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ABSTRACT

Attempts to apply space age management to social problems have been plagued with difficulties. Recent experience in the State of Delaware and in New York City, however, indicate new possibilities. Project management as practiced in NASA has been applied with promising results in programs dealing with housing and social services. Such applications are feasible, according to recent research, because project management utilizes social and behavioral approaches, as well as advanced management tools - such as PERT -- to achieve results. At the same time, agencies dealing with social problems, are increasingly concerned with defining and achieving specific objectives, with "outputs", and with productivity. Therefore, they are receptive to management approaches concerned with those matters. Thus, there is an improved outlook for the successful application of space age management to earth-bound problems.

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SPACE AGE MANAGEMENT FOR SOCIAL PROBLEMS

Can the management experience gained in the Apollo and other space programs be used to solve social problems? Despite optimistic predictions[1] the outlook, until recently, has been discouraging. Attempts to apply space age management to social problems have been plagued with failure or severe difficulties. Yet, within the past year, new possibilities have emerged. Promising applications have been made in the State of Delaware and in New York City. In addition, research on the processes involved in management of NASA programs indicates that the transfer of management approaches used in the space effort is more feasible than previously believed.

What accounts for the difficulty of transfer of space age management and what are the new possibilities? The underlying problem of transfer lies in the fact that management approaches and techniques used in the space program (such as systems engineering and PERT - the Program Evaluation and Review Technique),[2] were designed for the problems and the environment of agencies with technological missions. In comparing such agencies with those concerned with social problems, observers have noted significant differences which they feel make transfer extremely difficult, if not wholly impractical:[3]

- Technological agencies are concerned with solving engineering or science problems not directly involving the daily lives of large segments of the population. Legal, procedural, bureaucratic, interest group and political considerations assume much less importance than in agencies concerned with social problems.

- Goals in technological organizations are clearly stated, and the parameters of cost, time and performance are well defined. On the other hand, in agencies concerned with social problems, goals are vague, if stated at all, the time frame may be lacking, cost is less predictable, and performance standards, in terms of goal achievement, may be non-existent. Thus, measurement of performance is either absent, or when attempted, fraught with controversy.[4]

• Technological agencies can choose and control the participants in the research, development, and manufacturing processes. In the case of NASA, for example, contractors and university investigators are selected and paid by the agency. On the other hand, a local urban renewal agency has no control over real estate interests, landlords, tenant groups, and community organizations, not to mention other city agencies and Federal and State housing and funding authorities. It is true that some participants in technological agency programs -- such as other agencies, or (in multi-lateral space missions) other nations -- are neither chosen nor controlled. But technological agencies generally do not have to deal with citizen or community groups, or be concerned with intergovernmental relations.[5]

Examples of Difficulties

In a much touted experiment in the 1960's, the State of California engaged aerospace companies to propose solutions for problems of transportation, solid waste disposal, and crime control in the state. Firms that had enjoyed great success in such endeavors as development of the Polaris missile attempted to apply advanced technology and management techniques to these mixed social and technical problems.[6] Although some observers felt that the proposals and back-up studies[7] were interesting and valuable, the results, in practical terms, were not encouraging. It appears that only a minimum of transfer was achieved. What is more disappointing, no problems were solved.

The solutions proposed by the aerospace experts lacked reality. Ida Hoos, who studied the "California experiment" at length for her recent book on systems analysis in public policy states: "The aerospace team studying waste management...recommended a centralized authority with virtual dictatorial powers over all resources as though they were dealing with virgin territory, unsullied by counties, towns and cities with entrenched interests about land use and zoning. The group designing a criminal justice system arbitrarily defined and disposed of a population-at-risk as though this existed in a social vacuum...the transplanted experts (studying transportation)...never came to grips with the dilemmas facing the planners today."[8] Numerous other instances can be cited of difficulties and failures in applying advanced mangement methods to social problems.[9]

Recent Experience with Project Management

Despite this history, very recent experience in applying one aspect of space age management to social problems indicates that successful application is possible. This aspect known as "project management", utilizes temporary organization, combined with specialized techniques for managing complex and dynamic activities. It has been used successfully to manage Apollo and hundreds of projects in NASA and other technological agencies. What are its attributes?

