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It's time to sober up: The direct costs, side effects and long-term consequences of creativity and innovation

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ABSTRACT

The literatures on creativity and innovation are each premised on the same important assumption that has gone largely unquestioned: Creativity and innovation are outcomes that are almost inherently positive. Decades of research on creativity in organizations have been motivated by the assumption that creative ideas can be implemented to realize innovations that will inevitably increase profit, strengthen competitive advantage and ensure firm survival. The assumption that creativity and innovation have positive downstream consequences has constrained existing research by forcing a myopic focus on creativity and innovation as dependent variables. Thus, in a significant departure from the existing literature, we turn the tables to conceptualize creativity and innovation as independent variables that can have a sweeping and frequently negative impact on a wide range of other important outcomes. We conclude by calling for a new stream of research to more soberly evaluate the direct costs, side effects and long-term consequences of creativity and innovation.

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Introduction

The large and vibrant literatures on creativity and innovation are each premised on the same important assumption that has gone largely unquestioned: Creativity and innovation are outcomes that are almost inherently positive. A recent influential review of these literatures probably states this assumption most clearly: "Creativity and innovation can occur at the level of the individual, work team, organization, or at more than one of these levels combined but *will invariably result in identifiable benefits* at one or more of these levels of analysis." (Anderson, Potočnik, & Zhou, 2014: 1298; italic is added for emphasis). In other words, creativity and innovation are widely assumed to be positive by definition (Gilson, 2008; Gong, Zhou & Chang, 2013).

Creativity is a fruitful change in perspective that results in insights, inventions and enlightenments (Cronin & Loewenstein, 2018). Creativity has been heralded as the engine of scientific discovery and the fundamental driving force of positive change (Hennessey & Amabile, 2010); an ability that has been associated with intelligence, wisdom, and moral goodness (Niu & Sternberg, 2006; Sternberg, 1985). Decades of research on creativity in organizations have been motivated by the assumption that creative ideas can be implemented to increase profit, strengthen competitive advantage and ensure firm survival (Amabile, 1988; Amabile & Pratt, 2016; George, 2007; Gilson, 2008; Woodman, Sawyer, & Griffin, 1993).

In a similar vein, most research on innovation has taken for granted that innovation, defined as an invention that has been successfully implemented and brought to market (Edwards & Gordon, 1984; Kline & Rosenberg, 1986), is largely beneficial for firm performance and survival (for review see Ahuja, Lampert & Tandon, 2008). Since the seminal works of Schumpeter (1934, 1942) on the central role of innovation in the evolution of industries and markets, a long stream of research has investigated how innovation affects the development of firms and industries (for reviews see Ahuja et al., 2008; Freeman & Soete, 1999). The dominant view in this literature is that in dynamic industries, innovation can directly benefit firms. Firms that successfully innovate experience positive consequences for their performance, while firms that fail to innovate are likely to lose in competition, exit the industry and thereby reduce the competitive pressure on surviving firms (e.g., Abernathy & Clark, 1985; Eggers, 2012; Henderson & Clark, 1990; Klepper & Simons, 2000a; Tushman & Anderson, 1986; Tripsas, 1997).

Because winning the innovation battle is allegedly so critical to firm performance and survival, scholars in management and related disciplines have fully investigated the antecedents of innovation. Scholars have traced this process from the beginning by thoroughly unearthing the numerous cognitive (Nijstad, De Dreu, Rietzschel, & Baas, 2010), affective (Amabile, Mueller, Barsade, & Staw, 2005) and social (Amabile & Pratt, 2016; Sutton & Hargadon, 1996) antecedents of creativity. A similar effort has been undertaken at the macro level where there has been a broad focus on all of the intervening processes that lead up to an invention commercialized into an innovation (Dougherty & Hardy, 1996; Garud, Tuertscher, & Van de Ven, 2013; Henderson, 1993; Kline & Rosenberg, 1986; Katila & Shane, 2005;). This herculean effort has revolved around the questionable assumption that creativity and innovation have positive downstream consequences. This assumption has constrained existing research by forcing a myopic focus on creativity and innovation as exclusively dependent variables. Thus, in a significant departure from the existing literature, we turn the tables to conceptualize creativity and innovation as independent variables and in doing so, we discover that both creativity and innovation can have sweeping and frequently negative effects.

We begin by investigating the psychological, interpersonal and behavioral consequences of creativity in organizations. An important theme that emerges from our review is that, though most organizations desire creativity, there are important negative repercussions that might result from being creative at work. We develop a theoretical perspective in which engaging in the creative process can cause disinhibition – a psychological state that we link to a range of important consequences such as rule breaking, workaholism, over-indulgence, risk taking and aggression.

The potentially negative outcomes of creativity might be justifiable if the end result – a commercially viable innovation – would ensure firm survival. Yet, we also undertake a comprehensive review of existing work on innovation to question this deeply rooted assumption on two fronts. First, the empirical studies that purportedly demonstrate the positive consequences of innovation share important flaws that cast doubt on this conclusion. Second, the benefits of innovation might occur only under very specific circumstances that existing research has not yet fully

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identified. Indeed, our review of the costs of innovation suggests that even a commercially successfully innovation, one that is profitable on the market, can still threaten the long-term survival of a firm. We conclude by calling for a new stream of research evaluating the psychological and organizational consequences of creativity and innovation.

From creativity to innovation: how the process unfolds

In the literature, the boundaries between creativity and innovation are not always clear (see also Anderson et al., 2014). In this chapter, we suggest that creativity and innovation are the beginning and ending points of an innovation process in organizations – a process that unfolds in a series of steps (see Fig. 1). The process starts with creativity, defined as the generation of an idea that is novel and useful (Amabile, 1996; Mumford & Gustafson, 1988). A creative idea can be produced in a focal organization or borrowed from the outside (Zhou & Shalley, 2011). If relevant organizational decision makers find the creative idea appealing, they will support the development of this creative idea into a full-fledged invention or prototype (Mueller, Melwani, Loewenstein, & Deal, 2018). The last step of the innovation process requires commercializing an invention into an innovation that necessarily involves the successful implementation of a prototype into production and bringing it to market (Edwards & Gordon, 1984). In other words, the transition from a creative idea to invention involves idea implementation, and the transition from invention to innovation involves invention implementation. Though these transitions are distinct, they are often treated as interchangeable (Garud et al., 2013).

Clarifying the distinctions between creativity, invention and innovation reveals that disproportionate attention is paid to the consequences of invention, but the literature has yet to fully consider and account for the consequences of creativity and innovation (see Fig. 1). Most agree that invention is risky and can generate significant costs, but it is widely assumed that creativity and innovation are inherently good, and the more the better (Anderson et al., 2014). The logical basis for this assertion has been questioned, but research on the consequences of creativity and innovation remains at a nascent stage of development. Moreover, the range of negative consequences considered in existing research is exceedingly narrow. Thus, we offer a systematic and comprehensive review that not only waves caution flags about the possibility of negative consequences, but also identifies the underlying mechanisms that might explain why these costs accrue.

We suggest that when evaluating the consequences of either creativity or innovation, we need to look at their net benefits. To do so, it is important to take into account the entire equation – not just the total benefits, but also the total costs of creativity and innovation:

$$\text{Net benefits of (creativity/innovation)} = \text{Total benefits of (creativity/innovation)} - \text{Total costs of (creativity/innovation)}$$

Chapter overview

Our coverage of the literatures on creativity and innovation is wide-ranging. In the chapter that follows, we review many different literatures, spanning multiple levels of analysis and crossing several related fields. The processes leading from a creative idea to an invention and finally to innovation are complex and diverse in their mechanisms and consequences. Yet, there are a few general parallels in effects of creativity and innovation on organizations. Both creativity and innovation may bring not only benefits, but also significant costs to companies and their employees. Although the variety of these possible consequences is large, they can be analytically grouped into three major themes: (1) inherent costs of action, (2) side effects, and (3) long-term consequences. We use these common themes to organize our review and analysis of creativity and innovation as independent variables. We cover both positive and negative consequences of creativity and innovation for organizations, with a main emphasis on the negative effects that have been largely ignored. Table 1 provides a road map for our review and analysis.

EVALUATING THE CONSEQUENCES OF CREATIVITY

Creativity is a crucial driving force behind most, if not all, new endeavors. In fields as disparate as art, science, and technology, creative ingenuity is a highly desirable skill (Alperson, 2003; Kern, 2010; Simonton, 2004). Any occupation that demands the generation of new ideas, new technology, or creative content actively seeks to attract individuals with creative talent (Florida, 2014). Nevertheless, many disparate streams of research converge on the possibility of negative consequences related to creativity at work.

Inherent costs of creativity

In this section, we review the inherent costs involved in being creative. Creative ideas, employees and leaders are likely to encounter immediate resistance. We focus on four key sources of resistance: (a) explicit resistance to creative ideas, (b) implicit resistance to creative ideas, (c) resistance from creative employees, and (d) resistance to creative leadership. Countering these oppositional forces in the pursuit of creativity is likely to generate significant direct costs.

Explicit resistance to creative ideas

Creative ideas can potentially solve problems, lead to more efficient work processes and even boost well-being (Cronin & Loewenstein, 2018; Feist, 1994), but there are many reasons for employees to explicitly reject them. First, given that creative ideas can upset the status quo (Nemeth, 1986; Nemeth & Staw, 1989) and call into question long held assumptions about the way work is done, one employee's creative idea could undermine other employees' prior work, expertise and contributions. For example, in the 1990s, Kodak employees with experience and expertise in film photography were not welcoming of creative advances of co-workers in digital photography and even sometimes sabotaged them (Gavetti, Henderson, & Giorgi, 2005). Second, endorsing another employees' creative idea could make that person seem

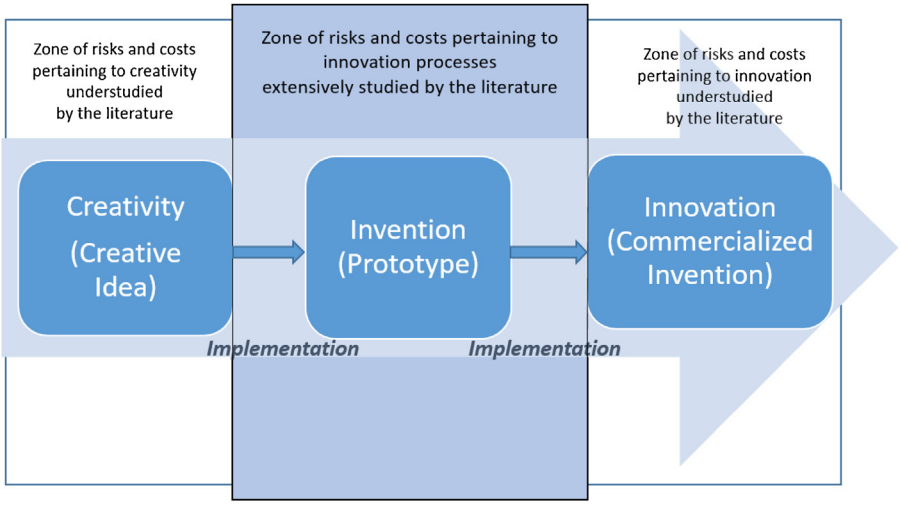

Fig. 1. Steps in the process of innovation.

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Table 1
Map of creativity and innovation consequences.

	I. Creativity consequences	II. Innovation consequences
(1) Inherent costs of action	a) Explicit resistance to creative ideas b) Implicit resistance to creative ideas c) Resistance from creative employees d) Resistance to creative leadership	• Innovation outcomes: a) Costs of incorrect forecast of market demand b) Costs of unsuccessful appropriability c) Benefits and costs of complicated relationships with audiences • Innovation development: a) Costs of frequent product innovations b) Costs of simultaneous development of multiple innovations c) Costs of innovation in structurally complex organizations
(2) Side effects	a) Benefits and costs of creative disinhibition b) Stereotype reduction c) Social connection d) Creative inflation	a) Risk of cannibalization b) Intensified competition c) Harm to audiences and society
(3) Long-term consequences	a) Formation of creative identity b) Traps of past creative success c) Erosion of standards used to evaluate new ideas	a) Costs of organizational identity violation b) Traps of past innovation success

more competent and valuable, thus bolstering the career of one's possible replacement. In other words, politically motivated evaluators might reject creative ideas to avoid a competitive threat (Menon, Thompson, & Choi, 2006). Third, it is not enough to have a creative idea—ideas must move to the invention stage in which they are prototyped, tested, refined and tested again until the initial idea reaches fruition (West, 2002). The impending stage of innovation can involve a great deal of time, effort and investment so evaluators might reject a creative idea simply to avoid the work involved in making the idea become reality. In short, if I endorse your creative idea, I might have to help you implement it and that might generate extra work for me. Though the idea might generate value for the organization in the long-run, evaluators might be more motivated by narrow self-interest. Finally, creative ideas, if implemented, could disrupt longstanding norms and routines, thus forcing people to adjust (Gilbert & Bower, 2002). As cognitive misers, it might be more tempting to rely on habit than relearn how to do things in a new way, even if new approaches have the potential to boost efficiency in the long run (Ford & Ford, 1995; Reger, Gustafson, Demarie, & Mullane, 1994; Robertson, Roberts, & Porras, 1993). Though it is tempting to subscribe to the rosy view of creative evaluation—a view in which people value progress, are open to new and better ways of approaching their work and are willing to take on additional work to improve the organization—self-interest might come into play (Bruhn, Zajac, & Al-Kazemi, 2001). Evaluators might happily endorse creative ideas so long as those ideas are not threatening, risky or likely to require additional work or cognitive adjustment on their part.

Implicit resistance to creativity

Despite the litany of reasons for explicitly rejecting creative ideas, the bias against creativity may not be conscious or deliberate. Explicit judgments of creative ideas are judgments that are intentionally and deliberately generated (Ferguson, Hassin & Bargh, 2008). Most research has focused on explicit judgments of creativity (Mann, Katz, Ferguson & Goncalo, 2018). For example, in past research evaluators have generated explicit judgments about the creativity of new products like towel carriers (Berg, 2016), new ideas like how to improve the student experience at a university (Mueller, Wakslak & Krishnan, 2014) or new entrepreneurial pitches (Brooks, Huang, Kearney, & Murray, 2014). Explicit judgments about creativity tend to be positive—few decision makers would admit to rejecting a creative idea simply because it is creative (Staw, 1995; Mueller et al., 2012). Yet, using a modified Implicit Association Test, Mueller et al. (2012) uncovered an implicit bias against creativity that caused evaluators to reject creative ideas in favor of purely practical solutions. Although gatekeepers may explicitly claim to desire creativity, the risks involved in actually endorsing a creative idea influence their judgments. Ideas that diverge from the status quo may not only turn out to be wrong (March, 1991), but may also encounter resistance because they are initially perceived as deviant, risky or unproven (Mueller et al., 2012). The bias against creative ideas might not be explicit or overt but it can cause evaluators to subtly reject creative ideas in favor of ideas that are more practical or easily implemented (Mueller et al., 2012).

The bias against creativity is also strongly in force among individuals with the power to make decisions and allocate resources (Mueller et al., 2018). Being in the role of a decision maker prompts an economic mindset that causes evaluators to downgrade creative ideas with cues of low social approval (Mueller et al., 2018). Though we would hope that gatekeepers have the courage, given their decision making power, to endorse ideas that are risky and controversial, the very decision making role they embody works against their willingness to do so. In sum, creative ideas may be valued in theory, but in practice they are often regarded as too risky to actually pursue (Mueller et al., 2012).

Resistance from creative employees

Given that creativity is viewed as an engine of economic growth and prosperity, there is a widespread interest in understanding who creative people are and how firms, cities and regions can cater to their preferences and thereby attract more creatives (Florida, 2014). In seeking to attract creative people, some research has highlighted their quirky but loveable idiosyncrasies – they would rather wear a hoodie and jeans than a three-piece suit, pay for experiences over possessions and seek learning opportunities rather than advancement up a traditional hierarchy (Florida, 2014). Yet, as Staw (1995) noted, if organizations really understood the dark side of creative personalities, many organizations would probably avoid them. Creative people can be highly reactive – defying authority simply to demonstrate their independence (Brehm, 1966; Gough, 1979). Rather than being the cooperative team players that are prized in many organizations, creative people can be arrogant, self-interested and self-absorbed (Gough, 1979; McMullan, 1976).

