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The Influence of Hierarchy on Idea Generation and Selection in the Innovation Process

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Abstract. The link between organizational structure and innovation has been a longstanding interest of organizational scholars, yet the exact nature of the relationship has not been clearly established. Drawing on the behavioral theory of the firm, we take a process view and examine how hierarchy of authority—a fundamental element of organizational structure reflecting degree of managerial oversight—differentially influences behavior and performance in the idea generation versus idea selection phases of the innovation process. Using a multimethod approach that includes a field study and a lab experiment, we find that hierarchy of authority is detrimental to the idea generation phase of innovation, but that hierarchy can be beneficial during the screening or selection phase of innovation. We also identify a behavioral mechanism underlying the effect of hierarchy of authority on selection performance and propose that selection is a critical organizational capability that can be strategically developed and managed through organizational design. Our investigation helps clarify the theoretical relationship between structure and innovation performance and demonstrates the behavioral and economic consequences of organizational design choice.

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Keywords: hierarchy of authority • innovation/idea generation/selection • organizational design/structure • advice/input utilization • behavioral theory of the firm • multimethod

1. Introduction

The link between organizational structure and innovation has been a longstanding theoretical interest of researchers across a variety of fields, yet the exact nature of the relationship has not been clearly established. For instance, contrary to the widely held belief by many scholars and practitioners that hierarchical organizational structures dampen innovation, high degrees of centralization and formalization have not necessarily been found to be detrimental to innovation (for a review, see Damanpour and Aravind 2012). As a result, to better understand the complex relationship between organizational structure and innovation, scholars have recommended taking a more granular view of the underlying innovation process, rather than looking solely at innovation outcomes (e.g., Garud et al. 2013, Sheremata 2000).

Indeed, innovation research has long recognized the multiphased nature of the innovation process, which is broadly presumed to start with idea generation or search, followed by evaluation of those ideas, and ending with idea selection and implementation (e.g., Amabile 1996, Duncan 1976, Mumford and Simonton 1997, Rogers 1962, Shalley et al. 2004, Zaltman et al. 1973). Yet there exists little research that directly ties performance in these different phases of the overall innovation process to organizational structure. This is in part due to the difficulty of observing real agents at different steps of the innovation process in the field, since ideas that are generated but not selected are often invisible to researchers as well as the larger part of the organization itself. In response, recent work in the tradition of the behavioral theory of the firm (Cyert and March 1963) has employed computational methods to examine how particular facets of organizational structure can affect performance at the idea generation and selection phases of the innovation process (e.g., Csaszar 2013, Knudsen and Levinthal 2007). This line of inquiry provides important process-level insights into how the organizational structure can create trade-offs across different phases of the innovation process. However, the mechanisms through which organizational structure can affect agent behavior have received remarkably limited attention (Gavetti 2005, Gavetti et al. 2012). Understanding how organizational structure affects individual agent behavior and innovation performance is particularly crucial if we are to clarify the complex relationship between organizational structure and innovation and reconcile inconsistent past findings, as noted by scholars across multiple literatures (e.g., Adler and Borys 1996, Cardinal 2001,

Gavetti et al. 2007, Jansen et al. 2006, Knudsen and Levinthal 2007, Reitzig and Maciejovsky 2015).

Building on the behavioral theory of the firm and integrating insights from organizational behavior research on creativity (e.g., Amabile 1996, Shalley et al. 2004) and advice taking (e.g., See et al. 2011, Yaniv and Kleinberger 2000), we examine how hierarchy of authority—a fundamental element of organizational structure (Cardinal 2001, Hage and Aiken 1969, Jansen et al. 2006, Schminke et al. 2000)—differentially affects agent performance in the idea generation versus selection phases of the innovation process. In addition, we identify a critical behavioral mechanism underlying selection performance. Our main argument is that while hierarchy of authority is detrimental during the idea generation phase of the innovation process, hierarchy can be beneficial during the idea selection phase by reducing a bias toward promoting the selection of one's own ideas. To examine these relationships, we take a multimethod approach that combines an experiment that directly observes idea generation and selection behavior with a field study of products in the fashion industry that vary in terms of the relative importance of generation versus selection.

