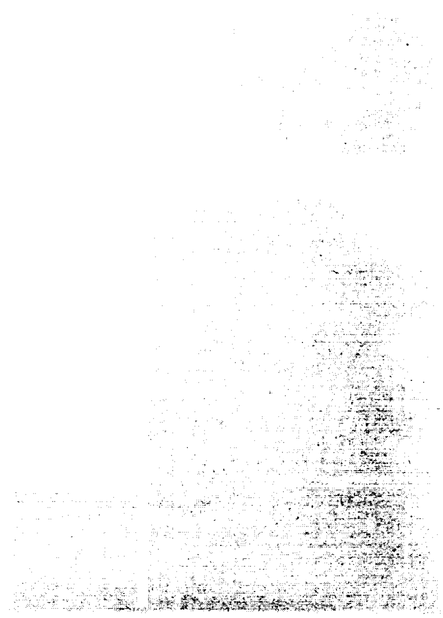
Chapter III

A CONCEPTUAL FRAMEWORK FOR THE CONSIDERATION OF DEMONSTRATION PROJECTS IN FEDERAL R&D POLICY



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Our approach to demonstrations is from an R&D perspective. It is not a narrowly technical perspective, but one that explicitly recognizes the way that political and technical factors interact in demonstration projects. In this way, we believe that a conceptual framework can help in understanding the uses and limits of demonstrations as a policy instrument.

This chapter sets forth a conceptual framework within which to examine demonstration projects. We examine the purposes of demonstration projects in meeting R&D objectives and other policy goals and review the general factors that affect the probability that demonstration projects will achieve these purposes. Throughout we draw upon the literature to provide illustrations and support for the analysis.

The Purposes of Demonstrations

The purposes of demonstrations can be considered from two quite distinct perspectives: purposes related to the development and application of knowledge through an R&D process, and their uses within a political process.

Demonstrations in the R&D Tradition

Within the R&D tradition there are two fundamental purposes for a demonstration project:

- To aid Federal policy makers in deciding whether or not to adopt a policy.
- To promote the use of an innovation.

Demonstration projects in which the first purpose predominates we refer to as ***policy-formulating demonstrations;*** projects in which the second purpose predominates we call ***policy-implementing Ciemonstrat#ons.***

A good example of policy-formulating demonstrations is the income maintenance experiments conducted by the Office of Economic Opportunity (OEO) and the Department of Health, Education, and Welfare. These experiments were begun in the late 1960's and continue at the present time. They have sought to provide information to policy makers concerning the effects of income maintenance payments upon the work incentives of the participants in the programs, the administrative feasibility of implementing such a program, and the difficulties of integrating income maintenance programs with other service programs such as manpower training. The emphasis upon the work incentives reflected the beliefs of the demonstration's sponsors concerning the likely focus of a policy debate over welfare reform. The sponsors in OEO felt that a major congressional concern would be whether individuals who receive some form of guaranteed income would withdraw from the labor force and become permanent members of the welfare population.2

An example of a policy-implementing demonstration is those conducted by the Shipbuilding Research, Development, and Demonstration program; through this program, the Maritime Administration is attempting to stimulate innovation in the shipbuilding industry by organizing an interindustry consortium of shipbuilding firms to propose and assist in managing demonstration projects. The projects with this program invoke

'We define innovation as a program, product. or production process in the particular existing context: innovation is not necessarily new in the sense of "first instance. "

'Joseph A. Pechman and P. Michael Timpane (eds.), Work incentives and income Guarantees: The New Jersey Negatiue Income Tax Experiment, The Brookings Institution, Washington, D. C., 1975, pp. 15-24.

the development and testing of a new technological device or production method, which is followed by a formal demonstration in a shipyard to which all industry engineers are invited. Most of the projects are small and concern the pragmatic "nuts and bolts" problems of shipbuilding, not large-scale demonstrations of significantly new technologies. The projects have included new techniques of welding, surface coating, materials handling, and automation.[3]

In all cases in this paper, our perspective is that of a Federal policy maker. This caveat is important. It is quite possible that the firm or institution carrying out a project the Federal Government views as a policy-implementing demonstration conceives the project as a means of formulating its own "policies. " But because we are examining demonstrations sponsored by the Federal Government, our analysis is from the perspective of the Federal policy maker.