Creative people can also be highly unpredictable – working when they are inspired rather than adhering to deadlines (Mackinnon, 1962; Selby, Shaw, & Houtz, 2005). Traditional

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incentives like additional pay are not always motivating to highly creative people who are more energized by the sheer enjoyment of the work itself or by external recognition for their work rather than purely material things (Amabile, 1989). Many innovative organizations reward creative employees with prizes (the most extreme being HP's Medal of Defiance once conferred by David Packard), but some creative employees might be uninterested and unmotivated by the prospect of such recognition (Packard, 1995).

Sadly, there is also evidence of an association between creative achievement and susceptibility to severe mental illnesses such as schizophrenia and bipolar disorder. Higher rates of both creativity, mental illness and suicide have emerged in many occupational samples (Claridge & Blakey, 2009; Jamison, 1995; Ludwig, 1994; Schildkraut & Otero, 1996), including samples from non-artistic fields (Post, 1994). A qualitative analysis of 1005 biographies showed a positive correlation between severe psychopathology and magnitude of creative achievement (Ludwig, 1995). There is even evidence that both creativity and mental illness might be heritable. For instance, children separated early from schizophrenic mothers and reared in adopted families had 50% higher rates of both creative achievement and schizophrenia (Heston, 1966). A more recent study compared adoptees whose parents had schizophrenia to control adoptees with no history and found adoptees with a family history but no disorder were rated by outside judges as more creative than adoptees with no family history and no disorder (Kinney et al., 2001). What explains this association? It is possible that some symptoms of mental illness, like allusive or over-inclusive thinking, might resemble the kinds of thought processes that are characteristic of creative cognition, like the ability to make unusual associations between concepts and the ability to connect seemingly disparate pieces of information. What this means for organizations is that creative professionals might be susceptible to mental illnesses, raising healthcare costs and possibly contributing to higher rates of turnover and absenteeism, thus raising the cost of pursuing creative goals.

In sum, creative people are known for questioning and breaking norms (Nemeth, 1986; Nemeth & Staw, 1989). They are described as egocentric, impulsive, and risk-taking (Amabile, 1989; Eysenck, 1993; Gough, 1979; Selby et al., 2005). They regularly engage in task conflict with their colleagues (Nemeth, Personnaz, Personnaz, & Goncalo, 2004) as they openly disagree with and compete against them (Beersma & De Dreu, 2005; Cummings & Oldham, 1997; Munkes & Diehl, 2003; Shalley & Oldham, 1997). This disruptive behavior can spark creativity, but it can also be costly to manage.

Given their characteristics, it is unclear how unruly creatives would fit with the culture of most organizations. Organizations benefit from having a strong culture in which norms and values are strongly held and widely shared (Chatman & O'Reilly, 2016). Strong organizational cultures are advantageous because they can sustain employee commitment and motivation (O'Reilly & Chatman, 1996; Kristof-Brown, Zimmerman, & Johnson, 2005). Therefore, organizations with strong cultures try to hire people who hold similar values to their own as these newcomers are easily socialized into the firm's culture (Kristof-Brown et al., 2005; O'Reilly, Chatman, & Caldwell, 1991). Person-organization fit is valuable because it reduces turnover and boosts cooperation (O'Reilly et al., 1991). Creative people likely react against a strong culture to assert their independence and perhaps even weaken the existing culture if they manage to convince others to follow their lead (Goncalo & Duguid, 2012).

If creativity is the desired goal, it might be more effective to avoid creative people entirely. In an experiment, Goncalo and Duguid (2012) showed that it is possible to make uncreative personalities voice significantly more creative ideas in a brainstorming session by introducing a social norm that is appropriate to the task of being creative (e.g., individualism) and then reinforcing that norm with the overt threat of social sanctions. Intriguingly, the level of creative output, both in terms of sheer numbers and rated creativity was the same for teams of highly creative people working under weak norms compared to less creative people working under strong norms. Thus, it is possible to leverage social influence to prod less creative people into achieving creative outcomes and thus avoid the considerable costs of recruiting and managing creative personalities.

Resistance to creative leadership

The desire for creative employees has even traveled to the upper echelons of many firms. According to a recent survey of 1500 chief executives, conducted by IBM's Institute for Business Value, CEOs identify "creativity," the ability to generate novel and useful solutions, as the most important leadership competency for the successful organization of the future (Kern, 2010). Creativity helps leaders move organizations in profitable new directions, a view supported by management research showing that leaders with creative ability are more effective at promoting positive change and inspiring their followers than leaders who lack creative ability (House & Howell, 1992; Mumford & Connelly, 1991; Mumford, Marks, Connelly, Zaccaro, & Reiter-Palmon, 2000; Shin & Zhou, 2003; Shin & Zhou, 2007; Sternberg, 2007; Tierney, Farmer, & Graen, 1999; Yukl, 1989).

Despite the desire for and benefit of creative employees and particularly leaders, growing evidence suggests that creative people can generate impressions that are not entirely positive. In other words, people form impressions and make judgments about others based on the kinds of ideas they express. One might assume that pitching a creative idea would generate favorable impressions, given how desirable creative ideas allegedly are. Yet, individuals who pitch creative ideas are viewed as quirky, unpredictable and unconventional (Elsbach & Kramer, 2003). In some industries such as product design, film, marketing and venture capital funding, these are favorable impressions (Elsbach & Kramer, 2003). Generally though, they are not. Consequently, creative people can be filtered out on the way to the top. For example, one study showed that employees who pitch a creative idea may be viewed as having less leadership potential than employees who share an idea that is purely practical (Mueller, Goncalo, & Kamdar, 2011). This happens because prototypes of "creative people" and "effective leaders" may sometimes clash in the minds of evaluators. The most prototypical kind of leader is expected to organize and coordinate groups to diminish uncertainty and promote order by emphasizing shared goals (Phillips & Lord, 1981). The prototypical leader is also expected to conform to group norms and goals in order to symbolically support the group identity (van Knippenberg, van Knippenberg, De Cremer, & Hogg, 2004) and to promote collective action (Lord, Foti, & de Vader, 1984). Individuals who behave in ways that convey these characteristics to others are readily categorized as fitting the leadership prototype.

Far from matching fundamental leadership expectations associated with exuding control and promoting clear goals, the expression of creative solutions may actually introduce ambiguity or uncertainty, because novel ideas involve deviations from the status quo and are not yet proven (Amabile, 1996; Staw, 1995). Prototype theory confirms this view that the expression of creative ideas is often associated with uncertainty, nonconformity, unorthodoxy, and unconventionality (Elsbach & Kramer, 2003; Sternberg, 1985) – traits which run contrary to deeply rooted expectations that prototypical leaders diminish uncertainty and provide normative order (Phillips & Lord, 1981). The bias against creative leadership is consistent with a number of findings in the

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leadership literature. For example, members who are different from the majority (Hogg, 2001) or who are much more intelligent than their followers (Antonakis, House, & Simonton, 2017; Simonton, 1985) are unlikely to be chosen as leaders. People also think traits that seemingly run counter to creativity, like consistency, are a good sign of leadership (Staw & Ross, 1980) while traits that might stimulate creativity, like cognitive complexity, are bad for leadership (Tetlock, Peterson, & Berry, 1993). Traits like agreeableness and sociability are not often associated with creativity but they are good for group and organizational functioning (Miron-Spektor, Erez, & Naveh, 2011).

An important implication of this mismatch between creativity and leadership is that organizations may face a bias against selecting the most creative individuals as leaders in favor of selecting leaders who will preserve the status quo by sticking with feasible but relatively unoriginal solutions. This may explain why, in their analysis of scores of leaders, IBM's Institute for Business Value found that many leaders expressed doubt or lack of confidence in their own ability to lead through times of complexity (Kern, 2010). If the dominant prototype of leadership favors useful, non-creative responses, then the senior leaders in the IBM study may have been promoted based on this prototypical perception of leadership and now find themselves in a world that has vastly changed – one that requires much more creative responses and thinking than they are comfortable with. This bias in favor of selecting less creative leaders may partially explain why so many leaders fail (Hogan & Hogan, 2001), and why so many groups resist change (Argyris, 1997; Mueller, 2017), as the leaders selected may simply lack the openness to recognize solutions that depart from what is already known.

In sum, though organizations claim to welcome creative ideas, employees and leaders, feelings of uncertainty may push evaluators to reject creativity because it can be perceived as threatening. Because of this bias, people who attempt to be creative should know they are doing so at a considerable cost to their reputations and to their careers.

Side effects of creativity

In the last section, we noted the direct costs of creative action. Because of a deeply rooted, though rarely acknowledged bias against creativity, openly expressing a creative idea can have immediate, negative consequences. In this section, we turn to the potential indirect side-effects of actively engaging in the creative process. Obviously, undertaking the effort to develop creative ideas will increase the odds of yielding creative outcomes, but here we think more broadly about the other unintended consequences that might arise as a by-product of being creative. In particular, we look at the following types of positive and negative side effects: (a) creative disinhibition; (b) stereotype reduction, (c) social connection, and (d) creative inflation.

Creative disinhibition

Drawing on the theory of behavioral disinhibition, we offer a framework for thinking about the potential side effects of engaging in the creative process. Disinhibition (the opposite of latent inhibition) is defined as the loss of control over one's behaviors, thoughts, or emotions (Baumeister, Heatherton, & Tice, 1994; Ward & Mann, 2000). To cite a classic example, disinhibition occurs if a person who is on a diet—one that restricts caloric intake—loses self-control and binges on cake or some other high calorie food (Ward & Mann, 2000). In developing our framework, we suggest that creativity and behavioral disinhibition are intertwined. Behavioral disinhibition cannot only lead to creativity, but being creative can also produce feelings of disinhibition that will, in turn, fuel further creativity. We coin the term creative disinhibition, which we define as an intuitive, subconscious driven way of thinking, behaving or feeling that is brought about by working on creative tasks or engaging in the creative process. Creative disinhibition will have unintended side-effects on a potentially wide range of important work outcomes, both positive and negative. In other words, the creative process may, in and of itself, trigger a particular mindset that could, in turn, have downstream consequences.

Disinhibition leads to creativity

The ability to inhibit is generally a desirable skill that, for example, prevents people from blurting out inappropriate comments to others and helps to filter out irrelevant responses (Lubow, 1989). Yet, disinhibition may also stimulate creative problem solving. Disinhibition allows problem solvers to associate seemingly unrelated ideas (Mednick, 1962) and it facilitates idea generation fluency (Gascon & Kaufman, 2010). Disinhibition can be advantageous for creative tasks because it allows people to voice all of their ideas freely, particularly the most novel ideas that are initially strange and that would otherwise be withheld for fear of rejection (Camacho & Paulus, 1995).

Many of the interventions intended to stimulate creativity operate by disinhibiting problem solvers in some way. Opportunities for play (Feldhusen & Hobson, 1972; Mainemelis & Ronson, 2006), anonymity (Sosik, Kahai, Avolio, & 1999) and even moderate alcohol consumption (Norlander, 1999) all disinhibit people, prompting them to consider and voice a wider range of potential solutions that might otherwise be dismissed as too impractical or risky (Mueller et al., 2012). In other words, disinhibition opens the funnel that allows problem solvers to consider more information and more disparate information that can then be combined in novel ways (Staw, 1990). That may explain why disinhibition is strongly correlated with high creative achievement only in combination with high IQ—disinhibited problem solvers might need a high level of intelligence to cope with the large amount of information they attend to during creative problem solving (Carson, Peterson, & Higgins, 2003; Gascon & Kaufman, 2010).

Being creative leads to disinhibition

On the flip side, we suggest it is also possible that actively engaging in the creative process will cause disinhibition. The creative process is multi-faceted and includes activities like generating ideas that diverge in multiple directions, connecting pieces of information that are seemingly disparate and changing perspectives to see old problems from a new point of view (Cronin & Loewenstein, 2018). Though little direct evidence exists, there are at least two mechanisms through which engaging in the creative process might activate feelings of disinhibition. First, doing creative work can be cognitively taxing and it is likely to deplete cognitive resources (Roskes, De Dreu, & Nijstad, 2012). Creative problem solvers might then be less able to devote sufficient resources toward maintaining self-control, thus becoming disinhibited. Second, the process of being creative can also involve a disregard for social norms, conventions, and concerns as creative people frequently break from the status quo and regularly call existing solutions into question (Kim, Vincent, & Goncalo, 2013). Some organizations, like Hewlett-Packard, have encouraged this positive rule breaking in order to foster creativity (Nemeth, 1997). Actively participating in the process of rebelling against convention can, over time, reduce social desirability concerns and produce feelings of disinhibition (Hirsh, Galinsky, & Zhong, 2011). These processes might occur simultaneously as creative problem solvers are both cognitively taxed and actively being rebellious—activities that can be disinhibiting either alone or in combination.

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The link between creativity and disinhibition has yet to be tested directly, but there is some intriguing supportive evidence from recent research. In an experiment, participants were asked to complete a brainstorming task, with one group randomly assigned to generate creative solutions and the other to generate practical solutions to a problem (Goncalo, Vincent, & Krause, 2015). In a subsequent survey, participants who had been randomly assigned to spend ten minutes generating creative ideas reported feeling more (a) liberated, (b) uninhibited, and (c) unconstrained compared to participants who had generated practical solutions—feelings that are highly consistent with disinhibition. Disinhibition did not result when participants were restricted to brainstorming around one particular category of ideas, suggesting that it is the ability to freely explore alternatives that produces disinhibition.

Consequences of creative disinhibition in organizations

There are several advantages of viewing the consequences of creativity through the lens of disinhibition. First, disinhibition can tie together and explain existing findings on the consequences of creativity, currently sparse and scattered, under one framework. Second, the effects of disinhibition are broad, including a mix of both positive and negative outcomes (Amodio, Master, Yee, & Taylor, 2008). Third, and most importantly, linking creativity to disinhibition leads to a number of possible directions for future research. Below we review and theorize about the positive and negative side effects of creative disinhibition in organizations.

Positive side effects of creative disinhibition

There may be positive consequences of disinhibition for psychological well-being. For example, engaging in the creative process can lift or ease psychological burdens, like the burden associated with concealing a big secret (Goncalo et al., 2015). Maintaining a secret is not only experienced as a psychological burden but also as a physical burden. Secrets can literally feel like one is carrying a heavy weight (Slepian, Masicampo, Toosi, & Ambady, 2012). This is because abstract concepts like secrecy can become intertwined with physical experiences like physical burden and eventually attain a reality of their own (Barsalou, 2008).

There are many other examples of this psychological phenomenon. Take, for instance, the notion that people can be either "cold" or "warm." "Cold" and "warm" refer to both physical experiences and to psychologically potent metaphors for personality. Because the metaphor and the physical experience are meshed together, people can actually rate a stranger's personality as warmer when holding a warm as opposed to a cold beverage (Williams & Bargh, 2008). Similarly, walking backwards can cue memories of the past, while walking forward can cue thoughts about the future (Miles, Nind, & Macrae, 2010). Through this process, keeping a secret can have real physical consequences. For instance, people keeping a big secret think and behave as though they are shouldering a physical burden. Secret keepers can overestimate the steepness of a hill (because hills seem steeper when you are feeling weighted down) or the weight of a common object (because objects also feel heavier when you are feeling weighted down) (Slepian et al., 2012).

Engaging in creative work may provide a way to overcome those burdens of secrecy without disclosing information that one either cannot disclose or chooses not to disclose. In a laboratory experiment, participants were asked to think of a big or small secret they keep, and they were then assigned a brainstorming task with the instruction to generate either "creative" or "practical" solutions depending on the condition to which they were randomly assigned (Goncalo et al., 2015). After completing the brainstorming task, participants were asked to help carry heavy book stacks. Ostensibly, the lab was moving into a new location and so the experimenter supposedly needed help moving the books. People who feel physically burdened should offer to help move fewer stacks of books. Indeed, the participants who were asked to keep a big secret but did not have a creative outlet offered to move significantly fewer books than the secret keepers who were given a creative outlet. The latter participants offered to move as many books as the participants who were not keeping a big secret. In other words, holding a big secret causes physical labor to seem more effortful, but this burden was lifted after doing creative work (Goncalo et al., 2015).

