

Chapter 12. Leadership¹

By Jon Olson and Patricia Bolton

One of the dominant themes in the management literature today involves the role of leadership in assuring organizational effectiveness. While less significant in the sociological literature on organizations, the literature on organizational psychology, management, and particularly the popular literature, has elevated the leader/manager into one of the prime determinants of organizational success. This is no less true in the world of public science than in the world of commercial business. Given the pace of change in science these days, creating and maintaining effective organizational and management systems, motivated and creative staff, and strategically focused research is particularly important. Leadership in scientific organizations requires a challenging combination of technical, organizational, and political knowledge, managerial competence, political savvy, organizational vision, and communication and human relations skills. The organizational literature can help public science managers structure their thinking about the attributes of effective leadership in public science organizations, learn from the experiences of others who have held positions of leadership, and understand the strategies organizations have used to develop and capitalize on effective leaders.

What is Leadership?

The early literature on leadership was dominated by attempts to define its essential characteristics. This exercise has generated much debate and difference in perspective. According to Bass (1997:17),

leadership has been conceived as the focus of group processes, as a matter of personality, as a matter of inducing compliance, as the exercise of influence, as particular behaviors, as a form of persuasion, as a power relation, as an instrument to achieve goals, as an effect of interaction, as a differentiated role, as an initiation of structure, and as many combinations of these definitions.

One of the first steps in assessing the relevance of the literature on leadership for science management organizations, therefore, is to bring a little clarity to what is meant by leadership.

Among the different definitions of leadership found in this literature are:

- ♦ *Leadership as personality*: this literature focuses on discovering the leadership personality and examining what it is about the character, underlying motivations, and basic behavioral styles that make an individual a leader. Writers were drawn to the obviously exceptional, and at times extreme, personalities of particular leaders (Alexander, Lincoln), and thus sought the explanation of leadership in the similarities among these personalities (Bogardus 1928). This line of inquiry has not been supported by the results of empirical research.

¹ Related chapters include: Strategy; Change Management; Teams, and Project- and Program- Based Organizations; Organizational Culture; Organizational Communication

- ◆ *Leadership as an outcome of group process*: this line of research focuses on group dynamics and defines leadership as an outcome of this dynamic, rather than as a separable phenomenon in its own right (Cooley 1902). Research has confirmed that group dynamics are an important determinant of leader behavior, but that leadership also has a separable effect on groups (Bass 1981).
- ◆ *Leadership as influence*: in contrast to the group dynamics perspective, other writers have defined leadership as the process of exerting individual influence on followers' behaviors. This literature defines leadership as the power to persuade (Stogdill 1950), both through the control over resources (rewards and punishments), and via the exercise of charisma and argument. In this literature, a distinction is frequently made between transactional and transformational leaders (Bass 1981). Transactional leaders are defined as those who achieve compliance through social exchange (e.g., rewards and punishments), while transformational leaders convince others to view the situation differently than they otherwise would, and to respond positively to the leader's alternative vision. Transformational leadership is thus similar to charismatic leadership. Heifetz (1994) provides a good discussion of the challenges and requirements of transformational leadership and its role at different levels in an organization.

A parallel contrast is made in the organizational literature's description of organizational ideal types referred to by McGregor (1960, 1966) as Theory X and Theory Y. Theory X organizations are command and control with compliance achieved through rewards and punishments. Theory Y organizations are looser and freer, with control achieved by voluntary compliance gained through persuasion and affiliation.

- ◆ *Leadership as a pattern of activities and focus of attention and effort*: this research focuses on what leaders do when providing leadership. Kotter (1999), Laurie (2000), and Heifetz (1994) emphasize the set of responsibilities that leaders must meet and the type of focus and actions needed to accomplish them. Both Laurie and Heifetz emphasize leaders' important role in stepping outside the day-to-day crises to provide a broader perspective on the challenges and opportunities facing the organization to improve their effectiveness in setting the context, framing the problems, and mobilizing the staff to work on those problems. A significant subset of this literature identifies the creation, management, and, when necessary, transformation of organizational culture as the essential function and key competency of leadership (Schein 1992, 1999). See Chapter 11 for a more detailed discussion of the intersection between leadership and organizational culture.