A project management organization is a temporary unit set up within an agency. It is usually located organizationally near the top of the agency with a direct line of communication to the chief administrator. The project manager heads the unit and is charged with the responsibility for drawing on agency resources and personnel -- wherever they are located in the agency -- for the purpose of reaching project goals. If necessary, the project manager can go beyond the agency by contracting out or making inter-agency agreements to obtain the resources required. Thus, project management facilitates and emphasizes management across functional lines in order to bring together at one focal point the management activities required to accomplish specified objectives.[10]

David Willemon of Syracuse University who studied the Apollo project identified certain generalized characteristics of project management:[11]

Problem Orientation and Finite Duration. Project management organizations are established solely for solving complex problems. Once the problem is resolved, the project organization is usually dissolved. It is used to accomplish specific objectives within stated parameters, i.e., usually cost, performance and schedule goals.

Interdiscriplinary Emphasis. The nature and scope of complex problems demand the inputs of several discipline oriented specialists. Problems can more adequately be analyzed and resolved because expertise is found in these disciplinary specialists. Project management techniques have been found to provide an important method for integrating the inputs of diverse specialists.

Systems Approach. Project management by its very nature provides a systems perspective in solving problems. Effectively managed, a project group can be designed to be cognizant of both the internal workings of a project as well as the environmental "set" of the project. The management of large-scale programs requires an "open systems" approach.

Fluid Organizational Relationships. It operates both vertically and horizontally within a larger "host" organization. The fluid approach to organizational design encourages peer-to-peer communication, multi-discipline integration, and dynamic problem solving capabilities. It also allows the project manager to accomplish his objectives with the minimum hierarchical restraints. There is greater potential for flexible, "free floating" yet directed problem solving.

Responsibility Identification. A deductive approach is used in breaking a problem down into its most relevant and integrated sub-components. When project management is practiced in the technical hardware projects, e.g., building a rocket engine, the total task is divided into "work packages." For each work package, responsibilities for accomplishing the work package can be assigned and objectives established in terms of cost, performance, and schedule. Such procedures establish a system of responsibility and accountability for all.

Communication Efficiency. Formal communication lines are shortened, making for greater efficiency, flexibility and responsiveness in problem solving. The short channels of communication offer minimal distortion in communication among those administering the project and the project participants.

Management Science Orientation. Because of the complexity of large scale problem solving, there is a strong emphasis on the use of management science techniques. Model building and simulation techniques can be used in estimating the consequences of alternative courses of action, project costs, the schedule of projects, and in measuring the performance of the project. Additionally, the effective use of information systems is vital for planning and auditing the progress of the project.

It is particularly significant that the introduction of project management does not change the basic structure (or division of labor) in an agency. The difficulty of making such changes in public organizations, because of statutory restrictions or collective bargaining agreements, is a strong inducement for considering the project management approach. It is significant as well that while costs, deadlines and performance standards are targeted, most of the resources in the agency are left where they are -- in other people's departments rather than transferred to the project organization. Utilization of such a "matrix" approach causes minimum organizational and bureaucratic disruption, an important consideration in governmental settings.

The lack of disturbance of the basic structure and location of organizational resources places on the project manager a major responsibility for working with operating department heads. He must rely on his ability to persuade, bargain with and cajole line officials to obtain the support he needs from the functional units. This fact emphasizes that project management utilizes behavorial approaches to administration as well as management science techniques.

The project manager generally does not have the authority commensurate with his large responsibilities, and must utilize his leadership and social skills to achieve results. In many ways, he acts as a "change agent", affecting the behavior and perceptions of line supervisors and subordinates and focusing their attention on goal realization. Because of these factors, top management commitment is required to help the project manager in carrying out his tasks.

Of course, the very attributes which make project management useful for new and complex problems may mitigate against its use in other situations. Project management may not be applicable to routine, repetitive administrative functions, specialized functions requiring expertise for defining standards, etc. It may not be advisable to install in agencies which are experiencing major internal conflict and cannot afford even the minimal disruption which may be caused by clashes between the project manager and line department heads. The initial monetary costs of setting up a project organization must also be considered, particularly in agencies facing severe budget constraints.

How does project management as a form of temporary organization work in practice? Let us look at some actual cases in urban settings where the social problems involved were fraught with conflict, including black-white animosity.