The findings of this experiment also pointed to the underlying process that explains why creative work lifts the burden of secrecy. The unburdening effect of doing creative work was fully mediated by self-reported disinhibition. In other words, people who kept a big secret reported that generating creative ideas gave them a general feeling of being disinhibited and those feelings of disinhibition, in turn, predicted their willingness to help on tasks that would otherwise be too physically taxing.

Thus, disinhibition might be a useful framework for explaining the positive consequences of creative work. Keeping secrets can make people feel socially isolated and may even exact a physical toll. The challenge in managing the consequences of secrecy is that employees cannot always be expected to simply divulge. Some secrets are too personal to share. However, doing creative work, because it permits people to freely explore a wide range of different ideas can offer psychological refuge to employees who are constrained to withhold their true selves from others.

Negative side effects of creative disinhibition

Creative disinhibition may also have a dark side, as it is likely to reduce the self-control necessary to follow norms and rules – something that could be either positive or negative depending on the context. Disinhibition might be positive in situations that demand creative solutions because it might motivate people to rebel against the status quo – breaking the "rules" that might ordinarily constrain creative thought. However, creativity has also been linked to anti-social forms of rule breaking such as dishonesty and theft (Gino & Ariely, 2012). Creative people are more likely to lie, cheat and steal than their less creative peers – and this tendency toward dishonest behavior occurs even when creativity is induced with a situational prime (Gino & Ariely, 2012).

Why are creative people more dishonest? Existing research suggests creativity may directly enable dishonesty by giving people the cognitive flexibility to reframe their dishonest acts as morally acceptable (Gino & Ariely, 2012; Mazar & Ariely, 2006). Cognitive flexibility or the ability to easily switch from one perspective to another is considered to be a necessary antecedent of creativity (Nijstad et al., 2010). Nevertheless, this ability may also help people morally disengage from their actions (e.g., I was not stealing that pen, I was just borrowing it) (Vincent, Emich & Goncalo, 2013). Yet, this dark side of creativity may also be parsimoniously explained by behavioral disinhibition—being creative can sap people of the self-control necessary to identify an act as immoral and to resist the temptation to engage in it (Gino, Schweitzer, Meade, & Ariely, 2011).

Creative disinhibition might also explain another intriguing finding about the consequences of creativity – work-life imbalance (Harrison & Wagner, 2016). Anecdotal evidence suggests that highly creative people are very self-absorbed. For example, Elon Musk is completely absorbed with his work and expects employees to follow suit, "If you want a family or hobbies or to see any other aspect of life other than the boundaries of your cubicle, SpaceX is not for you and Elon doesn't give a damn" (engineer at SpaceX quoted in Feloni, 2014). Recent empirical evidence suggests that Elon Musk is not unusual, but rather his behavior is part of a larger

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pattern. Empirical research shows that doing creative work significantly and negatively predicts the amount of time an individual spends with his or her spouse at home (Harrison & Wagner, 2016). Interestingly, it was only variance-focused creative behaviors (e.g., idea generation) that produced this negative effect, not selection-focused behaviors (e.g., idea evaluation). It is possible that limited time spent with one's spouse reflects a kind of workaholism – a self-control failure that might prevent a worker from disengaging from tasks they find absorbing, challenging and enjoyable (Spence & Robbins, 1992). For example, doing creative work can boost subsequent task engagement, intrinsic motivation and long-term knowledge retention (Conti, Amabile, & Pollack, 1995). Variance-focused creative work might produce this effect because it allows for the kind of wide-ranging and uncontrolled exploration that produces disinhibition (Goncalo et al., 2015).

The study of creative disinhibition may also open numerous avenues for future research on counter-productive, even anti-social work behavior. For example, creative disinhibition might contribute to greater aggression at work, particularly among employees who might be low in trait self-control (DeWall, Baumeister, Stillman, & Gailliot, 2007). Many jobs nowadays are unstructured and thus require self-structuring, which in turn, requires an immense amount of consistent self-control. However, the various forms of temptation made possible by the internet such as Facebook, online-shopping, various instant messengers and the like, which are easily accessible at work, wear on our self-control. Once self-control is diminished, disinhibition (depleted self-control) easily leads to and is almost synonymous with procrastination (see Steel, 2007 for a meta-analytic review), which is defined as the "[voluntary delay of an] intended course of action despite expecting to be worse off for the delay" (Steel, 2007: 66). In other words, allowing workers to be creative might give rise to negative side effects that might prove costly in the long run.

Disinhibition increases the temptation to consume alcohol and also leads to higher alcohol consumption (Muraven & Shmueli, 2006). For example, disinhibition led male social drinkers to consume significantly more alcohol in a "taste test" even when they knew that they had to perform a driving test immediately afterwards (Muraven, Collins, & Nienhaus, 2002). In a diary study, underage participants who experienced disinhibition (via high demands on their self-control resources) consumed alcohol above their personally imposed limits (Muraven, Collins, Shiffman, & Paty, 2005). Disinhibition also leads people to choose unhealthy, tempting foods over healthy foods in food-tasting tests (Vohs & Heatherton, 2000). Regularly giving in to high calorie foods can lead to weight gain and ultimately to obesity, which has a number of health consequences that prevent employees from working regularly (Cawley, Rizzo & Haas, 2007; Tucker & Friedman, 1998).

There is preliminary evidence to suggest that doing creative work might cause people to overindulge through disinhibition. In a recent study, participants were asked to spend time brainstorming either creative or practical ideas and then move on to a subsequent and unrelated decision making task. In the subsequent task, participants were asked to decide on the toppings they would use to construct a burger they would like to eat. Preliminary results have shown that being creative on a prior task caused people to overindulge by not only choosing more toppings but also making burgers that were significantly more caloric (Vincent, Krause, & Goncalo, 2018). This effect occurred even though participants had no information about the actual creativity or quality of their ideas, thus suggesting that this effect might emerge because of a loss of self-control rather than rewarding oneself for a job well done. Given these initial findings, future research might also investigate the possibility that individuals who do creative work might be susceptible to alcohol and substance abuse on or off the job (Bacharach, Bamberger, & Sonnenstuhl, 2002).

Creativity reduces the propensity to stereotype

On a more positive note, creativity also has the potential to reduce stereotyping. In an experiment, participants were primed to be either "creative" or "thoughtful" by listing three concrete examples of a time they exemplified either behavior (Sassenberg & Moskowitz, 2005). The results showed that participants who were primed to be creative were, in a subsequent task, less likely to stereotype an outgroup member compared to participants who were primed to be thoughtful (Sassenberg & Moskowitz, 2005). Because the concept of creativity invokes the goal of avoiding conventional ways of thinking, it also has the potential to interfere with the automatic reliance on stereotypes by encouraging people to think different (Sassenberg & Moskowitz, 2005).

Creativity fosters social connection

Another recent study suggests that creative acts might provide a foundation for reducing loneliness and encouraging social bonding at work. In a series of studies, participants were asked to either generate creative or uncreative ideas for new products (candle scents and potato chip flavors) and at the end, they were asked about their feelings of self-disclosure (Goncalo & Katz, 2018). The results show that generating creative products caused participants to feel as though they disclosed something very personal about themselves. In a follow-up study, dyads were asked to generate creative or uncreative ideas and then share those ideas with their partners. It was found that partners not only felt as though they shared something personal about themselves, but also that, in the process of being creative, they also learned something personal about their partner (Goncalo & Katz, 2018).

Self-disclosure may, in turn, foster the formation of meaningful relationships at work. There is a strong link between self-disclosure and social connection for three reasons. First, people who disclose more are more liked by others. Second, people tend to disclose more about themselves to those whom they like more. Third, people like those to whom they disclose more (Collins & Miller, 1994). Through this process, self-disclosure can lead to an upward cycle of relationship building. A person begins to disclose to another, which causes him to like that other person more, which then causes him to disclose more to that person and so on. Because people who do creative work reveal their personal identities, interests and passions, other people might be emboldened to respond in kind – a process that can strengthen relationships over time. In other words, self-disclosure is not simply a way to develop intimacy in and increase the strength of existing relationships, but it can also form the basis for and even strengthen new relationships that previously did not exist at all. Self-disclosure can decrease loneliness, by supporting the formation of new relationships with others. One person discloses more to others, which then causes those others to disclose back, which generally increases liking between people at a variety of different stages and strengthens the relationship. Self-disclosure is not a one-way street. Indeed, self-disclosure from one party encourages self-disclosure from the other (Jourard, 1971). Different disclosure levels from one partner directly predict disclosure levels of the other partner, regardless of initial levels of liking (Derlega, Harris, & Chaikin, 1973). These cycles of reciprocal self-disclosure can gradually increase liking of even previously unacquainted partners (Sprecher, Treger, Wondra, Hilaire, & Wallpe, 2013).

Creative work can be an impetus for self-disclosure. While it may be inappropriate or even bizarre to share deeply personal information in a work setting, doing so in the context of creative work might allow personal information to be shared within the context of a professional relationship. As people share their passion through their work, they reveal themselves to others and

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doing so can build meaningful bonds that reduce feelings of loneliness.

Creativity, competition and creative inflation

Creative ideas are often sparked by competition either within (Goncalo & Krause, 2010) or between organizations (Baer, Leenders, Oldham & Vadera, 2010). Competition can encourage people and groups to engage in a process of upward social comparison that inspires individuals to one-up each other in an effort to suggest ideas that stand out as increasingly more creative (Dugosh & Paulus, 2005; Sutton & Hargaddon, 1996). Such creative inflation can cause ideas that are initially regarded as highly creative to become taken for granted (Cropley, Kaufman & Cropley, 2008). Creative inflation can cause a shift in standards used to evaluate creative ideas, as such standards are not fixed but rather highly malleable depending on the context (Loewenstein & Mueller, 2016; Mueller et al., 2014). As the overall level of creativity in a team or an organization increases, the harder it will be to stand out from the crowd, as the bar for judging an idea as "creative" gets higher and higher. This process should spur ever-rising levels of creativity in an organization. However, rising standards in the context of fierce competition could also produce feelings of emotional exhaustion, cynicism and inefficacy that are hallmarks of job burnout among employees (Maslach, 2003). And, creative competition can also have another negative side effect. Competitive norms can turn toxic if employees are encouraged to be jealous, overly aggressive and willing to lash out at co-workers in creative ways (Harris & Reiter-Palmon, 2015). Competitive efforts can even have a broader effect on organizational culture if it inspires malevolent forms of creativity – creativity aimed at doing others harm, being cruel or inciting destruction (Cropley et al., 2008).

Long-term consequences of creativity

Even if organizations manage the inherent costs of creativity and the side effects, there may still be significant downstream negative consequences of creativity on long-term work performance. We discuss three major mechanisms behind these negative consequences: (a) the formation of a creative identity; (b) traps of past creative success, and (c) the erosion of standards used to evaluate new ideas.

Formation of a creative identity

Creative people may form personal identities that inflate their sense of importance and make them feel entitled to special treatment at work. A creative personal identity is defined as the overall importance a person places on being creative as part of his or her self-definition (Jaussi, Randel, & Dionne, 2007). Supervisors' expectations (Scott & Bruce 1994), coworker support and interaction (Amabile, Conti, Coon, Lazenby, & Herron, 1996; Zhou & George, 2001) and creativity relevant norms (Goncalo & Duguid, 2012) can activate a creative identity at work. Individuals with a creative identity feel motivated to act in ways that are in line with the positive self-concept of a creative individual (Petkus, 1996). Existing research on the creative identity has focused on its consequences for creative performance. People with a creative identity may actually perform more creatively because they are motivated to maintain and support that identity, even if they do not necessarily have more creative talent than their peers (Jaussi et al., 2007; Lemons 2010).

Yet, the consequences of a creative identity are not necessarily positive if one considers a broader set of outcomes than just creative performance. Vincent and Kouchaki (2016) argue that one consequence of the creative identity is an exaggerated sense of entitlement, because the ability to be creative is typically regarded as a rare and valuable attribute (Campbell, Bonacci, Shelton, Exline, & Bushman, 2004). In a series of studies, Vincent and Kouchaki (2016) found that making a creative identity salient by asking people to recall and write about a time they solved a problem creatively (as opposed to logically) triggers feelings of entitlement – the perception that one is owed more than others. Moreover, feelings of entitlement had some surprisingly negative consequences. In a subsequent task, participants were asked to solve a series of problems while seated alone. The experimenter asked participants to grade the problems themselves using an answer key, to write down the number of correct solutions solved and to pay themselves the correct amount of money before leaving the experiment. All participants were told that their true answers were completely anonymous when in fact they could be traced using a code that was written at the top of each sheet in invisible ink. The results of this experiment were striking. Participants primed to think of themselves as creative were not only more likely to lie about how many answers they solved correctly, but they also stole significantly more money. Furthermore, the relationship between creative identity and dishonesty was fully mediated by feelings of entitlement – creativity makes me special, so I am rightfully owed more than everyone else. Organizations that desire creativity are then faced with a double-edged sword – encouraging a creative identity encourages employees to be more creative, but it could also license them to steal with impunity (Vincent & Goncalo, 2014).

Future research might expand on the insight that viewing oneself as a creative individual triggers feelings of entitlement. Entitlement has been linked to a number of outcomes that might be dysfunctional in organizational settings such as selfishness (Campbell et al., 2004; Zitek, Jordan, Monin & Leach, 2010), a diminished sense of social responsibility (Watson & Morris, 1991) and the willingness to demand unreasonably high salaries (Campbell et al., 2004). These potential costs of the creative identity should be considered along with the potential benefits of cultivating creative ideas.

Traps of past creative success

Here we consider the rather perverse possibility that prior creative success may actually stifle subsequent creative achievement (Audia & Goncalo, 2007; Goncalo, Vincent, & Audia, 2010). Once a creative solution has been identified, an employee is likely to prefer exploitation over exploration, because exploitation of existing knowledge that has proven to be effective guarantees more certain results and therefore reduces the risk that their efforts will lead to dead ends (Levinthal & March, 1993; March, 1991).

Yet, prior creative performance may operate as a constraint on the process of generating novel ideas by focusing an employee's attention excessively on the building blocks of creativity (e.g., ideas, knowledge) that have already been used in the past. In other words, the tendency to focus on what we know can facilitate productivity, while simultaneously blocking the broadminded exploration of novel solutions. Every person working in a given field is faced with an enormous array of information that may be combined and recombined until a particular idea is deemed to be worthy of "selection" (Campbell, 1960; Csikszentmihalyi, 1999). However, once an employee experiences success with one idea, all subsequent ideas may be framed narrowly from that perspective. For example, Audia and Goncalo (2007) show that, although inventors who successfully generated and patented their inventions in the past tend to generate a greater number of inventions in the future, these inventions become more incremental and less significant.

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The constraining effects of past success may be explained, at least in part, by the phenomenon of cognitive framing, which suggests that when people have experienced success with a particular strategy, they often become narrowly focused on implementing that strategy to solve new problems (Duncker, 1945; Luchins, 1942). This type of mental block is called negative transfer (Bartlett, 1958) and it has been found to deter the generation of novel solutions in a variety of situations, such as negotiations over time (Bereby-Meyer, Moran & Unger-Aviram, 2004), factory operation after a change in accident monitoring devices (Besnard & Cacitti, 2005), firms acquiring targets from different industries (Finkelstein & Haleblian, 2002), and firms changing their strategies following a radical environmental change (Audia, Locke, & Smith, 2000).