Moreover, individual demonstration projects can possess elements of both policy-formulating and policy-implementing purposes. A project that begins as a test of the worth of an innovation may ultimately serve as an exemplary demonstration for other sites that are funded under a new Federal program created as a result of the test. Alternatively, a demonstration project may be initiated to promote what is considered to be a proven concept but, as a result of adverse experiences in the early stages of the project, it becomes a means of testing the worth of the concept. A project may also possess different purposes, as perceived by the various actors concerned with its execution. The funder of a project may view the project as a test of a concept; the manager, as a means of promoting the use of an innovation whose worth has already been proved.

Although a demonstration may possess elements of both purposes, the distinction is important. If policy makers do not specify the purposes of a demonstration, agencies conducting the demonstration are free to view its purposes from the perspective that best suits their individual needs. This may result in the promotion of the use of innovations that Congress or executive policy makers do not feel are proved: demonstrations that these policy makers view as policy-formulating are viewed by the agencies as policy-implementing. Alternatively, agencies may treat programs as experimental that Congress sees as a means of implementing desirable policies.

For either policy formulation or policy implementation, the value of demonstrations should be based upon their ability to provide more credible information to either policy makers or potential users of innovations than would be available from other R&D methods. A project's scale and the realistic environment within which it is tried are the major contributors to this credibility.

Policy-formulating demonstrations should provide information to Federal policy makers about:

- Technological and administrative feasibility of instituting the policy or adopting the innovation on a wider scale.
- Expected economic, environmental, and social impactsof the policy or innovation.
- Relative merits of alternative policies or innovations intended to meet the same needs.
- Unanticipated consequences of adopting a particular policy or innovation.

In seeking to provide this information, demonstrations may help to clarify the nature of the policy problem itself. For example, the New Jersey income maintenance experiment highlighted the sensitivity of program costs to the frequency and manner of assessment of a family's income, an issue that was given little attention in early legislative planning. The experiment also provided detailed information on the variability of the incomes of the working poor.[4]

Negative information, information concerning the shortcomings of an innovation, may also be an important output of policy-formulating demonstrations. Because these demonstrations take place before a commitment to a course of policy, negative results can be used to support a decision to abandon consideration of the policy. '

Policy-implementing demonstrations should provide many of the same types of in-

[3]Federal Demonstrations: Case Studies, pp. E-1 - E-6.

[4]Pechman and Timpane, op. cit, pp. 207-214.

[5]0E0's experiment with Educational Performance Contracting is a good example. See Edward M. Gramlich and Patricia P. Koshel, Educational Performance Contracting, An Evaluation *of* an Experiment, The Brookings Institution, Washington, D. C., 1975.

formation to potential users of information. However, the emphasis is typically placed upon

- Costs of adopting and using the innovation.
- Reliability of that innovation in use.
- Demand for the innovation.
- Feasibility of implementing the innovation at the adopter's site.

Inherent in the definition of purposes of demonstrations is a specification of audiences. For policy-formulating demonstrations, the audience is the Federal Government and the constituencies that seek to influence Federal policy; for policy-implementing demonstrations, potential users of the innovation. Two classes of users can be identified: "final" users—private consumers, local governmental units, or individual firms; and "intermediary" users—suppliers of equipment, for example. Planning for a demonstration should involve clear identification of the audience and a determination of their information needs.

These two types of demonstrations should be distinguished from two other types of activities that share some characteristics of demonstration projects. We do not consider large-scale engineering tests of hardware *components* to be demonstrations. Such projects, which typically test scaled-up components of an innovation process or product, neither test a full "system" nor take place in a realistic operating environment. For example, aircraft engines may be run in large test cells or even mounted on test aircraft before being integrated into prototype systems. Such activities are potentially quite important to the development of new products but should be considered part of development rather than an instrument for promoting the transition from development to use.

The second type of activity that we exclude is the projects that are created as a result of Government subsidies for local *development.* In a number of social programs, for example, funds are provided to local political jurisdictions to develop innovative activities. The Law Enforcement Assistance Administration (LEAA) has provided such funds to police departments; Title IVC of the Elementary and Secondary Education Act supports innovative projects that relate to local or State school needs. Projects such as these are generally not considered as means of promoting the use of a particular innovation. Rather, they place the responsibility for innovating on the local jurisdiction itself.