Housing in New Castle County, Delaware[12]

The first instance involved the launching of a program for building low and moderate income housing in New Castle County, Delaware. The county has a population of 365,000, and includes the City of Wilmington (population 85,000). The county government provides the local services for all residents, except those in Wilmington. Despite a long standing recognition of the need for housing action all previous attempts had met with such strong community opposition that nothing had been done. A proposed "Operation Breakthrough" project, sponsored by the Federal Department of Housing and Urban Development, for the area had been killed in the Spring, 1970. The efforts described here began in October, 1970.

The approach taken was to designate a "special assistant for Housing to the County Executive" who became essentially a "project manager" charged with the task of planning and organizing a County Housing Authority, getting it funded, and implementing a comprehensive housing program.

Utilizing NASA management techniques, the "project manager" initiated a series of actions which resulted in accomplishment of the goal. First, he set up a temporary organizational vehicle for combining and integrating the planning efforts of the three county government units responsible for housing -- the Chief Administrator's Office, the Planning Department, and the Department of Development and Licensing. The temporary organization was a housing cabinet composed of the chief administrative officer, the director of planning, and the director of development and licenses, with the "project manager" acting as chairman, and the County Executive as an ex-officio member. Second, he overcame a sense of futility which had developed among county officials due to earlier experiences with large coordinating committees whose recommendations had been ignored by the County Council. He infused enthusiasm and excitement in these officials by his own commitment and by enlisting the active support and leadership of the County Executive. Third, he was able to gain the cooperation and support of a citizens' advisory committee on housing (another temporary organization) which had been set

up following the abortive attempt to establish Operation Breakthrough in the county. This was done through development of good working relationships with the Chairman of the committee and several of its key members. Fourth, he saw to it that the recommendations of the housing cabinet and the citizens' committee to the County Council were compatible. This was an important factor in encouraging the Council to act favorably on the report of the citizens' committee which recommended that the County build or lease 900 low income units and establish a County Housing Authority.

The "project manager" then became a lobbyist, working with key state legislators to assure passage of an act enabling the establishment of the Authority. When this was accomplished, he concentrated his efforts on persuading the County Council to approve sufficient funds to start a housing program. Two of the leading civic groups in the area were enlisted to conduct an educational effort to this end. While housing is yet to be built, the authority and machinery for financing and construction are in being as a result of the transfer of space-age management approaches.

A Health and Social Service Center[13]

The second instance also involved New Castle County, but in this case the problem was the organization and building of a health and social services center in a disadvantaged area of the county known as De La Warr. The crime rate and the incidence of mental illness in De La Warr are among the highest in the county, while the level of income and the availability of health care and social services are among the lowest. Concern for this area of the county had been growing for several years, reaching a peak in the summer of 1970 when a black owned shopping center was burned by black vandals.

The "project manager" entered the picture in the Fall of 1970. His title was "consultant to the County Executive." Soon after he was appointed, the "project manager" learned that emnity between blacks and whites had effectively prevented agreement both on what action should be taken on the issue of a health and social services center or who should take it. There was also a sharp disagreement on what services the center, should it be built, would emphasize.

The initial step taken by the "project manager" was to perform a systems analysis, in which the affected groups, resources, problems, and sources for solutions, were identified. The analysis indicated that community consensus was the major obstacle to action. The "project manager" decided to work on methods for achieving working relationships among citizens. By defining the goal of deciding on a specific location for the center and getting resources and authority to build it (even though the questions of specific functions and emphasis of the center would be left for later decision), the "project manager" was able to focus the community's attention on a mission. This permitted the development of a temporary organizational vehicle -- a citizen's council -- as well as an ad hoc group of officials from the school board, the office of the Governor of the State, and the County government, to work behind the scenes to insure coordination of efforts and to give the project priority attention on the various levels of government.

A process of interaction -- of frequent meetings and discussion sessions -- was developed by the "project manager", not only between citizens but between citizens and county officials as well. There developed a growing willingness to work across neighborhood and racial barriers. In the words of the "project manager", "as black men and white men argued over the social service center, they found their problems weren't so different after all. And they both won by working together."

The cohesion of the community helped to ease the way for the County Council to approve funds for the service center. Ground breaking took place in October, 1972, just two years after the project was begun. It is planned to continue the project approach until the center is operational.

Project Management in New York City[14]

In New York City, project management has been applied to a variety of tasks in the areas of social services, health, housing, planning, transportation, education, and public safety. Approximately 80 projects are active. They range from implementation of a drug treatment program to civilianization of police department office jobs to free patrolmen for street duty.

