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# The Leadership Quarterly

journal homepage: [www.elsevier.com/locate/leaqua](http://www.elsevier.com/locate/leaqua)

## Exploring the effects of creative CEO leadership on innovation in high-technology firms

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### ARTICLE INFO

**Keywords:**  
 Strategy  
 Leadership  
 Innovation  
 CEO

### ABSTRACT

This study introduces two dimensions of strategic leadership, termed operational and creative specifically developed for top executives of high-technology firms. Creative leadership reflects a CEO's emphasis on developing social and human capital and investing in the firm's internal knowledge development. We contrast this with operational leadership which reflects a CEO's ability to explore new paths of growth as well as exploit existing ones by redefining and extending the boundaries of the firm to new product and market domains. Hypotheses relating these two dimensions of leadership with innovation quantity, innovation resonance and novelty are tested using a sample of 77 high-technology firms.

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More than half of economic growth during 1945–2002 is attributed to innovations within the high-technology sector (Leary, 2002). For high-technology firms, innovation, organizational learning and the creation of new knowledge are vital for long-term survival and renewal because they have to deal with rapid and discontinuous change (Makri, Lane, & Gomez-Mejia, 2006). As such, executive leaders are constantly challenged to leverage the intellectual capital of their firms. This scenario raises the question: how might creative leadership behaviors must executives of technology-intensive<sup>2</sup> organizations balance in order to enhance innovation quantity, innovation quality and innovation novelty?

Although leadership and the influence tactics leaders use affect follower's willingness to engage in creative ventures (Mumford, Scott, Gaddos, & Strange, 2002), research in the area of leader influence on creativity and innovation has been scarce (e.g. Cummings & Oldham, 1997; Mumford et al., 2002; Tierney, Farmer, & Graen, 1999). Most studies in strategic leadership that looked at this issue (e.g. Elenkov, Judge, & Wright, 2005; Jung, Chow, & Wu, 2003) have used the traditional conceptualizations of transactional and transformational leadership (e.g. Bass, 1985) to capture CEO leadership characteristics. While these traditional conceptualizations can reflect the CEO's relationship with followers, the concept of strategic leadership in the context of high-technology firms calls for constructs reflective of the CEO's overall effectiveness in spearheading invention, innovation and commercialization. More specifically, there is a need for refinement of the constructs that measure creative leadership to reflect the CEO's ability to create new knowledge as well as commercialize existing knowledge and derive profit from it. In this study, we examine the relationship between innovation quantity, quality, and novelty and creative leadership. Because the innovation value chain involves idea generation (invention), idea development, and idea commercialization, effective leaders are those who can simultaneously explore and exploit, while at the same time can lead *creatively* and *operationally*.

The contribution of our research is twofold. First, we bridge the existing gap between creative leadership and organizational innovation (Bontis, Crossan, & Hulland, 2002; Jung et al., 2003; Vera & Crossan, 2004). While several studies examined the relationship between CEO leadership and firm performance, only a handful addressed the effects of leadership on innovation albeit using the traditional measures of transactional and transformational leadership (Elenkov & Manev, 2005; Elenkov et al., 2005; Jung

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<sup>2</sup> Consistent with much of the literature, we use the terms "high technology," "technology intensive," and "R&D-intensive" interchangeably.

et al., 2003; Vera & Crossan, 2004). Second, we develop a perspective on creative leadership that complements existing theories (e.g. personality theory, transformational/transactional leadership theory, visionary leadership theory, theory of cognitive complexity, social intelligence, and behavioral complexity, Cannella & Monroe, 1997; Boal & Hooijberg, 2000), while better representing the essence of strategic leadership for high-technology firms. Simply put, the goal of this study is to attend to existing gaps in the literature between creative leadership and innovation using a sample of high technology, knowledge-intensive firms to examine what leadership characteristics are significant for executives in high-technology firms.