Our investigation addresses a theoretical gap at the intersection of the behavioral theory of the firm (Cyert and March 1963, Gavetti et al. 2007) and other process-level perspectives on innovation (e.g., Amabile 1996, Duncan 1976, Mumford and Simonton 1997, Rogers 1962, Shalley et al. 2004, Zaltman et al. 1973). In particular, we highlight that idea selection is a critical and distinct component of the innovation process that has not been sufficiently studied on its own right, and we identify the promotion/selection of one's own ideas as a key behavioral mechanism that drives the effect of hierarchy of authority on selection performance. Such findings complement and extend the existing body of formal and computational research in the tradition of the behavioral theory of the firm (e.g., Csaszar 2013, Knudsen and Levinthal 2007) by suggesting that organizational design affects the behavior of individual agents in the innovation process with performance implications at both individual and organizational levels. Our work also speaks to the growing theoretical interest in the microfoundations of capabilities (Felin et al. 2012, Gavetti 2005) by exploring how organizational structure alters the psychological and behavioral patterns of individual agents within the organization, thereby encouraging or suppressing the organization's ability to generate and select innovative ideas. Finally, we raise theoretical and practical concerns about the increasing popularity of less hierarchical organizational structures by highlighting their potential downside during the selection phase of the innovation process.

2. Theoretical Background

There are two related but largely independent approaches to studying the linkage between organizational structure and innovation. They differ substantively in their measurement of particular elements of organizational structure, operationalization of innovation, analytical focus, and methodology employed. The first stream of research uses survey and archival data to study innovation as concrete outcome, such as a patent, the introduction of new products, or other discrete events, and represents the majority of research on organizational structure and innovation to date. We briefly review a few key studies in this literature in Section 2.1, as it helps set the stage for our focus on agent behavior in the underlying innovation process. Then, in Section 2.2, we more fully review a second stream of research, which studies innovation as a multistage process, often by employing experiments or computational simulation. In Section 3 we build upon these latter streams of process-level research to theorize on how one fundamental element of organizational structure, hierarchy of authority, might influence agent behaviors and, in turn, differentially affect performance at the idea generation versus idea selection phases of the innovation process. We focus on hierarchy of authority, which reflects the degree to which managerial oversight is required to go about one's job, because it represents one of the defining features of centralization in the organizational structure (e.g., Hage and Aiken 1969, March and Simon 1958). Our focus on the idea generation and selection phases of the innovation process follows from prior process-level perspectives of innovation that have emphasized the critical role of these two phases in how organizations approach decision making (e.g., Amabile 1996, Cyert and March 1963).

2.1. Organizational Structure and Innovation as an Outcome

Organizational structure generally refers to the arrangement of lines of authority (reporting relationships) and roles in an organization. A widely accepted premise of Burns and Stalker (1961) is that organic organizational structures, characterized by decentralized decision making and fluid roles with a wider span of control, are more conducive to innovation than more hierarchical, mechanistic organizational structures. However, subsequent empirical research on innovation has failed to reach an agreement on how one of the most basic elements of structure, hierarchy of authority, influences innovation performance (Davis et al. 2009). In response, recent studies have attempted to reconcile the inconsistent findings by examining an increasingly sophisticated set of moderators, such as differentiating product and process innovation and considering the radicalness of the innovation outcome

or the relatedness of requisite innovation inputs to existing resources. Yet even these nuanced efforts continue to yield equivocal findings on the relationship between structure and innovation (for a review, see Damanpour and Aravind 2012).

Notably, two relatively recent influential studies arrive at opposite conclusions on how formalization and centralization affect innovation performance. In a study of 57 pharmaceutical companies, Cardinal (2001) finds that both formalization and centralization increase the number of radical innovations (i.e., new drug introductions), but that for incremental innovations (i.e., enhancement of existing drugs), only centralization has a positive effect, whereas formalization has a slightly negative effect. In stark contrast, Jansen et al. (2006) study the financial performance of new product offerings in the banking industry and find that formalization and centralization have negative effects on radical innovations (i.e., mobile banking), but that for incremental innovations (i.e., automated teller machines), only centralization has a negative effect, whereas formalization has a positive effect.

In discussing the counterintuitive aspects of their findings, both Cardinal (2001) and Jansen et al. (2006) suggest that future research should examine whether managers perceive elements of the organizational structure as enabling or coercive (Adler and Borys 1996) within specific industry contexts, bringing attention to the need for a deeper understanding of how organizational structure affects managerial cognition and behavior. Indeed, by focusing on the effect of organizational structure on the success of high-level organizational outcomes associated with the innovation (e.g., the frequency of new product introductions or their financial performance), it is difficult to identify potential trade-offs or tensions across different phases of the innovation process that may underlie the mixed empirical findings discussed above.

