and the firm. However, there is also a sense in which the firm and the Government have an inherent divergence of interests. Whereas the firm seeks to capture for itself as much of the benefits of the innovation as it can, the Government seeks to assure a widespread distribution of such benefits at the lowest cost to the general public. In a market economy, competition is the principal means relied upon to accomplish these public objectives.

Competition also provides a means for making procurement awards in a recognized and impartial manner. Competitive bidding not only serves the Government's interest in obtaining a favorable price; it is intended also to assure that the Federal Government selects among alternative suppliers in an equitable manner.

However, the means for selecting among alternative recipients of assistance awards are relatively undeveloped. Thus, Federal administrators generally have tended to use the procurement system for supporting efforts such as development and demonstration projects to meet specific civil sector needs. The explicit inclusion of such efforts within the class of assistance relationships points up the need to develop a system for making assistance awards that are equitable as well as effective.

If assistance to a firm is effective, it would tend to give that firm at least a temporary competitive advantage. Such assistance also runs the risk of displacing private funds with public funds, thereby enhancing private gain without corresponding increases in public benefits. Openly competitive assistance awards would minimize these difficulties. Moreover, the Grant and Cooperative Agreement Act encourages the use of competition, where appropriate, in the making of assistance awards.

It should be emphasized that procedures for making competitive assistance awards to *com*mercial firms ought to differ in fundamental ways from the corresponding procedures for procurement awards. Assistance awards would be aimed at stimulating the widespread adoption and diffusion of a new technology. However, Federal officials generally would have inadequate knowledge of the market factors which govern a new technology's rate of adoption and diffusion. And contrary to the case in making procurement awards, Federal officials likely would lack the knowledge necessary for setting the terms of an award to ensure that it meets the desired objective. Thus, in setting the terms for such competitive awards, there would be a need for in-

volvement of representatives from the various segments of a given policy sector who understand the requirements for successful innovation in that sector. It would clearly be the responsibility of Federal officials to assure that this be done in an open manner and with all-interested parties represented to protect against abuse.

Such an approach presumes that there is a basis for cooperative dialogue between the Federal Government and the non-Federal participants in a given policy sector. Without mutual acceptance of the Federal and non-Federal roles and responsibilities in a given policy sector, the opportunity for effective Federal support of technological innovation in that sector is limited.

In the next chapter, we briefly discuss the issue of openly competitive assistance awards within the context of the OMB study. We also offer an example of how the terms for such awards might be set in the hypothetical scenario presented in appendix B. However, it is well beyond the scope of this report to prescribe detailed procedures that would strike the proper balance between equity and effectiveness in making assistance awards to commercial firms. Rather, the intent is to focus attention on an issue raised by the requirement of the Grant and Cooperative Agreement Act to distinguish between assistance and procurement relationships.

Chapter **III**

Framework of Relationships

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Framework of Relationships

The Grant and Cooperative Agreement Act establishes criteria for the use of contracts, grants, and cooperative agreements so that these legal instruments reflect the underlying relationships between executive agencies and non-Federal parties. We considered in the previous section the implications of distinguishing assistance relationships as a class from procurement relationships without reference to the specific means the Act employs for making this distinction. As recommended by the Procurement Commission, the Act also distinguishes between different types of assistance relationships. For each relationship distinguished, the Act requires that a specific legal instrument be employed to reflect that relationship.

The framework of relationships thereby established is intended to provide a first step toward the development of a more consistent and effective set of practices for the administration of Federal assistance. Recognizing that it is only a first step, the Act mandates a 2-year comprehensive study of Federal assistance to be conducted by the Director of OMB. We therefore pose issues important to consider in this study.

Choice of Legal Instruments

The Procurement Commission examined the administration of different assistance programs by various agencies. It found that the enabling and appropriation statutes often are inconsistent in specifying the circumstances for using grants. Furthermore, the agencies' perceptions of what is required to effectively administer programs are often incompatible with the statutes' requirements. Agencies generally prefer to use grants for transactions that require little involvement or participation during performance. However, the statutes often require the use of grants for programs that the agencies believe require substantial agency participation during performance. The Commission also found that some agencies use grants for procurement purposes and procurement contracts for assistance purposes.

The situation is further confused by the lack of any precise meaning for the terms "grant" or "grant-in-aid, " which cover a range of transactions from the simple to the complex. The Procurement Commission sought ways to draw operationally significant distinctions between grant-type transactions. However, it found that on an operational level none of the usual distinctions, such as discretionary grant vs. mandatory grant, formula grant vs. project grant, or categorical grant vs. block grant, proved adequate. Similarly, it found distinctions based on factors such as cost-sharing or the type of recipient to be inadequate operational distinctions.

To bring greater consistency and effectiveness to the administration of Federal assistance, the Commission recommended distinguishing between three basic relationships and restricting the use of each legal instrument to one of these underlying relationships. The three basic relationships distinguished provide broad operational definitions for the roles and responsibilities of the executive agency and the non-Federal party. The Grant and Cooperative Agreement Act embodies this recommendation with one exception.

The first type of relationship is that of procurement. Here the "executive agency is ultimately responsible for assuring performance. The agency must therefore establish the specific requirements to be met, judge the acceptability of the product or service against those standards, monitor the work, and be involved to the extent necessary to assure timely and satisfactory performance. It has the right to unilaterally change the work and terminate it for default, if necessary. The Act requires that only ***contracts*** be used for procurement relationships.

The second type of relationship is an assistance relationship where the executive agency has

little or no need for involvement during performance of the activity assisted. The agency's responsibility lies in defining the scope of the work and in such monitoring as may be necessary to assure that the work is performed within the agreed-upon scope. It is the recipient who ultimately is responsible for assuring performance and expending funds within this agreed-upon scope, as in a basic research grant. The Act requires that a type of ***grant*** be used to reflect this relationship. The scope of the work to be performed may be either broadly or narrowly defined. The central point is that the ultimate responsibility for assuring performance lies with the recipient, not the agency. Although grants currently account for the great bulk of assistance relationships,it should be noted that existing grants frequently do not conform to this description.

The third type of relationship also is an assistance relationship, but one in which the agency is substantially involved during performance. In this case, responsibility for assuring performance is shared by the agency and the recipient. Correspondingly, defining the performance roles of the respective parties also is a shared responsibility. Examples of this type of relationship are provided in large, project-type assistance awards where executive agencies are actively involved during performance because of technical or managerial complexity, a need for coordination with other federally supported projects, or a need for involvement to launch a new activity. The Act requires that a type of ***cooperative agreement*** be used to reflect these relationships.