People store a wealth of information in the form of ideas or concepts, and creative solutions emerge when pieces of prior knowledge stored in memory are combined in novel ways (Audia & Goncalo, 2007). Ward (1994) demonstrated the constraining effects of experience on creativity in a study, in which he asked participants to draw an alien from another planet that was "beyond their wildest imagination." Instead of drawing radically different creatures, participants drew figures that conformed to the basic features of earth animals, such as, bilateral symmetry (Ward, 1994).

The constraining effect of past experience was also demonstrated in a brainstorming study, in which subjects were asked to generate new ideas; half the subjects were given an example to get them started and the other half were given no examples (Smith, Ward, & Schumacher, 1993). Groups that were given examples generated less creative ideas than the groups that were given no examples because their "new" ideas followed the examples too closely (Smith et al., 1993). These blocking effects may have considerable negative consequences for creative idea generation because people will suggest ideas that follow existing solutions too closely (Audia & Goncalo, 2007). In other words, a highly creative idea will constrain future creativity because all subsequent ideas will be framed narrowly from the perspective of the initial, highly salient, creative idea. In sum, creativity can be constraining in the long run. Ideas are not merely problem solutions; they are tied to our sense of self: they send reputational signals and they provide a point of view on the world from which it can be difficult to break away.

Early creativity can undermine subsequent idea evaluation and selection

Organizations that successfully manage the creative process will ideally encourage employees to generate a wide range of ideas and solutions. However, it is impossible to turn every idea, even every truly creative idea, into a commercialized invention. Rather, organizations are faced with the task of choosing which ideas will be pursued to fruition – a practical reality that requires the accurate evaluation and selection of one or a few ideas and the rejection of others. Though most research on creativity has focused on ideation, there is growing evidence that idea evaluation is extremely challenging. In a number of experimental studies, neither interactive groups, in which the group members brainstorm together, nor nominal groups, in which the group members brainstorm individually and to then combine their ideas, selected an idea that was better than their average idea (Faure, 2004; Putman & Paulus, 2009; Rietzschel, Nijstad, & Stroebe, 2006; Rietzschel, Nijstad, & Stroebe, 2010).

One reason that evaluators fail to accurately identify their most creative ideas is confusion over what standard to apply when making their selection. Rather than establishing clear standards and applying those standards to make a judgment, evaluators fall prey to numerous biases that cause them to overlook creative ideas. For example, idea evaluators can be self-serving – favoring their own ideas over the superior ideas suggested by others (Keum & See, 2017). Evaluators can also be misled by superficial cues such as confidence (Goncalo, Flynn, & Kim, 2010), the pitcher's sex and physical attractiveness (Hosoda, Stone-Romero, & Coats, 2003; Marlowe, Schneider, & Nelson, 1996), thus giving confident and attractive men an unfair advantage in the evaluation process. Ideas generated early during a brainstorming session are favored over ideas that are generated late even though they are not necessarily better (Johnson & D'Lauro, 2018). These problems might stem from confusion over the meaning and definition of creativity in the real world. Among lay people, creativity is associated with myriad other broadly positive concepts such as happiness, high tech, and fashionable, among others (Loewenstein & Mueller, 2016). Additionally, Eastern cultures have a different implicit theory of what is creative than Western cultures, thus compounding the confusion that results when people from different cultures evaluate each other's ideas (Loewenstein & Mueller, 2016). Moreover, given a wide range of creative ideas, selecting one or a few ideas to pursue to the next stage necessarily involves discussion and compromise. Rather than strongly advocating in favor of highly creative ideas, it might be tempting to lower standards and compromise by selecting relatively unoriginal ideas—ideas that are less likely to generate controversy (Goncalo & Staw, 2006).

Organizations that attempt to foster creativity may inadvertently exacerbate the confusion that makes idea evaluation and selection so challenging. In order to spark creativity, organizations try to permit a wide range of people, perspectives and approaches to doing work, because all of this diversity can be a resource in the creative process. The result might be a wide range of creative ideas and a litany of different perspectives, but no remaining paradigm from which to judge them (Kuhn, 1970). It is counterproductive to have many ideas but no clear consensus around what constitutes a creative idea (Rietzschel et al., 2006). Prescriptions intended to boost creativity such as ensuring equal participation of all members, do not criticize anyone else's ideas, allow for deviance and welcome misfits (Goncalo, Katz, & Ellis, 2018), are in direct contrast to the prescriptions intended to strengthen paradigm development – build consensus, allow elites to set the standard and eliminate deviant perspectives (Pfeffer, 1993). In other words, the factors that boost creative output, like welcoming deviant perspectives, might undermine the eventual selection of a creative idea by impeding paradigm development. Conversely, groups with strong paradigms might be positioned to make sound evaluations but they may have an uncreative pool of ideas from which to make their selection. By the time highly creative teams turn to idea selection, the stage may have already been set for failure.

What is the cost of creativity?

In sum, although creativity may spark new and valuable ideas, which can lead to invention, innovation, progress, and profit (Amabile & Pratt, 2016), we challenge the assumption that creative work is inherently positive by showing in three sections that creativity has both positive and negative consequences. In our first section, we summarize research showing that even though decision-makers in organizations claim to want creative ideas, employees, and leadership, they are in fact biased against them because creative ideas are risky and uncertain (Mueller et al., 2012), and the prototype of a creative person is in direct opposition to the prototype of a leader (Mueller et al., 2011). Thus, creativity is not as welcome as assumed. In our second section, we develop a theory of creative disinhibition. We argue that engaging in creative work disinhibits employees, which feels liberating and lifts

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burdens (Goncalo et al., 2015), but on the downside can lead to unethical behavior (Gino & Ariely, 2012) and work-life imbalance (Harrison & Wagner, 2016). Furthermore, while engaging in creative work can reduce stereotyping (Sassenberg & Moskowitz, 2005) and foster social connections (Goncalo & Katz, 2018), it may also increase competition and the expectation of ever-rising creativity. In our third section, we discuss three long-term consequences of creativity. First, the formation of an enduring creative identity can lead to entitlement and dishonesty (Vincent & Kouchaki, 2016). Second, past creative success may encourage exploitation and discourage further exploration (Audia & Goncalo, 2007). Third, just because creative ideas are generated does not automatically mean that employees are able to recognize them as such and select the most creative idea for implementation (Rietzschel et al., 2010; Keum & See, 2017). In sum, though many organizations actively recruit creative people on the assumption that their potential future inventions will generate revenue and profit, they may not be aware that adding and nurturing these creative people might also make the organization more vulnerable to dishonesty, theft, broken homes, substance abuse and unhealthy overindulgence.

EVALUATING THE CONSEQUENCES OF INNOVATION

Innovation as an Independent Variable

Our analysis of the consequences of creativity uncovered a number of possible negative outcomes, from outright rejection of creative ideas and creative people, to psychological side effects such as anti-social and unhealthy behavior. Given these costs, the odds that a creative idea will develop into a valuable invention and then into an innovation successfully introduced to market are low (Harvey, 2014). When a firm does manage to successfully transition from a creative idea to invention to innovation, it is widely assumed that innovation benefits will far outweigh the costs. Much like the creativity literature, the notion that innovation is beneficial for organizational performance and survival is widespread and almost taken-for-granted. But is this notion well-grounded?

Are the effects of innovation on firm performance always positive?

The management of innovation literature is truly enormous (for review see Ahuja et al., 2008). Despite the great volume of existing empirical work, scholars have focused on a few themes: uncovering predictors of firms' innovation efforts and outputs (Ahuja et al., 2008), antecedents and inhibitors of successful innovation (Benner & Tushman, 2003), diffusion of innovation (Rogers, 1995; Teece, 1986), and, more recently, firm responses to unsuccessful innovation (Eggers, 2012; Maslach, 2016). Very few studies have looked directly at the effects of innovation on firm performance (for a similar point see Carroll & Teo, 1996; Damanpour & Evan, 1984; Khessina, 2003; Lahiri & Narayanan, 2013). It seems that scholars have assumed that if a firm succeeds at innovation, it will inevitably reap performance benefits. Consequently, the dominant objective in the literature is to understand what types of organizations in what environmental conditions are likely to succeed at innovation, rather than to establish the consequences of innovation (for a review see Ahuja et al., 2008).

It is striking that, without relying on direct empirical evidence, the vast majority of studies strongly imply that innovation positively affects firm performance and survival. As Fig. 1 shows, scholars usually admit that commercializing invention into innovation can be risky (Ahuja et al., 2008; Kline & Rosenberg, 1986). Organizations often fail to transform invention into innovation altogether (Dougherty & Hardy, 1996; Gavetti et al., 2005), but even when they do succeed, it may often carry significant costs (Tripsas, 1997; Eggers, 2012). In contrast, many scholars imply that once invention is successfully commercialized into innovation (i.e., put into production and shipped to market), innovation itself is largely unproblematic for firm operation and survival. Of course, scholars distinguish between innovations that failed and succeeded commercially on the market. However, the literature has focused on the causes, rather than consequences of an innovation's commercial failure and success (e.g., Teece, 1986; Dougherty, 1992). More importantly, even fewer studies have suggested that innovation that achieved commercial success on the market might still incur significant downstream costs (Carroll & Teo, 1996; Khessina, 2003; McKendrick & Wade, 2010).

When researchers do attend to the linkage between innovation and firm performance, they tend to look for evidence of benefits rather than costs, thus confirming their assumption. For example, scholars have theorized advantageous effects of innovation on firm market share (Henderson & Clark, 1990), profitability (Geroski, Machin, & van Reenen, 1993), sales growth (Anderson & Tushman, 1990), revenues (Rothaermel, Hitt, & Jobe, 2006), patent citation rates (Sørensen & Stuart, 2000), market leadership (Christensen & Bower, 1996), firm renewal (Kaul, 2012), and efficiency (Damanpour & Evan, 1984). The literature also proposed that innovation may benefit the performance of innovative firms indirectly by triggering a process of "creative destruction", whereby less innovative firms are driven out of an industry by more successful innovative competitors (Abernathy & Clark, 1985; Eggers, 2012; Schumpeter, 1934; Sosa, 2011; Tripsas, 1997). Accordingly, empirical research has largely examined the questions of whether and how innovation boosts firm performance and survival (e.g., Bayus, Erikson & Jacobson, 2003; Christensen & Rosenbloom, 1995; Henderson, 1993; Klepper & Simons, 2000a).

Despite the broad consensus that greater innovation leads to higher organizational performance, the reliable empirical evidence of this linkage remains minimal (Khessina, 2003; Lahiri & Narayanan, 2013). We think the conclusion that innovation necessarily enhances firm performance may be premature given the theoretical and methodological challenges in the research that purportedly supports this assumption.

Challenges of establishing innovation effects on firm performance

Definitional issues

Many scholars rely on one or more aspects of the original definition of innovation provided by Schumpeter (1934), according to whom, innovation may include the launch of a new product, creation of new production and sales methods, discovery of new sources of supply of raw materials and semi-finished goods, opening of a new market, and creation of a new industry structure. The literature disproportionally focuses on technological innovation and defines it as a technical advance over old technology that requires new knowledge or reconfiguration of existing knowledge (Tushman & Anderson, 1986). Depending on the extent of new knowledge required, innovations are classified either as major (e.g., radical, competence-destroying, architectural, disruptive, etc.) or as incremental (Christensen & Rosenbloom, 1995; Henderson & Clark, 1990; Tushman & Anderson, 1986; for review see, Gatignon, Tushman, Smith, & Anderson, 2002). Most empirical studies, however, do not provide a conceptual definition of innovation and define it only in empirical terms.

It is common to define innovation by firm success in the market. For example, Kamien and Schwartz (1982) define innovation as new products and processes that resulted in an improvement of a firm's market position. Roberts (1999) defines only those new products as innovative that have high initial market share. But

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defining innovation by financial success or increase in a market share means that it is not surprising at all to find that innovation is beneficial for organizational outcomes; such tautological definitions depend on the outcome itself.

Studies that avoid tautological definitions often have a different issue – they define innovation too broadly. Definitions of innovation, similar to "doing things differently in the realm of economic life" (Schumpeter, 1939: 84) or "the adoption of an idea or behavior that is new to the organization" (Hage, 1999: 599), are common. For example, Damanpour and Gopalakrishnan (2001: 47) define innovation "as the adoption of an idea or behaviour, pertaining to a product, service, device, system, policy, or programme, that is new to the adopting organization." Unfortunately, research that relies on such broad definitions often confounds invention and innovation (Gatignon et al., 2002). It leaves unclear whether innovation means just a prototype or a fully commercialized product or process (see Fig. 1). Yet, as Schumpeter (1939: 85) put it: "the making of the invention and the carrying out of the corresponding innovation are, economically and sociologically, two entirely different things." It is important to distinguish them both theoretically and empirically (Chandy, Hopstaken, Narasimhan, & Prabhu, 2006; Kline & Rosenberg, 1986).

In our view, the most promising definitions of innovation avoid the fallacies described above: (1) they are not tautological; and (2) they are specific enough to avoid confounding invention and innovation. For example, Edwards and Gordon (1984: 1) define innovation as "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." In a similar vein, Katila and Shane (2005) define innovation as a commercialized invention; Garud et al. (2013) define innovation as the invention, development, and implementation of new ideas. These definitions treat innovation as more than just the emergence of new ideas or inventions. Rather, such ideas have to be developed and implemented into commercial products or processes in order to be called innovation.

Empirical measurement concerns

Poor definitions of innovation often spillover to empirical designs. Overly general definitions of innovation allow for the construction of a great variety of empirical measures. Many of these measures, however, have the same problems as the definitions they are based on. Below we discuss strenghts and weaknesses of popular innovation measures and summarize this discussion in Table 2.

At the outset of empirical research on innovation, research and development (R&D) expenditures were a popular measure of innovation (e.g., Acs & Audretsch, 1988; Cohen & Klepper, 1996; Scherer, 1982; Soete, 1979). Yet, not all firms that manage to innovate have R&D (Geroski et al., 1993). Furthermore, the linkage between R&D investments (which measure innovation inputs) and innovation outputs is tenuous at best (Erickson & Jacobson, 1992; Hall, Griliches & Hausman, 1986). Over time, as more direct measures of innovation have become available, the popularity of R&D investments has declined (Becheikh, Landry, & Amara, 2006).

Another common approach to measuring innovation is based on the distinction between major (e.g., competence-destroying, radical, architectural) and incremental innovations; with most research focused on the effects of major innovations (e.g., Benner, 2010; Christensen & Rosenbloom, 1995; Henderson & Clark, 1990; Maslach, 2016; Tushman & Anderson, 1986; Tripsas, 1997). Most studies of major innovations provide very valuable insights and rich analysis of their particular cases. However, cross-study comparisons of the findings are difficult, because the measures of major innovations are often based on the subjective *ex-post* judgment of experts about specific contexts.

The search for more objective and generalizable measures has led to the increasing popularity of patents (and patent citations) as a measure of innovation (e.g., Acs & Audretsch, 1989; Carnabuci & Operti, 2013; Joshi & Nerkar, 2011; Kim, 2016; Lee & Berente, 2012; Sørensen & Stuart, 2000; Schilling, 2015; Whittington, Owen-Smith & Powell, 2009). However, patents as a measure of innovation, although instructive for many purposes, are also problematic. First, patents confound invention and innovation. Many patented inventions are never developed into commercialized products and thus, never become an innovation. For example, Chandy et al. (2006) revealed that of all 1573-drug related patents that were in existence from 1980 to 1985, only 18.3% were converted to actual launched drugs by the end of 2001. They also found that firms that generated too many patents were less likely to convert them into actual products. Thus, the assumed linkage between patenting activity and innovation that made it to the market is questionable.

Second, patents do not capture a wide range of process innovations, defined as creating new production processes or delivery methods through changes in an operational process or new equipment (Levin, Klevorick, Nelson, & Winter, 1987). Furthermore, patents do not capture important technological activities that accumulate into commercial products, such as imitation, intangible know-how, on-the-job training, production engineering or learning-by-doing (McKendrick & Wade, 2010). Discoveries in social and organizational arrangements are also rarely patented (Rhoten & Powell, 2007).

Third, companies often prefer to protect their inventions through secrecy rather than through the patent system (Cohen, Nelson, & Walsh, 2000). Arundel and Kabla (1998) estimated that companies only patent about 35.9% of their product innovations and 24.8% of their process innovations.