2.2. Organizational Structure and Innovation as a Process

Instead of viewing innovation as a patent, product offering, or other discrete event, there are streams of innovation research that examine how innovation progresses and evolves through different stages. This process-based approach to studying innovation is reflected in various literatures that have in some way acknowledged or directly examined the multiphased nature of innovation, such as research on organization-level innovation processes (e.g., Duncan 1976, Rogers 1962, Zaltman et al. 1973), individual and group creativity research (e.g., Amabile 1996, Mumford and Simonton 1997, Shalley et al. 2004), and recent computational studies in the tradition of the behavioral theory of the firm (e.g., Csaszar 2013, Knudsen and Levinthal 2007). We discuss of each of these three literatures in turn.

First, within the stream of research examining organization-level innovation processes, there is no consensus on the number or order of phases that constitute the innovation/creativity process (e.g., Mumford and Simonton 1997, Rogers 1962), but many researchers have viewed idea generation or brainstorming as the first stage in the overall innovation process, with innovation culminating in "the successful implementation of creative ideas within an organization" (Amabile et al. 1996, p. 1155). Some early work in this area proposed that more highly centralized organizational structures impede the initiation stage of innovation but enhance the implementation stage of innovation (Duncan 1976, Rogers 1962), which hints at the potential for organizational structure to have conflicting effects at different phases of the innovation process. However, this line of research focuses on providing segmentations of the overall innovation process based on descriptive case studies (Wolfe 1994). Also, these studies do not distinguish between the idea generation and selection stages that are at the center of our investigation.

In contrast to the research just described, some recent studies in the small groups and creativity literature explicitly distinguish between the idea generation and selection phases of the overall creativity process and test some determinants of creativity in the workplace across the two phases (e.g., Girotra et al. 2010, Perry-Smith and Coff 2011, Rietzschel et al. 2006, Yuan and Zhou 2008). For example, Girotra et al. (2010) compare the idea generation and selection performance of individuals engaged in group brainstorming versus those in a hybrid condition in which they start out by working independently before joining a group. They find that the hybrid group excelled at both generating more ideas and selecting higher quality ideas, although both conditions did poorly in absolute terms when selecting the best ideas. Other prior studies of group creativity suggest that the requirements for effective idea generation versus idea selection may differ. Yuan and Zhou (2008) find that expectation of external evaluation reduces the number of ideas generated but improves the degree to which participants improve their initial ideas for the final solution. Perry-Smith and Coff (2011) examine collective group mood and find that an activated pleasant mood facilitates the generation of a viable business plan, but that effective selection among potential plans requires an unactivated pleasant mood. The above investigations employ lab experiments to unpack idea generation and selection performance in the overall creativity process and rely on independent raters to measure the quality of selected ideas. While providing insights into psychological channels that may differentially affect idea generation and selection performance, prior individual and group creativity research has not yet considered

hierarchy of authority or any other elements of formal organizational structure as an independent variable (for a review of empirical studies on hierarchy and group performance outcomes, see Greer et al. 2016).

Finally, at the organizational level, recent work grounded in the behavioral theory of the firm (Cyert and March 1963) examines how varying degrees of organizational hierarchy affect performance at underlying phases or tasks in the innovation process. Much research in this tradition decomposes innovation and broader organizational decision-making processes into three distinct stages: the generation of alternatives followed by their evaluation and selection (e.g., Knudsen and Levinthal 2007). It is often impossible to directly observe or identify options that were generated but not selected in an actual organizational setting and attribute (low) performance to the generation, evaluation, or selection phase (see Csaszar 2012). Thus, investigations in this tradition primarily employ computational modeling to explore how agent characteristics (e.g., varying degrees of bounded rationality), organizational structure, and solution space (environment) interact and determine performance at one or more of these stages. Organizations are often portrayed as climbing a rugged (NK) landscape with multiple peaks, whereby a faster climb of a higher peak represents better organizational performance (Kauffman 1993). At each step of the climb, individual agents that comprise the organization must search for alternatives (generation). Most of the initial investigations in this stream of research have focused on the generation or search process and assumed agents to accurately assess and select the best alternative among generated options (e.g., Rivkin and Siggelkow 2003).

