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A Typology of Innovation Leadership: A Comparative Study of Four Administrators at NASA

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To analyze the concept of innovation leadership, the management style of four administrators of the National Aeronautics and Space Administration from 1961 to 1985, is scrutinized. Aside from the innovation leader's concern to encourage significant innovations by instilling in the organization the values of flexibility, vertical and lateral communication, participation, risk-taking attitude, etc., it is equally important for the top administrator to take an active role in shaping the external political environment and obtaining sturdy political backup for the goals pursued by the organization. Otherwise, innovation leadership will not fluorish. This concept, however, is not only applicable to technically oriented programs. It can also be useful in other public arena, especially in developing countries, provided that the organization focuses on a single and common goal which is widely accepted by the target population.

Introduction

Some of the more significant social and technological innovations that emerge in the post World War II era resulted from the efforts of the United States' civilian space program. The Apollo mission and its subsystems–Voyager, Skylab and the shuttle orbiter–have fed the imagination of the world with dreams of a future beyond the confines of the earth. This technological marvel is brought into being by a management style which nurtures the civilian space program.

This paper aims to determine those elements of a leader's management style and the environment that encourage an organization to produce innovations. To do so, it examines and compares the terms of office of four administrators of the National Aeronautics and Space Administration (NASA)–James Webb (February 1961-October 1968), Thomas Paine (May 1971-May 1977), James Fletcher (March 1969-September 1970), and James Beggs (July 1981-December 1985)–in an effort to isolate the variables that comprise the concept of "innovation leadership."

Through such examination and comparison, the study analyzes the concept of innovation leadership as it is practiced in the NASA and its possible application to a wide variety of endeavors in the public service.

Thus, the study investigates whether within certain definable limits, the agency head and his top managers can manipulate the organizational environment and its structure to better accommodate the production of innovations. It discusses

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characteristics, management style, and organizational environments that proved most conducive to innovation. This study relies on data derived from a survey of current and former NASA managers and from internal NASA historical documents and histories.

The paper then provides a discussion of the relationships between innovation leadership and the innovative organization, on planting innovations firmly into the organization, and institutionalizing the capacity for organizations to be innovative. The conclusion consists of an overview of the implications of innovation leadership to the study and practice of public administration.

Typology of Innovation Leadership at NASA

Leaders with certain background and unique management styles can positively encourage the production of significant innovations when placed in specific organizational and political environments. These innovation leaders are concerned primarily with strategy and tactics.

The NASA administrator, in concert with his top management team, is responsible for obtaining financial and political resources to enable the agency to meet its mission. The top administrator can play an active role in shaping the external political environment, rather than passively accepting it as given.

Team-Based Management

Innovation leadership is team-based. The team orientation is manifested at all levels of government: within and among the executive and legislative branches, and within NASA itself. Within the agency, the administrator and associate administrator have managed to effect innovative changes through teams, as characterized most dramatically by the Webb-Seamans-Dryden troika.[1] According to Webb, not a single important decision affecting the agency was made without the approval of this "triumvirate." This supports the contention that innovation leaders are consultative; they discuss major issues with colleagues, often reaching consensus before taking action. They foster team building within the agency, and between the agency and contractors. To balance this team orientation, they also foster internal competition, as manifested most clearly during Webb's tenure at NASA. Such internal competition was deemed important to foster a quality of output (Peters and Waterman 1982).

Theory X - Theory Y Orientations

The original hypothesis for this study postulated that the innovation leader is a "Theory Y" manager, after the Douglas McGregor typology[2] (McGregor n.d.). A strict Theory Y orientation at the top of the organization may not be required for innovation leadership to exist. A strict Theory Y orientation, however, is more applicable to the operational management ranks of the agency than to the highest echelons of the

organization. But many elements associated with that concept are important: reduced hierarchy, participation and democratization. Evidence suggests that everyday, human resource management at NASA was indeed in line with Douglas McGregor's teachings, but this was caused by top management.

NASA's organizational dynamics were, given its predominantly professional and expert environment, probably more in tune with Theory Y assumptions than with other, more direct styles. This is particularly true given the mandate to run the civilian space program openly. The most logical alternative to this style is the military model, with its command and control orientation. This model was not deemed appropriate by the agency's designers as they sought to create an open program. Nor were a number of other more "business-like" environments deemed acceptable, as they foster secrecy as well as penalties for mistakes.