Demonstrations as Instruments in the Political Process

The purposes of demonstrations can also be viewed in terms of their usefulness within our political system. Demonstration projects are a means of showing political initiative at relatively low budgetary cost. They are an attractive compromise between the advocates of sweeping policy or program change and the supporters of the status quo. They can help promoters of a policy to "get a foot in the door" to build a constituency. By demonstrating a concern for an issue or a particular group, demonstrations can become significant symbolic acts. They can assist Federal R&D managers to gain a political constituency. Demonstrations permit an R&D program manager to maintain some momentum in his program if the political support for expansion does not otherwise exist. Finally, demonstration projects can serve the needs of traditional pork barrel politics.

These are important functions within our governmental system because there are many issues on which compromises are needed. In the absence of such compromises, we would often reach an impass between advocates and opponents of a policy. A demonstration project may permit concrete experience with a policy to be obtained to settle the debate. It may provide a vehicle through which a particular interest group can establish a dialogue with elements of the Government. A demonstration can provide an important governmental gesture of concern for individuals facing difficult problems when the Government does not know how to solve those problems.

The fact that a demonstration is a compromise poses substantial problems for a project with R&D objectives. The parties to the compromise have a variety of objectives and frequently the compromise itself will not specify which of these objectives should predominate. The Follow Through Program illustrates this problem well. Follow Through was proposed as a program to provide continuing compensatory educational services to schools with disadvantaged children coming from Headstart preschool programs. Advocates of the program argued that such continued services would prevent the students from losing the gains they had achieved in their

Headstart programs. Opponents argued that there were insufficient funds to support such a program and in any case there was no evidence that it would be effective. The compromise was a "planned variations" program to test the effectiveness of different program designs. [b]

The advocates of an operating program sought quick implementation and, as a consequence, most of the programs were incompletely designed. In addition, the experimental design necessary to detect differences among programs was deemed inappropriate by the operating officials. The absence of clearly defined goals led the evaluators to collect data having only marginal usefulness. While there have been some useful outcomes, it seems unlikely that they are commensurate with the costs that were incurred. An important cause of this low yield was the conflicting goals of the parties to the compromise and the failure to resolve these conflicts in the design of the program.

The political uses of demonstrations will lead to projects with multiple and often conflicting objectives. Those groups that are involved will frequently possess "hidden agendas" that may interfere with the R&D objectives of the project. The absence of a clear consensus about goals may weaken project management and lead to inconclusive evaluations. A major task of both the executive branch and Congress should be to recognize both the political and R&D functions of demonstration projects and to design projects in a manner that minimizes the adverse interactions of the goals.

In the next section we address the factors that affect the success of demonstration projects as part of the R&D tradition rather than as instruments in the political process. Our concluding section will consider how the political and R&D uses of demonstrations can usefully be melded together.

General Factors Affecting the Success of Demonstrations

Many factors affect the success of a particular demonstration project: the quality of the project staff, the appropriateness of its goals, the adequacy of the funding, and the nature of the political and physical environment. Moreover, these factors will affect the outcome of demonstration projects in every policy area. Our interest, however, is not to investigate how an individual project can be most successfully executed once a decision has been made to initiate it. Rather, we seek to understand the types of situations in which well-executed demonstrations are most likely to be successful in reaching their objectives.

Our review of the literature leads us to suggest that two factors are likely to be of prime importance in determining the success of a demonstration project: first, the nature of the technology that is being demonstrated; second, the nature of the institutional environment within which a demonstration must be carried out.

The Technology

As we have noted, we use the term "technology" to denote the *inputs,* outputs, *and theory relating them that are associated with the innovation under consideration,* [7] The technology of the automobile is thus the inputs of personal time and invested capital, the output of transportation services, and the theories that relate the inputs to outputs that are embodied in the automobile itself. Two points deserve note. First, the definition of a technology is a matter of convenience. We can discuss the technology of an automobile or we can enlarge the concept to discuss the technology of an urban transportation system. The choice of the scope of the technology depends upon the purposes for which the concept is used. In this report, the scope is associated with the innovation whose demonstration is being contemplated. If the innovation is an electric automobile, the technology would be the automobile itself. If the innovation were a van carpool system, however, the technology would extend beyond the vehicle to encompass the system of roads, the manner in which carpools are formed, the location of work and living sites as inputs, and transportation services as outputs. The theories that relate these inputs are no longer solely embodied in physical entities but extend to institutions and behavioral responses.

