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Innovate or die: How should knowledge-worker teams respond to technological turbulence?

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ABSTRACT

In this research, we view knowledge-worker teams as open systems that are directly affected by changes in the external environment. Drawing on the strategic contingency perspective of power, we propose and demonstrate that in the face of a turbulent technological environment, knowledge-worker teams should engage in two team processes, namely, de-dependence on established team experts and new knowledge acquisition, to achieve high innovation performance. We conducted two field studies to test our hypotheses. Study 1 had a multi-source, multi-wave design involving 109 new product development (NPD) teams in technology-intensive industries. Study 2 had a multi-source, cross-lagged panel design involving 65 NPD teams in the information technology industry. Results based on the two field studies provide considerable support for our central hypotheses, i.e., the two team processes mediate the relationship between team perception of technological turbulence and team innovation performance and team autonomy enhances the two positive mediated relationships. We discuss the theoretical and practical implications of our findings on how and when knowledge-worker teams can reap the innovative benefits from environmental technological turbulence.

1. Introduction

> "We live in an age in which the pace of technological change is pulsating ever faster, causing waves that spread outward toward all industries."
>
> Andy Groove, co-founder of Intel

Work teams are complex, intact social systems that engage in multiple, concurrent projects and that are partially nested within, and loosely coupled to, surrounding systems (McGrath, 1991). Increasing global competition and fast technological advancement have made innovation, or the generation and implementation of new ideas, processes, or products (West & Farr, 1990), central to organizational survival and competitiveness. To foster innovation, organizations rely on teams as building blocks for rapid, flexible, and adaptive responses to the demands of the external environment (Kozlowski & Bell, 2003). Viewing teams as nested within organizations, most of the studies on team innovation have focused on organizational, group, and individual factors such as organizational autonomy support, team composition and leadership, or individual member creativity that can enhance or inhibit team innovation (e.g., Anderson, Potočnik, & Zhou, 2014; Hülsheger, Anderson, & Salgado, 2009; Mathieu, Maynard, Rapp, & Gilson, 2008). These findings have substantially enriched our understanding on the within-organizational inputs of team innovation. However, research has not yet touched upon another important surrounding system, that is, the external environment (Mathieu et al., 2008; West, 2002), especially the fast-changing business landscape owing to dramatic technological changes. The past two decades have witnessed accelerating changes in technology, such as information technology, biotechnology, and material technology, and technological turbulence has become a defining property of the environment (Silberglitt, Antón, Howell, & Wong, 2006). Hence, it is imperative to investigate how work teams respond to technological turbulence to stay competitive, both theoretically and empirically.

In this paper, we study knowledge-worker teams that are typically formed to respond to rapid changes and advancements in a variety of areas, such as new product development (NPD), marketing, and consultancy (Edmondson & Nembhard, 2009; Griffin, 1997). These teams operate as open systems that are "embedded in and relevant to wider

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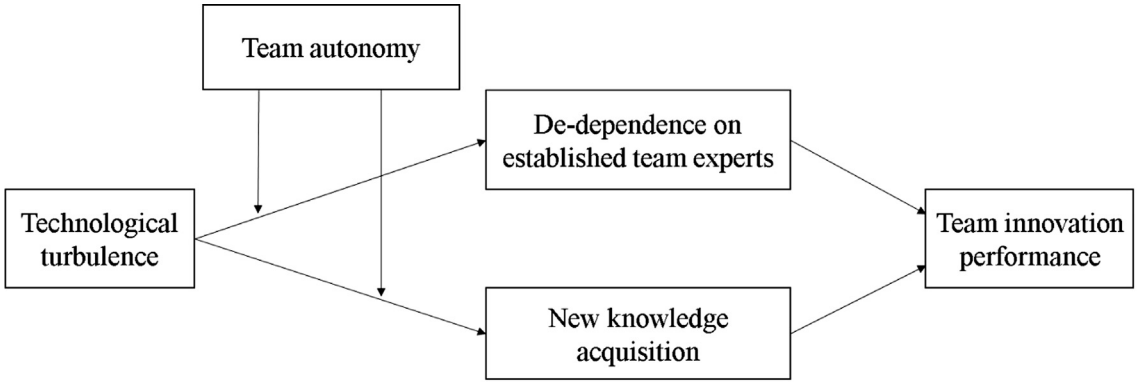

Fig. 1. Theoretical model.

resource and institutional environments" (Humphrey & Aime, 2014, p. 450). They must directly transact with the environments beyond their organizational boundaries (Ancona, Bresman, & Kaeufer, 2002; Arrow, McGrath, & Berdahl, 2000; Scott, 1981). Confronted with a turbulent technological environment, these teams are under the pressure of innovation to survive (Edmondson & Nembhard, 2009; Griffin, 1997). For instance, the fast growth of digital marketing impels marketing teams to innovate their products based on new technologies; otherwise, they will fail (Brinker & McLellan, 2014; Teixeira, 2012). West (2002) reviewed the team innovation literature and concurred that "the effort required to innovate has to be motivated, at least partly, by external demands" (pp. 366–367). However, we have limited knowledge on how knowledge-worker teams deal with technological turbulence and capitalize on this environmental challenge to fuel innovation performance.