One exception to these three basic relationships should be noted. Section 4(2) of the Act provides that a type of procurement contract shall be used in specific instances where an executive agency determines it would be appropriate. Thus, a type of procurement contract could be used for an assistance relationship in specific instances. For example, in a two-step transaction, a Federal agency could first obtain medicines through a procurement contract, and then provide the medicines to non-Federal hospitals through grants.

'*Report of the Committee on Governmental Affairs*, U.S. Senate, S.431, Federal Grant and Cooperative Act of 1977, 95th Congress, U.S. Government Printing Office, Washington, D. C., 1977, p. 9.

Table 1 presents a comparison of the three basic relationships and the legal instruments used to reflect them. It describes the Federal and non-Federal roles, responsibilities, involvement, and rights in both procurement and alternative assistance relationships. All of these alternative relationships can be used within a single program. This point is well illustrated by the hypothetical scenario constructed in appendix B.

The Act excludes from the definition of grant or cooperative agreement any agreement which would provide only direct Federal cash assistance to individuals, a subsidy, a loan, a loan guarantee, or insurance.

Use of Cooperative Agreements

Federal assistance often has been equated with the provision of financial assistance alone. However, the cooperative agreement reflects a relationship where substantial agency involvement during performance of the assisted activity is an integral part of the assistance.

Before passage of the Grant and Cooperative Agreement Act, DOE already had the authority to use cooperative agreements. Although DOE has little operating experience with this important new instrument, it is instructive to briefly consider the approach taken toward its use. The following excerpt from the Energy Research and Development Administration (ERDA) *Federal* Assistance *Manual* emphasizes the central role of negotiation in arriving at a mutual understanding of the roles and responsibilities of the parties to a cooperative agreement:

> . . . . under a cooperative agreement it is the partner/joint venture relationship itself which in each case is the subject of negotiation. Rather than having a host of non-negotiable terms and conditions, the rights of the parties are the subject of negotiation, The object of the negotiation of a cooperative agreement is to establish a "business agreement" which carefully defines the performance responsibilities of the parties, and describes the proper allocation of rights appropriate to the parties involvement and investment.2

[2]U.S. Energy Research and Development Administration, Federal Assistance *Manual* (fifth draft), March 1977, p. 503.

Table 1.—A Context for Federal Transactions*

	Procurement contract	Cooperative agreement	Grant
Federal role	"Purchaser"	"Partner" or "active supporter"	"Patron" or "passive supporter"
Primary responsibility	Federal	Shared	Recipient
Type of Federal involvement	Whatever involvement is necessary, consistent with Federal procurement regulations	Substantial management or technical involvement during performance on specific decisions, substanrds, provision of guidance or technical assistance, collaboration	Federal delegation or devolvement of decisions and approvals
Right to redirect or change within scope	Unilateral Federal right to change or redirect	Recipient right to change or redirect, subject to Federal advice, assistance, persuasion, or concurrence	Recipient right to change or redirect

● Modified version of table in: Robert D. Newton, "Contracting Under Grants: The Need to Define the Federal Role," *Public Contract Law Journa/* 9:1 (June 1977), pp. 35-44.

As in a joint venture between two private parties, the whole range of factors affecting the venture and its outcome are the subject of negotiation. These include performance responsibilities, cost-sharing and cost recoupment, data and patent rights, termination rights and procedures, cost-accounting, subcontracting, and liability and indemnification. Although cost-sharing is a common feature of cooperative agreements, as it is with grants, it should be noted that the criteria established by the Act for the use of these instruments does not require cost-sharing.

Much attention has been given to the question of patent rights for the products of Government-supported R&D, and there is as yet no uniform, Government-wide patent policy, The approach reflected here is to treat patent rights merely as one among many items to be negotiated between an agency and a non-Federal party. Such flexibility is consistent with the fact that the public benefits from the support of R&D come only from the widespread deployment of the products of that R&D in the civil sector. Since experience clearly indicates that there is no assurance of realizing such benefits from Federal support of R&D, it is not apparent that the attention given to patents is fully warranted. In part, this attention may derive from the focus on utilizing federally supported R&D, as opposed to fostering technological innovation in the civil sector. In the former perspective, the R&D is perceived as something of public value. In the latter perspective, public benefits are perceived as deriving from the widespread deployment of socially beneficial technologies, and Federal ownership rights are no more important than a number of other issues to be negotiated in seeking an accommodation of public and private interests. However, all agencies do not have the statutory latitude to deal with patent rights in this manner. The explicit focus on Federal assistance established by the Grant and Cooperative Agreement Act may provide an opportunity for Congress to reconsider this question in the light of assistance objectives.

Flexibility in negotiating such matters as cost-sharing and data and patent rights presupposes a clear understanding on the part of an executive agency of its objectives and priorities. It further presupposes an understanding of the risks and rewards for the non-Federal parties. Such factors provide the necessary context for an agency to negotiate the terms of a joint-venture relationship.

In testimony before Congress on this legislation, the Department of Health, Education, and Welfare objected that the cooperative agreement is unnecessary since any degree of Federal agency involvement in an assistance relationship could be assured simply by adding the necessary provisions onto a grant.[3] However, it should be

[3] Hon. John R. Ottina, in Hearings before the Ad Hoc Subcommittee on Federal procurement and the Subcommittee on Intergovernmental Relations of the Committee on Government Operations, U.S. Senate, on S.3514, Federal Grant and Cooperative Agreement Act of 1974, 93d Congress, U.S. Government Printing Office, Washington, D. C., 1974, p. 64.

emphasized that the principal motivation in establishing the Government-wide authority to use cooperative agreements is not some unique property inherent in this legal instrument as opposed to a grant or contract. Rather, the Procurement Commission believed that assistance relationships involving substantial agency involvement constituted an operationally significant class of relationships which should be distinguished by a separate legal instrument. It was felt that formally recognizing this class of relationships would protect the integrity of the procurement contract, on the one hand, and the traditional grant, on the other. Both instruments, especially the grant, were being undermined by their use in inappropriate circumstances.

Coordinating the activities of the various institutions that need to be involved in technological innovation is likely to provide much of the basis for the substantial Federal involvement that characterizes the cooperative agreement. Where these institutional linkages are already in place, and there is a tradition of drawing upon R&D to better meet user needs, technological innovation proceeds without direct Federal support or stimulation, so long as the necessary incentives are not substantially altered. Such institutional environments already draw effectively upon the science and technology knowledge base. In these cases, the Federal Government can ensure the satisfaction of unmet civil sector needs through directing adequate resources to the enrichment and expansion of that knowledge base. However, in the absence of the necessary linkages between users, suppliers, and R&D performers, technological innovation in the civil sector cannot proceed.

