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The relationship between team autonomy and new product development performance under different levels of technological turbulence☆

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ABSTRACT

Operations management researchers have frequently suggested that autonomy can motivate teams to actively and flexibly adapt to fast-changing environments, fostering innovation and creative problem solving. However, empirical studies have not consistently supported the benefits of team autonomy. We articulate the behavioral and mechanistic effects of team autonomy by integrating operations management and behavioral literatures. Further, we view team autonomy as a bipolar factor and argue that both the behavioral and mechanistic effects of team autonomy on operational outcomes are non-linear. Drawing on information processing theory, we propose that the benefits of team autonomy depend on the degree of technological turbulence. A study of 212 new product development projects supports these propositions. Specifically, the relationship between team autonomy and operational outcomes is ∩-shaped in technologically turbulent environments and U-shaped in technologically stable environments. Further, operational outcomes mediate the relationships between team autonomy and product success. We discuss the theoretical implications regarding new product development, operations management, the bipolarity of autonomy, and information-processing theory.

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1. Introduction

The influence of decision-making autonomy, such as team autonomy or operational autonomy in operational or innovation processes, is a key issue in operations management (OM) studies (Das and Joshi, 2007; Maritana et al., 2004; Tatikonda and Montoya-Weiss, 2001; Tatikonda and Rosenthal, 2000). OM researchers have frequently touted team autonomy as a means to promote innovation (Das and Joshi, 2007) and creative problem solving (Tatikonda and Rosenthal, 2000) by granting teams the freedom to engage in and support new ideas, experimentation, and creativity, and to take action. Team autonomy has become an integral mechanism used by managers to improve project operational outcomes in both project management and new product development (NPD) settings.

Some scholars suggest that team autonomy – the extent to which the team has authority and freedom in making decisions to fulfill its mission – can motivate teams to actively and flexibly adapt to fast-changing environments, which in turn can lead to better team performance with the implicit assumption of a linear relationship (Langfred, 2005; Patanakul et al., 2012). Others have pointed out the risks of isolation (Haas, 2010) and the loss of managerial control (Mills and Ungson, 2003) which may result from giving teams too much autonomy. As a result, the findings have been inconsistent and contradictory. For example, Cohen and Bailey (1997) concluded that team autonomy improves the performance of stable work teams but not for temporary project-based teams involving high levels of uncertainty. In contrast, Patanakul et al. (2012) found autonomous teams to be more effective in developing radical innovations than teams with less autonomy. While some studies confirmed the moderating effect of technological novelty (Olson et al., 1995; Patanakul et al., 2012), others did not (Tatikonda and Montoya-Weiss, 2001; Tatikonda and Rosenthal, 2000). A meta-analysis concluded that autonomy "appears to be helpful for teams, but additional research is needed to understand

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the environmental conditions that influence the extent to which autonomy improves performance" (Stewart, 2006: 46). A recent meta-analysis reached a similar conclusion (Chen et al., 2010). We believe these inconsistent results indicate that context may play a key role in the autonomy-team performance relationship. Hence, questions that beg to be answered are: *under what circumstances does team autonomy contribute to operational success* and *what mechanisms underlie these relationships*? Specifically, we ask how team autonomy affects NPD project operational outcomes and how technological turbulence affects the relationship.

Consequently, we propose a three-step theoretically-driven argument. First, to respond to repeated calls for the integration of behavioral and OM research (Bendoly et al., 2006; Bendoly and Hur, 2007; Croson et al., 2013; Powell and Johnson, 1980), we argue that team autonomy has both behavioral and non-behavioral effects on operational outcomes. Consistent with Bendoly and Hur (2007), the behavioral effects can be viewed as psychological functions of the capabilities of the team and the perceived characteristics of its work environment, which may lead to team motivation or stress. The non-behavioral effect can be viewed as mechanistic functions of the inherent capabilities of the team and the extent to which the work processes and procedures allow them to make use of those capabilities.

Second, we diverge from the traditional view that team autonomy is a facilitator that influences performance in a linear fashion. We consider team autonomy as a 'bipolar factor' that can act as both a situational constraint and a situational facilitator depending on its relative level (Bendoly and Hur, 2007). As such, we argue that both the behavioral and mechanistic effects of autonomy on operational outcomes performance are non-linear.