Second, the theories and inputs associated

'Alice M. Rivlin and P. Michael Timpane (eds.), Planned Variation in Education: Should We Give Up Or *Try* Harder?, The Brookings Institution, Washington, D. C., 1975, chapter 1.

'Our use of the term "technology" is similar to that of economists who are concerned with production functions.

with differing technologies vary substantially in quality. These variations are important to understanding the impact that the quality of a technology has on the usefulness of demonstration projects as policy tools. Technologies differ in the degree to which their inputs involve important uncontrollable variability. Thus, the inputs of an education technology such as a reading program include teachers and students whose capabilities vary substantially. The technology associated with a large coal powerplant involves inputs of coal and water whose characteristics are predictable and have little variance for a single plant. Technologies also differ in the degree to which the inputs interact and change in the course of the transportation to outputs. In education, the qualities of teachers can be modified as they work to change the skills and other attributes of the students. For example, teachers can become more or less directive in their instruction or change their allocations of time among students. In the case of the powerplant, the coal does not change its attributes in unpredictable ways as it enters the process of producing power. Finally, technologies differ in the nature of their associated theories. For a technology such as power production, the theories that underlie the transformation of the inputs to outputs and residuals are quite deterministic and provide high confidence that certain inputs will lead to predictable outputs. In the case of education, the theories that relate inputs to outputs either do not exist or can predict outputs only within very broad ranges.

For some technologies, theory can be improved through research, development, and testing. While we may not be sure that a new design for an internal combustion engine will have high fuel efficiency and useful power output, we are confident that the developing and testing will allow us to perfect the technology's theory in the sense that we have used the term. In other cases, we are far less confident that we can produce such theory through R&D processes. For example, incentive systems for encouraging the insulation of houses can be designed and tested but will probably never reach a point where we may confidently predict that a particular individual, faced with the incentives, will make a particular decision. Even without the capability to make such exact predictions, however, decisionmakers can reduce the uncertainty concerning the behaviors of groups of individuals. Thus, while the theory may not be as deterministic as that associated with internal combustion engines, it is useful to a policy maker and it can be improved through R&D. In other areas, however, theory may be at such a primitive stage that it cannot be readily perfected through R&D. This may well be the case with police patrol procedures, where the relationship between the frequency of patrols, the type of patrol, and the type of site on the one hand and the occurrence of crimes on the other seems to be beyond our present capacities to discover.[8]

These qualities of a technology can be conveniently characterized in essentially two ways. The first of these is the degree to which a technology *is reproducible* from site to site. With what confidence can the policy maker or the industrial firm say that the use of the innovation will result in the transformation of inputs into desired outputs? This will depend upon the variability of the inputs, their tendency to interact or modify themselves in the course of the transformation, and the quality of the theory that exists. In general. technologies that are substantially embodied in hardware would be quite reproducible, while those that involve processes of human interaction would be relatively nonreproducible. Some technologies occupy a middle ground. For example, transportation systems have some reproducibility but will vary substantially by site.

The second quality of a technology is the *degree to which research, development, and testing* can reduce uncertainty about the likely outputs to be associated with a particular set of inputs. Designing and testing prototype models of automobile engines can yield high-confidence estimates of the performance of the engine. Tests of curriculum materials, on the other hand, yield only low-confidence estimates concerning the performance of those materials because of the weak theory upon which they are based and the variability of the inputs to the education process. If the uncertainties surrounding the relationship between the inputs and outputs of a technology have been substantially reduced prior to its incorporation as a demonstration, we will refer to the technology as being well *in hand.*

“Jan Chaiken, What is Known About Deterrent Effects of Police Activities, The RAND Corporation, P-5735-1, July 1977.