An Office of Project Management operates in the Mayor's office. In the past year, project management offices have also been set up in the Human Resources Administration, the Fire Department, the Police Department, and the Housing and Development Administration, among others.

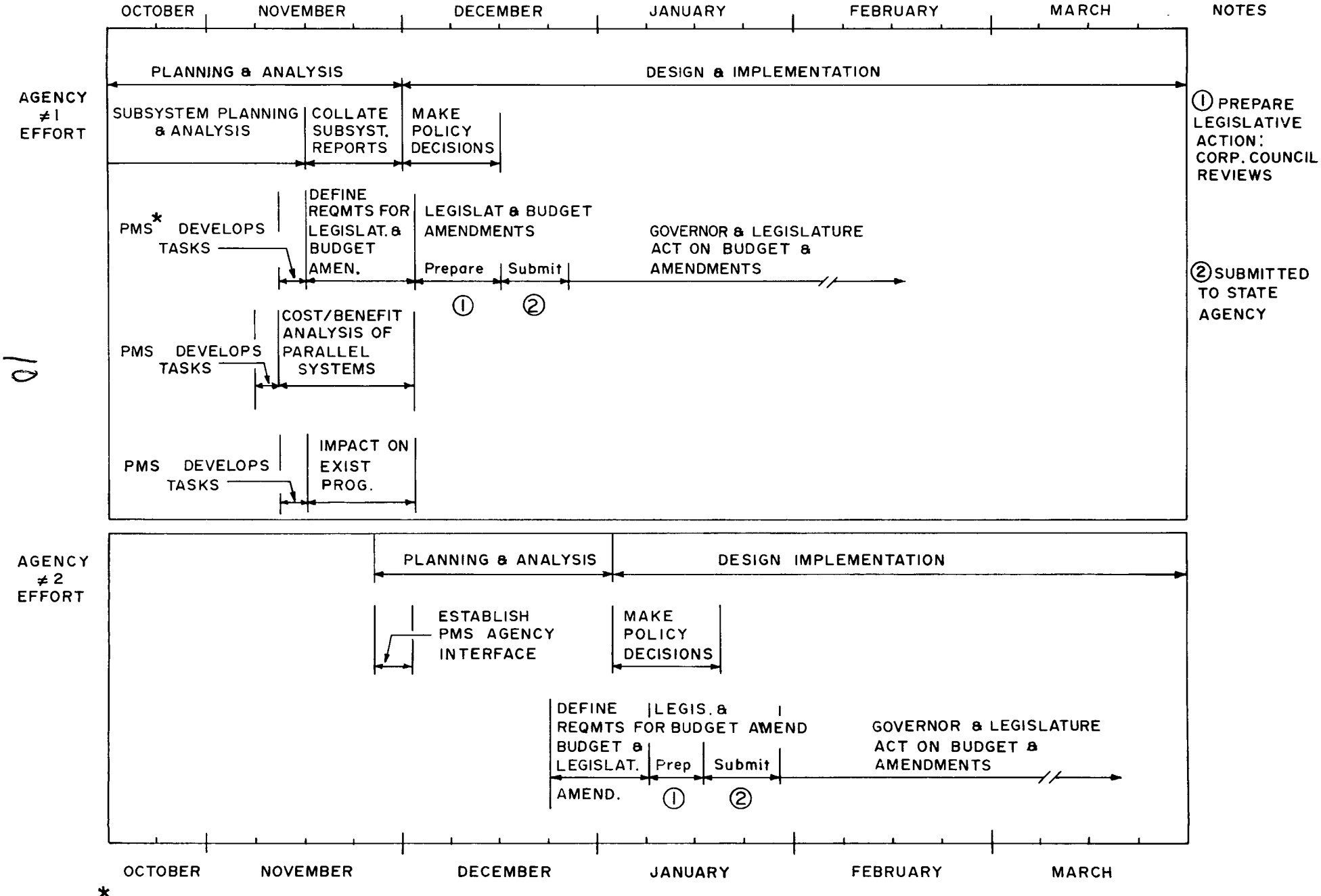
The Office of Project Management is essentially an extension of the Mayor's office and receives assignments from the Mayor or his top aides. The professional staff of the office numbers thirty, most of whom are recent graduates of Master of Business Administration programs. All staff members are "provisional employees" serving at the pleasure of the Mayor. For each project handled, a member of the staff is designated "project manager". He is responsible for developing a project plan, a work breakdown structure, and determination of milestones. He works closely with the agencies involved and must rely on them to provide personnel and material resources, as well as for implementation of the project. Figure 1 shows a typical project milestone and progress chart.