Fourth, some firms practice defensive and offensive patenting. They patent even minor inventions with low probability of becoming an innovation in order to make it hard for competitors to enter their market space and to protect themselves from the analogous actions of competitors (Rice, 2015).

Lastly, a granted patent is an outcome of a complicated social process that involves inventors, assignees, lawyers, and patent examiners with their own individual biases and interests (Myers, 1995; Jensen, Kovacs, & Sorenson, 2018). As a result, successful patenting reflects not only a company's inventive capabilities, but also its political and regulatory skills (Whittington et al., 2009).

Given the multiple issues with innovation measures based on patents, some researchers have proposed measures based on product-level data (Katila & Shane, 2005; Khessina, 2003; McKendrick & Wade, 2010). One approach relies on new product development (e.g., Bayus et al., 2003; Benner, 2010; Fosfuri & Giarratana, 2009; Katila, 2002; McCann & Bahl, 2017; Wu, 2013). The introduction of new products captures the potential commercial importance of a company's innovative activities more directly than patents do, because most innovative activities can significantly affect firm performance only when inventions are commercially developed and introduced to the market (Katila, 2002). In empirical studies, scholars using this approach define a new product as one that shows a change in design characteristics (Bayus et al., 2003; Martin & Mitchell, 1998). However, while such innovations are new to the firm, they are not necessarily new to the market (Leiponen & Helfat, 2010).

An alternative approach treats a product as innovative only when it is new both to the firm and to the market. It measures innovation by taking into account only new products introduced at the industry frontier or its close proximity (e.g., Khessina & Carroll, 2008; McKendrick & Wade, 2010; Roy & Sarkar, 2016). The

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Table 2
Strengths and weaknesses of popular innovation measures.

Type of innovation measure	Examples of studies	Measurement strategy	Strenghts of the measure	Weaknesses of the measure
R&D expenditures	Acs and Audretsch (1988),Cohen and Klepper (1996), Kaul (2012), Scherer (1982) and Soete (1979)	• Total financial expenditures on research and development	• Data available for many large public companies	• Not all innovative firms have R&D • R&D expenditures measure inputs to the innovation process • The linkage between R&D expenditures and innovation outputs is tenuous
Major innovations	Benner (2010), Christensen and Rosenbloom (1995), Carroll and Teo (1996), Henderson and Clark (1990), Leiponen and Helfat (2011), Maslach (2016), Sorescu, Chandy, and Prabhu (2003), Tripsas (1997) and Tushman and Anderson (1986)	• Identified by an expert	• Rich description and analysis	• Relies on subjective ex-post judgements of experts • Ignores incremental innovations • Hard to compare across studies
Patents	Acs and Audretsch (1989), Carnabuci and Operti (2013), Joshi and Nerkar (2011), Kehoe and Tzabbar (2015), Kim (2016), Kim et al. (2016), Lahiri and Narayanan (2013), Lee and Berente (2012), Samila and Sorenson (2010), Schilling (2015), Sørensen and Stuart (2000), Stuart (2000) and Whittington et al. (2009)	• Number of patents • Number of patent citations	• Data is publically available for all companies in any market	• Confounds invention and innovation • The linkage between patenting activity and innovation that made it to the market is questionable • Does not capture a wide range of process innovations • Does not capture imitation, intangible know-how, production engineering or learning-by-doing • Not all inventions and innovations are patented. Some companies prefer to use secrecy instead of the patent system to protect their inventions • Some firms practice defensive and offensive patenting • Patenting reflects not only a company's inventive capabilities, but also its political and regulatory skills
New product development	Bayus et al. (2003), Benner (2010), Fosfuri and Giarratana (2009), Katila (2002), Katila and Ahuja (2002), Leiponen and Helfat (2010), Martin and Mitchell (1998), Maslach (2016), McCann and Bahl (2017), Un (2011), and Wu (2013)	• New products that show a change in design characteristics	• Captures the potential commercial importance of a company's innovative activities	• Such products are new to their firms, but not necessarily new to the market • Does not capture process innovation
New products at the industry frontier	Dodson (1985), Karim (2009), Katila and Chen (2008), Keeney and Lilien (1987), Khessina (2003), Khessina and Carroll (2008), McKendrick et al. (2009), McKendrick and Wade (2010), Roy and Sarkar (2016), Sahal (1985) and Turner et al. (2010)	• New products introduced at the industry frontier or its close proximity • New products that improve relative to other products in their firm and cross a threshold into a new technological regime • New products that result in a firm's entry into a new product market	• Effectively differentiates between innovation and invention • Allows cross-study comparisons	• Does not capture process innovation

basic assumption here is that such products show improvement in design and technology characteristics important to users (Katila & Chen, 2008; Sahal, 1985). This measure often defines industry frontier by the best technical performance existing at a particular time and accounts for the distance of any new product from this frontier (Khessina 2003; McKendrick, Wade & Jaffee, 2009). Slightly different approaches measure new products as innovative only if they offer both improvement relative to other products in their firm and cross a threshold into a new technological regime (Turner, Mitchell & Bettis, 2010) or if they result in a firm's entry into a new product market (Karim, 2009).

Innovation measures based on the introduction of new technologically advanced products effectively differentiate between innovation and invention, are available for all firms in many industries and are somewhat easy to compare across studies. One weakness of these measures, however, is that while they measure product innovation well, they only indirectly measure process innovation, such as innovation in production processes or delivery methods.

Overall, while all existing measures of innovation offer unique advantages, they also have disadvantages, which are more extensive for some measures (e.g., R&D expenditures, patents) than for others (e.g., introduction of new advanced products). Reliance on different measures makes it difficult to interpret and compare empirical findings and can be another reason why scholars overlook the costs of innovation. For example, if a measure relies on patent counts, the probability of uncovering negative

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effects of innovation on firm performance will be much smaller than if a measure relies on counts of new products introduced at the frontier. This happens because the process of generating and patenting inventions is much less disruptive for a firm's operation than the process of commercializing these inventions.

Sample selection issues

The third common methodological problem in the empirical literature on innovation is sample selection bias. This bias happens when a researcher uses a non-random sampling principle to sample the underling population for statistical analysis and, consequently, ends up with a distorted representation of the true population (Heckman, 1990). Many studies reporting purported benefits of innovation, analyzed non-randomly selected groups of firms: market leaders, large firms, or public companies. Some even sampled on the dependent variable by studying only surviving firms, most of which are inherently successful.

Examples of studies with sample selection problems are plentiful. For instance, in a study of the photolithographic alignment equipment industry, Henderson and Clark (1990) relied on *ex-post* expert judgements to determine architectural innovations, defined as new products with the same components, but changed architecture. In their study of the worldwide hard disk drive industry, Christensen and Bower (1996) used *ex-post* expert judgements to measure disruptive innovation, defined as a new class of products within an old industry that disrupted the incumbent order. These two studies showed positive effects of innovation on firm market share and leadership. However, because they analyzed only industry leaders, their findings do not generalize to small, medium-sized, or even large non-leader firms. Sørensen and Stuart (2000) used U.S. patents to measure firm innovation in the semiconductor industry. Geroski et al. (1993) relied on *ex-post* expert judgements to measure firm innovation as the number of technologically important and commercially significant innovations in the U.K. manufacturing sector. Both studies analyzed innovation impact only on large and public companies, and thus left open the question of whether innovations in these respective markets affect the performance of small and private firms.

Those empirical studies that avoid the sample selection issue by covering all firms participating in a given industry over a long (or entire) period of industry development are not conclusive about the impact of innovation on firm performance. On the one hand, some studies revealed a positive effect of innovation. For example, Banbury and Mitchell (1995) relied on *ex-post* expert judgement to identify important incremental product innovations, defined as refinements and extensions of established designs that result in substantial price or functional benefits to users. They found that in the U.S. cardiac pacemaker industry, more innovative firms had higher market shares and greater survival rates. Klepper and Simons (2000b) focused on major innovations identified as such *ex-post* by experts as well, and found that in the U.S. tire industry innovative firms survived longer.

On the other hand, other studies failed to find an unambiguously beneficial effect of innovation on firm performance. For example, Carroll and Teo (1996) relied on *ex-post* expert judgments to define an innovation event as the earliest significant commercial introduction of a new product or process in the U.S. automobile industry. They found that firms that introduced a greater number of innovations survived longer, but the larger the company was, the less beneficial was innovation for its survival. In a study of the U.S. semiconductor industry, Barnett and Freeman (2001) defined innovative products as the first time that a given product category ever appeared in the industry. They found that while firms with more innovative products on the market survived longer, firms that introduced many innovative products simultaneously had higher failure rates. Khessina (2006) found that in the worldwide optical disk drive industry, although firms with innovative products, defined as products with performance at the industry's technological frontier, survived longer, this benefit diminished for firms with too many innovative products.

To summarize, empirical studies conducted on all firms in a given industry over whole or long periods of industry development demonstrate that the relationship between innovation and firm performance is more complex than it first appears. Innovation may not only fail to enhance firm performance, but under certain conditions it can be outright harmful.

Sources of negative innovation effects

Although the positive consequences of innovation are allegedly well established, inconsistent empirical findings suggest that innovation may have a range of positive and negative effects. Since the literature takes for granted the existence of positive effects of innovation and has reviewed them elsewhere, we focus on a systematic review of the negative effects and the underlying mechanisms that drive these effects.

Following previous research, we define innovation as "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: 1; Garud et al., 2013; Katila & Shane, 2005). To simplify our arguments we focus on product innovation (by which we mean both product and service innovations), because it has the greatest variety of consequences, but most of our theorizing applies to both product and process innovation.[1]

In parallel with the section on creativity, we look at the three negative consequences of innovation: (1) inherent costs of innovation, (2) side effects of innovation, and (3) long-term consequences of innovation. Table 1 provides an analytical map of these factors.

Inherent costs of innovation

Product innovation is a type of organizational change, and as with any other organizational change, it has inherent costs. To uncover these costs, we adapt a model developed by organizational ecologists for understanding the consequences of organizational change. According to this model, organizational change has two dimensions: content of change and process of change (Carroll & Hannan, 2000). Content of change refers to what is different in an organization before and after transformation. Process of change refers to the way the change in the content occurs: decisions made, sequences of specific actions undertaken, resistance encountered, speed of transformation, and so on. Process of change may generate significant costs even when content of change is beneficial. We apply this two-dimensional model to uncover the inherent costs of product innovation to its organization.

Product innovation comes to its logical completion when a firm brings to the market a new product with parameters at the industry frontier. We call it an *innovation outcome*. It is a similar construct to content of change. When successful, innovation outcomes often bring benefits to their firms. However, in order to produce innovation outcomes firms have to engage in *a process of innovation development;* that is, a process of creating products with

[1] Product innovation is defined as new products or services developed and introduced to market to meet the needs of external users (Damanpour & Gopalakrishnan, 2001; Katila & Ahuja, 2002). Process innovation is defined as developing and implementing a new or significantly improved production process or delivery method through changes in the operational process or new equipment (Utterback & Abernathy, 1975; Wong, Lee, & Foo, 2008).

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advanced technical or functional performance, starting with a creative idea, developing it into an invention, and then finally commercializing it into an innovation in a form of a new product shipped to the market. Garud et al. (2013: 776) describes this development process "as the sequence of events that unfold as ideas emerge, are developed, and are implemented within firms, across multi-party networks, and within communities."

The process of innovation development is a similar construct to process of change. It can incur significant costs, even if the resulting innovation outcomes are beneficial. Specifically, the development of innovation may create disruptions in a firm's internal routines and structures and relationships with environmental actors, and in this way reduce or even eliminate potential benefits from innovation outcomes (Carroll & Teo, 1996; McKendrick & Wade, 2010). A complete assessment of the effects of innovation on organizational performance and survival requires considering both aspects of innovation: innovation outcomes and the development process that led to these innovation outcomes (Carroll & Teo, 1996; Khessina, 2003).

Outcomes of product innovation: benefits and costs

A firm that succeeds at generating innovation outcomes may experience both positive and negative consequences. Because the literature has already thoroughly discussed the benefits of innovation outcomes, we will mention them only briefly. Instead, we will focus on three different ways that innovation outcomes can cause harm: (a) incorrect forecasting of market demand; (b) unsuccessful appropriability; and (c) complicated relationships with audiences.

Costs of an incorrect forecast of consumer preferences and market demand

Not every firm that succeeds at shipping its innovative product to market manages to derive benefits from this innovation. If a new product offers features that customers do not either understand or appreciate, it will not manage to attract customer attention. This happens when a firm inaccurately predicts consumer preferences and market demand, developing a product that customers either do not want at all or are not ready for yet.

The severity of inaccurate forecast of demand by innovating producers depends on the stage of technology evolution (Klepper, 1997). The basic evolutionary model of technological change suggests that a cycle typically starts with a technological discontinuity, defined as an order-of-magnitude improvement in the maximum achievable price vs. performance frontier of an industry (Tushman & Anderson, 1986). Technological discontinuity either gives rise to a new market or transforms the existing market by unleashing an era of ferment characterized by a high level of technical variation and uncertainty. Over time, the processes of selection and convergence among competing technologies likely lead to the emergence of a dominant design, which starts a period of incremental change, until another technological discontinuity comes to life and starts the cycle anew (Anderson & Tushman, 1990).

The evolutionary model of technological change suggests that the accurate prediction of customer demand is most challenging in nascent markets during the era of ferment when neither the nature of new technology nor its trajectory is obvious *ex ante* (Anderson & Tushman, 1990). Nascent markets are particularly challenging for three major reasons that we discuss below.

Nascent markets: cost of betting on a losing technology

The simultaneous proliferation of competing technologies is common in nascent markets (Eggers, 2012; Wade, 1995). Firms need to choose which technology to support. This choice involves sunk investment in tangible resources and capability development. Unfortunately, it is hard to forecast which technology will win. Firms that bet on a technology that is eventually selected out and abandoned, will bear the costs of imprinting on a failing technological path (Arthur, 1989; Nelson & Winter, 1982). Even when it becomes clear which technology is winning, most firms that bet on a losing technology will either continue making innovative products based on it, or will try to (mostly) unsuccessfully switch to the winning technology (Eggers, 2012). Customers will ignore products made by companies that recently switched in favor of products made by organizations with well-developed capabilities in the winning technology (Wade, 1995).

Incorrectly forecasting the winning technology makes it hard (if not impossible) for a firm to derive benefits from its innovation in both the short and long-term. For example, in the early stages of the flat panel industry, among many competing options two technologies attracted a lot of producer attention and support: plasma displays and liquid crystal displays (LCD). Still, it was uncertain which technology would eventually win. Eggers (2012) shows that a great majority of firms that bet on plasma displays were unable to successfully switch to LCDs when it became clear that LCD technology was winning.

Nascent markets: cost of relying on divergent technological frames

A firm may fail to forecast demand for its innovative products correctly when the company and its potential customers rely on different "technological frames", defined as cognitive tools that actors use to make sense of technologies (Orlikowski & Gash, 1994). Technological frames shape actors' decisions and choices (Davidson, 2006; Leonardi, 2011). They affect whether producers invest in a specific technology, how they develop and commercialize this technology, as well as whether users choose this technology over competing options and adopt it (Kaplan & Tripsas, 2008).

When a firm and its potential customers rely on divergent technological frames, they interpret technology and its usefulness differently. Under these conditions, the firm may release a product innovation believing it will address consumer demands, but consumers will fail to see that and ignore the firm's new product. One reason this might happen is the inertia of incumbent firms, which tend to impose on new technology old technological frames developed under technological regimes of previous industry affiliations (Benner & Tripsas, 2012). As a result, their approach to new products is often more outdated than what customers expect. For example, in the nascent personal digital assistant (PDA) industry, many first entrants developed products that were similar in design and functionality to their previous products: Hewlett Packard made its PDAs look like sophisticated calculators, NEC made its PDAs look like word processors and so on (Kaplan & Tripsas, 2008). However, users found devices that combined the functionalities of PDAs and mobile phones more appealing and quickly switched to smartphones.