The Institutional Environment

A demonstration will result in a number of outcomes. Some of these will simply be what we have referred to as outputs of the technology associated with an innovation; others will be associated with the impacts that the use of the innovation has upon the environment, the behaviors of groups of citizens, or the employment in a community. A major reason for conducting a demonstration project is to improve knowledge concerning the effect of using the innovation on these outcomes.

The context in which the demonstration is carried out determines the scope of relevant outcomes. The needs and interests of the target audiences determine the specific outcomes measured. If, for example, the demonstration is intended to influence local police departments to adopt and use a new piece of equipment, the outcomes examined are those that are important to officials in these departments. The choice of a site or sites should include operational environments that are similar to the sites of most potential adopters. If the demonstration is intended to aid in the congressional debate concerning a new welfare system, it should be designed to address questions that Congress and its constituents consider important.

Thus, the relevant scope of outcomes for a demonstration is determined by the institutional environment in which it will be implemented. This environment encompasses the collection of organizations and the linkages among those organizations that are involved in selecting and implementing the innovation being demonstrated. The developers of the innovation, ultimate users, regulatory bodies, markets, and the Federal agencies that fund the demonstration are components of the institutional environment. The concept of a "technology delivery system" suggested by Wenk and that of a "selection environment" used by Nelson and Winter are roughly equivalent concepts.[9]

The institutional environment has importance to Federal officials for two reasons. If the Federal Government were contemplating using a demonstration to help determine the worth of a policy or the desirability of promoting the use of a particular innovation, the relevant scope of outcomes as set by the institutional environment would determine the inputs and outputs that must be measured to make credible inputs to the policy process. If, on the other hand, the Government were considering a demonstration to promote the use of an invention, the institutional environment would be the medium in which the use would take place; the important actors and communications links in this environment would be the critical determinants of the way in which the innovation is adopted and used.

The basic proposition about institutional environment that emerges from the literature is that innovation is strongly affected by the nature and the workings of the institutions in a policy sector. There are some familiar examples that help to clarify this point. In the area of national security, it is widely believed that the development, procurement, and development of new weapons systems is facilitated because the Federal Government is the sponsor of the relevant R&D, the buyer of the R&D product (usually a weapons system), and the user of that product. Even though the institutional environment in the national security area is complex, the dominant position of the Federal Government simplifies the process of innovation relative to other areas involving intergovernmental or public/private relationships. 10

A second example is that of the Bell System. Within the framework of the American Telephone and Telegraph Company are the Bell Laboratories, the R&D organization; Western Electric, the production organization; and the Long Lines Division and the operating telephone companies, the organizations providing service. Thus, institutions within the AT&T organization are specialized in their functions, yet they are highly integrated concerning the manner in which each plans its operations and the ways in which each transfers the information or products to the others. It is argued by the Bell System, and believed by many, that this complex group of in-

'See Edward Wenk, Jr., "The Social Management of Technology," in John E. Mock (cd.), Science for Society, proceedings of the National Science Conference held at Atlanta, Ga., Oct. 12-14, 1970; The Committee on Public Engineering Policy, National Academy of Engineering, Priorities for Research Applicable to National Needs, report to the National Science Foundation, Washington, D. C., 1973; Arthur A. Ezra, "Technology Utilization: Incentives and Solar Energy, " Science, Vol. 187, Feb. 28, 1975, pp. 707-713; Richard T. Nelson and Sidney G. Winter, "In Search of Useful Theory of Innovation, " Research Policy, Vol. 6, 1977, pp. 36-76.

'"Herbert F. York and G. Allen Greb, "Military Research and Development: A Postwar History, " Bulletin Of the Atomic Scientists, Vol. 33, No. 1, January 1977, pp. 13-26.

stitutions, tied together as they are, facilitates the generation and diffusion of new communications technologies.[11]

A third example is found in the agricultural sector. The U.S. Department of Agriculture (USDA) has developed an institutional system over an extended period of time that is thought to be quite effective in ensuring the flow of innovation in agriculture. The USDA directly supports a national laboratory, four regional laboratories, and satellite research laboratories through the Agriculture Research Service. Through the Cooperative State Research Service, it finances research jointly with the States in colleges of agriculture and State experiment stations across the country. The Agricultural Extension Service, funded jointly by Federal, State, and county funds, supports the agricultural extension agents who are responsible for the dissemination of R&D results to prospective users and the needs of users to the research system. Thus, a strong system need not be centralized.[12]

