
Why Innovation Demands Aren't as Conflicted as They Seem: Stochasticism and the Creative Process

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As Bledow, Frese, Anderson, Erez, and Farr (2009) discuss, innovation invariably requires the integration of multiple conflicting demands. For the individual employee, this might entail being both conscientious and open to experience. For the organization, this might require the provision of both slack resources and time pressure. However, how can the antecedents of innovation be so contradictory? In this commentary, I propose that the antecedents of innovation are not as disparate as they seem but rather are tied to the same underlying creative process. In analyzing this process, I link the conflicting antecedents of innovation to two fundamental mechanisms—domain breadth and persistence—and show how an examination of these mechanisms can help practitioners decide when to implement specific organizational interventions.

Stochasticism: A Process Approach to Innovation

What do employees do when they innovate? Although innovation can involve

logical, stepwise processes, it has also been suggested that chance and randomness play an important role. History is rife with examples of serendipitous innovation, from the apple that fell on Newton's head to Alexander Fleming's discovery of penicillin. Workplace models for group idea generation likewise highlight the role of randomness, as in the case of brainstorming sessions where employees simply think of as many ideas as possible to "see what sticks."

The importance of randomness in the creative process is most notably emphasized in Simonton's (2003) theory of *stochastic creativity*. According to Simonton, creativity necessitates "the intrusion of a restricted amount of chance, randomness, or unpredictability" (p. 476). When modeled as a stochastic (i.e., random) process, an individual's creative outputs can be traced to two fundamental inputs: (a) the *domain breadth* of one's creative efforts and (b) the *persistence* with which creativity is attempted.

Domain breadth refers to the set of ideas and concepts to which an individual or group limits its creative efforts. As domain breadth increases, so too does the potential for radical innovation. For instance, a researcher who considers ideas from both psychology and economics is more likely to randomly stumble upon a radical theoretical innovation than a researcher who only considers one narrow

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branch of economics. Persistence refers to the effort directed toward innovation. As in noncreative realms, persistence can be expected to increase creative performance. Thus, a researcher who spends 40 hours per week engaged in theory development is more likely to develop an innovative idea than a researcher who spends only 5 hours per week on the same task.

As I will argue, the demands of innovation conflict not because they represent fundamental dichotomies but because they inevitably focus on one aspect of the creative process (domain breadth or persistence) at the expense of the other. For creativity to flourish, both aspects of the creative process must be emphasized (Figure 1). In the sections below, I present four distinct examples of how domain breadth and persistence combine to yield a range of conflicting innovation demands. With each example, I discuss how an understanding of these underlying processes can help managers intervene to foster innovation within their organizations.

The Conflicting Demands of Innovation

Example 1: Resource availability. Previous research has implicated both resource

abundance and necessity as antecedents of innovation. Bledow et al. highlight these conflicting demands yet only allude to the processes that underlie their effects. Following the stochastic perspective, the effects of resource abundance and necessity can be traced to their impact on domain breadth and persistence, respectively. First, slack resources enhance radical and explorative innovation by widening the domain from which individuals draw during the stochastic process. An extended deadline, for example, could help a researcher widen his or her domain breadth by providing sufficient time to consider multiple disciplinary perspectives. Necessity, however, enhances innovation by encouraging persistence—highlighting the need for innovation and, consequently, increasing employee effort toward the goal of innovation. Thus, time pressure might be particularly effective for a researcher who thinks broadly, yet lacks motivation. This perspective is indeed closely aligned with Bledow et al.'s focus on the link between necessity and personal initiative (Frese, Teng, & Wijnen, 1999).

Implications for practice. The challenge for any organization is to integrate their policies to encourage both persistence and

Domain Breadth	<p>Outcome. Occasional radical innovation.</p> <p>Caused by. Wide domain breadth and a lack of persistence.</p>	<p>Outcome. Significant radical innovation.</p> <p>Caused by. Wide domain breadth and high persistence.</p>
	<p>Outcome. Occasional incremental innovation.</p> <p>Caused by. Narrow domain breadth and a lack of persistence.</p>	<p>Outcome. Significant incremental innovation.</p> <p>Caused by. Narrow domain breadth and high persistence.</p>
	Persistence	

Figure 1. Stochastic creativity: The impact of domain breadth and persistence.

wide domain breadth. If a company finds that employees are thinking broadly yet lack the motivation to persist in their creative efforts, interventions that signal necessity (e.g., time pressure) should be most effective. Conversely, if a company finds that employees are thinking too narrowly, slack resources should prove most useful. By examining precisely where employees are falling short, managers can thus implement an appropriate set of organizational practices, exerting pressure when persistence is low and providing slack resources when employees are thinking too narrowly.