Other more recent computational investigations, on the other hand, go beyond the idea generation stage to explore how different organizational structures aggregate the noisy evaluations of individual agents and thereby arrive at a selection (Csaszar 2013, Christensen and Knudsen 2010, Knudsen and Levinthal 2007). For instance, Knudsen and Levinthal (2007) show that when individual agents have noisy assessments of alternatives, a more decentralized organizational structure that requires fewer layers of approval has the advantage of forcing the exploration of a wider set of alternatives but at the cost of decreasing an organization's ability to reliably select an attractive alternative. Csaszar (2013) demonstrates that the choice of organizational structure critically influences the organizational propensity for committing commission and omission errors during the selection phase, and Csaszar (2012) offers rare empirical evidence of this account using unique features of the mutual fund industry.[1] Overall, studies drawing on the behavioral theory of the firm suggest the importance of taking a more detailed process-based approach to examining the complex relationships between organizational structure and innovation, and suggest that structure might create trade-offs in idea generation and selection performance.

While serving as the basis of current investigation, the varied literature reviewed above leaves unaddressed the critical issue of how elements of organizational structure, such as hierarchy of authority, might affect conflicts of interest and agent behaviors at different stages of the innovation process and ultimately affect innovation performance (Gavetti et al. 2007). We address this gap in the literature in the following section, thus responding to earlier calls for a better understanding of how managers perceive and respond to the organizational structures in which they are embedded as a means of clarifying the theoretical relationship between structure and innovation performance and reconciling inconsistent past findings (Adler and Borys 1996, Cardinal 2001, Jansen et al. 2006).

3. Hypotheses

Hierarchy of authority reflects the degree of managerial oversight (i.e., supervisor presence and approval) necessary to go about one's job (Cardinal 2001, Hage and Aiken 1969, Jansen et al. 2006) and is closely related to vertical authority (layers of sequential authority or formal rank; see, e.g., Reitzig and Maciejovsky 2015, Seshadri and Shapira 2003, Seshadri et al. 2015). In field research, it is typically measured using surveys, and in studies at the group level, it is often manipulated in the context of an experiment (Greer et al. 2016). An extensive number of studies have examined how hierarchy affects behavior and performance of individuals and groups, yet the results remain inconclusive (Greer et al. 2016). For example, the meta-analysis by Greer et al. (2016) of 83 studies at the group level reveals a slightly negative overall effect of hierarchy on group effectiveness. The authors conclude that because hierarchy provides functional benefits while also increasing intragroup conflict, the overall effect on group performance is highly contingent on the task or context. Along these lines, Halevy et al. (2012) find that the presumed functional benefits of hierarchy, such as improved coordination and control, are more pronounced in team sports like basketball, but that hierarchy decreases performance in more independent sports like baseball. These group-level findings are consistent with extant contingency perspectives at the organizational level of analysis, which suggest that hierarchy of authority is effective for routine tasks that require coordination, whereas a lack of hierarchy is better for complex, novel, or dynamic tasks (Anderson and Brown 2010, Burns and Stalker 1961). We extend this contingency reasoning to our process-based view of innovation to make predictions about the conflicting impact of hierarchy

of authority across the idea generation and election phases of the innovation process.

3.1. Hierarchy of Authority and Idea Generation

The idea generation stage at the beginning of the innovation process often involves a complex problem that cannot be solved with extant organizational devices (e.g., routines, standard operating procedures, or technology), and thus requires the generation of novel alternatives. One of the basic premises of organizing is that hierarchy can help coordination across multiple agents and expand information-processing capacity (Chandler 1962, Marschak and Radner 1972, March and Simon 1958) that can be put toward tasks such as searching for information and generating ideas. At the same time, the hierarchy of authority inherent in most vertical structures is thought to reduce cognitive adaptability and constrain the direction and breadth of the search for solutions (Cardinal 2001, Jansen et al. 2006).