As in the case of project managers in technological agencies, project managers in New York City must negotiate and bargain with line officials for the amount and type of resources needed, and must coordinate efforts across agency lines. The project manager is held responsible for keeping the project on schedule and for cost and performance, and is expected to get results. Successful project managers are rewarded with salary increases and promotions. Unsuccessful managers may lose their positions.

The project management offices in the other city agencies operate in much the same manner, but handle tasks confined to their own agencies. The offices in Police, Fire, and the Housing and Development Administration have just begun operations. The project management effort in the Human Resources Administration (HRA), however, has been in existence for over a year, and currently has 50 active projects, with a professional staff of 150. HRA utilized project management to organize and implement the taking of identification photographs of half a million welfare recipients -- a herculean task by any standard -- as well as to develop methods for getting 30,000 drug addicts currently on the welfare rolls onto treatment programs. Another project involved the recertification for eligibility of 310,000 recipients. The project management staff also is working on improved methods for implementing separation of income maintenance from social services.

PROJECT MANAGEMENT IN ACTION

MILESTONE AND PROGRESS CHART



*PROJECT MANAGEMENT STAFF

The results of project management in New York City are too tentative at present to permit evaluation of this approach in comparison with traditional management. However, optimism is expressed by sources both in and outside City government that significant gains will be achieved, especially for programs in which two or more agencies are involved.

Officials in HRA feel that its project managed programs have given them a much better picture of who welfare recipients are, and is helping them to eliminate those not eligible. In addition, it is helping them pinpoint recipients who should have special attention, such as narcotic addicts and persons requiring treatment in nursing homes.[15] The project managers in the Mayor's office feel that major breakthroughs, especially in housing, and in health services for children, will result from their efforts.

Why Project Management May be Transferred

Research on project management in NASA yields insights as to why this particular aspect of advanced management may be transferred. Studies show that the social skills of the project manager are as important, if not more vital, than his technical ability.[16] NASA project managers spend large percentages of their time in bargaining, coaxing, cajoling and confrontation.[17] Sayles and Chandler, of the Columbia Graduate School of Business note, "As one observes these managers, they seem to be engaged in a ceaseless round of 'political' give and take."[18]

The walls of a project manager's office are covered with PERT charts, or other visual means of tracking progress. But the action within the office resembles that which might go on in the rooms of a local political leader who is trying to get the city moving on a pet project.[19]

The similarity between problems encountered in technological and social programs is striking. Both, for example, are highly vulnerable to actions by a large number of persons or groups who can stop a project. "NASA's launching procedure for Apollo allows more than one hundred engineers and technicians to stop the countdown if they observe some malfunctioning in the systems or subsystems under their surveillance. The typical large (social) program has an analogous number of people who can call a halt and upon whose concurrence the program depends. This can be seen easily in urban-redevelopment programs. In one instance, because one department store changed its mind about moving into a new shopping center, the total redevelopment plan was halted. In another case, the reluctance of

one faculty member in an urban university to offer consulting assistance to a set of potential new tenants (who were to be attracted partially on the basis of the availability of high quality technical support) caused the early demise of an imaginative "university park" type of redevelopment program."[20]

In both the technological and social programs, the project manager takes the responsibility for insuring that "all systems are go" -- that the launch will not be interrupted or that the urban renewal project will not be halted. He will do all he can to insure that no inferior engineering, no communications snags, no lapse of quality control will cause a stoppage of the launch. Similarly, he will do all he can to persuade the department store to go back to its original plans, to find a suitable substitute for the professor who withdrew, or to find other solutions which will permit the project to continue. Frequently in non-project organizations, no single person assumes this type of responsibility.

The management techniques and skills associated with project management are quite different from the image of the precise and neat controls which are associated with what has been called "space age management" or "systems engineering." This may explain the difficulties experienced by attempts to transfer to social programs only those aspects of advanced management technology which are primarily concerned with systems engineering, task breakdown and work flow. The specialized tools and techniques of space age management are extremely useful, but only in conjunction with the astute use of social and political management skill.[21] Project management provides the structural context as well as the behavioral setting for the utilization of the needed social and political interaction, while making use of the modern techniques as aids to management.