This situation is fundamentally different than in procurement relationships. The Federal Government has very effectively utilized procurement relationships to draw upon a wide range of R&D performing institutions —Government-owned, contractor-operated laboratories; universities; nonprofit institutions; and commercial firms. However, fostering technological innovation requires more than matching technological opportunities to user needs. It also requires the commitment of resources. Without engaging those non-Federal parties who have the incentive and the resources necessary for making technological change actually happen, there is no purposeful fostering of such change. Thus, R&D-performing institutions must be effectively linked to those institutions that actually produce and deliver goods and services, whether in the public or private sector, if the assistance of innovation is to be effective. Forging the necessary linkages where they do not exist is likely to require substantial involvement on the part of executive agencies. A hypothetical example of such involvement, to aggregate a local government market, is presented in appendix B.

OMB Study

The effectiveness of the Grant and Cooperative Agreement Act in stimulating technological innovation depends entirely on how well it is implemented. Consequently, the OMB study of Federal assistance is of central importance.

Purposes of the study are to develop a better understanding of alternative means of implementing Federal assistance programs and determine the feasibility of developing a comprehensive system of guidance for such programs. To the extent practicable, the study is to involve representatives of the executive agencies, the Congress, the General Accounting Office, State and local governments, other recipients, and interested members of the public.

The Procurement Commission already has offered a number of suggestions on how this study might proceed, as a means of improving the management of Federal assistance. The Commission proposed focusing attention on generalizing management methods applicable to whole categories of assistance programs.[4] This proposed focus contrasts with the current focus on achieving the objectives of hundreds of individual programs. The Commission believed such generalizations would contribute not only to greater simplicity and consistency in the administration of Federal assistance, but to greater program effectiveness as well. In developing such generaliza-

[4] *Report* of *Commission on Government Procurement,* op. cit., Vol. **3,** Part F, pp. 168-171.

tions, the Commission recommended considering the whole range of program inputs which determine or influence program outputs. These inputs include both formal and informal interactions between Federal agencies and non-Federal parties before, during, and after the activity assisted. This empirical approach would reflect not only the state of current practice, but indicate opportunities for improvement as well.

Although the approach of the present report has been primarily at the conceptual, rather than the descriptive level, it is also aimed at defining opportunities for improvements in current practice. The following issues are important to consider in the OMB study:

1. **Program Categories.** -In civilian-oriented R&D programs, it is important to distinguish between categories of programs aimed primarily at generating new knowledge, on the one hand, and fostering technological innovation, on the other. Distinguishing the latter as a separate category would focus attention on the important differences between innovation goals and R&D goals. It also would focus attention on the administrative practices most effective in achieving innovation goals.

2. **Non-Federal Involvement.** -To help ensure that the innovation process, once initiated, continues beyond the stages of Federal support, non-Federal users, suppliers, and other interested parties should be involved in the development of a programmatic strategy. Guidelines for their effective involvement need to be developed to ensure that information is developed about risks, costs, markets, and the capacity and incentive of non-Federal participants to carry through with the innovation process to the point where widespread public benefits ensue.

3. **Alternative Approaches. -The involvement** of non-Federal parties also helps to ensure that alternative approaches are considered in defining a basis for effective Federal/non-Federal cooperation in achieving a common objective. Thus, for example, if the principal barrier to bringing about a desired innovation is perceived by non-Federal decisionmakers as being nontechnical in nature, Federal support for developing the technology would generally be ineffective in stimulating the desired innovation. If the nontechnical barrier were removed, Federal support for developing the technology might become unnecessary. The point is that the full range of alternative approaches toward attaining a desired innovation are far more likely to be identified and adequately assessed with non-Federal participation.

   The formal methods used for evaluating alternative approaches in major systems acquisitions provide a provocative analogy in this regards Obviously, any formal methods for evaluating alternative approaches toward meeting assistance objectives would have to be specifically developed to meet the unique needs of cooperative Federal/non-Federal efforts. Nonetheless, their consideration emphasizes the Federal responsibility in managing a strategic approach for making technological change actually happen.

4. **Competitive Assistance Awards.** -The need for a strategic approach also is apparent in considering competitive assistance awards to commercial firms along the lines discussed in the previous section. Both DOE and the National Science Foundation have developed procedures for making assistance awards on a competitive basis through program opportunity notices, program research and development announcements, and program solicitations.[6] These methods are suitable for selecting among alternative proposals on the basis of their scientific or technical merit. However, for fostering the adoption and widespread

[5] *Report of* Commission *on Government Procurement,* op. cit., Vol. 2, Part C.

[6] Energy Research and Development Administration, *Federal Assistance Manual* (sixth draft), April 1977, Sections 211 and 301; National Science Foundation, *Grant Policy Manual,* Section 202, FR 42:20, January 1977.

diffusion of a new technology, the use of such methods presumes that Federal officials possess the knowledge of market factors that govern a technology's rate of adoption and diffusion. Since this generally would not be the case, there is a need to develop procedures for making competitive assistance awards in which non-Federal parties who do possess this knowledge would be involved in setting the terms for the awards. There is an obvious need for executive agencies to assure that the terms for such openly competitive awards be set in a public manner with all important stakeholders represented. The point to be emphasized here is that it would be easier to strike an adequate balance between equity and effectiveness if such awards were an integral part of a recognized, well-articulated strategy for achieving a desired objective.

5. **Negotiating Cooperative Agreements.–The** guidelines established for negotiating cooperative agreements will set the framework within which broad public interests and the particular interests of non-Federal partners in a cooperative agreement can be accommodated. Negotiating prerequisites for executive agencies are: 1) a clear understanding of public policy objectives; 2) the steps necessary to attain those objectives; 3) the risks and awards involved for the non-Federal party; and 4) how a particular transaction fits into the larger programmatic strategy. Within this context, the need for flexibility in negotiating such matters as cost-sharing and data and patent rights should be carefully assessed.
6. **Personnel Policy.** -Effective implementation of the Grant and Cooperative Agreement Act depends heavily on the capabilities and attitudes of Federal personnel. It is therefore essential to have adequate incentives for Federal personnel to become effectively engaged in cooperative efforts with non-Federal parties to stimulate technological innovation.