The extent to which Webb, Paine, Fletcher and Beggs espoused Theory Y assumptions is debatable. For instance, while a positive orientation toward people is often associated with Theory Y assumptions, there is evidence suggesting that Webb or Fletcher were especially people-oriented. Both men could, in fact, be difficult to approach, as well as occasionally unpleasant. Webb was known for his very forceful personality, Fletcher for his very retiring nature. Nonetheless, the term of Webb was most prone to innovation. This suggests that the innovation leader need not be a Theory Y manager even though another evidence indicates there was a de facto Theory Y spirit in many parts of the organization. The emphasis on a Theory Y orientation should, instead, be replaced with an emphasis on the innovation leader as strategist, who focuses not as much on making the organization run well, as on how to remain flexible in a political and expert environment.

The innovation leader is more aligned with what Philip Selznick terms an institutional, rather than a technical or administrative manager; he[3] promotes and protects values, sets goals and establishes the character of the organization (Bower 1983). The innovation leader also has characteristics in common with Joseph Bower's political, as opposed to technocratic managers. Political managers work toward distributing costs and benefits to society's activities in order to enjoy stability and a sense of legitimacy. For both Selznick and Bower, the administrative or technical manager is responsible for the day-to-day operations of the organization, as was Robert Seamans during the Webb administration.

Situational Flexibility

An effective innovation leader is able to change styles as the situation demands. Instead of offering one prescription for a given circumstance, applying situational, or contingency theory, permits the use of different forms, depending on the specific needs (Gortner, *et al.* 1987:111-112). Innovation leadership is situational, as is leadership in general according to Barnard Bass (1981). He posits that successful leadership depends on one's actions when faced with a given confluence of factors; use of an inappropriate

leadership style may cause the leader to fail in his initiatives. According to Fred Fiedler (1974), leadership is contingent on the situation. The leader can determine the most effective leadership style, given a certain situation. Situational leadership allows for flexibility and adaptation of leadership style to a given circumstance. This flexibility is required of the innovation leader.

The wealth of research and theory in the field suggests, therefore, that there is no one best way to lead all of the time. This is well illustrated at NASA during the Apollo years, for example, where James Webb was often viewed as an autocratic administrator. Overall, the organization was team-based, and relatively democratically organized and run.

Significantly, at its most innovative era, NASA employed a flexible philosophy of management. Administrator Webb and his associates did not require strict adherence to procedures, but allowed personnel to pursue alternative means in achieving the agency's objectives. Further, the type of technical professionals engaged by the agency, who were primarily scientists and engineers, would have resisted attempts to be "micromanaged," or managed in more directive ways. This flexibility did erode as inquiries were made into the Apollo 204 fire in 1967.[4] Webb reacted to these inquiries by imposing greater control over his agency, after which NASA became less innovative. Under such a regime, many professionals may not have been attracted to the agency in the first place.

The innovation leader also incorporates characteristics associated with what Anthony Downs terms "advocates" in "The Life Cycles of Bureaus;" advocates are optimistic, energetic officials who are willing to engage in conflict for what they believe is the best way to achieve their objectives (Downs 1967:102). Without a display of such optimism and energy on the part of NASA's leadership, it is doubtful that the space agency could have achieved its successes.

Substantive Knowledge

An innovation leader is one who has substantive knowledge of the work of the agency. Each of the administrators studied was either a scientist or an engineer with the exception of Webb. He was a lawyer and a political manager but extremely conversant with technical aerospace matters. Further, innovation leaders are often seen in the "trenches." A visible "hands on" style of management, or active "management by walking around,"[5] increases the probability of evoking innovation-producing behavior. In such a setting, the administrator is able to take personal interest in, and visibly champion new ideas. Webb in particular was adept at meeting with and being seen among the lower-level scientists and engineers in his agency.

Prior experience in organizations that deal with products similar to those of the agency can be important in helping an administrator understand the agency and its

personnel, and to stimulate the organization to want to produce innovations. Each of the administrators studied have had such experience, some with NASA, some with aerospace contractors, and some with both.