To fill this void, we draw on the *strategic contingency perspective of power* (Hickson, Hinings, Lee, Schneck, & Pennings, 1971; Salancik & Pfeffer, 1977) that addresses how environmental changes affect organizational systems as an overarching framework to guide our theorizing. Rooted in the assumption that power—or relative dependencies among people—is based on the asymmetric control of valued resources (Emerson, 1962), this theoretical view postulates that environmental turbulence changes the value of resources and then triggers the act of aligning power-dependence relationships. The power-dependence relationships describe the order regarding who is influential and deferential in the course of teamwork (Emerson, 1962). In the face of a turbulent environment, team members with valuable resources that are strategic in addressing the new environmental challenges should obtain disproportionate power, whereas those with devalued resources are dispossessed of power (Aime, Humphrey, DeRue, & Paul, 2014; Burkhardt & Brass, 1990; Magee & Galinsky, 2008). This means that power in open systems is typically held outside the team and exercised at review gates. Aligning the power-dependence order, in turn, enables teams to access the resources most relevant to coping with the team's situational demands, thus allowing for the effective use of diverse team resources that benefit team innovation performance (Aime et al., 2014). In summary, aligning the power-dependence order provides a plausible outlet to understand how teams respond to environmental changes and achieve high innovation performance.

In knowledge-worker teams, although roles and status indicate power to a certain degree, the critical resources for problem-solving and task accomplishment are knowledge and expertise (Barton & Bunderson, 2014; Bunderson, 2003; Van der Vegt, Bunderson, & Oosterhof, 2006), and knowledge/expertise-based power is fundamental for the effective teamwork of knowledge-worker teams (Joshi & Knight, 2015). The power-dependence literature posits that members of such teams should allocate disproportionate power to expert members and have asymmetric dependence on their opinions and guidance to capitalize on their expertise advantages and achieve high performance (Bunderson, 2003). However, this argument does not consider that expertise, or the established domain-relevant expert knowledge acquired through past experience (Dane, 2010), may become obsolete when the external technological environment changes fast.

Indeed, technological turbulence is characterized by rapid obsolescence and advancement of knowledge (Calantone, Garcia, & Dröge, 2003; Song, Droge, Hanvanich, & Calantone, 2005). The existing expertise may no longer be able to directly address the new situational demands, while real-time acquisition of new knowledge relevant to the changing situational contingencies becomes crucial. Based on the strategic contingency perspective of power, we theorize that knowledge-worker teams engage in two unique team processes to align the power-dependence order. The first is a de-dependence process in which team members have low asymmetric dependence on the members who have established an expertise advantage (e.g., higher technical certification levels or longer technical experience). The second is a learning process in which members acquire new knowledge from external sources (e.g., Tsai, Compeau, & Haggerty, 2007). We postulate that *de-dependence on established team experts* and *new knowledge acquisition* are two distinct team processes that enable knowledge-worker teams to respond to technological turbulence and achieve high innovation performance.

In addition, we identify team autonomy as a key boundary condition for the abovementioned processes to take effect. In the present study, team autonomy refers to the freedom and discretions as well as personal responsibility and accountability, which are given to team members to initiate and regulate actions in the team (Langfred, 2004). When teams have high autonomy, they are better able to align the within-team power-dependence order in response to changes in the value of expertise and knowledge caused by technological turbulence. In this sense, team autonomy will enhance the relationship between team perception of technological turbulence and the engagement of the two proposed team processes, which will ultimately enhance team innovation performance. Fig. 1 depicts our hypothesized theoretical model.

2. Theoretical background and hypothesis development

2.1. A Strategic contingency perspective of power and dependency in knowledge-worker teams

Power can be defined by the relative dependencies among people (Emerson, 1962). The resource dependence perspective of power posits that power-dependence orders are determined by the asymmetric control over valued resources (Aime et al., 2014; Anderson & Brion, 2014; Emerson, 1962). While valued resources can take many forms (e.g., hierarchical position, money, time, or social capital), knowledge and expertise are critical resources in knowledge-worker teams for problem-solving and task accomplishment (Barton & Bunderson, 2014; Bunderson, 2003; Van der Vegt et al., 2006). Drawing on status