In this literature a distinction is often made between leadership and management. A fairly recent example of this contrast is provided by Kotter (1997, 1999). Kotter defines the essence of leadership as "coping with change," and management as "coping with complexity." Management activities include planning and budgeting, organizing and staffing, and controlling and problem solving. In contrast, Kotter describes the key leadership activities as setting a direction, aligning people (with the direction), and motivating and inspiring. Thus, management is more administrative, leadership more interpersonal.

The Model Leader

Much energy has been expended in the literature attempting to discover or define the model leader. Early work looked for this model in the traits and skills of particular leaders. Studies of

the world's great leaders were pursued in order to distill the essence of leadership (see Bass 1997 for a discussion of this early literature).

Although the research literature has not generally supported the development of a singular robust model, the popular management literature continues to advance sets of traits and behaviors as nearly universally applicable. A recent version of the model leader literature focuses on analyzing significant trends in organizations and in the broader society to identify the leadership skills and traits that are most conducive to success within emerging forms of organization and evolving societal expectations (see, for example, Hesselbein et al. 1996). This research offers some insight into leadership. At the risk of oversimplification, key attributes of the modern version of the model leader include the ability to frame and communicate a grand and strategic vision, empower others and foster collaboration and teams, recognize and reward individual and team accomplishments, and motivate and influence (Hitt 1993, Kouzes and Posner 1995, Covey 1996).

Contingency Theory

For almost as long as there has been research on leadership there has been a recognition that different types of leaders are best adapted to different types of situations. For example, Weber's (1946) early work on the bases of legitimate authority in the state identified three types of legitimate leaders: those who base their authority on social tradition, those who base their authority on rationality, and those who exert charismatic influence over others. Different types of leaders were viewed as successful in different types of situations.

A fairly recent review of the leadership literature by one of its most respected contributors (Fiedler 1996) identifies some of the most important aspects of a contingent view of leadership. First, the research literature provides no evidence for the existence of universal traits, personalities, or even behaviors that can be linked to leader effectiveness. Second, the effectiveness of a leader in a particular situation depends on "how well the leader's personality, abilities and behaviors match the situation in which the leader operates" (p. 242). Third, a key mediating factor between the leader's traits and the situation is how the leader responds to stressful situations – what types of situations they find to be stressful and how they engage their groups and make decisions in the face of stress.

Leadership skills have been studied as part of the observed trend toward team-based organizations (Mohrman et al. 1995; see also Chapter 8. "Teams and Project- and Program-Based Organizations"), which is seen to result from the response of organizations to an increasingly complex external operating environment. Organizations tend to become more internally complex in order to respond to the external complexity (Lawrence and Lorsch 1967), and one way to deal with the demands of increased internal and external complexity is to organize around teams (Galbraith 1994). Teams then conduct the basic work of the organization. Teams are defined and staffed with varying levels of permanence and typically bridge historic line organizations. This organizational pattern is particularly relevant to science and technology-based organizations, given the complexity of the environments that these organizations face. The types of leadership skills that are necessary to operate this type of organization include functional or technical competence, broad-based knowledge of the organization, interpersonal and conflict resolution skills, decision-making skills, learning skills, communication, meeting management, and interpersonal influence (Mohrman et al. 1995).

Also consistent with contingency theory is the notion that periods of planned or unintended organizational change require leaders with particular skills and attributes in order to help the organization successfully navigate the change process. A current popular example of this approach can be found in Kotter (1996), who emphasizes the influence aspects of leadership by stressing the importance of a leader's ability to establish a sense of urgency and to develop and communicate a vision for change. He also stresses the importance of the leader's political skills in understanding the organization, tying the change agenda to the underlying culture, creating a dominant coalition within the organization in support of change, motivating support by empowering employees, and generating short-term wins.

Leadership, Innovation, and Science

Based on contingency theory, it is reasonable to assume that leadership best-practice will vary somewhat for organizations that produce science as their main product in contrast to organizations that produce other things. The role of leadership in science-based organizations has not received the level of research attention that it deserves. However, the emerging research on technology-based organizations and innovation may provide some insight into leadership models for science management.