Nascent markets: cost of innovating in a categorization vacuum

The risk of incorrectly forecasting customer demand for innovative products increases in nascent markets that lack a well-defined categorization order. Market categorization is a process by which audiences, such as investors, suppliers, employees, security analysts, and consumers, sort organizations and their products into categorical groups with labels based on organizational and product similarities (e.g., biotechnology firms, nanotechnology devices, etc.). Over time, market categories may become institutionalized and acquire a taken-for-granted status as the result of consistent usage by audiences (Hannan, Pólos, & Carroll, 2007). Institutionalized market categories are vital because they provide meaning systems, shape

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identities of producers and their audiences and define rules for conformity and sanctions for nonconformity in industries (Hannan et al., 2007; Khaire & Wadhwani, 2010; Zuckerman, 1999). Categories allow actors to make sense of products, producers and their audiences more easily (Khessina & Reis, 2016; Porac, Thomas, Wilson, Paton, & Kanfer, 1995).

Nascent markets, however, do not have established categorization orders and require time to become cognitively coherent (Rosa, Porac, Runser-Spanjol, & Saxon, 1999; Suarez, Grodal, & Gotsopoulos, 2015). Producers and their audiences need to continuously interact and negotiate meanings in the process of public discourse to develop new classification systems (Kahl & Grodal, 2016; Kennedy, 2008; Koçak, Hannan, & Hsu, 2014;). Before new categories emerge and are agreed upon, firms selling innovative offerings face considerable risks. Customers tend to ignore innovations that they fail to categorize, as they are likely to perceive them as incomprehensible and strange and, thus, not useful (Rindova & Petkova, 2007). For example, Sony initially failed to generate decent sales in the USA for its first entertainment robot for the home: a pet dog, AIBO. General manager, T. Yazawa, argued that Sony "could sell more AIBOs in the United States if more people *understood* what we are selling." (Moon, 2003: 10; Rindova & Petkova, 2007).

The emergence of categories is rarely a smooth process. Suarez et al. (2015) suggest that nascent industries start with a phase of categorical divergence, when a great number of categories come into existence, but remain fuzzy and cause confusion. For example, in the early days of the automobile industry, audiences referred to automobiles as "the velocipede, motorcycle, locomobile, electric runabout, electric buggy, horseless carriage, automobile, and quadricycle" (Rao, 2008: 19). Such a great variety of emerging, but fuzzy categories related to an automobile, reflected not only the differences in technology and strategic positioning of producers, but also pointed to the confusion and diversity of audiences' understandings of what this new product was about. The great diversity and fuzziness of emerging categories made it difficult for firms to understand what customers actually wanted. Additionally, it made it hard for producers to predict which category would eventually become dominant (Suarez et al., 2015).

If the industry persists, the phase of categorical divergence is followed by the phase of categorical convergence and the development of a categorization order (Rosa et al., 1999; Suarez et al. 2015). An established categorization order makes it easier for innovating firms to find a common language with customers, but until this happens the forecasting of demand remains an uncertain activity and innovation based on incorrectly predicted demand remains a high risk endeavor.

Mature markets: cost of consumer post-purchase regret

Firms may miscalculate demand for their innovations not only in emerging markets in the era of ferment, but also in mature markets in the period of incremental change. In this period, innovation efforts of companies shift either to process innovation or to improving performance and features of existing offerings (Klepper, 1996). Firms try to forecast which new features and performance advances in existing products customers will appreciate enough to pay for. The problem, however, is that customers may be uncertain about what they want (Jiang, Narasimhan, & Turut, 2017). For example, a customer may know that features of a new smartphone improved (e.g., the resolution of the phone's display became higher), but remain uncertain about how much she will benefit from these new higher-quality features. This uncertainty may prevent the consumer from making a purchase. Additionally, when thinking about a purchase many consumers may anticipate post-purchase regret and decide against the purchase altogether (Jiang et al., 2017). Thus, even in mature markets, forecast of demand could be challenging and firms may create, produce and ship to market innovative products that customers are not willing to buy.

To summarize, a firm may fail to accurately forecast customer demand in both nascent and mature markets. Such a firm will fail to generate anticipated sales and will not manage to recoup its expenses from the development of innovation. Its overall performance will suffer and the risk of failure will go up.

Costs of unsuccessful appropriability

A firm may accurately predict market demand, create and ship an innovative product that appeals to customers, but still fail to benefit from it, if rivals manage to imitate this innovation with lesser investments and, therefore, increase competition for the original innovator (Encaoua, Guellec, & Martinez, 2006). This situation describes an appropriability problem. Appropriability refers to a firm's ability to capture economic returns to its investment in innovation (Teece, 1986). Low appropriability is one of the key reasons why firms may fail to benefit from their innovation outcomes even when important audiences find them of high value.

Firms appropriate returns from their innovations in two major ways: Through formal legal mechanisms, such as intellectual property (IP) rights, and through mechanisms that prevent competitors from seizing their knowledge through spillovers (Knott & Posen, 2009). Knowledge spillovers happen when an organization's investments in knowledge creation produce external benefits by facilitating innovation by other firms (Jaffe, Trajtenberg, & Fogarty, 2000), either unintentionally, when other firms imitate the organization's invention, or intentionally, when the organization's scientists disclose their research (Breschi & Lisson, 2001).

Patenting prevents direct imitation in industries with strong IP protection (for review, Somaya, 2012). Complementary assets (defined as assets helpful for commercialization of innovation, such as, marketing, competitive manufacturing, distribution system, after-sales support and so on), secrecy, and efforts to locate away from the market space of competitors are key mechanisms to prevent knowledge spillovers, especially in markets with weak IP regimes (for review, James, Leiblein, & Lu, 2013). All of these mechanisms are costly to develop and maintain, and none of them are foolproof.

Patent protection is costly to create and enforce. Costs include patent filing fees, follow-on patent issuance, patent maintenance fees, costs of identifying infringement and legal costs to defend rights to exclusivity (James et al., 2013). In exchange for incurring these costs, patent law gives the owner or licensee of the patented invention a legal right to prevent others from using it. Unfortunately, in many industrial contexts, the actual protection afforded by patent law is often much weaker than intended. This happens because a patent offers an exclusionary right instead of an affirmative right, i.e., it does not allow a patent's owner to exploit the invention if such use infringes on the rights of others, as is the case with patents based on prior inventions that are still covered by someone else's patents (Ziedonis, 2004). It may also be impossible to effectively enforce exclusionary protection (James et al., 2013). As a result, there is no guarantee that a patent holder will capture the expected profits from its invention (Cohen et al., 2000).

When a patent protection regime is weak, firms may rely on secrecy as a value capture mechanism (Cohen et al., 2000). Secrecy refers to procedures that restrict the flow of information within and outside of a firm (James et al., 2013). The efficacy of secrecy varies with the complexity of the technology underlying an

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innovation. Secrecy is less effective at protecting innovations that can be reverse-engineered, but more effective at protecting more complex, hard to imitate innovations (Rivkin, 2000). Even when effective, secrecy has costs. It is costly to create and maintain organizational structures that control the flow of information and monitor employee behavior (Liebeskind, 1997). Additionally, because such structures restrict the flow of innovation they inhibit future innovation (James et al., 2013).

Complementary assets are instrumental to commercializing any innovation and become extremely important when both patent and secrecy protections fail. Complementary assets can be generic (commodity-type assets that can be transacted for in the open market) or specialized (unique assets that are critical to the commercialization of an innovation) (Kapoor & Furr, 2015; Rothaermel & Hill, 2005; Teece, 1986). The latter are more effective at appropriating returns to innovation (Cohen et al., 2000; Teece, Pisano, & Shuen, 1997). Having marketing, distribution and other systems customized to a specific innovation, allows a firm to produce, promote, and sell an innovative product much cheaper and faster than competitors can, even if they imitate the innovation. However, because specialized complementary assets are costly to develop, firms may not possess them and, as a result, fail to capture value from their innovation.

In short, firms operating in industries or countries with a weak IP regime and firms lacking complementary assets are at high risk of imitation and may be unable not only to generate profits from their innovation, but also fail to recoup their investment expenses (James et al., 2013; Teece 1986).

Benefits and costs of complicated relationships with audiences

If the firm accurately forecasts demand for its new product and has capabilities to appropriate returns from its innovation, it may greatly appeal to several important resource-holding audiences, such as consumers, suppliers, investors, employees, alliance partners, other firms, and governmental agencies. For example, if a new product embodies features that address changing customer preferences, the firm will increase both its product and organizational appeal to consumers and, as a result, will elicit higher sales (Gunday, Ulusoy, Kilic, & Alpkan, 2011; Sorenson, 2000). Such a firm also possesses an advantage in attracting talented employees (Almeida & Kogut, 1999), makes a more desirable partner for joint ventures and R&D alliances (Mowery, Oxley & Silverman, 1998; Sampson, 2007), acquires greater attention and resources from potential partners in the value chain of the production process (Podolny, Stuart & Hannan, 1996), and successfully mobilizes funds from investors (Bygrave & Timmons, 1992; Sorenson, Assenova, Li, Boada, & Fleming, 2016).

Thus, firms with successful innovation outcomes are likely to perform better with a variety of important audiences than less innovative firms (Christensen & Rosenbloom, 1995; Stuart, 2000). However, the overall effect of a firm's increased appeal to audiences is not always straightforward and can become double-edged in the long run. For example, although firms with successful innovation outcomes are sought out by other companies for R&D alliances, they may fail to derive an innovation advantage from such joint ventures if other participants possess lower innovative capabilities (Doz, 1988). They may also become a victim of misappropriation if alliance partners have better capabilities for appropriating innovation (Katila, Rosenberg & Eisenhardt, 2008). Finally, a firm may waste its resources on an alliance without obtaining any substantial benefits if the alliance fails to generate an effective system of knowledge exchange (for a review see Wang & Rajagopalan, 2015).

While innovative companies manage to attract many talented and creative employees, they often fail to keep them. They are constantly at risk of losing their best talent to poaching competitors and employee-started ventures (Ganco, Ziedonis, & Agarwal, 2015). By hiring a firm's talented employees, competitors not only put a dent into the firm's stock of human capital, but also learn the firm's technological know-how from the poached hires (Rosenkopf & Almeida, 2003). As a result, the firm may lose its innovative advantage to competitors (Singh & Agarwal, 2011). Additionally, talented knowledge workers may leave these companies to start their own technological ventures, known as spin-offs and spin-outs (Agarwal, Echambadi, Franco, & Sarkar, 2004; Brittain & Freeman, 1986; Wong et al., 2008). These former employees tend to transfer the knowledge they acquired at parent companies to their own ventures, diluting the parent's innovative advantage (Franco & Filson, 2006; Klepper & Sleeper, 2005). Thus, while firms with successful innovation outcomes appeal to important audiences, the resulting interactions with audiences may bring both benefits and significant costs, generating short- and long-term tradeoffs.

To summarize, although successful outcomes of product innovation have great potential to generate sales and bring other performance advantages to the innovative firms, they have inherent costs that in certain circumstances can be quite high. First, firms may successfully ship their product innovation to market only to discover that they incorrectly predicted customer demand. Second, innovative firms may fail to appropriate returns from their innovation if they operate in a low appropriability regime and do not have complementary assets to compensate for the lack of IP protection. Finally, although firms with successful innovation outcomes attract many audiences, these audiences could take advantage of these firms in the long run.

Development process of product innovation: the risk of unintended consequences

To benefit from innovation outcomes a firm needs to produce innovation that addresses market demands and to possess IP protection or complementary assets to appropriate returns from this innovation. Yet, even then, the firm may still bear the costs of unintended negative consequences because of a second aspect of product innovation. In order to cultivate innovation outcomes, the firm has to engage in the process of innovation development, and that process tends to be hazardous.

For example, Boeing's 787 Dreamliner project announced in 2003 and commercialized in 2011 was a highly successful product innovation if we treat it only as an innovation outcome. The Dreamliner aircraft was revolutionary in technology and design (Shenhar, Holzmann, Melamed, & Zhao, 2016). It has generated high demand in the market. Moreover, Boeing has warded off competition from its key competitor, Airbus, and appropriated the returns from its innovation (Wren, 2017). Yet, if we look at the Dreamliner project from the standpoint of innovation development, we will see that the process of developing this innovation generated massive unintended consequences. The Dreamliner program was supposed to cost $6 billion and launch the first plane in 2008. However, numerous extensive delays, service problems and costs overruns resulted in $33 billion of escalated costs and delayed the delivery of the first aircraft by 40 months (Shenhar et al., 2016). Some analysts believe that, because of colossal unanticipated costs, Boeing will not be able to profit from the Dreamliner project (Gates, 2015). Thus, while Boeing experienced a tremendous success with its innovation outcome, the costs of developing this innovation outcome turned out to be enormously high and harmed both the short and long-term performance of the company.

A formalized theory of architectural change (Hannan, Pólos & Carroll, 2003, 2007) helps to explain why the development of innovation, as a type of structural change, may harm firm performance and survival. It suggests that structural change in

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organizations has a "cascading" nature, such that change in one architectural unit in a firm creates a structural violation in units subordinated to it.[2] As a result, the initial change triggers adjusting changes in other units to remove the violation. The units that undertake adjusting changes subsequently trigger changes in subordinate units, and so on. Consequently, a local structural change in the organization may initiate a cascade of other structural changes, especially if an organizational architecture is complex and interdependent.

Cascading changes prolong the time required for reorganization, drain firm resources, and distract managerial attention. During such reorganization periods, managers are forced to focus on solving the restructuring problems and, as a result, miss many revenue-generating opportunities. Firm performance suffers and its mortality hazard goes up. For example, in 1999, previously well performing, Xerox Corporation found itself on the brink of dying after it simultaneously reorganized its sales and billing functions. These two changes generated so many structural issues and behavioral mistakes that the firm's management spent the next 18 months focused on fixing internal problems and lost its grasp on customer relations and competition (Hannan et al., 2003).

We think the development of innovation, as a type of structural change, may have cascading consequences. The development of innovation typically involves changes in firm internal structures (e.g., retraining employees, creating research teams, relocating resources, changing the reward structure) and relationships with external actors (e.g., choosing different suppliers, hiring employees with novel skills, creating new R&D alliances, shifting to new customers). Moreover, innovation requires the coordinated effort of many actors across different parts of an organization and even across organizational boundaries (Dougherty, 1992; Garud et al., 2013; Tatikonda & Montoya-Weiss, 2001). Many of these transformations in organizational architecture, both formal and informal, generate cascading changes and end up costing an organization far more than was initially expected (Carroll & Teo, 1996; Gaimon, Özkan, & Napoleon, 2011).

Structural strains from cascading changes caused by innovation development not only distract managerial attention from external opportunities, but also create a significant emotional and psychological burden on employees (Dahl, 2011). For example, uncertainty of innovation development gives rise to fear, stress, and similar negative emotions among top and middle managers (Vuori & Huy, 2016). Thus, the overall effectiveness and productivity of employees can significantly decrease. As a result, the firm experiences not only disruptions from innovation development, but also the lack of ability to effectively deal with them.

There are several conditions under which innovation development is likely to generate unintended cascading changes and be disruptive. In the next section, we focus on three sources of such conditions and associated costs: (a) the frequency with which a firm undertakes the development of innovation; (b) the number of innovations that a firm develops simultaneously; and (c) a firm's structural characteristics.

Costs of frequent development of product innovations

The development of innovation requires structural changes. Some may be small, others quite substantial. Even when the development of innovation entails small structural changes, they may still have negative consequences if a firm frequently initiates innovations that require different structural adjustments (McKendrick & Wade, 2010).[3] Such a firm may find it difficult to maintain a smooth transition from one product innovation to the next (Gaimon et al., 2011; Garud et al., 2013). Repetitive rounds of innovation development cumulatively amplify the burden on organizational operations through ongoing cascading changes in an organization's structure. For example, in the semiconductor industry, frequent innovation requires firms to initiate and simultaneously manage a large number of alliances, which creates multiple and persistent structural challenges for firms and reduces their overall performance (Lahiri & Narayanan, 2013).