Further, the interdisciplinary approach of project management may be a decided asset in dealing with social problems. The interrelation of poverty, crime, educational opportunity, health, and housing is apparent.

Conclusion

At the beginning of this paper we noted that differences between agencies with technological and social missions appeared to present obstacles to the application of space age management to social problems. Studies of project management in NASA indicate that these differences are not so pronounced. In the management of a large scale technological program the social and political factors are of prime importance.

Similarly, the goals of technological organizations are not clear in many instances. For example, industrial firms attempting to develop new products do not necessarily have clear goals in mind as to what the product will be, except that it should meet a consumer need, be popular, and profitable. The specific product is defined as a result of a process of development.[22] Even in the space program, it is only after considerable research and study that specific missions and objectives are agreed upon. The assurance that they can be achieved is based on experience, experimental and theoretical knowledge and technical and management competence.

The social goals of providing warm, safe and clean housing to low income families or of eradicating use of hard drugs do not seem less vague than those of technological agencies when viewed in the context discussed above. In fact, the degree of agreement within the society on the desirability of these social goals may be greater than for the goals of the space program. The problem is in managing the process through which the broad and vague goals are defined specifically and implemented.

Perhaps the difference between technological and social programs in this regard is the emphasis on the need for accomplishment. In technological agencies or industrial firms, it is a foregone conclusion that striving for the achievement of the objective is a necessity. Specific goals will be defined and management will do or die in an attempt to carry them out. Project management is advantageous when this emphasis is present. In social agencies, a similar emphasis is emerging.

The application of quantitative analysis to social areas, and the use of "social indicators" is beginning to imbue personnel in social programs with the concepts of measurement of progress toward objectives. To a larger extent than previously, also, the importance of timely solutions to social problems is being recognized, as citizens' groups demand that action be taken quickly to meet community needs.

The fiscal crisis in local government has produced concern with costs of social programs and methods for achieving objectives within cost guidelines. Local government is now deeply concerned as well with questions of productivity of employees and cost effectiveness.[23]

A tentative answer, then, to the question of whether space age management is applicable to social problems is dependent on the specific aspect of space age management to be applied. It appears that the aspects involving temporary organization or project management are applicable on the basis of limited experience to date and comparisons of management problems in technological and social programs.

Further, it appears that if public administrators apply the management approaches of the space effort selectively and creatively, advances in the management of government social programs would result. While attempts at transfer are still in their infancy, they promise to justify the hopes of those who believe that if we can land men on the moon, we can make the Earth a better place to live.

NOTES

1. James Webb, Space Age Management (New York: McGraw-Hill 1968) esp. pp. 3-32; Office of Technology Utilization, National Aeronautics and Space Administration, Systems Analysis Technology and Its Transfer to Civil Systems, NASA SP 5048, 1968.

2. For information on these techniques, see David I. Cleland and William R. King, Systems Analysis and Project Management, (New York: McGraw-Hill, 1968); David Allison (ed.), The R and D Game (Cambridge, Mass.: MIT Press, 1969).

3. See Henry J. Anna, "On the Transfer of Organizational Technology," paper delivered at the Annual Conference of American Society for Public Administration, New York City, Spring, 1972 (copies available from author, University of Cincinnati), and Orion White, Jr., "Organization and Administration for New Technological and Social Imperatives" in Dwight Waldo (ed.), Public Administration in a Time of Turbulence (Scranton, Pa., Chandler, 1971) esp. pp. 164 ff.

4. See Anna, op. cit.; Raymond A. Bauer (ed.), Social Indicators Cambridge, Mass.: MIT Press, (1966) esp. Ch. 1 and 2. The controversy involved in attempting to measure performance in social programs is seen in the reactions to evaluative studies of Head Start and other poverty programs, or in the current discussion of attempts to measure productivity of employees in social service agencies.

5. David Wilemon, "Transferring Space Age Management Technology", The Conference Board Record, Vol. VII (October, 1970) contains a discussion on this point (see esp. p. 52). See also, Leonard Sayles and Margaret K. Chandler, Managing Large Systems (New York: Harper and Row, 1971), pp. 320-21.

6. Murray L. Weidenbaum, The Modern Public Sector (New York: Basic Books, 1969) pp. 78-80; Bruce L. R. Smith, "The Future of the Not-For-Profit Corporation" Public Interest (Summer, 1967) p. 137.