These three examples illustrate relatively well-developed institutional environments. In contrast, consider the elementary and secondary education system. The National Institute of Education, the National Science Foundation, and the Office of Education provide funds at the national level. Fifty State departments of education assume a variety of stances toward promoting the use of new innovations in local school districts. Most education costs are for personnel. Training professionals in the school system is mainly the province of a large number of teacher preparation colleges that are not widely known for their interest in or conduct of R&D activities. Decisions concerning the adoption of new curriculum materials vary widely among States and localities. A beleaguered and embryonic network of R&D centers established by the Office of Education over a decade ago has failed to achieve notable successes. A persistent hostility exists between the practitioner community and the research community, which makes it difficult for communications to occur between them. The textbook manufacturers place little reliance on systematic materials development and testing. The components of the institutional environment are unevenly developed, poorly linked, and frequently in disagreement over the process of change in the schools.[13]

An important contributor to the nature of the institutional environment is the degree of consensus that exists concerning the appropriate Federal role in a particular policy area. In chapter II, we briefly sketched the evolution of the Federal role in a number of policy areas. In areas such as national security or agriculture, a strong Federal role is viewed as legitimate and is generally accepted and understood by the elements of the institutional environment. Similarly, there is fairly general agreement concerning the limits of the Federal role in promoting the use of basic research. However, in many areas of domestic policy and in energy policy there is considerable debate over the appropriate Federal role.

The strength of the rationale for Federal involvement in these "mixed responsibility" sectors varies substantially; more importantly, it is subject to a great deal of controversy. The involvement of the Federal Government in these sectors has come about because important political constituencies have felt that the performance of these sectors was inadequate for the needs of the country. For example, the Federal Government entered the health care financing area because the health needs of the elderly and the poor were not viewed as being adequately addressed by the existing Federal policy in these areas. State and local officials, whose operations are being curtailed by Federal activities, see Federal officials as interfering in their legitimate policy responsibilities. When demonstrations become a tool to further controversial Federal policies, their legitimacy is questioned.

This problem is exacerbated by increasing pressures from Congress and the public to take results of publicly supported research "off the shelf" and put them into practice. While we may question whether sufficient R&D exists "on the shelf" to justify this concern, the pressure has led Federal R&D agencies to promote the commer-

[11] See H.W. Bode, Synergy: Technical Integration and Technological Innovation in the Bell System, Bell Laboratories, Murray Hill, N. J., 1971.

[12] A. Hunter Dupree, Science in the Federal Government, Harvard University Press, Cambridge, Mass., 1957.

[13] For a description of the education R&D system and the institutional environment which surrounds it, see The Status of Education Research and Development in the United States: 1976 Databook, The National Institute of Education, Washington, DC., 1976.

cialization and use of R&D activities and to provide demonstration projects with a promient role in this effort. The Federal Government must choose specific technologies for demonstration. These demonstrations will be chosen to advance Federal policy goals, ghals that maybe in conflict with those of State and local authorities or the private sector. In the situation where such conflict exists, the probability of success in promoting the use of a new innovation or technology will be low.

Another general factor that shapes the institutional environment is the extent to which an R&D tradition is a part of the operations of a policy sector. For example, in the military sector, in civilian technology, in agriculture, or in parts of the health sector, there is a long tradition of using R&D results to improve performance. In contrast, R&D in support of the improvement of the criminal justice or educational systems is relatively recent. In the absence of a tradition of using R&D and of training emphasizing the utility of R&D to important actors within a sector, it is unlikely that R&D and demonstration will play a major role in the near future.

Judging the Development of Institutional Environments. -The examples and discussion suggest criteria by which to judge the degree of development of these institutional environments. A well-developed environment might have the following attributes:

- A set of institutions necessary for the entire process of research, development, commercialization, and application.
- Established, agreed-upon roles and responsibilities of these institutions (including the Federal role).
- Communication paths among these institutions along which information critical to the R&D planning, utilization, commercialization, and innovation process can flow.
- Communications among institutions that are sufficiently frequent and strong to facilitate the movement of an innovation into utilization.
- Well-developed criteria at each stage of the innovation process for evaluating the desirability of the movement from one stage to the next.