Over time, cumulative structural changes generate increasingly burdensome drains on firm resources. Distracted by operational problems created by constant reorganization, the firm may miss revenue-generating opportunities. Therefore, the greater the number of diverse innovations a firm has undertaken in the past, the higher the cumulative structural strain it currently experiences, and the less beneficial its current innovation will be for its overall performance and long-term survival.[4] For example, Lahiri and Narayanan (2013) find that in the semiconductor industry, firms with a high patenting frequency and large R&D alliance portfolios have significantly lower net income. Khessina (2003) shows that in the worldwide optical disk drive industry, firms that introduce frequent product innovations have higher failure rates. McKendrick and Wade (2010) reveal that in the worldwide floppy disk drive industry, small firms that undertake product innovation frequently are more likely to exit the market than small firms that innovate less often.

Costs of simultaneous development of multiple product innovations

When an organization develops many product innovations simultaneously, the resulting structural strains and disruptions can be very substantial and hazardous (Hannan et al., 2003). Even single innovation development requires adjustments in different parts of the organization (Garud et al., 2013). When multiple product innovations occur at once, structural adjustments very quickly become complicated: a structural adjustment for one innovation may interfere with adjustments for others and so on (Dougherty & Hardy, 1996; Van de Ven, Polley, Garud, & Venkataraman, 1999). As a result, cascading changes quickly multiply, and harm firm performance and survival chances. For example, in the U.S. semiconductor market, firms that release too many innovative products in the same year, experience lower survival rates (Barnett & Freeman, 2001). This effect is significantly larger for the introduction of related products. Barnett and Freeman (2001) argue that the development of related innovations requires coordination, which creates even larger structural strains than the development of independent innovations. The rate of firm failure spikes up when a firm introduces many new products, but then decreases over time. In short, new product introductions to market can become "too much of a good thing" if too many products are released simultaneously.

[2] Subordination/superordination refers to specified lines of authority, the flow of work, or any similar relation that allow one part of the organization to impose constraints on another part (Hannan et al., 2007).

[3] When an organization undertakes frequent innovations that are based on the same existing knowledge and does not require different structural changes, it is unlikely to generate negative costs (Ahuja & Katila, 2001). By contrast, we focus on frequent innovations that require different structural adjustments.

[4] There exists an alternative view that frequent innovation is an important mechanism for gaining a competitive advantage and adapting to a changing environment (Brown & Eisenhardt, 1997; Dougherty & Hardy, 1996; Henderson & Clark, 1990; Nelson & Winter, 1982; Tushman & Anderson, 1986). For example, the successful company 3M is known for routinization of innovation. McKendrick and Wade (2010) suggests that the alternative approach likely holds for markets where technological change is a key to survival, but will not necessarily work in other conditions.

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A single innovation project can sometimes be so complex that it involves (even requires) many different simultaneous innovations. For example, some researchers propose that one of the key reasons Boeing's Dreamliner project turned out to be so unexpectedly expensive was the complicated nature of its innovation development. The development of this innovative aircraft included so many simultaneous innovations in materials, construction, assembly and management that they created massive structural strains in the company, hiking up the overall costs of the project (Shenhar et al., 2016).

Costs of development of product innovations in structurally complex organizations

The third condition under which the development of innovation is likely to be disruptive is when it occurs in an intricate organizational structure. An organizational structure is intricate when it consists of units that are densely interconnected (Hannan et al., 2007). It is useful to think about the intricacy of an organizational design in terms of the centrality of organizational units. A unit is central if it is connected to many units that, in turn, are connected to each other and to other units as well (Bonacich, 1987). Structural change in a central unit causes a great number of structural adjustments in units connected to it, in the units connected to these units, and so on. As a result, increasingly intricate architectural design induces greater cascading changes in an organization (Hannan et al., 2007; Zhou & Wan, 2017). For example, Boeing complicated its already intricate architectural design by involving, within the Dreamline project, a global network of about 700 local and foreign suppliers responsible for more than 70% of the aircraft design, manufacturing and assembly. The resulting organizational architecture was so complex and interconnected that any change in one part of it created massive problems through the rest of the organization, generating additional issues and slowing down the problem-solving and response time (Shenhar et al., 2016).

Why do organizations undertake changes that result in costly and dangerous structural adjustments? One answer is that disastrous consequences are often unanticipated because of limited foresight on the part of those initiating a change. Decision makers are more likely to suffer from limited foresight in opaque organizations – organizations in which information about some units is unavailable to other units (Hannan et al., 2007). Opacity arises when information between units flows only in highly aggregated forms (e.g., budget estimates), when organizational units speak different languages (e.g., engineering and marketing departments), when some units strategically withhold information (e.g., finance department), and so on (Dougherty, 1992; Rogers & Rogers, 1976; Stinchcombe, 1990). Opacity causes actors to underestimate the length of reorganization and the cost of change and, therefore, often unwittingly undertake disastrous changes (Hannan, Pólos, & Carroll, 2004). For example, he organizational architecture created for Boeing's Dreamliner project was very opaque, because it included developers and suppliers from different countries with highly dissimilar culture and work ethics. Top management failed to foresee many structural, cultural and political issues because it did not completely understand how the hired contractors operated (Shenhar et al., 2016).

This discussion implies that the development of innovation creates more disruptions and carries greater costs in structurally intricate and opaque organizations than in simple and transparent ones. Both organizational intricacy and opacity typically vary with firm size and age. Specifically, large organizations tend to have more complex architectural designs and more opaque structures than smaller firms (Carroll & Hannan, 2000; Rogers & Rogers, 1976; Zhou & Wan, 2017). Therefore, in large firms the development of innovation will generally create greater structural disruptions, and, consequently, will be more burdensome and hazardous. As a result, large organizations will reap fewer benefits from their innovation outcomes than smaller firms. Indeed, Carroll and Teo (1996) found that in the U.S. automobile industry, larger firms derived significantly fewer survival benefits from major innovations than did smaller firms. Similarly, Khessina (2003) showed, that in the worldwide optical disk drive industry, large firms benefited significantly less from product innovation than did smaller firms.

Organizational age may also have a profound effect on innovation development. As firms age, they acquire more complex structures (Hannan, 1998). The number of dysfunctional routines that preserve action-constraining features (e.g., political coalitions, precedents and the like) also increases with firm age (Barron, West, & Hannan, 1994; Levitt & March, 1988). Accordingly, empirical research shows that older firms experience more disruptions from change than younger ones (Amburgey, Kelly, & Barnett, 1993; Delacroix & Swaminathan, 1991). Therefore, older organizations should experience greater disruptions from innovation development, and as a result, experience smaller benefits from innovation outcomes than younger firms.

In sum, while innovation outcomes that successfully make it to market often (but not always) bring benefits to the firm, the process of developing these innovation outcomes tends to be disruptive and may reduce or even eliminate these benefits. Firms that undertake frequent and simultaneous innovations, as well as firms with complex and opaque organizational structures, are especially likely to suffer from the harmful effects of innovation development.

Side effects of innovation

Even commercially successful product innovation with low inherent costs may generate harmful side effects for its firm and sometimes even for its audiences and society. Innovation may become very costly if it: (a) cannibalizes the firm's existing product line; (b) intensifies competition in the industry; and (c) brings audiences harm.

Risk of cannibalization

Cannibalization is the process by which a new product diverts the attention of customers and takes away sales from existing products offered by the same firm (Copulsky, 1976; Heskett, 1976). In the context of innovation, cannibalization happens when an incumbent firm's sales of a new innovative product directly and significantly reduce the company's profits from sales of products based on the old technology (Henderson, 1993; Reinganum, 1983). Cannibalization not only affects sales, but it may also reduce the actual and potential value of a firm's investments in organizational resources and capabilities (Chandy & Tellis, 1998).

Even though cannibalization reduces a firm's profits from existing products, under certain conditions it can be advantageous. Cannibalization is desirable when the choice is between losing market share of the firm's old products to its new products and losing market share of the firm's old products to products of competitors (Kerin, Harvey, & Rothe, 1978). Additionally, a firm's willingness to cannibalize its existing products may lead to the development of new resources and capabilities that may enhance future innovation (Danneels, 2002; Danneels & Sethi, 2011). Still, short-term effects of cannibalization are often very costly to firms, whereas long-term effects, though potentially beneficial, are often uncertain.

Benefits and costs of intensified competition

If innovative firms manage to navigate the development of innovation with minimal inherent costs, they become stronger

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competitors than either less innovative firms or firms that stumbled during the process of innovation development. This competitive advantage can be observed both at the level of innovative products and at the level of innovative firms. Innovative products likely generate higher demand and greater sales than non-advanced offerings (Bayus et al., 2003; Fosfuri & Giarratana, 2009) and, thus, increase the intensity of inter-firm competition for customer attention (McKendrick & Wade, 2010). Consequently, innovative products are more likely to harm the performance of firms in the industry than non-innovative products. For example, Carroll and Teo (1996) find that in the American automobile industry, a focal firm's failure rate increased with the number of major innovations introduced by competing firms.

Not only do innovative products increase competition, but firms that offer these products do it as well. This happens because innovative firms shift the frontier, making it hard for laggards to catch up (Methe, Swaminathan, & Mitchell, 1996; Sosa, 2011). They tend to generate higher sales and grow faster (Bayus et al., 2003). They are likely to monopolize the attention of customers and resource-holding agents (Fosfuri & Giarratana, 2009; Sørensen & Stuart, 2000). For all these reasons, more innovative companies generate stronger competitive pressures than less innovative firms, negatively affecting the performance and survival prospects of other firms.

It is important to note that these competitive advantages do not come without a price. Innovative firms exert competitive pressures on all firms in the industry, including other innovative firms (Barnett & Hansen, 1996; Khessina, 2003). Moreover, competition between innovative firms (e.g., technology races) can be of much higher intensity and consequence than between innovative and non-innovative firms (Lerner, 1997). According to the Red Queen theory of competition (Barnett, 2008), firms exposed to direct competition become stronger competitors in the process of learning, which in turn intensifies competition and triggers a new wave of learning and improvement in firms, which in turn intensifies competition even more, and so on. Competition between innovative firms often follows the Red Queen pattern and puts pressure on firms to win or at least stay in technology races (Barnett & McKendrick, 2004; Lerner, 1997). Such races put a strain on resources of innovative firms and may diminish their performance.

Therefore, although successful innovation often increases performance of innovative firms directly, the same innovations may decrease these firms' relative performance indirectly by intensifying product- and firm-level competition in the industry, especially competition between innovation leaders. For example, in the worldwide optical disk drive industry, firms with more innovative products had greater survival chances, but the proliferation of innovative products at the industry level increased failure rates of all firms, including innovative companies (Khessina, 2006). Thus, while the direct effect of innovation is often positive, its indirect effect through intensified competition is harmful and can significantly diminish direct benefits.

Innovations dangerous to audiences and society

Under certain, not uncommon circumstances some product innovations may harm firm employees, consumers, competing organizations, governmental actors and other audiences. One key audience, often negatively affected by innovative activities of companies, but rarely discussed in this respect, is employees who participate in the process of innovation development. Because the process of innovating is often uncertain, but highly consequential, employees who participate in it may experience strong emotions (Elfenbein, 2007). Vuori and Huy (2016) suggest that hope and fear as future-oriented emotions are very common during the process of innovation development. However, negative emotions tend to override positive emotions in stressful situations because they evolved to ensure survival (Baumeister, Bratslavsky, Finkenauer, & Vohs, 2001). Additionally, past-oriented negative emotions that people may feel during the innovation development, such as, shame or envy, can turn into fear. As a result, fear becomes a central emotion in employees involved in developing innovations and may negatively affect their well-being (Baumgartner, Pieters & Bagozzi, 2008; Vuori & Huy, 2016).

Consumers are another key audience often negatively affected by innovation. As the literature on product-harm crises (defined as well-publicized occurrences wherein a product is found to be dangerous for consumers) and product recalls shows, some innovative products turn out to be unsafe to users and can harm them (Siomkos & Kurzbard, 1994; Wowak & Boone, 2015). For example, Vioxx – an innovative drug for treating arthritis that was recalled by Merck in 2004 – was linked to over 27,000 cases related to heart attack and stroke accidents (Berenson, 2007).

A product-harm crisis may hurt not only consumers, but also reduce firm performance. It may cause a drop in the firm's stock prices (Pruitt & Peterson, 1986) and damage both consumers' and the media's favorable assessment of the brand (Klein & Dawar, 2004; Zavyalova, Pfarrer, Reger, & Shapiro, 2012). A firm's most common response is to withdraw its dangerous product from the market, either voluntarily (Siomkos, 1999) or under pressure from national authorities (Mowen, Jolly, & Nickell, 1981). If a company does not manage to recall its harmful product in a timely and responsible manner, it will experience a blow to its reputation, brand integrity, legitimacy and profitability (Lai, Yang, & Wu, 2015). Although a good faith recall of unsafe products is necessary for legitimacy preservation, it may still have a large negative impact on a firm's profitability because of disruptions in the production process (Wowak & Boone, 2015) and legal charges. For example, Merck agreed to pay $4.85 billion to settle lawsuits related to the 27,000 cases of injuries and death caused by Vioxx (Berenson, 2007). Thus, product innovations that turned out to be unsafe may bring harm to consumers, and as a result, undermine a company's legitimacy, and both short-term and long-term financial performance and even survival (Magno, 2012).

Innovation may harm not only audiences, but can hinder future innovations and scientific progress overall. In industries with strong IP regimes, companies patent their inventions and innovations. However, patents are a double-edged sword. On the one hand, by providing IP protection, they increase firms' incentives to innovate. On other hand, patents create monopoly rents and raise barriers to knowledge access and diffusion, slowing down future innovation (Encaoua et al., 2006). Indeed, an increasing rate of patenting at U.S. universities is linked to a slowing pace of knowledge exploitation in science-based technology areas (Fabrizio, 2007). Thus, successful product innovation in some organizations can hinder future innovations in others, slowing down the overall industrial and even scientific progress at the societal level.

To summarize, product innovations with low inherent costs may still harm organizational performance and survival if they generate significant negative side effects, such as cannibalizing a firm's current products, intensifying competition in the industry, as well as endangering and harming a firm's audiences.

Long-term consequences of innovation

Innovation has not only short-term, but also long-term consequences for firm performance and survival. We discuss two major mechanisms behind negative long-term consequences of innovation: (a) identity concerns and (b) traps of past innovation success.

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Costs of (in)congruence of innovation with organizational identity

Organizational identity is a set of codes that audiences, such as employees, suppliers, investors, security analysts and consumers use to classify an organization as a member of a specific market category (Pólos, Hannan, & Carroll, 2002). For example, in the U.S. brewing industry, lovers of specialty beer categorize firms as craft breweries if they exhibit features of traditional methods, natural ingredients, small volume production and local distribution; which explicitly and consequentially distinguishes them from mass-market brewers (Carroll & Swaminathan, 2000). Firms possess both internal identity (a set of codes shared by an organization's members) and external identity (a set of codes shared by external audience members) (Hannan et al., 2007). Firms develop organizational identities based on characteristics of specific industries they participate in, as relevant audiences start associating firms with their particular markets (Khessina & Carroll, 2008; McKendrick, Jaffee, Carroll, & Khessina, 2003). These identities are often intertwined with a firm's earlier technological choices (Tripsas, 2009). Audiences form clear ideas about what firms with a specific organizational identity do and penalize the violation of their expectations by withdrawal of resources and attention (Hsu & Hannan, 2005).

Some product innovations violate a producer's identity and, consequently, cause significant penalties from audiences that diminish and even remove altogether potential benefits from innovation. Specifically, when a firm creates a product innovation, which is radically different from what it did in the past, relevant audiences may see it as incongruent with the organizational identity that they attached to this firm based on shared understandings about its previous industrial and technological activities. Such identity-challenging innovations (Anthony & Tripsas, 2016; Tripsas, 2009) violate expectations of audiences, and, as a result, audiences penalize the firm by withdrawal of symbolic and material resources (Kim & Jensen, 2011). For example, craft beer producers that introduce innovative products in the American lager category receive negative evaluations in product reviews from consumers of specialty beer (Barlow, Verhaal, & Hoskins, 2016). This happens because consumers associate the American lager category with mass producers and consider innovations in this product space as violating the identity of a craft brewery (Verhaal, Khessina, & Dobrev, 2015).