Chapter IV

Implications for Congressional Oversight



Chapter IV

Implications for Congressional Oversight

The Grant and Cooperative Agreement Act places Federal support of civil sector R&D explicitly within the larger context of Federal assistance. The effectiveness of this R&D in producing public benefits is viewed therefore from the perspective of Federal/non-Federal relationships. From this perspective, effectiveness and public accountability are two closely related issues. Accountability is frequently interpreted as exercising control over the expenditure of public funds. In a larger sense, however, accountability is being answerable to society for its public investments. Assuring the effectiveness of those investments in producing the intended public benefits, therefore, becomes an essential element of accountability. As previously noted, the Grant and Cooperative Agreement Act expresses no policy preference as to whether there should be more or less Federal involvement or control in assistance relationships. Rather, it establishes a framework of relationships that require explicit delineation of the Federal and non-Federal roles and responsibilities most effective for achieving public policy objectives. It is at the level of choosing among alternative Federal and non-Federal roles and responsibilities that effective management control of Federal assistance is exercised.

This conception of accountability and effective management control is essential for Federal efforts to foster technological innovation. The central fact to bear in mind in fostering innovation is that successful innovation requires the commitment of resources by those non-Federal parties involved in the production and delivery of goods and services, whether in the public or private sectors.

Only to the extent that Federal agencies are successful in linking the objectives of public policy to the willingness of non-Federal parties to undertake risks and commit resources can they be successful in bringing about technological innovation. Thus, effective management control is essential at the level of choosing among the alternative means of providing assistance that might lead to this objective. Obviously, individual transactions also must be managed in a manner appropriate to the character of the relationship. However, it is at the level of choosing among alternative roles and responsibilities that the Grant and Cooperative Agreement Act places the greatest emphasis for attaining the objectives of Federal assistance.

This stress upon choosing among alternatives is especially appropriate for assisting technological innovation. Innovation is an inherently uncertain and high-risk venture, so failure often is inevitable. Therefore, redirecting or terminating a project is in itself no indication of inadequate project management. The support of R&D is a limited policy instrument for achieving social and economic goals. Failure to achieve a linkage between public policy objectives and the necessary commitment of resources by non-Federal parties may indicate a need for other policy measures, rather than inadequate mar agement by executive agencies.

Congressional Guidelines

The assistance perspective and framework of relationships established by the Grant and Cooperative Agreement Act could be very helpful in evaluating the effectiveness of Federal efforts to stimulate technological change in the civil sector. The following questions are designed to assist the Congress in overseeing these Federal efforts:

1. Is the distinction clearly drawn between: (1) generating new knowledge to expand the range of technological options, and (2) fostering specific technological innovations'?

In the former case, R&D goals are appropriate; in the latter case, innovation goals are appropriate. A distinguishing feature of innovation goals is that their attainment lies beyond the limited period of Federal support and involvement. Thus, executive agencies must develop effective program strategies which engage those non-Federal parties that have the capacity and incentive to actually deliver the goods and services from which public benefits derive. Otherwise, the realization of public benefits is simply left to chance.

As previously discussed, in policy sectors where there is a tradition of using the results of R&D and the necessary institutional linkages are in place and functioning, the Federal Government can effectively satisfy unmet civil sector needs through expanding the range of technological options. Where such linkages are inadequate, however, expanding the range of technological options is unlikely to lead to the adoption and use of new technology without further efforts to foster specific innovations. It is therefore essential that executive agencies correctly analyze the institutional environments they encounter in each particular circumstance and adopt goals appropriate to each situation.

2. Are the Federal and non-Federal roles and responsibilities appropriate to assistance relationships reflected in the use of alternative legal instruments?

Assistance relationships imply a cooperative effort between the Federal Government and non-Federal parties in achieving a common objective. The cooperative nature of assistance relationships is especially important in achieving innovation goals, since the attainment of these goals lies beyond the limited period of Federal involvement and support. Thus, in implementing a cooperative assistance perspective, the retention of the same measure of Federal control as in a procurement contract is likely to be the exception rather than the rule. The introduction of the cooperative agreement on a Government-wide basis provides a means for sharing responsibility with non-Federal parties while retaining the degree of Federal involvement deemed necessary to achieve public policy objectives.

The relative proportion of assistance relationships handled through contracts, cooperative agreements, and grants readily reveals the overall extent of an executive agency's control or involvement. Thus, the framework of assistance relationships reveals perceptions at the operating program level as to what level of control or involvement is most effective for attaining mission objectives. The framework of assistance relationships, therefore, offers the opportunity to require of executive agencies explicit rationales as to how a particular level of control or involvement is related to their mission.

One of the purposes of the Grant and Cooperative Agreement Act is to help eliminate unnecessary administrative requirements of recipients of Federal awards through clarifying the operational roles and responsibilities of both executive agencies and non-Federal recipients. The establishment of a framework of Federal/non-Federal relationships facilitates congressional shaping of policy on the extent of Federal involvement or control in the assistance of non-Federal activities, rather than such policy being shaped, as it were by default, through the promulgation of unnecessary rules and regulations.

3. Are program strategies for achieving innovation goals systematically developed?

As previously emphasized, technological innovation requires the commitment of resources and the acceptance of risk by non-Federal parties. Therefore, stimulation of innovation should be oriented toward engaging those non-Federal parties, whether in the public or private sector, who have the capacity and incentive to actually produce and deliver the desired goods and services. Developing and assessing alternative strategies for accomplishing this goal requires the involvement of interested non-Federal parties who understand the conditions for successful innovation in a particular policy sector.

Such program strategies provide the necessary context for making informed choices among alternative legal instruments in individual transactions. Such strategies also provide the context for making assistance awards on an openly competitive basis. The key point is that an agency mission to stimulate socially desirable innovations in

a particular policy sector implies the responsibility to develop and manage program strategies that lead to that goal.

Such strategies are pertinent for assessing the causes of failure when it occurs. As already noted, innovation is an inherently uncertain venture, and failure often is inevitable. However, if an agency has exhibited a pattern of adequate management, and has attempted to engage the appropriate non-Federal parties, then failure may simply indicate the limitations of R&D as a policy instrument for achieving a particular objective. The emphasis upon choosing among alternative roles and responsibilities and exercising management control at a strategic level offers a means of reconciling the demands of accountability with the inherent risk of assisting innovation.

4. Is the potential of a uniform Government-wide framework for systematically learning which program inputs produce the desired program outputs being fully exploited by executive agencies?

Congress seeks to ensure the integrity of the management process in executive agencies, so that set policies can be effectively implemented. In this regard, the establishment of a uniform framework for assistance relationships would greatly facilitate more effective project and program evaluation. Moreover, a Government-wide framework makes possible meaningful comparisons between different agencies. If the OMB study mentioned earlier is successful in developing more adequate administrative practices for assisting technological innovation, the potential for systematically learning on a Government-wide, institutional basis what works and what does not could be enhanced even further. Thus, if the opportunity for improving program management is fully exploited, an understanding of which program inputs produce the desired outputs could be systematically acquired.