Finally, building on Tatikonda and Montoya-Weiss (2001), Tatikonda and Rosenthal (2000) operations model, in which technological uncertainty moderates the relationship between organizational process factors, such as project management autonomy, and operational outcomes, we argue that technological turbulence moderates the team autonomy-operational outcome relationship. Based on information processing theory (Galbraith, 1973; Tushman and Nadler, 1978), different levels of technological turbulence in an NPD project are associated with different information processing requirements, which in turn influence both the behavioral and mechanistic effects of team autonomy. In this study, we focus on technological turbulence because turbulence is an important dimension of environmental uncertainty (Duncan, 1972). Technological turbulence is highly relevant for teams involved in knowledge-intensive work, such as the development of new products and technologies (Calantone et al., 2003; Song and Montoya-Weiss, 2001) and autonomy is regarded as a valuable tool to adapt to a turbulent environment.

In this study, we focus on two key aspects of operational outcomes (Tatikonda and Rosenthal, 2000). The first is *development speed*, which delineates how quickly an idea moves from concept to a product in the marketplace and is a central variable of many OM studies (Chen et al., 2010; Swink et al., 2006). The second is *development cost*, which refers to the degree to which the team adheres to its developmental budget. As operational outcomes are not the end, but the means to achieve market performance, we follow Tatikonda and Montoya-Weiss (2001) to examine the mediating effects of these two operational outcomes on the financial success of NPD projects.

We aim to contribute to both the OM and NPD literatures by integrating behavioral operations with a bipolar concept and incorporating information processing theory to explain the conflicting empirical results on the effects of team autonomy on operational outcomes. This study is among the first to empirically test and confirm curvilinear relationships between team autonomy and operational outcomes under different levels of technological turbulence. The findings, based on the data from 212 NPD project teams, suggest that in technologically turbulent environments, a greater degree of autonomy leads to better project operational outcomes; however, due to the risks involved in granting high levels of autonomy, a shared power approach may be more effective. In technologically stable environments, a clearer distribution of power, either directive-oriented or autonomy-oriented, will result in faster, more effective decision-making than a shared-power approach.

2. Theory and hypotheses

We define team autonomy as the extent to which a team has the authority and freedom to make its own decisions to fulfill its mission (Gerwin, 1999; Langfred, 2005; Stewart and Barrick, 2000). While most researchers and practitioners advocate for the benefits of team autonomy, others emphasize the risks and costs. Without an integrated picture, the results from empirical studies are inconsistent and contradictory. We propose a theoretically-driven explanation for these inconsistencies in autonomy research. First, we discuss the behavioral and mechanistic benefits of team autonomy. Second, we introduce technological turbulence as an essential contextual variable influencing the team autonomy-operational outcomes relationships using information processing theory. We then discuss how the relationship changes from an inverted U to a U-shaped function as technological turbulence decreases. Finally, we discuss the mediating effect of operational outcomes between team autonomy and product success. Fig. 1 summarizes the core model.

2.1. The behavioral and mechanistic effects of team autonomy

We view the effects of team autonomy from two aspects, namely through a behavioral effect and a non-behavioral or mechanistic effect. In particular, we regard autonomy as either a constraining or facilitating factor as the degree of autonomy granted can either limit or increase a system's ability, or the ability of a team within that system, to attain a higher level of performance (Bendoly and Hur, 2007). Greater decision-making authority can increase a team's qualitative workload and eliminate constraints on the team's behaviors and performance. We argue that the behavioral and mechanistic effects of team autonomy are curvilinear because team autonomy can either facilitate or inhibit a team's ability to achieve its work goals, depending on the degree of authority

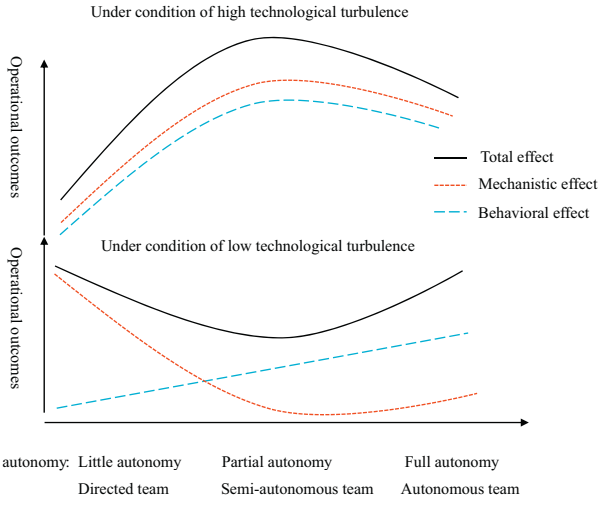

Fig. 1. Theoretical prediction on the relationship between team autonomy and operational outcome under different conditions of technological turbulence.