Even when audiences are not outright negative about identity-challenging innovations, they may still ignore them, because they often do not have tools to evaluate such innovations. For example, in the photography industry and the wireline telecommunication market, in their reports, security analysts ignored incumbent firms' identity-challenging innovations, defined as new products based directly on a novel technology, because such innovations did not fit within traditional valuation models used by analysts in respective market categories (Benner, 2010). Since the lack of attention from security analysts leads to a discount in firms' stock prices (Zuckerman, 1999), the introduction of identity-challenging innovations may have a substantial long-term negative influence on the performance of firms in these markets (Benner, 2007).

When a firm participates only in one industry, it develops a focused identity, as audiences unambiguously associate it with one particular market (Khessina & Carroll, 2008; McKendrick et al., 2003). Empirical research shows that audiences evaluate firms with a focused identity more favorably (Hannan, 2010). Major innovations may lead focused identity firms to innovate in new, not-well-understood domains that blend different technological categories (Lo & Kennedy, 2015). Innovating in such domains dilutes a firm's focused identity (Carnabuci, Operti, & Kovacs, 2015). This identity violation prompts relevant audiences to penalize a (formerly) focused identity firm even if its resulting product innovation is technologically sound (Benner, 2010). For example, Carroll, Feng, Le Mens, and McKendrick (2010) found that in the tape drive data storage industry, producers introducing product innovations associated with an unfocused organizational identity exited the market at a higher rate. By contrast, firms that innovated in areas associated with a focused identity survived longer.

To summarize, organizational identity affects what innovative actions of a firm are perceived as legitimate by relevant audiences. Identity-challenging innovations, even when technologically sound, may violate expectations of audiences and result in symbolic and material penalties. Consequently, firm performance and survival may suffer.

Traps of past innovation success

There is consistent evidence that firms that succeeded at innovating in the past become less innovative in the future (e.g., Levinthal & March, 1993; Tripsas & Gavetti, 2000; Wu, 2013). The literature has identified two general types of interrelated mechanisms that can explain this tendency: human and structural.

Human factors

The first set of mechanisms relates to the nature of employee cognition and socio-political behavior. Both managers and non-managerial employees fall victims to the trap of past innovation success. Driven by previous success in product innovation, managers tend to stick to strategies proven to work in the past (Audia et al., 2000; Miller & Chen, 1994). They do so, because they prefer to repeat actions associated with positive outcomes (Levitt & March, 1988), and because they consider it more efficient to exploit current competencies than to explore new knowledge and possibilities (March, 1991). Although both exploitation and exploration are essential for organizations, they compete for scarce resources. Exploration is more uncertain and riskier than exploitation. Managers are likely to take risks when they are still searching for adequate solutions. Past success in innovating, however, shifts their preferences from risky exploration with its uncertain outcomes to more certain exploitation based on experiential wisdom (Gavetti & Levinthal, 2000; Levinthal & March, 1993).

The balance between exploitation and exploration is the key to sustained successful innovation (March, 1991). Even when companies manage to pursue both exploitation and exploration, they may still fail to combine them in a productive way. Companies may continue to exploit old knowledge and at the same time aggressively explore new and distant knowledge, but fail to commercialize their new research and inventions because of management's cognitive inertia (Gavetti, 2005a; Tripsas & Gavetti, 2000).

Bounded rationality prompts managers to develop and rely on mental models, which are simplified representations of the world (Simon, 1955). Mental models are typically based on historical experience and influence how managers frame problems and seek solutions (Tripsas & Gavetti, 2000). Senior managers who experienced successful innovation in the past develop mental models that impede their ability to depart from past innovations (Brown & Eisenhardt, 1998). For example, senior managers at Polaroid Corporation developed mental models based on the company's past success in innovating in instant (analog) photography and failed to update these models when the new era of digital photography arrived (Tripsas & Gavetti, 2000).

Middle managers may also become victims of cognitive inertia created by past innovation success. For example, Gavetti et al. (2005) describe how Kodak failed at successfully switching from the traditional film photography to digital imaging despite

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inventing the first digital camera in 1975. In 1993, the company hired an outside CEO George Fisher who attempted to move Kodak into the new digital era. Although Fisher hired a new top management team with mental models similar to his, he failed to recognize that the vast majority of middle managers was ingrained with the old, previously very successful, mental model and resisted and even sabotaged Fisher's new digital strategy (Gavetti, 2005b).

Non-managerial employees can also become a reason for the trap of past innovation success. Previously successful inventors may find it more efficient to focus their innovative efforts on the exploitation of familiar knowledge that initially brought them success. Reliance on familiar knowledge helps inventors generate more ideas, more quickly (Levinthal & March, 1993). Additionally, ideas based on familiar knowledge are less likely to encounter resistance from managers and other employees (Tripsas & Gavetti, 2000). However, in their study of patenting activity, Audia and Goncalo (2007) show that the increasing focus on exploitation of past success makes inventors generate innovative ideas that are increasingly incremental, and thus less likely to result in a significant innovation.

Socio-political behavior of employees is another important factor for innovation success traps. Previous innovation success tends to launch managers and inventors into positions of power in an organization (Levinthal & March, 1993). For example, very successful inventors acquire status of star scientists and, as a result, get allocated greater tangible resources (Kehoe & Tzabbar, 2015). Control over tacit knowledge underlying the past successful innovations and tangible resources creates a power imbalance between star scientists and their colleagues (Overbeck & Park, 2006), which star scientists are motivated to preserve (Pfeffer, 1981). Star scientists often prevent the diffusion of tacit knowledge and sharing resources in order to promote their self-interests and impede the rise of a new generation of innovation leaders (Kehoe & Tzabbar, 2015). Given that inventors successful in the past tend to become more incremental (Audia & Goncalo, 2007), the political suppression of the emergence of new innovation leaders likely leads to the reduction of successful innovative output in the firm.

Structural factors

The second set of mechanisms behind the traps of past innovation success concerns organizational capabilities and competencies, which refer to an organization's ability to execute routines and solve problems. They include a firm's ability to coordinate organizational structures of employment and production, and the relationships with external actors (Carroll & Hannan, 2000; Nelson & Winter, 1982). Organizations develop and refine their capabilities in the process of learning as they age and acquire experience (Nelson & Winter, 1982). Learning, however, is a double-edged process that creates a number of traps: As producers develop capabilities that improve their current performance, they simultaneously close themselves off to innovation in new knowledge areas (Levinthal & March, 1993).

Leonard-Barton (1992) explains how core capabilities, defined as a set of distinct technical systems, skills, and managerial systems deeply rooted in values, may become core rigidities that impair a firm's ability to innovate in a new knowledge area. Core capabilities develop as the result of an organization's early success and are effective for innovating in the technological regime of that period. Because such core capabilities are entrenched in the old value system, they prevent the development of capabilities in new knowledge areas. The earlier in the organizational life cycle innovation success occurs, the more detrimental its effect on a firm's future innovations. This happens because early innovation success pushes a firm to focus on exploitation before it manages to develop exploration capabilities (Rhee & Kim, 2015).

Learning theory explains why firms fall into traps of past innovation success. Driven by the mutual positive feedback between experience and competence, organizations tend to engage in activities at which they are competent and avoid those at which they are not (Denrell & March, 2001). This self-reinforcing nature of learning makes it attractive for organizations to become specialized in areas in which their capabilities bring immediate advantage, and reduce experimentation with other bases of knowledge (Levitt & March, 1988). Thus, past innovation creates the competence trap. It encourages the utilization of existing capabilities or complementary assets (Teece, 1986), which in turn impedes future innovations in new knowledge areas (McMillan & Overall, 2017).

Successful innovation reinforces the existing capabilities that deal not only with internal processes, but also with the relationships with external audiences. It prompts a firm to develop value networks by creating marketing, distribution, and other capabilities aimed at serving customers that became attracted to the firm by its initial technological success (Christensen & Rosenbloom, 1995). However, when a new technology emerges, the firm's well-developed capabilities in serving existing customers may push it to ignore the new technology preferred by new customers until it is too late (Christensen & Bower, 1996). Empirical studies show that, indeed, when a firm enjoys demand growth in its current market that seems sufficiently high relative to alternative markets, it is unlikely to move into a new market, even if it is capable (Wu, 2013).

Past innovation success may also push an organization into the power trap (Levinthal & March, 1993). An innovative firm may become a dominant player on the market capable of shaping its environment through imposing its policies, products, and strategies on others. However, the longer such an organization adapts by changing its environment, the less it becomes capable of changing itself (Barnett, 1997; Levinthal & March, 1993). When the environment shifts dramatically, such a firm is likely to have trouble innovating in order to adapt to the new order.

It is necessary to note that, although in specific situations either human or structural factors may play a larger role in generating traps of past innovation success, both factors significantly matter and interact in their impact. The cognition of employees shapes organizational capabilities, while at the same time existing capabilities mold employee cognition (Garud & Rappa, 1994; Gavetti, 2005a).

To summarize, product innovations with low inherent costs and minimal side effects may still harm organizational performance and survival if they generate negative long-term consequences in the form of identity penalties and traps of past innovation success.

General discussion

We began this article by drawing attention to the existing orthodoxy that creativity and innovation are outcomes that are seen as almost inherently positive. By reversing the equation to consider creativity and innovation as independent rather than dependent variables, our review uncovered a number of consequences that are not necessarily positive and certainly more complex than existing research would suggest. Both innovation and creativity carry inherent costs, generate side effects, and are subjects to tradeoffs between short-term and long-term consequences. For example, being creative may feel liberating and even mitigate psychological burdens, while at the same time trigger impressions of volatile unpredictability and even license employee theft. Similarly, an innovative outcome may bring profit, while at the same time disrupt critical organizational routines, the loss of which may prove to be costly in the long run. Our comprehensive review also suggests that creativity and innovation are not separate processes unfolding in isolation from each other, but rather the consequences of each are deeply intertwined.

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Ripple effects: path dependence from creativity to innovation

The process leading from creativity to innovation has the potential to be highly path dependent as events that occur in the early stages of creativity can have ripple effects that might impede the subsequent development, implementation and commercialization of an idea. For example, the bias against creativity might have negative downstream consequences. Innovations represent only a narrow slice of the ideas that were initially available for selection. If evaluators systematically avoid creative ideas, then only a sub-optimal set of ideas will survive to be developed into inventions and innovations. The end result might be the commercialization of mundane products that will not necessarily be appealing to customers. In other words, the bias against creativity can also curtail innovation and lead to the generation of innovations that fail to address market demands. Occasionally, there are errors in the selection process and a highly creative idea might survive the biases that are aligned against it. However, resentful evaluators, thwarted in the creativity stage, might attempt to sabotage the idea at the stage of invention, thus raising the costs of testing and prototyping the idea and possibly causing the firm to incorrectly reject the prototype as a failure.

Path dependence might also have negative consequences if highly creative people, who might tend to be narcissistic and egotistical, successfully convince evaluators to pursue their ideas even if their ideas are not actually very good. The brashness and unapologetic self-confidence that creative people have in their own ideas can make their pitches highly persuasive, even at the expense of passing over objectively better ideas that are pitched by individuals with less charisma. Pushing bad ideas through the review process might eventually turn out to be costly and distract attention from more promising ideas or from existing products.

Finally, because creative people are often filtered out, it is possible that decision makers with the most authority to green light new ideas might be the least capable of recognizing a creative idea when they see one. On the one hand, non-creative leaders might produce innovations at a higher cost, because they are too careful and do not look for non-standard solutions, but on the other hand, they might produce innovation at a lower cost, because they avoid risk. Future research should investigate the downstream consequences of creative leadership for innovation to ascertain whether the propensity of creative leaders to take risk will lead to profit or simply raise the costs incurred at the innovation stage. In sum, the consequences of creativity, invention and innovation are interconnected, as decisions and mistakes made in the earliest stages of creativity can reverberate through the entire process and eventually raise the cost of developing innovations.

Downstream costs of creative disinhibition for innovation

In evaluating the costs of innovation, one must consider the costs that are incurred before an idea even reaches the stage of invention. Engaging employees in the creative process can disinhibit a host of anti-social behaviors that can indirectly harm the organization and raise the cost of innovation. Dishonesty, theft, overindulgence and raucous conflict all amplify both the direct costs (e.g., stolen resources) and indirect costs (delays with completing implementation) of the development of innovation, and as a result, significantly reduce potential benefits from innovations shipped to the market.

The costly side effects of creative disinhibition also raise the incentive for organizations to steal ideas from each other and, as a result, substantially decrease appropriability from innovation. From a human resource perspective, it is far less costly to implement creative ideas invented elsewhere, given the baggage that comes along with recruiting, selecting and retaining creative people. Darker still is the possibility that creative disinhibition might lead employees to produce innovations with a high risk of harming consumers and other audiences. Indeed, the cognitive flexibility that is required to produce creative solutions can also lead to moral flexibility, making creative people particularly adept at justifying immoral new ideas.

The consequences of creative disinhibition are not inevitably negative, however. The innovation process can be stressful to the point of making employees more reliant on prescription medication, but, ironically, creative people might be more resilient to the disruptive nature of innovation given their tolerance of ambiguity and openness to new experience. Many other aspects of engaging in the creative process can reduce stress, for example, being creative can trigger positive emotions, help people relieve psychological burdens, and build social bonds. All of these side effects of being creative can help people cope with subsequent stressors resulting from innovation.

Comparing creativity and innovation: parallel effects at multiple levels of analysis

Our review uncovered some parallel effects of creativity and innovation that might occur at different levels of analysis. For example, both creativity and innovation can ramp up competition as rising levels of each raise the standards from which subsequent ideas and innovations are judged. Such inflation of standards will raise the cost of staying on the frontier of both creativity and innovation.

We also noted that both creativity and innovation can potentially harm key audiences. Both creativity and innovation can cause employees to feel stress as they deal with disrupted routines, rising conflict, and resistance to change. Both creativity and innovation can upend the status quo, leaving people to manage high levels of uncertainty. Both creativity and innovation can give rise to dangerous ideas and dangerous products that might bring harm to consumers.

Creativity and innovation are also difficult to maintain over time, because they are subject to traps of past success. Past success can stifle creative thought and diminish innovation by prompting people and organizations to focus on exploiting what they know at the exclusion of exploring in new directions. In other words, both creativity and innovation can precede long periods of stagnation.

Feedback loops: from innovation to creativity

Traps of past success may give rise to feedback loops, as innovation can impact the creative process in several, potentially contradictory ways. Innovation that achieves significant commercial success might, as we mentioned above, reduce creativity as the firm switches from an exploration to exploitation mode of innovating. But, if innovation turns out to be a commercial failure, two scenarios are possible. If the firm has enough resources, management may start encouraging creativity more than it did in the past, hoping to eventually develop a commercially successful innovation. If the firm's resources were severely depleted by a failed attempt at innovation, management may discourage creativity, as decision-makers will need to focus on the challenge of renewing available resources as the firm struggles for survival. Future research could establish which scenario is more likely and under what conditions.

Conclusion

In this paper, we demonstrated why, when evaluating benefits of either creativity or innovation, it is important to look not just at their total benefits, but at *net* benefits after taking into consideration all possible costs. It is eminently practical to fully consider all of the potential costs that might be incurred before deciding to pursue creativity and innovation in organizations. A more

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complete understanding of the costs involved might allow organizations to anticipate and diffuse the inevitable byproducts of creativity at work and the implementation of innovation.

We see many opportunities for advancing theory in management and related disciplines based on the idea of creativity and innovation being important and useful independent variables. Indeed, our review has barely scratched the surface of the many new questions that remain to be asked along the lines that we have outlined here. Thus, we propose the alternative conceptualization of creativity and innovation as independent variables as a new area of inquiry that holds considerable promise.

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