5. Are the limitations, as well as the opportunities of R&D as a policy tool for meeting social and economic needs being fully reflected in Federal assistance of innovation?

In seeking reauthorizations and annual appropriations for their programs, it is natural that executive agencies emphasize the opportunities their programs offer for dealing with important national problems. However, the limitations of R&D as a policy instrument also provide important information to Congress in the ongoing formulation and reformulation of national policy. The mere matching of technological opportunities and user needs reveals little in this regard. However, efforts designed to lead to the commitment of the non-Federal resources necessary for technological change should reveal the extent to which such commitments **can** be linked to public policy objectives. Where such a linkage appears infeasible, further policy measures may be required if the objective is to be attained.

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The Grant and Cooperative Agreement Act clarifies the basis for relationships between the Federal Government and non-Federal parties in the support and stimulation of technological change in the civil sector. If the provisions of the Act are effectively implemented, the R&D system sustained by the Federal Government for the purpose of meeting civil sector needs will be much more explicitly oriented toward meeting those needs than heretofore. This R&D system should therefore become more responsive to the range of non-Federal parties and institutions it is intended to serve. Such responsiveness should lead to more effective exploitation of opportunities for meeting social and economic needs through R&D—while recognizing 1) the limitations of this policy instrument and 2) the need for its effective integration with other policy instruments in meeting public policy objectives.

Appendixes



Appendix A

Text of Federal Grant and Cooperative Agreement Act of 1977

Public Law 95-224
95th Congress

An Act

To distinguish Federal grant and cooperative agreement relationships from Federal procurement relationships, and for other purposes.

Feb. 3, 1978
H.R. 7691]

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That this Act be cited as the "Federal Grant and Cooperative Agreement Act of 1977".

Federal Grant and Cooperative Agreement Act of 1977.
41 USC 501 note.

FINDINGS AND PURPOSE

SEC. 2. (a) The Congress finds that—

41 USC 501.

(1) there is a need to distinguish Federal assistance relationships from Federal procurement relationships and thereby to standardize usage and clarify the meaning of the legal instruments which reflect such relationships;

(2) uncertainty as to the meaning of such terms as "contract", "grant", and "cooperative agreement" and the relationships they reflect causes operational inconsistencies, confusion, inefficiency, and waste for recipients of awards as well as for executive agencies; and

(3) the Commission on Government Procurement has documented these findings and concluded that a reduction of the existing inconsistencies, confusion, inefficiency, and waste is feasible and necessary through legislative action.

(b) The purposes of this Act are-

(1) to characterize the relationship between the Federal Government and contractors, State and local governments, and other recipients in the acquisition of property and services and in the furnishing of assistance by the Federal Government so as to promote a better understanding of Federal spending and help eliminate unnecessary administrative requirements on recipients of Federal awards;

(2) to establish [lovet'r~llic]~t-wide criteria for selection of appropriate legal instruments to achieve uniformity in the use by the executive agencies of such instruments, a clear definition of the relationships they reflect, and a better understanding of the responsibilities of the parties;

(3) to promote increased discipline in the selection and use of types of contract, grant agreement, and cooperative agreements and to maximize competition in the award of contracts and encourage competition, where deemed appropriate, in the award of grants and cooperative agreements.; and

(4) to require a study of the relationship between the Federal Government and grantees and other recipients in Federal assistance programs and the feasibility of developing a comprehensive system of guideline for the use of grant and cooperative agreements, and other forms of Federal assistance in carrying out such programs.

DEFINITIONS

41 USC 502.

SEC. 3. As used in this Act, the term—

(1) "State government" means any of the several States of the United States, the District of Columbia, the Commonwealth of Puerto Rico, any territory or possession of the United States any agency or instrumentality of a State, and any multi-State, regional, or interstate entity which has governmental functions;

(2) "local government" means any unit of government within a state, a county, municipality, city, town, township, local public authority, special district, intrastate district, council of governments, sponsor group representative organization, other interstate government entity, or any other instrumentality of a local government;

(3) "other recipient" means any person or recipient other than a State or local government who is authorized to receive Federal assistance or rocurement contracts and includes any charitable or educationafinstitution.;

(4) "executive agency" means nny executive department as defined in section 101 of title 5, United States Code, a military department as defined in section 102 of title 5, United States Code, an independent establishment as.defined in section 104 of title 5, United States Code (except that it shall not include the General Accounting Office), a wholly owned Government corporation; and

(5) "grant or cooperative agreement" does not include any agreement under which only direct Federal cash assistance to individuals, a subsidy, a loan, a loan guarantee, or insurance is provided.

USE OF CONTRACTS

41 USC 503.

SEC. 4. Each executive agency shall use a ty e of procurement contract as the legal instrument reflecting a re lationship between the Federal Government and a State or local government or other recipient—

(1) whenever the principal purpose of the instrument is the acquisition, by purchase, lease, or barter, of property or services for the direct benefit or use of the Federal Government; or

(2) whenever an executive agency determines in a specific instance that the use of a type of procurement contract is appropriate.

USE OF GRANT AGREEMENTS

41 USC 504.

SEC. 5. Each executive agency shall use a type of grant agrecment as the legal instrument reflecting a relationship between the Federal Government and a State or local government or other recipient whenever—

Transfers

(1) the principal purpose of the relationship is the transfer of money, property, services, or anything of value to the State or local government or other recipient in order to accomplish a public purpose of support or stimulation authorized by Federal statute, rather than acquisition, by purchase, lease, or barter, of property or services for the direct benefit or use of the Federal Government; and

(2) no substantial involvement is anticipated between the executive agency, acting for the Federal Government, and the State or local government or other recipient during performance of the contemplated activity.

USE OF COOPERATIVE AGREEMENTS

SEC. 6. Each executive agency shall use a type of cooperative agreement as the legal instrument reflecting a relationship between the Federal Government and a State or local government or other recipient whenever- 41 USC 505.

(1) the principal purpose of the relationship is the transfer of money, property, services, or anything of value to the State or local government or other recipient to accomplish a public purpose of support or stimulation authorized by Federal statute, rather than acquisition, by purchase, lease, or barter, of property or services for the direct benefit or use of the Federal Government; and Transfers.

(2) substantial involvement is anticipated between the executive agency, acting for the Federal Government, and the State or local government or other recipient during performance of the contemplated activity.

AUTHORIZATIONS

SEC. 7. (a) Notwithstanding any other provision of law, each executive agency authorized by law to enter into contracts, grantor cooperative agreements, or similar arrangements is authorized and directed to enter into and use types of contracts, grant agreements, or cooperative agreements as required by this Act. Contracts, grant or cooperative agreement. 41 USC 506.