Participatory Organization

An innovation leader encourages organizational experimentation in an organization perceived to be participatory. Organizational variety was more evident in Beggs' administration than in the three others studied. The innovation leader does not require a traditional pyramid-shaped hierarchical bureaucratic organization, but rather tends to experiment with and encourage nonfamiliar (innovative) forms. These are usually designed to reduce hierarchy and allow employees to work together as teams in which they recognize that they have a voice in matters affecting their organizational lives. This is consistent with Warren Bennis' identification of democratic, "adaptive, rapidly changing, temporary systems" (Bennis 1968) as organizations most likely to initiate changes and thus, to innovate.

NASA was a leader in the team approach to managing projects, and a number of the Field Centers implemented various forms of quality circles. The Kennedy Space Center was innovative to the point of establishing quality circles that included contractor personnel. Furthermore, much of NASA's work force consisted of scientists and engineers who required a considerable amount of freedom to perform their work, a requirement not readily met by traditional organizational structures.

Communications and Sharing of Knowledge

Innovation leaders encourage open communications in their organization. During the Apollo years, Webb considered it critical to foster an environment in which communications could freely flow vertically, laterally, and diagonally through the organization. One tool he used was the Managerial Reviews, in which lower-level personnel made presentations to Webb and his staff on a monthly basis. This type of communication facilitated the process of innovation, for the presentations stimulated the thinking of attending scientists and engineers. Other tools included the distribution of program notes and status reports, distribution of hard copies of slides following presentations and briefings, and more recently, a closed-circuit television network linking the NASA centers.

Risk-Taking, Risk-Aversion and Organizational Calcification

The NASA experience suggests that the innovation leader is a risk-taker. He accepts mistakes as contributory to learning, and does not cultivate fear for their repercussions. The risk-taking attitude, and thus innovation at the space agency, was significantly reduced in two occasions: first, after the Apollo 204 fire; second, after the Challenger incident, as the organization's leaders began to react to outside investigatory forces in the Administration and Congress.

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Observers of NASA often comment on the agency's bureaucratization, by which they mean bureaucratic calcification. It is well documented that subsequent to the Apollo 204 fire in January 1967, Webb imposed controls on the agency with the creation of the Office of Management. He and his agency became increasingly sensitive to external criticisms, and layers of hierarchy were consequently imposed on the decisionmaking/ approval process. In any organization, this slows down the operations and reduces the momentum that keeps it energetic and increasing stagnation. By the time these controls began to have their effects, NASA entered the post-Apollo era, with no long- range plan, reduced resources, diminishing motivation and consequently diminished innovativeness.

Paula Korn, consultant to NASA, believes that with time, such a posture has made NASA afraid of taking risks:

> When NASA started out in the late '50s, there was no history, and therefore no failures; the potential for success was therefore much greater. Risks were so unknown people weren't thinking about their objectives. Also, there was a completely different environment; politically and economically. But the more they did, the more errors they made, and the more risk averse they became (Interview with Korn, 4 January 1990, Washington D.C.).

A similar situation developed after the January 1986 Challenger tragedy. Perhaps the fact that the shuttle orbiter's explosion was witnessed by a huge live television audience exacerbated the situation.

Among the investigatory bodies studying the agency was a Presidential Commission, whose meetings were open to the public (including TV coverage of testimony) and the press. The press as well as politicians closely observed NASA, liberally criticizing its actions before and after the incident. NASA's reaction once again partly mandated, was to impose layers of control over its operations.

Life Cycles and Systems Theories

As an agency ages, it becomes less innovative. The lack of major projects on the scale of Apollo following the manned lunar missions did not provide the opportunity for much innovation. The agency suffered a malaise brought on by reduced budgeting and staffing levels, encroachment by the Air Force into the civilian space program, and a lack of vision. The external political environment became less supportive, and resources were reduced for missions which would allow the agency to produce major innovations at the previous rate.

In the 1960s, the entire space program was new to American government and industry. During that time, it was necessary to be innovative in developing the tools and infrastructure needed for a space program to evolve. Once the space technology and management base were established, there was less opportunity, or need, for innovation. As NASA has aged, it evolved in the classic manner of a contemporary bureau, becoming

more procedure-oriented, more hierarchical and less flexible. These qualities reduce the potential for innovation. This has been exacerbated by the "greying" of the NASA work force, much of whom were recruited in the Apollo era. In other organizations, there is a continuous inflow of new blood.