Example 2: Mood. Studies of the link between mood and creativity have yielded some of the most contradictory findings to date. Effects for both positive (e.g., Amabile, Barsade, Mueller, & Staw, 2005) and negative (e.g., George & Zhou, 2002) emotional states have been demonstrated, with still other studies positing a “dual tuning” model (George & Zhou, 2007). The stochastic perspective again provides clarity to these apparent contradictions. Akin to the impact of necessity, negative mood can be posited to facilitate creativity by encouraging persistence and thus increasing employees’ creative efforts. This perspective is consistent with the “mood-as-input” model, which suggests that negative moods facilitate creativity by signaling to employees that something is wrong in the organization (George & Zhou, 2002). Positive moods, however, can be posited to facilitate innovation by broadening the employees’ domain breadth. As Amabile et al. (2005) note, positive mood has been shown to encourage cognitive variation, broaden the scope of attention, and predict cognitive flexibility.

Implications for practice. Again, the implications for innovative practices are clear. Should employees seem to be thinking too narrowly, the research suggests that policies that foster positive moods will be most effective. However, should employees seem to lack creative persistence, interventions that

signal the need for change (e.g., constructively critical feedback that instills negative moods without sacrificing employee commitment) may be most effective.

Example 3: Openness to experience and conscientiousness. At the level of individual personality, previous research has linked Openness to Experience to creative thought processes and idea generation (George & Zhou, 2001), yet has also implied a role of Conscientiousness for innovation implementation (Miron, Erez, & Naveh, 2004). From a process perspective, Openness to Experience can be related to domain breadth and Conscientiousness to persistence. First, Openness to Experience widens the domain from which individuals draw, enabling them to develop more radical innovations than their less open colleagues. However, Openness is not related to persistence and has in fact been related to asocial tendencies, which may suggest divergence from organizational goals (Feist, 1999). Conscientiousness, however, is strongly associated with commitment to organizational goals (Barrick, Mount, & Strauss, 1993). Thus, it is better suited to innovations of narrower scope where persistence is most vital.

Implications for practice. Bledow et al. note the importance of self-regulation among employees particularly high on either Conscientiousness or Openness yet low on the other. The process perspective further clarifies precisely when regulation would be needed. When persistence is lacking, employees high on Openness yet low on Conscientiousness would need to regulate themselves in the goal of increased persistence. When domain breadth is too narrow, employees high on Conscientiousness yet low on Openness would need to regulate themselves in the goal of wider domain breadth.

From management’s perspective, the impact of personality on innovation also implies a potential for selection systems to be tailored to meet the organization’s

concerns. If the company is in need of “good soldiers” to focus on incremental innovation, it would be best to hire based on Conscientiousness. However, should radical new ideas be in demand, it would be best to hire based on Openness to Experience.

Example 4: Diversity and group-level creativity. Another source of confusion regarding the antecedents of innovation lies at the group level. Team diversity in particular is cited by Bledow et al. as a contradiction, spurring innovation through the integration of divergent perspectives while inhibiting innovation through conflict and decreased convergence. The positive impact of diversity on innovation is a direct product of diversity’s relationship with broad domain sampling. If group innovation can be modeled as at least partially additive, it is the sum of members’ nonredundant domain knowledge that determines the group’s potential for radical explorative innovation. Homogenous groups are in possession of homogenous information and so, conversely, are limited to a narrower band of domain knowledge that can inhibit innovation.

The disadvantages of group diversity stem from diversity’s impact on persistence during the creative process. Scholars have long noted a relationship between team diversity and conflict, such that diversity often increases the likelihood that interpersonal conflict will arise and impact group outcomes. From a process perspective, interpersonal conflict can be said to negatively affect innovation by decreasing the amount of time team members spend on innovation—in other words, by decreasing persistence.

Implications for practice. The stochastic perspective on group-level innovation is consistent with individual-level theory and provides clear recommendations for practitioners. If radical innovations are needed, it is better to create highly diverse teams that hold the potential for such innovations.

However, if greater persistence is needed, less diverse teams would be the best.

Conclusion

For science and practice, integration of the innovation literature is vital. The dialectic perspective represents an important step away from perceived dichotomies toward such integration. Delving deeper into the processes that underlie innovation, the stochastic perspective demonstrates that perceived innovation dichotomies are not as conflicted as they may seem but rather are tied to the same fundamental set of mechanisms.

By bringing innovation dichotomies together under the same theoretical umbrella, the stochastic perspective provides conceptual clarity to the conflicting demands of innovation. Furthermore, it allows practitioners to assess precisely *why* their organizations are failing to meet innovation goals, and how to adjust their management practices accordingly. The stochastic approach thus augments the dialectic perspective by clarifying when and why certain practices might be more desirable than others.

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