(b) The authority to make contracts, grants, and cooperative agreements for the conduct of basic or applied scientific research at nonprofit institutions of higher education, or at nonprofit organizations whose primary purpose is the conduct of scientific research shall include discretionary authority, when it is deemed by the head of the executive agency to be in furtherance of the objectives of the agency, to vest in such institutions or organizations, without further obligation to the Government, or on such other terms and conditions as deemed appropriate, title to equipment or other tangible personal property purchased with such funds. Scientific research.

STUDY OF FEDERAL ASSISTANCE PROGRAMS

SEC. 8. The Director of the Office of Management and Budget, in cooperation with the executive agencies, shall undertake a study to develop a better understanding of alternative means of implementing Federal assistance programs, and to determine the feasibility of developing a comprehensive system of guidance for Federal assistance programs. Such study shall include a thorough consideration of the findings and recommendations of the Commission on Government Procurement relating to the feasibility of developing such a system. The Director shall consult with and to the extent practicable, involve representatives of the executive agencies, the Congress, the General Accounting Office, and State and local governments, other recipients and other interested members of the public. The result of the study shall be reported to the Committee on Government Operations of the House of Representatives and the Committee on Governmental Affairs of the Senate at the earliest practicable date, but in no event later than two years after the date of enactment of this Act. The report on the study shall include (1) detailed descriptions of the alternative means of implementing Federal assistance programs and of the circumstances in which the use of each appears to be most desirable, (2) detailed 41 USC 507. Contents. Consultation. Report to congressional committees.

descriptions of the basic characteristics and an outline of such comprehensive system of guidance for Federal assistance programs, the development of which may be determined feasible, and (3) recommendations concerning arrangements to proceed with the full development of such comprehensive system of guidance and for such administrative or statutory changes, including changes in the provisions of sections 3 through 7 of this Act, as may be deemed appropriate on the basis of the findings of the study.

GUIDELINES

41 USC 508.

SEC. 9. The Director of the Office of Management and Budget is authorized to issue supplementary interpretative guidelines to promote consistent and efficient use of contract, grants agreement, and cooperative agreements as defined in this Act.

REPEALS AND SAVINGS PROVISIONS

Repeal; effective date.

SEC. 10. (a) The Act entitled "An Act to authorize the expenditure of funds through grants for support of scientific research, and for other purposes", approved September 6, 1958 (72 Stat. 1793; 42 U.S.C. 1891 and 1892), is repealed, effective one year after the date of enactment of this Act.

41 USC 501 note.

(b) Nothing in this Act shall be construed to render void or voidable any existing contract, grant, cooperative agreement, or other contract, grant, or cooperative agreement entered into up to one year after the date of enactment of this Act.

41 USC 509.

(c) Nothing in this Act shall require the establishment of a single relationship between the Federal Government and a State or local government or other recipient on a jointly funded project, involving funds from more than one program or appropriation where different relationships would otherwise be appropriate for different components of the project.

Excepted transactions.
41 USC 501 note.
Expiration date.

(d) The Director of the office of Management and Budget may except individual transactions or programs of any executive agency from the application of the provisions of this Act. This authority shall expire one year after receipt by the Congress of the study provided for in section 8 of this Act.

Approved February 3, 1978.

LEGISLATIVE HISTORY:

HOUSE REPORT No. 95-481 (Comm. on Government Operations),
SENATE REPORT No. 95-449 accompanying S. 431 (Comm. on Governmental Affairs).
CONGRESSIONAL RECORD:
Vol. 123 (1977): Sept. 27, considered and passed House.
Oct. 1, considered and passed Senate, amended, in lieu of S. 431.
Vol. 124 (1978): Jan. 19, House agreed to Senate amendment.

Appendix B

A Scenario for Innovation

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Introductory Note

The real significance of the Grant and Cooperative Agreement Act for stimulating technological change depends on its impact upon major problem areas such as energy, transportation, housing, sewage treatment and so forth. However, any scenario which attempts to deal realistically with one of these major problem areas from the assistance perspective established by the Act would constitute a major undertaking in itself. Furthermore, it would be necessary to delineate the similarities and differences in the hypothetical scenario relative to actual past or current efforts.

To avoid these difficulties, a problem of more modest dimensions that has no significant history of past efforts to deal with it has been chosen., Thus, it is the approach to a problem from the assistance perspective, rather than the problem itself, which the scenario presented in this appendix is intended to illustrate.

A Scenario for Innovation

This scenario for innovation illustrates how a Federal agency has worked to foster a quiet revolution in the administration of bonded indebtedness by county and municipal governments. The description is hypothetical, although the problem providing the driving force for the innovation is not. The purpose of the scenario is to provide a context in which the several types of transactions between Federal and non-Federal entities, introduced in chapter 111 of this report, may be better understood. Five major concerns are addressed here to develop the needed context. They are:

1. A description of a significant civil sector problem;
2. How innovation goals were established to solve the problem;
3. Alternative pathways to achieving the innovation goals;
4. The transactions undertaken to foster the innovation; and
5. Outcomes and evaluation.

The Problem

The Urban Observatory Network, originally established by the Department of Housing and Urban Development (HUD) approximately 10 years ago, presently involves six organizations operating in cities with populations of 500,000 or more. These observatories bring specialized research capability to address urban problems—sometimes working independently; sometimes through the coordinated efforts of the network. The Denver Urban Observatory, along with its several planning functions, operates a federally funded Public Technology program that brings the problem-solving resources of organizations in the metropolitan area into contact with city problems. The cost of bond- and coupon-accounting was one such problem, examined and reexamined over a 2-year period.

In the City and County of Denver, for example, a staff of six persons, excluding supervisory personnel, verify and catalog some 30,000 interest coupons and 400 redeemed bonds each month. With inflation figured in, the personnel costs are estimated at $2 million over the next 20 years. To further **aggravate** the Denver situation, the city charter requires that the physical record of all coupons honored be maintained indefi-

nitely —because any interest or bond redemption claim is payable after maturity, regardless of when the claim is made. And all such claims must be verified. The value of storage space for retired coupons and bonds is estimated at $400,000 over the 20-year period; a similar dollar estimate was made for the cost of work space required for the six persons.

In the face of ever-expanding indebtedness (the present long-term obligations are more than $300 million), Denver's Director of Finance was concerned about how to reduce the cost of bond- and coupon-accounting. The Denver Urban Observatory was examining technical, legal, and financing issues involved in a potential solution to this problem, when a Department of the Treasury/Securities Exchange Commission study team examined the Denver situation as part of a national survey related to the same problem.