A better understanding of the problems facing NASA may be obtained through a brief review of general systems theory, which looks into the relationship between an organization and its environment. Daniel Katz and Robert Kahn (1966:302) maintain that organizations depend on their environments for their existence in a way similar to biological systems. They import energy from their environments, process it and release the output; it is the energetic output that revives the system. Katz and Kahn found that through dynamic homeostasis, organizations can reverse effects of the second law of thermodynamics, by which all systems tend toward disorganization and entropy. Organizations can import energy from their environments and obtain the resources necessary for survival, expansion and change.

Emery and Trist (1965:21-22) maintain that in order to understand organizational change, one must understand environmental processes, for they force change upon the organization. This is not to suggest that NASA was no longer innovative after Apollo. The shuttle orbiter, for example, is a very innovative concept in design, and one of the most complex pieces of technology in the world (witness the use of the shuttle as the ubiquitous design element used in selling computer software and monitors). Commercial agreements entered into during the Beggs administration are very innovative, as are plans for the space station Liberty. However, it is suggested that with stronger support, an infusion of new thinking and a stronger sense of mission, NASA could have been more innovative in these and other missions.

Nurturing Political Relationships

When the agency's mission is to accomplish a highly imaginative objective, as the case with the manned lunar landing program, the administrator may have less need to concentrate on motivating his staff than if such an objective did not exist. In such a setting, personnel are driven by the objective itself, being closely associated with the challenge and the glory of the mission. The administrator can then concentrate on attaining the mission objectives and obtaining the political and budgetary support necessary for accomplishing them.

The challenge of Apollo was a dual one: to accomplish what men had only dreamed of doing for centuries–setting foot on a celestial body, and doing it before the Soviets were able to. When the agency is not challenged by such a mission, the administrator must rely on the use of motivational tools to inspire the staff to be creative. When a vision of future accomplishments is lacking, it is more difficult to motivate personnel to be creative. Paine failed to inspire the Nixon administration to support his bold visions for a space program, leaving NASA with a more dispirited work force.

Without a political climate conducive to and supportive of a major project such as Apollo, the space shuttle or the space station, there are fewer opportunities for a leader to act as an innovation leader. An innovation leader needs a sophisticated understanding of the political environment faced by his agency and needs to know how to exploit it by nurturing and maintaining the right political (and public) relationships. This requires keeping abreast of political development in the executive and legislative branches. Further, the political environment must be conducive to supporting a major project such as Apollo, an orbiting space station or lunar and Martian bases if a leader expects to make headway.

Jesco von Puttmaker, who has been with NASA since its inception and headed NASA's long-range planning efforts, concurs that an effective leader's style depends on the political environment:

> There is no secret recipe for leadership at NASA. Leadership profiles have to change with the times, respond to the outside world. What made a good leader in the Apollo years would not necessarily make a good Administrator today....The '70s' national policies are different from those of the '60s'. Could an ideal leader have made [the fate of Challenger] different? Probably not.[6]

An administrator who has a good relationship with, ready access to, and genuine regard from a president and the top executive staff, has a greater opportunity to be an innovation leader. Webb demanded access to the President before accepting the position of administrator, and Beggs appeared to be genuinely liked and appreciated by the White House. In both cases, the presidents demonstrated substantial support to space programs. Neither Paine nor Fletcher enjoyed such access, however, and in both their administrations, NASA suffered from lack of budgetary support.

An analogy can be drawn between innovation leadership and the literature of third world development in public administration. Walter W. Rostow, for example, proposed that before a nation can embark on the road to development and modernization, it must meet certain "preconditions for takeoff" (Rostow 1971). Similarly, it might be said that a supportive political environment willing to commit resource is a precondition for innovation leadership to exist in large national programs. It continues to be a conditional variable throughout the life cycle of the program, for loss of the support can mean a substantial downgrading and perhaps elimination of major portions of the project. This was the experience of the Skylab mission, as well as of the proposed space transportation system, which was reduced from an elaborate system of vehicles and spaceware to a downsized and considerably limited shuttle orbiter.

