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Leadership development: Towards a more systematic approach in technology management

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ABSTRACT

Technology leadership research pays little attention to leadership differences across organizational levels. Research at the upper echelons is particularly sparse despite the importance of strategy in technology management. The “leadership pipeline”, with its specification of six levels of organizational leadership, the leadership challenges at each, and the appropriate leadership preparation for each, can be adapted to technology management to provide an integrated, systematic, approach to technology leadership development and practice. A review of technology management research reveals shortcomings which could be remedied through the application of a pipeline approach. Future research should focus more on reliably differentiating the hierarchical levels of technology management, particularly at the middle management and executive levels. From there, the differing demands at each and the requisite capabilities for meeting them can be determined. This would facilitate the development of more effective leadership preparation for technology managers as they transition from level to level, to their career benefit and for the competitiveness of their organizations.

1. Introduction

Leadership is an important concern for researchers in the technology management field (Edler, Meyer-Krahmer, & Reger, 2002; Gritz, Fufeld, & Carpenter, 2017; Rifkin, Fineman, & Ruhnke, 1999; Tschirky, 2004). Evidence indicates that many technology executives are not effectively leading the strategic mobilization of technology in the competitive positioning of their firms (Uttal, Kantrow, Linden, & Stock, 1992). For example, Edler et al. (2002) found that only 45% of the firms in their sample perceived the Chief Technology Officer (CTO) to be playing a significant role in setting business unit strategy and only 55 perceived the CTO as significantly involved in setting corporate strategy. Zehner (1998) found that, among CEOs in Fortune 1000 companies, only 3% had backgrounds in R & D. Rifkin et al. (1999) concluded that the identification and development of technology managers for all levels is “troublesome” for most companies and suggests that a more systematic approach be taken, as do Uttal et al. (1992). Gritz et al. (2017), in a very large sample across diverse organizations, found that R & D managers at all levels were rated as less effective leaders than non-R & D managers. R & D executives were examined separately and they, too, were rated as less effective than their non-R & D counterparts.

Stevens and Swogger (2009a, 2009b) describe a successful systematic approach to selecting, training, and coaching technical leaders, and others, at Dow Chemical. In summary, these papers suggest that technology leadership at all levels needs to be improved and that part of the solution is to take a more systematic approach to the development of technical people for leadership.

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Ensuring a steady supply of effective leaders for all levels (not just the top) and in all functions of the organization (not just in technology management) is a significant challenge for most organizations (Charan, Drotter, & Noel, 2011; Drotter, 2011; Freedman, 1998; Groves, 2007). Charan et al. observe that a common problem is that leader selection and development is fragmented across levels and functions so that a steady stream of capable leaders is not available for open positions when they occur. There is no integrated, comprehensive system of leadership development, no leadership pipeline, which ensures that people are selected and developed over the period of their careers to move through progressively more challenging levels of leadership, for the benefit of themselves and their organizations. The research by O'Connor and her colleagues (e.g. O'Connor & Euchner, 2017) affirms that levels of management can be meaningfully distinguished in the technology/innovation management context and those distinctions contribute importantly to our understanding of how to innovate radically and effectively. Firms, such as GE, which have developed effective leadership pipelines, can have enduring success in the marketplace (Groves, 2007).

It is a premise of this paper that the fragmentation of technology leader development is a significant impediment to the effective mobilization of technology in many organizations and a more systematic, comprehensive approach should be taken which includes the differentiation of demands at different levels of the hierarchy (DeChurch, Hiller, Murase, Doty, & Salas, 2010). The leadership pipeline (Charan et al., 2011) is based on many years of practical experience in leadership development and provides such an approach. This paper will review the research on technology leadership at the levels of the organization identified by the pipeline model. It will show that technology leadership development is wanting in several respects and goes on to suggest research directions to remedy this. The outline of this paper is as follows. In the second section, the empirical research showing different leadership challenges at different levels of the organization will be reviewed, supporting a fundamental assumption of this paper. In the third part, the levels of leadership in the pipeline model (Charan et al., 2011) will be described. Fourth, research on technology management will be mapped onto the pipeline levels. Correspondences and anomalies will be revealed. The fifth section proposes future research directions and the sixth draws conclusions.

2. Different leadership challenges at different levels of the organization

The leadership pipeline (Charan et al., 2011; Drotter, 2011) assumes that different levels of management require different leadership skills and this section reviews the research which supports that assumption. Most of the evidence comes from non-technical settings. Katz (1955) did founding conceptual work proposing three broad management levels; executive, middle, and supervisory. Jacobs and Jaques (1987) called these “domains” and proposed seven sub-divisions of the three principal levels, and some other researchers posit more than three principal levels. In brief, top executives include the CEO and those who report directly to the CEO. Supervisors are those who manage people who do not manage others. Middle management includes all the levels between supervisors and executives. In large firms, the middle can include several levels which may differ significantly. The three levels of management differ in their responsibilities, functional activities, time spans of responsibility horizons, and primary skill requirements (Kaiser, Craig, Overfield, & Yarborough, 2011) as shown in Table 1, where each cell is an abbreviated version of what Kaiser et al. (2011) included in the corresponding cells in their table.

In Table 1, the second column, “Responsibilities”, describes the parts of the organization that managers at each level are responsible for. These parallel the levels in the leadership pipeline (Charan et al., 2011) as will be shown below. The third column, “Functional Activities”, shows the nature of the activities managers are responsible for at each level. The nature of these activities follows from the organizational responsibilities shown in the second column. The fourth column, “Time Span”, indicates the time horizon of the matters for which the manager is responsible. The higher the level in the hierarchy, the longer the time span. The fifth column, “Primary Skills”, indicates the most critical skills for effectiveness at each hierarchical level. The three skills shown in Table 1; conceptual, inter-personal and technical; were originally proposed by Katz (1955) and more recent work has expanded the list (e.g. Mumford, Campion, & Morgenson, 2007).

The requisite skills for each level of management have been the subject of several studies. Katz (1955) proposed that although each skill is particularly critical at one level (as shown in Table 1), all are required to some degree at all levels. Mumford et al. (2007) examined four skills; business, strategic, interpersonal and cognitive; and found that the importance of all four increases with increasing hierarchical level and that the order of importance was the same at all levels, in ascending order of importance; business, strategic, inter-personal and cognitive. De Meuse, Dai, and Wu (2011), measuring a wide range of competencies, also found that most increased in importance across the ascending levels of hierarchy. Only one competency, technical learning, showed a consistent decline in importance across ascending levels. Kaiser and Craig (2011) examined several manager characteristics across the hierarchy

Table 1
Managerial work at three organizational levels.
After Kaiser et al. (2011).

Managerial level	Responsibilities	Functional activities	Time span	Primary skills
Top (<i>Executive</i>)	Performance of an enterprise or a group of businesses	Creation of strategy, structure, systems, culture	10 or more years	Conceptual
Middle (<i>Middle Management</i>)	Performance of multiple functional units or a division	Translate strategy into operational goals, allocate resources	2 to 5 years	Interpersonal
Bottom (<i>Supervisory</i>)	Performance of a small team within a single function	Manage operations	Less than 2 years	Technical

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