Innovation and the associated scientific and technological knowledge it involves have increasingly become important features for value creation in many industries; R&D investments are one of the most important decisions that executives of high-technology firms must make (Greve, 1998). First, it is important to define innovation. We espouse the 1991 OECD definition of innovation as: “an iterative process initiated by the perception of a new market and/or service opportunity for a technology-based invention which leads to development, production and marketing tasks striving for the commercial success of the invention” (Garcia & Calantone, 2002; p. 112). This definition suggests that the process of innovation starts with idea generation, then moves to idea development which involves the technological development of an invention and ends with the commercialization of that invention and the diffusion to end-users (Hansen & Birkinshaw, 2007; Mumford et al., 2002). Stated differently, at the origin of the innovation value chain are inventions, and while innovations and inventions are related, they are not identical. The distinction is that innovation is a “process that begins with an invention, proceeds with the development of the invention and results in the introduction of a new product, process, or service to the marketplace (Edwards & Gordon, 1984; p. 1)” (Acs & Audretsch, 2005). While innovation refers to the development and commercialization of an invention, invention refers to the act of creating something new (Ahuja & Lampert, 2001). We adopt this conceptualization and suggest that innovation quantity, quality, and novelty will be the outcomes of this three-step innovation value chain.

We introduce two dimensions of strategic leadership, termed *creative* and *operational*, to suggest that an effective leader is one who is able to simultaneously invent, develop, and commercialize. More specifically, our conceptualization of *operational leadership* reflects a CEO's ability to sense new market needs, develop new concepts for products and services, and increase the firm's knowledge diversity by diversifying into new products/markets via mergers, alliances, or acquisitions. Advances often emerge from the margins of a knowledge field (Kuhn, 1970) thus a successful operational leader would be a good scout in terms of identifying important advances. Further, because organizations must exploit existing knowledge stocks as well as explore new knowledge paths, an effective operational leader plays a boundary spanning role. A high-technology firm may produce a large number of inventions, but these may be of little value unless the CEO is able to push them through the pipeline, commercialize them, and derive a profit from them. As projects move to the development and implementation phase, an effective leader demonstrates operational skills in terms of securing resources, and communicating with external constituencies (e.g. FDA) to manage the project development cycle (Mumford et al., 2002). Put differently, a CEO who exhibits characteristics of operational leadership would have an external focus when it comes to innovation and would be skilled at communicating with the external environment and broadening the firm's knowledge-creation opportunities by external knowledge acquisition.

Creative leaders, on the other hand, tend to be characterized by a focus on developing human and social capital as well as the ability to create a supportive environment within the organization (Mumford et al., 2002). They tend to focus on expanding the firm's existing knowledge stocks internally and they are skilled at stimulating creative staff intellectually, trusting and supporting them, and providing them latitude. Further, they promote individual initiative while promoting integration of group activities and teamwork (Mumford et al., 2002). Several studies support that an organization's climate for innovation is an important determinant of innovation (Bain, Mann, & Pirola-Merlo, 2001; Jung et al., 2003; Scott & Bruce, 1994). Hambrick, Black, and Fredrickson (1992) found that high-technology firms benefit from CEOs who are capable of fostering innovation by “catalyzing and exploiting the talents of the firm's technical professionals ...these [successful] CEOs are very collaborative, open-minded, and energetic. Even though these seem like universally ideal qualities for a CEO, they appear to be particularly important in the high-technology firm which has to deal with rapid and discontinuous change, with value-creation hinging on a staff of high-grade technical professionals” (p. 11). Similarly, in a series of case studies of Japanese high-technology firms, Kodama (2005) found that the most important determinant of CEO success in those firms is “building a knowledge-creation environment” (p. 153).

The first step in the innovation value chain, idea generation, is distinct from the other two in that it is the most people-centered and internally-focused. In contrast, idea development and commercialization, involve facilitating development either by securing resources internally or acquiring them externally as well as expanding the firm's reach to new markets. Being able to shift from new knowledge creation and exploration, to new knowledge application and exploitation highlights the challenge of leading effectively in high-technology firms. Because of the synergistic benefit between creative and operational leadership, there is a need to manage the balance between the two. Tushman and O'Reilly (1996) suggest that an ambidextrous firm able to simultaneously explore and exploit, able to simultaneously invent and innovate, will outperform firms that emphasize one at the expense of the other. Simply put, CEOs who are able to simultaneously focus on the external and internal environment, will be more effective leaders.

## 1. Theory development and hypotheses

There are various definitions of strategic leadership in management research. Strategic leadership has been defined as “a person's ability to anticipate, envision, maintain flexibility, think strategically, and work with others to initiate changes that will create a viable future for the organization” (Ireland & Hitt, 1999; p. 45). It has also been defined as the creation of an overall sense

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