One of the consequences of recent Department of Treasury involvement in avoiding default on New York City's municipal bonds was broad exposure to the accounting and control practices of non-Federal entities during the retirement of bonded indebtedness. This exposure made it apparent that State and local governments often were incurring large and continuing expense simply by administering the payout of the interest and redemption of general obligation bonds and anticipation warrants.

The Treasury found that the finance department of most large cities in the United States maintains **a** separate clerical staff to account for redemptions and to verify and catalog the stream of coupons representing interest payments to the owners of "bearer bonds. " This did not seem like an important city problem until it was realized that a $20 million bond issue, with interest payments due every 6 months for 20 years, would force a city to account for some 160,000 to 900,000 coupons, depending on the bond denominations. The scale of the problem began to emerge when it was considered that a medium-sized city might have $200 million in debt-financing being serviced at any one time, and that nationwide, the cities have some $60 billion in long-term debt being serviced, using essentially the same labor intensive methods of 50 years ago.

The Treasury's Office of the Comptroller sought the advice of the Securities and Exchange Commission (SEC) concerning its understanding of this situation and its knowledge of past initiatives to help reduce the cost of servicing State and local indebtedness. Although these debt obligation issues are excluded from regulation by the SEC, it was aware of past efforts by local governments to improve on this system. The SEC also was aware of the fundamental stumbling block that frustrated these past efforts. The investment community generally asserts that the vitality of the local debt-financing system lies in the nature of "bearer bonds:" that is, bearer bonds are highly negotiable securities with interest payable to the person having possession of the bonds. This means that there are no transfer fees or registration necessary when such bonds exchange hands. It is this feature that makes the bonds attractive to many investors, as well as to the diverse governmental units issuing the bonds; it is precisely this feature that has made it impossible to introduce computer technology to aid in the management and control of bond redemption and interest payments. Coupons, for example, are redeemed on demand by the issuing jurisdiction and/or cooperating banks as the interest becomes due and payable. No one has discovered a way of simplifying the process without some form of registration for the bonds, a step that would change the basic character of bearer bonds.

The interaction between the Treasury and SEC led to the competitive award of a jointly funded study contract to a major accounting firm. The study was designed to obtain a clear picture of just how much it costs State and local jurisdictions to service and account for bearer bond payments. The Treasury Department **was** concerned because the banking system is so intimately involved in the redemption of bonds and in the payment of interest coupons, as well as in the provision of accounting services for certain local jurisdictions. The SEC was concerned because of the importance of municipal bonds in capital markets. In the face of increasing local reliance on bonded indebtedness as a means of funding capital improvements (it is growing at the rate of 10 percent per year), the possibility of reducing the cost of servicing this debt could have impor-

tant long-term advantages to local governments, particularly in their ability to retire these obligations. The costs of bond- and coupon-accounting were found to be extremely high.

The study found that about half of the Nation's local governments maintain internal staff for bond- and coupon-accounting (usually as a result of local charter requirements or State law). The other half of the governmental units or jurisdictions rely on the services of cooperating and correspondent banks to develop administrative records, in addition to handling the actual cash payments made to bond owners. There are important savings involved in allowing the banking system to provide the administrative records, because the coupons and redeemed bonds are handled only once (by the bank). But there is, of course, the associated loss of control over the redemption and interest payouts—a situation not permitted by the statutes of most large cities and some States.

While the Denver experience is typical of jurisdictions maintaining systems for bond- and coupon-accounting, the situation encountered in the banks providing accounting services to local governments is similar in many respects. The coupon redemption system is basically a manual system that is burdensome to the banks because of its labor intensity. Consequently, the study showed, the banking system would welcome any improvement in handling the coupons that also would help jurisdictions reduce the cost of internal control. An idea to address the family of constraints was needed.

Establishing Innovation Goals

The Denver Observatory appeared to be well along in the development of an idea, and exploratory meetings were held by Treasury and Observatory staff. The idea focused first on the essential requirements for mechanizing the handling of coupons after redemption. It was necessary to unambiguously associate a coupon with a specific bond, the bond issue of which the bond is a part, and the date after which the interest payment represented is due and payable. A code was visualized to accomplish this, not unlike that now being used on the labels of merchandise at supermarkets. Such a code, if printed on the back of the bonds and coupons, could be read with an optical scanner and the data obtained processed by computer if suitable bond- and coupon-handling equipment were also designed.

The question was: Who designs the code and guarantees that no two bonds would ever have the same code? Further, if this uniqueness can be assured, how could the system be phased into city finance operations? The Observatory staff envisioned that a new institution would have to be created, perhaps along the lines of the title guarantee company found in the real estate field. The company would provide the codes used in new bond issues, perform the accounting functions for a large group of cities on a subscription basis, and guarantee the cities that the system would perform over the life of a bond issue.

Treasury's Office of the Comptroller began to pursue the idea, not fully recognizing that its role should be one of a catalyst for institutional development and not that of the technologist. Certainly technology was needed, and its development for this application could be undertaken consistent with Treasury R&D mandates. The basic question regarding institutional development was, how does the Treasury help put some group into the bond guarantee business no matter how indirectly and not be open to criticism—even though public benefits (i.e, reduced costs) must be present for the venture to work in the long run? This was a very clear insight into the inherent tension between assisting in technological change and the essential questions of equity that are always present. This issue was considered to be so serious, however, the whole problem was put on the "back burner" for almost 1 year.

After almost a year, following the passage of the Federal Grant and Cooperative Agreement Act of 1977, the issue was reexamined in light of the distinction between Federal and non-Federal use of research results. A new perspective was gained by examining the reasons the private sector was not already providing this service. While the idea itself was significant, it also appeared that the most important single factor was the need to aggregate a market for the idea. Cities, for example, have different procedures and traditions that would have to be accommodated; the

promise of future savings is not necessarily the only criterion for adopting a technology. For this reason, the Federal role was determined to be one of supporting the aggregation of the municipal market through the development of detailed knowledge of city procedures and requirements, conducting a thorough demonstration of the concept, and in consultation with the SEC, developing guidelines for coupon coding. These guidelines were considered necessary to ensure that the coding concept, when used in conjunction with future municipal and possibly other types of bond issues, would conform to basic standards and not upset existing systems.

Even though new equipment was required, the Comptroller's Office was satisfied that it should be assumed 1) the technology resided within the capability of the manufacturing sector and 2) this capability could be directed to the problem through the workings of the marketplace, rather than through direct Federal support of R&D. Further, it was recognized that the consequences of fostering the introduction of this innovation should include private gains for "bond guarantee and accounting services" that might emerge from their initiatives. In fact, such gains are crucial to the change sought, and the challenge to the Treasury was really one of assuring equity rather than avoiding private gains.