In considering how hierarchy of authority might affect performance in the idea generation stage, varied literatures at both the group and organizational levels of analysis have suggested that greater hierarchy might elicit multiple psychological reactions from employees that heighten self-censoring or internal filtering. In particular, the presence of individuals of different rank from oneself (i.e., supervisors and subordinates) in a vertical hierarchy can create expectations and apprehension of external evaluation that decrease the number of ideas generated (Yuan and Zhou 2008) or shared (Reitzig and Maciejovsky 2015). Relatedly, monitoring and scrutiny associated with more centralized and hierarchical structures are purported to lead employees to make safer choices and avoid mistakes (Burgelman and Sayles 1986). Still, other authors have proposed that because individuals have a diminished sense of control over the final decision in more centralized organizations (where there is greater hierarchy of authority), they are less motivated to voice suggestions or seek out new approaches in such contexts (Jansen et al. 2006, Morrison and Milliken 2000, Reitzig and Maciejovsky 2015). In contrast, from the perspective of those in a more "flat" structure with relatively little or no hierarchy of authority (i.e., peers), the absence of a formal hierarchy of authority can lead to competition in which participants try to increase their status by outperforming each other (Gruenfeld and Tiedens 2010, Loch et al. 2000, Magee and Galinsky 2008). For example, Sutton and Hargadon (1996) document a brainstorming session at IDEO where each team member engages in status jockeying. In this organization famous for creativity and lack of organizational hierarchy, each member competes to earn colleagues' respect by attempting to contribute many unique ideas.

Based on the various psychological reactions discussed above, we hypothesize that hierarchy of authority is detrimental to idea generation in the innovation process. Specifically, we argue that greater hierarchy of authority reduces the generation or expression of ideas that might be deemed too risky or may not conform to the preferences of one's supervisor or other higher-ups. Generation of a creative idea, defined as a combination of originality (or novelty) and feasibility (Amabile 1996, Diehl and Stroebe 1987), involves trial and error as well as experimentation. The presence of individuals of a higher rank who are in a position to evaluate and monitor others can reduce risk taking and sense of control for lower level employees and thus create bias toward generating fewer ideas, duplicate ideas (agreement with the supervisor), or perhaps more feasible ideas at the cost of originality. Such effects are problematic, as one of the main tenets of successful idea generation is to avoid self-censoring (Diehl and Stroebe 1987). Thus, greater hierarchy of authority might reduce the number and originality of ideas generated. In the case of an organizational structure with less hierarchy of authority, however, proposing cautious or redundant ideas and simply agreeing with others contributes very little to one's success. As a consequence, members working in such a context are more motivated to express a greater number of novel or even radical ideas to demonstrate their unique contribution and gain status. Taken together, we predict the following:

Hypothesis 1. *Less hierarchy of authority in the organization structure will be associated with better performance on idea generation tasks in the innovation process.*

3.2. Hierarchy of Authority and Idea Selection

Successful innovation starts with creative idea generation, as noted above. However, prior empirical findings on creativity and innovation indicate that the availability of better ideas does not necessarily lead to better selected outcomes for the organization. For instance, Rietzschel et al. (2006) found that while individual brainstorming outperformed group brainstorming both in terms of the number of ideas generated and their originality score, there was no difference in the quality of selected ideas between the two methods. Girotra et al. (2010) similarly found that people generating ideas using individual, group, and hybrid forms of brainstorming all generally show poor abilities in absolute terms when selecting the best quality idea available to them. These studies indicate that selection of high-quality ideas is a challenging task. However, to our knowledge, no studies on the selection performance of individuals or groups have examined the effects of hierarchy of authority or other formal elements of organizational structure.

In empirical innovation research at the firm level, the focus has been predominantly on the generation of strategic alternatives or resources, overlooking how the inefficiencies in the subsequent selection phase of the innovation process might vary across different

group or organizational structures, as noted by several authors (Csaszar 2013, Eggers and Kaplan 2013, Reitzig and Sorenson 2013). The few prior studies with an explicit focus on selection of alternatives have either been computational or have not empirically examined behavioral mechanisms underlying the effects of organization structure on selection performance (e.g., Csaszar 2012, 2013; Knudsen and Levinthal 2007). In addition, the operationalization of organizational structure in computational work differs quite substantially from our focus on hierarchy of authority (Csaszar 2013, Knudsen and Levinthal 2007), as noted earlier (Endnote 1). Notably, Csaszar (2013) examined how evaluations of individual agents are aggregated upward via different organizational structures and result in a selection decision at the organizational level, whereas our focus is on how the choice of organizational structure may motivate individual agents' use of better filtering criteria and influence selection performance. While drawing on similar themes as Csaszar (2012, 2013), we offer a complementary and novel argument that less hierarchy of authority in an organizational structure can introduce behavioral biases in the selection phase of the innovation process, specifically a bias toward promoting the selection of one's own ideas.