Innovation Leadership: A New, Unique Style

The Innovation Leader

The innovation leader is a type of leader not explicitly identified in the leadership or innovation literatures. But there are unique characteristics associated with leaders who can promote innovations. The innovation leader is a distinct type of leader probably of equal rank with such other types as charismatic, political, religious, revolutionary, executive and transformational leaders. The lack of recognition of this category of leadership in the past may be traced to an assumption that inspiring an organization to produce innovations is one that a leader does in the line of duty.

An innovation leader is analytically distinct from other types of leaders and from general managers. Typologies that apply to a variety of leaders may be established to show how the characteristic activity of each is directed toward a specific end. Thus, some managers are adept at leading a processing environment, while others are effective as heads of academically-oriented research organizations. Neither one may require innovation. Some organizational environments require stability to be effective or accepted; and this stability might be disrupted by an innovative environment. Any type of leader emerges in response to certain stimuli and needs; the innovation leader emerges when there is a manifest need for an organization to be directed toward the production of innovations.

This is not to suggest that other types of leaders do not occasionally influence their organizations to produce innovations. The chief executive officer (CEO) of a production- oriented facility may well seek innovative ways to produce the organization's output, and adopt some of the characteristics of an innovation leader. A transformational leader, as characterized by James McGregor Burns (1978), may well, at times, assume some of the characteristics associated with transactional leaders in pursuing certain objectives. The situation governs which type of leadership attributes are called for.

Innovation Leadership and the Innovative Organization

There is a potentially strong relationship between innovation leadership and innovative organizations. First, it is likely that innovation leaders are drawn to innovative organizations. In the case of NASA, the four leaders manifested different degrees of innovation leadership, and were drawn to, as well as selected for, the top management position in an innovative organization. This is not to say that an innovation leader can only succeed in an innovative organization. Such a leader can help mold internal and external environments that will increase a noninnovative agency's innovation-producing ability. The concept of innovation leadership may be applicable to top managers of agencies other than NASA.

NASA has been able to move through changes in objectives and continues to be innovative despite the popularity of post- Challenger "NASA-bashing." The agency's

innovation-proneness, however, has been stymied in part by a lack of clear major objectives. This was the case of Apollo which would have generated its own level of excitement and motivation within the organization. Even the space station is considered but a step to more distant objectives, and is not as motivating a force as would be a lunar base or a Martian mission.

NASA's innovativeness could have been enhanced with a greater risk-taking orientation and an earlier devotion to long-range planning. Perhaps a large part of the responsibility lies with Webb, who had the opportunity to weave the space program into the very fabric of American life, but who chose instead to focus the energies of NASA on Apollo. As a consequence, NASA had no significant plan for the post-Apollo era. In this regard, Webb managed an organization which appears to have been established not to create an ongoing space program but to see through the accomplishment of Apollo.

Planting Innovations Firmly Into Organizations

Innovations became planted firmly once they came into routine use. Yin (1979) identifies the final stage of innovation diffusion as the "disappearance" stage, where the innovation disappears as a novel concept and becomes ingrained into the fabric of the organization. NASA's Technology Utilization Program (TUP)[7] started as a novel mission and process but later became an active, operational part of the space agency. Other government agencies accepted TUP as a model for innovative actions in their own spheres. Similarly, when the quality circles were established at Kennedy Space Center, incorporating participants from contractors, they constituted a relatively novel approach to this form of organization. Once the circles became operational and routine, the innovation disappeared. Finally, with respect to hard technology innovation, the space shuttle orbiter is the most complex assemblage of systems developed by man; it comprised a collection of what were acknowledged to be innovative technologies. The shuttle is in many ways losing its character as a novelty, and becoming routinized–ingrained into the fabric of the nation's space activities. Some even see the shuttle as obsolescent–a great novelty for its time, but no longer a creative approach to low-cost, reusable launch technology.

Institutionalizing the Capacity to be Innovative and to Deal with Novelty

Innovation objectives were written into NASA's charter when the agency was created to develop and implement the nation's civilian space program and to diffuse applicable technology developed for space into the nonaerospace economy. In this regard, innovations at NASA were intended to be institutionalized. NASA's leaders, applying various degrees of innovation leadership, encouraged various hardware and organizational innovations to achieve the organization's mandate. Innovation was institutionalized into the agency by the simple fact that everything related to space had to be invented: it had never been done before. Thus, in order to succeed at its mission, NASA had little choice but to be innovative. It also had to deal with novelty on an ongoing basis.