Alternative Pathways To Achieve Innovation Goals

With this rationale as a starting place, the Comptroller's Office began a series of planning conferences, bringing together the wide range of interests in bond- and coupon-accounting to develop a strategy. These interests included the American Bar Association, representing the law firms specializing in municipal bond issues, city finance officers, the National Association of Security Dealers, and the American Association of Commercial Banks. The initial meetings dealt with institutional issues almost exclusively, but the results were monitored closely by representatives of the electronic data processing trade media. This monitoring was encouraged as being essential to future involvement of manufacturing firms in the demonstration phase of the effort.

The broad outline of the program that emerged from these planning meetings was as follows:

1. A corporation was to be formed by the directors of the six Urban Observatories operating in major U.S. cities. The corporation was to be wholly owned by the Urban Observatory System, a corporation chartered in the State of California. The corporation would service only the 48 largest cities and be sold to private interests at the end of a 10-year operating period, All Federal monies would be recouped with the sale. Any excess from the sale would be divided between the cities that were charter subscribers to the service.
2. The corporation was to be profitmaking, with all unretained earnings divided between the observatories to further support their basic city planning role.
3. Each of the observatories was to be given a $20,000 planning grant to develop a charter for the corporation and coordinate with the management consulting firm (see below), with their respective city administrations, and with the Department of the Treasury.
4. A management consulting firm was to be competitively selected to provide market and risk analysis, design the services of the corporation, plan the demonstration phase, and oversee the equipment specification and evaluation.

The approach to development of the equipment needed to process the coupons and redeemed bonds followed the same pattern of conferences used earlier in the institutional planning effort. Instead of the typical bidder's conference format, however, these conferences focused on the potential commercial demand for the equipment that would be functionally specified by the management consulting firm. The reason for this emphasis **was** to set the stage for a rather unique invitation for industry involvement in equipment development. The equipment manufacturers were promised the opportunity to participate in the demonstration phase of the program, if in-

dustry would establish the technical and cost criteria for competitive selection among the interested firms.

The Department of the Treasury, on a cooperative basis with the new corporation, promised to place $250,000 in escrow for the purchase and trial of at least two separate systems for city coupon- and bond-accounting. It was up to industry itself to decide on the ground rules for competitive selection of industry participants,

The industrial firms, through the Western States Electronic Manufacturers Association, offered the following proposal, which subsequently was adopted:

1. A date would be set (by industry consensus), at which time all interested firms must be ready to demonstrate their respective equipment systems.
2. The systems would be rated against the functional specification and participation awards made on the basis of highest ratings. In the event that many systems qualified functionally, a cost/performance formula would be employed as a second selection criterion.
3. The rating was to be performed by an independent board involving industry and city representatives.
4. An additional $50,000 was to be placed in escrow to ensure that operating and maintenance expenses incurred by manufacturers with the prototype equipment would be reimbursed.
5. The Department of the Treasury was to pay the expenses incurred in implementing the industry proposal.
6. In the event that the code standards were not promulgated on a timely basis, the $250,000 would be forfeited to the industrial firms incurring development expenses as a result of the Treasury initiative.

The Transactions

The main reason that the Urban Observatories were selected as the focal point for the organization of the corporation was to capture their long-standing relationships with the city government. Further, by working through the observatories, it was possible to emphasize the profitmaking dimension of institution building and yet have these profits flow back to the cities—first, in an indirect manner by supporting the observatories in their normal functions, and then through the liquidation of the corporation **after** the 10-year period. The arrangement ensured that both the observatories and the subscribing cities would have a "vested interest" in the success of the project.

The initial study by the accounting firm on the costs to State and local governments of servicing bearer bond payments was obtained through a procurement contract. This instrument was used because the study was primarily to serve the planning needs of the Federal agencies.

The $20,000 planning grants were chosen as the mechanism for funding the activities involved in establishing the corporation because the Department of Treasury had no reason to be directly involved in the arrangements being made by the observatories either individually or by the observatory network. The Treasury was interested only in the establishment of the corporation, and that its charter conformed to the plan.

Subsequently, the Treasury entered into a cooperative agreement with the corporation, to (1) financially support the start-up operations, (2) ensure that the demonstration phase was properly completed, and (3) discharge its responsibility for the development of code standards together with SEC. The latter two responsibilities required Treasury involvement during performance of the assistance activity.

The management consulting firm was awarded a procurement contract on a competitive basis that equally weighted technical competence and cost factors. A procurement contract was the instrument chosen for the transaction, despite the fact that the purpose was primarily assistance. The Comptroller's Office was, in effect, procuring the services of the consulting firm for use by the new corporation. Furthermore, the Comptroller's Office had to ensure that the consulting firm would be responsive to its needs, particularly in the demonstration phase and in developing code standards. Making the award on a competitive basis also was important; the winning firm would

be in a unique position to help in the introduction of the concept into bank operations and other State and local settings. Thus the use of the procurement process was appropriate in this specific instance.

Finally, the Treasury and the corporation entered into a cooperative agreement with the Western States Electronic Manufacturers Association to implement the industrial proposal. This joint activity led to the selection of two participating manufacturers who subsequently contracted with the corpoation to provide and maintain equipment. Similarly, the corporation entered into contracts with the charter member cities to provide bond and accounting services for new bond issues.

Outcome and Evaluation

The rest is history. The corporation began working with 16 cities on a backup basis—that is, duplicating the accounting work routinely performed on new bond issues employing the code system for a 3-year period. By the time this experience was gained and the system adopted as the primary accounting method for all new bond issues, 21 other cities also had subscribed to the service. In addition to the two firms participating in the demonstration, three other firms have established bond-accounting systems in the commercial banking field, and 13 firms have been formed to provide bond-accounting services to States, local governments, and corporations on a national and regional basis.

The Treasury estimates that the corporation will be worth $4 million to $6 million when it is liquidated in 6 years. This net worth will easily provide funds for recovering the $900,000 (plus interest) of public money involved. The fact that other firms, with private funds, have entered the bond and accounting field, and that the Treasury Department is getting out of the business provides the most useful form of project evaluation.

Comment

In preparing this scenario for innovation, probably the most difficult challenge was to find a plausible basis for Federal involvement in the solution of bond- and coupon-accounting problems. It is not easy to place a State or local problem on the R&D agenda of a Federal agency. Attempts to solve such problems frequently are sidetracked as agencies perform their regular duties. This situation may be the fundamental limitation in the effectiveness of the Federal R&D policy tool—at least in terms of R&D expenditures used to stimulate desired technological change at the State and **local levels.**

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