7. Carl F. Stover, "Industry, Technology, and Metropolitan Problems", Public Administration Review, Vol. XXVII, No. 2 (June, 1967), pp. 112-117. Stover states that the California studies were valuable in that they demonstrate the long range potential for applying systems analysis and advanced management to social problems.

8. Ida Hoos, Systems Analysis in Public Policy: A Critique (Berkely: University of California Press, 1972) pp. 102-103.

9. One of the most ambitious attempts has been "Operation Breakthrough", a Department of Housing and Urban Development project to spur industrialized housing production for low and middle income families. Begun in May, 1969, this project is having great difficulty in achieving its goals. See Englebert Kirchner, "Can a $120 million R and D Injection Transform a $27 billion Industry", Innovation, Oct., 1971, pp. 18-27. Attempts to apply systems analysis in urban government have had mixed results, including outright failures. See "Applying Systems Analysis in Urban Government: Three Case Studies", a report prepared by the International City Mangement Association for the Department of Housing and Urban development (Washington, D. C., IMCA, 1972); Hoos, op. cit.

10. For a fuller discussion of project management see Cleland and King, op. cit.

11. Wilemon, op. cit., pp. 50-51.

12. This account is based on "Semi-Annual Progress Reports, Drexel University to NASA" under NASA Grant NGL 39-004-020, 1969-72, and on Hugh Annett, Development of Low and Moderate Income Housing in New Castle County, unpublished, Ph. D. dissertation, Drexel University, 1972. This case and the one following in the text resulted from "action research" performed by Drexel University faculty and research assistants under a grant from NASA for application of NASA management techniques to urban government. Drexel University and New Castle County reached an agreement under which a team of Drexel research assistants worked in the county government on specific projects. The team was composed of individuals with considerable experience in government or industry who were studying full time for the Ph. D., supported by the NASA grant. The approach used by the team had an Organization Development orientation. Team members were also interested in doing research on "temporary organizational systems".

13. Drexel Smi-Annual Reports, op. cit. Interview with G. M. Cadwell, the Drexel research assistant who was the "project manager" in this case. Philadelphia, Pa., Oct., 1972.

14. This description is based on interviews with James R. Chard, Director, Project Management Staff, Office of Project Management, City of New York, held in December, 1972, and on internal documents of the Office. See also, Jeffrey M. Franklin, "Photo ID for Public Welfare Recipients" State Government Administration, Vol. VII, No. 5 (September/October 1972) pp. 12-14.

15. Stern, op. cit. P. Kihss, "HRA Computer to Cut Rolls 14 per cent", The New York Times, November 22, 1972.

16. Studies have been conducted by Syracuse University, Northwestern University, Drexel University, University of Tennessee, and the National Academy of Public Administration under grants from NASA. The National Academy of Sciences sponsored a broad study of the management of large systems in which NASA project management was a main topic. The results of this study are contained in Sayles and Chandler, op. cit.

17. Sayles and Chandler, op. cit. E. Drucker, W. Pooler, D. Wilemon, B. Wood, Project Management in the Apollo Program: An Interdisciplinary Study (Syracuse, New York: Syracuse University, 1972).

18. Sayles and Chandler, op. cit., p. 213.

19. The importance of the skills of the project manager are emphasized by Sayles and Chandler as follows: "It is easy to be deceived about the functions of the project manager because...computerized controls appear to play such a crucial role. In fact, their operation is largely the responsibility of staff personnel within the project office. The project manager is more likely to want to see raw data, original correspondence, and the actual people who must make and carry out the development decisions. It will be his personal energy, powers of influence, and quickness that will be crucial in keeping things moving, avoiding holdups, and resolving seemingly unresolvable problems". Sayles and Chandler, op. cit., p. 213.

20. Ibid., pp. 211-213.

21. Webb, op. cit., p. 15.

22. Jack Morton, "From Research to Technology" in Allison, op. cit., pp. 213-235. The Minnesota Mining and Manufacturing Company initially did not know what consumer uses existed for its "scotch tape". It proceeded to discover which specific products it should make by taking surveys of the ways in which scotch tape was used by consumers and then manufacturing specific products, such as transparent tape on which one could write, "mystic" tape, etc., based on demonstrated needs.

23. See "Symposium on Productivity in Government", Public Administration Review, Vol. XXXII, No. 6 (November/December 1972).