The capacity to promote novelty, i.e., innovations, is not enduring for organizations. This was illustrated by studies conducted over 60 years ago which resulted in the recognition of the Hawthorne Effect: individuals behave differently when a situation is perceived as new, but they often return to old patterns of behavior when the newness fades. The principle was also recognized by Yin (1979), when he incorporated the "disappearance" of innovation stage into his process model. With this stage, innovations become ingrained into the fabric, into the routine processes of the organization. Thus, by definition, a novelty disappears as a novelty, either because for some reason it is rejected, or because it is adopted and becomes routine.

However, an organization's capacity to deal with novelty on an ongoing basis, as compared to dealing with a single novelty, does exist. An organization can be directed and structured in such a way to be able to create novelty on an ongoing basis. Certain organizational characteristics (decentralized structure, small work groups, intellectual challenge and open communications among others), coupled with the energy imported from outside the agency (i.e., national commitment to a project, political support, funding, and human resources) result in an agency having the ability to deal with novelty as well as to be innovative.

Implications of Innovation Leadership

Implications for the Study of Public Administration

The concept of innovation leadership involves a fusion of portions of the public administration subdisciplines of innovation and leadership. The literature of innovation is rich in information relating to organizational environments for innovation, and relevant activity at the technical and professional levels, but very little research has been performed to determine how innovation is managed at the top of public organizations. Numerous attempts have been made to distinguish between environments appropriate for the creative and implementation phases of the innovation process, as can be found in the works of Victor Thompson (1969), Lawrence Brown (1942), and Lawrence Mohr (1982) among others. Efforts have also been made to identify and graphically illustrate the constituent parts of that process, as what Robert Yin (1979) and Everett Rogers (1962) did. A great amount of the literature is also devoted to the manner in which innovation is diffused within and among organizations, and the way it spans organizational boundaries. Numerous writers make passing reference to managerial strategies for change, but very little work has been done heretofore to analyze the leader's role in innovation.

The concept of innovation leadership focuses on behaviors and characteristics of leaders which enhance the successful production of innovations in their organizations. It therefore enriches the process of innovation by providing it with another facet, a view of how an organization may be explicitly led to increase its innovation potential. The literature of leadership, an enormous amount of research and writing exists on the nature

of leadership. However, there is a dearth of information relating to how leadership in an organization might consciously contribute to producing innovations.

Implications to the Practice of Public Administration

The most obvious practical application of these findings is for its use in the selection of agency leaders. Those who choose agency heads can more consciously seek out people who meet the characteristics identified with an innovation leader. This is a leader who desires to increase the potential for the production of innovations and demonstrates knowledge and ability in managing large technological organizations, feels comfortable in a changing and nontraditional organizational environment, and commands the respect of and has the ability to deal with the world from which the agency obtains its resources and direction.

A supportive political climate is necessary for a major technological or new management program to be maintained and operated successfully. If the political support of grassroots, legislators, and leaders in the executive branch are not indicated, the program may falter. This places responsibility on the chief executive and his top managers to challenge and motivate the nation to take part in and look positively upon the program. There are many such programs in the United States to which innovation leadership can apply: currently, the human genome, space station, super conducting super collider, AIDS research, National Aerospace Plane, SDI and numerous other programs are examples. Each is under pressure to compete for resources, and to be innovative in finding solutions to the problems they seek to solve.

The head of a technological agency can use the findings like the ones discussed in this study to shape the internal organizational environment to one that is more conducive to the production of innovations. Further, the literature makes available to an agency head an intellectual base in selected aspects of leadership and innovation that may stimulate ideas. Attention to these studies might encourage an agency head to decide that a loser, more democratic structure would be more appropriate for his agency. Similarly, he might determine that a team approach for managing could improve the innovation-proneness of the organization including quality circles or other small team-based organizational structures. The leader should also be able to distinguish between the technical innovations, those related to the output of the agency and social innovations. Social innovations can provide the structures and strategies to best achieve the technical innovations, or be valuable in their own right.