These criteria for a developed institutional environment emphasize qualities that are likely to lead to routine and continuing innovative activities. Equally important, sectors that have the degree of development implied by these criteria are likely to have developed a consensus about the relevant scope of outcomes by which a prospective innovation should be evaluated; conversely, in less developed institutional environments, there is likely to be considerable disagreement over the outcomes of greatest importance.

The Interaction Between Technology and the Institutional Environment. - An appreciation of these factors and the manner in which they affect the success of demonstrations can be gained by an examination of several specific examples.

Central power generation can be contrasted with solar heating and cooling, a decentralized form of "power" generation. In both cases, the technologies seem reproducible. We know a great deal about their performance and are confident that we can learn more. Some aspects of these technologies are currently well in hand while others require further development. However, these two technologies are used in two quite different institutional environments.

Central power station technologies are developed and used in an environment where the suppliers are known; the regulatory apparatus is in place; and the market is orderly. " In contrast, solar heating and cooling is being developed and used in a less developed environment; its application is controlled by hundreds of building codes. The industry that supplies the technology is new and unstructured. Financial and tax policies for installations are not yet routinized. Regular sources of maintenance are not yet applicable. Suitable criteria for making decisions about whether or not to invest in the technology are not yet widely agreed upon. Thus, while we are confident that we know or can know a great deal about the performance of the technology, the institutional environment for facilitating the

"This institutional environment is less well developed now than several years ago because of the advent of both energy and environmental concerns. These concerns have resulted in new and as yet incompletely specified roles for the Federal Government. The regulatory structure governing powerplants has been elaborated and new groups have joined in powerplant design decisions Still. according to the criteria presented in this section, central power generation occurs in a developed institutional environment.

application of technology is not well developed. 15

Day care in industrial and community settings provides an example of how institutional environments of differing levels of development can shape the relevant scope of outcomes for demonstration projects. There is little agreement among child care specialists concerning the levels of inputs. competencies of care givers, and types of activities that will produce various outcomes in children in day care settings. The standards that should govern day care financed by the Federal Government have been subject to vigorous debate for a number of years. There is also considerable disagreement over what constitutes the appropriate measures of outcome for day care.

In the public sector, day care is typically provided by a variety of institutions for the benefit of the children, as well as the parents. Accreditation for day care centers varies substantially among jurisdictions. The standards for training of care givers are highly variable. Nationally, the level of subsidization for day care and the restrictions placed upon the operation of programs that receive subsidies are still matters of debate. The institutional environment is poorly developed. The relevant scope of outcomes is broad. The technology has low reproducibility.

"For an interesting discussion of institutional environments in general and that surrounding solar heating in particular, see Arthur A. Ezra, "Technology Utilization: incentives and Solar Energy, " science, VOI. 187. Feb. 28? 1975, pp. 707-713.

'[6]A brief history of the controversy surrounding Federal support for day care is contained in Gilbert Y. Steiner, The Children Cause, The Brookings Institution, Washington, D.C. , 1976, pp. 14-35.

Several years ago, as a result of the general concern over extending day care to more parents and the pressures from feminist and other groups, a number of industrial firms experimented with day care. These firms provided day care to small groups of their own employees on a trial basis .1' The firms quickly decided that the relevant outcome of the day care they supported would be reduced absenteeism and lower turnover among their personnel. These day care centers met existing local standards for good day care but did not consider provision of education to children as a relevant goal. The demonstrations suggested that relatively few parents found day care provided at the work site as desirable or no improvement in turnover or absenteeism. The idea seems to be largely abandoned. 18

In this case, within an industrial setting there was agreement over the outcomes that were important. Responsibility for the demonstration was clearly assigned. And there was general agreement over the meaning of the outcomes of the demonstration among the potential providers of industrial day care. The institutional environment was well developed. Moreover, the technology associated with these outcomes was reproducible. While there may be no reproducible means of providing day care that maximizes cognitive growth in children, there is no problem in creating day care centers that meet specified (input) standards.

"Using our terminology, they conducted policy-formulating demonstrations.

'*''Minding the Kid, Frustrating for Companies," New York Times, Sept. 11, 1977, p.F9.