According to two of the most influential writers on team-based organizations, Miller and Morris (1999:229), "The new leaders in the organization must look broadly rather than narrowly. They must have a solid technical foundation, but also understand people, business, learning, information technology, and marketing." The special role of these leaders is to assure that individuals and teams aggregate knowledge that has strategic relevance to the organization.

Based on a survey of over 600 technology organizations, Jonash and Sommerlatte (1999) have also identified a set of leadership traits that are related to higher levels of innovation and successful deployment of innovations. Primary among them is the model of the leader as coach.

Successful leaders of innovation management are not simply technology-minded autocrats.... They are, in a sense, like coaches of all-star football teams. They are not out on the field scoring touchdowns, but they are creating the conditions that make it possible for the entire organization to lead the league....These senior innovation leaders inspire the hearts, minds, capabilities, and powers of other key players ... (Jonah and Sommerlatte 1999:75).

The coach model emphasizes those leadership skills and traits embodied in team and transformational leadership.

Taking a longitudinal look at the effects of leadership patterns on innovation, Manz et al. (1989) find that both transactional and transformational leadership approaches are required for innovation, although at different times within a particular organization. That is, for both approaches, exchange relationships to ensure compliance and the process of interpersonal influence to ensure commitment are required. While studies of the role of leadership in science-producing organizations are rare, it can be anticipated that both transactional and transformational approaches are required to retain and motivate staff as well as to promote creativity while maintaining worker and environmental safety.

The Application of Leadership to Public Science Management

Leadership is an important area of consideration for assuring excellence in the management of science. However, determining exactly what aspects of leadership to stress and how public science organizations can take concrete steps to assure positive leadership within its science establishment are daunting tasks. In applying the literature on leadership to the management of public science, the following considerations may be useful.

Management: While some of the literature attempts to separate the concepts of management and leadership for analytical purposes, organizations – and individuals – should be concerned with both. Much in the enterprise of science is basically administrative (e.g., budgeting, procurement, personnel administration, information dissemination). First and foremost, public science organizations must have the systems and procedures in place to support the process of science. However, simply having the systems in place does not ensure that they will be used. Thus, the staffing of positions that have significant administrative responsibilities with leaders/managers who have the aptitude, skills, and motivation for administrative work is relevant to the goal of maintaining effective leadership.

Visionary Leadership: The pace of scientific and technological change is incredible. No longer can the advancement of science be viewed as the process of incremental additions to knowledge resulting from the research agendas of individual scientists (although these additions still can have a major impact). Instead, science is increasingly advanced by organizations and consortia of organizations mobilizing to develop programmatic approaches to a particular research area, supported by strategically defined facilities and research staff. While the basic research agenda may be framed by policy makers and research funders, visionary leaders are required to help shape that agenda, give it substance, and align the organization's resources in a way that leads to progress on the agenda. While the need for visionary leadership may be evident, it is less clear how public science organizations that are part of the governmental bureaucracy can promote or support visionary leadership within their laboratories, or even among their own staff.

Technical Leadership: The role of the technical leader in the advancement of science will always be a significant one. Technical leadership, however, refers to more than simply being the smartest scientist about a particular topic. It also refers to such attributes as being an effective project administrator and team builder, with the ability to define and build research programs. So, along with the requisite technical knowledge and mastery of method must be considered the administrative and people skills that make knowledge leadership an organizational asset. And while the pervasiveness of the pattern requires clarification, it is often noted that those staff with the greatest technical mastery are often those who lack the administrative and people skills to fully capitalize on technical knowledge and insight. To the extent that science organizations are able to find technical leaders who combine all of these strengths (or effectively compensate for their weaknesses), they can reasonably be expected to increase their effectiveness in the management of science. A thorough understanding of the current practice of technical leadership will help the organizations determine whether, and what, interventions are required.

Team Leadership: As described earlier, one of the dominant, recent additions to the literature on leadership focuses on team leadership. Most science advances through projects. Increasingly, those projects are comprised of interdisciplinary teams, and very often have project staff who are assembled specifically for the project in question. The ability of project managers (and others) to work effectively in this fluid organizational environment may thus become an essential

leadership-related attribute of effective science organizations. Public science organizations should consider evaluating the need for team leadership skills and assessing the extent to which those skills are evident in current practice.

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