Alternatively, he may seek assistance from an outside consultant on team-building and organizational restructuring who also knows the innovation leadership prescriptions, to establish internal climates most conducive to the production of innovations. Further, such guidance might help him or her determine that the agency's goals are not sufficiently clear to organizational members, or not sufficiently challenging to make the personnel want to make every possible effort to achieve them. Finally, the agency head

may determine that it would be more appropriate to become more active in the political arena as a way to obtain resources for programs.

The concept of innovation leadership appears to be highly applicable to a vast array of development efforts. Often, these efforts do not achieve the anticipated level of success because of lack of political support, insufficient managerial ability, poorly trained manpower or failure to properly recognize the recipient population's ability or willingness to accept desired change. It is suggested that the innovation leadership approach might facilitate the successful implementation of many programs in the developing world.

First, the program director should be a person who has knowledge of the activities in which his staff will engage. He should have previous managerial experience in a similar organization, and be sufficiently knowledgeable in the disciplines involved to be able to intelligently converse with trained technicians who will be implementing the program.

In order for any project to be successfully implemented, the program director must be assured of the political support necessary to assure adequate resources for completion of the venture. This may well require intense lobbying efforts before legislative as well as executive bodies and before the public. Further, the nature of the lobbying must be altered to meet changes occurring in the external environment. Failure to have a strong sense of the pulse of the political environment within which the program exists will almost assure failure; but to understand that environment is insufficient, it is also necessary to be a force that creates support for the program.

Armed with assurances of continued resource allocation, the innovation leader must instill in the organization a sense of mission. The objective of the program must be made clear to those who will be working toward it. The greater the extent to which the innovation leader can create in the organization, such values as participation, low level of hierarchy, situational flexibility, communications, and risk-taking, the greater the chance that the staff will avoid becoming bogged down by rigid standard operating procedures or by the newness of the objective and the methods required for achieving it.

The innovation leader must be adept in the political world in order to obtain the resources necessary to accomplish the agency's mission. At times, he has to create opportunities for the agency. Other times, agency heads have failed in the attempt, mainly because the larger external environment no longer supported large, extensive endeavors of the kind sought by the agency.

Finally, perhaps more important than in other situations, it is critical in development activities that the target population be willing and able to accept the changes proposed by the program. For example, the construction of schools in remote districts is useless if teachers are not available to run them, and the construction or installation of up-to-date medical equipment serves no purpose if there are no trained technicians to operate and maintain them, or population willing to use them.

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Endnotes

[1]James Webb retained former Deputy Administrator Hugh Dryden as his second-in-command and appointed Robert Seamans as the agency's "operating manager." Webb primarily concerned himself with the political community, Dryden with relationships within the scientific community and Seamans essentially provided managerial guidance to NASA. The three worked with a high degree of cooperation, forming a tight leadership circle often referred to as the "troika." This arrangement continued until Dryden's untimely death in 1965.

[2]In *The Human Side of Enterprise*, McGregor identified managers as either espousing Theory X or Theory Y assumptions. The former have an essentially negative view of workers, and as a result they manage by control. Theory Y managers, on the other hand, believe in their workers, allow them to grow and develop, and assume responsibility and accountability in their work.

[3]The four administrators studied were men. Consequently, references to the innovation leaders are all in the masculine gender. The writer is aware of newer conventions using the "he/she" form and hopes the reader understands that in no way does this reflect sexist orientations.

[4]In January 1967, four astronauts perished when the Apollo capsule in which they were practicing erupted in flames. The capsule was sitting atop a Saturn V booster at a launch pad at Cape Kennedy.

[5] Peters and Waterman suggest in their book *In Search of Excellence, op. cit.*, that in the best run companies, the chief executive officers are highly and visibly involved in the work of organizations. Thus, a factory manager will often be found on the shop floor, discussing day-to-day problems with the technical workers, as did the founders of Hewlett Packard. The authors referred to this approach as "Management by Walking Around," or MBWA.

[6]Interview with Jesco von Puttmaker, NASA, 13 November 1989. Furthermore, the reference to Challenger alludes to the space shuttle of that name which exploded shortly after takeoff in January 1986. The entire crew of seven astronauts, including school teacher Christa McAuliff, died in the accident.

[7]NASA's Technology Utilization Program (TUP) was designed to make technology developed for aerospace applications available for earth-bound uses. The technology is diffused to the economy through a network of nationwide centers. The TUP is the primary mechanism by which NASA has diffused technological innovations beyond the space program.

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