We proposed in the previous section that individuals will be more likely to engage in internal filtering when there is greater hierarchy of authority because of potential concerns about evaluation and monitoring, reduced sense of control, and competition for status. While such self-censoring is detrimental to the idea generation phase of the innovation process, it has the benefit of leading people to be more cautious or careful when selecting among, and advocating for, particular alternatives. Behavioral decision making research on advice taking has found that there is a robust tendency for people to egocentrically favor their own initial ideas and undervalue the advice or ideas of others, often leading to impaired decision quality (e.g., Harvey and Fischer 1997, See et al. 2011, Soll and Larrick 2009, Yaniv and Kleinberger 2000). Similarly, Reitzig and Sorenson (2013) found that there is a tendency for organizational subunits to undervalue ideas coming from other subunits. In a structure with less hierarchy of authority, where concerns about evaluation or lack of control are less salient, this cognitive bias toward favoring ones' own ideas is likely to go unchecked, ultimately decreasing the objectivity and efficiency of selection. In such a context, there can also be motivational reasons for promoting the selection of one's own ideas, since making a case for one's own ideas is critical to increasing status within the organization and can impact career success (Sutton and Hargadon 1996). The presence of those in position of authority, on the other hand, might heighten internal filtering in a way that encourages a fuller and more careful consideration of ideas beyond one's own that reduces self-promotion, ultimately leading to better selection performance. Along these conceptual lines, Aghion and Tirole (1997) propose a theoretical model whereby monitoring by supervisors reduces opportunistic behavior in project selection. Thus, we predict the following:

Hypothesis 2. *Greater hierarchy of authority in the organization structure will be associated with better performance on idea selection tasks in the innovation process.*

Next we present two studies to test our hypotheses. We first present the results of an experiment in which hierarchy of authority was manipulated and participants engaged in both idea generation and selection tasks. Experimental methods have been underutilized in research on the behavioral theory of the firm (Gavetti et al. 2012), yet they are particularly advantageous for our research question because they allow direct observation of how elements of organizational structure affect agent behaviors during the generation and selection of ideas. In addition, the experiment allows us to test our proposed behavioral mechanism that underpins the hypothesized relationships between hierarchy of authority and idea selection, namely, the tendency to promote/select one's own ideas, while controlling for participants' own subjective evaluation as well as outsiders' objective ratings of the quality of generated ideas. We then focus the majority of our empirical analysis on testing our proposed relationships in a field data set from a large, multinational fashion retailer, demonstrating the external validity and economic performance implications of examining the differential effects of hierarchy of authority on idea generation and selection within the apparel launch process.

4. Study 1: Experiment

4.1. Sample and Design

We adapted a standard experimental procedure used in past brainstorming research that includes an idea generation and idea selection task (e.g., Rietzschel et al. 2006) and added a manipulation of our focal element of organizational structure: hierarchy of authority. The entire study was completed online. Participants were 101 adults aged 25 and up who were recruited from a national panel to be in an online study that took an average of 10 to 30 minutes to complete. Participants were 33.7% male and had an average of 22.9 years of working experience. The study used a between-participants design where participants were randomly assigned to one of two structure conditions: hierarchy of authority ($N = 47$) or no hierarchy of authority ($N = 54$). Participants were paid $1.50 to complete the study.

4.2. Procedure

4.2.1. Structure Manipulation: Hierarchy of Authority.

Upon starting the study, participants randomly assigned to the hierarchy of authority condition were

informed that they were a junior manager working with one vice president, two senior managers, two other junior managers, and two entry-level analysts. A vertical organizational chart was displayed pointing to their position within the organization, and participants were told that the vice president (at the top of the chart) would monitor progress and assess performance based on quantity and quality of output after completion of all tasks. Participants in the no hierarchy of authority condition were informed that they were a junior manager working with other junior managers. An organizational chart comprised of peers at the same level was displayed indicating their position in the chart, and participants were told that output would be sent to the team for evaluation based on output quantity and quality. The appendix displays the organizational charts. All participants then completed two distinct tasks: idea generation and idea selection.

4.2.2. Task 1: Idea Generation. Participants were asked to generate ideas on ways to protect the environment. They were also asked to keep track of time but were free to spend as little or much time as they wanted. Ideas were typed onto a screen in which the timing of each entry was recorded but not visible to the participant, allowing for the total amount of time spent on the task to be captured for use as a covariate. Four sample ideas were provided as illustrative thought starters. Three common brainstorming rules were also provided to all participants (Rietzschel et al. 2006): (1) generate as many ideas as possible, (2) freewheeling is encouraged, and (3) refrain from self-criticism and evaluation.

4.2.3. Task 2: Idea Selection. Participants were then asked to select the best five ideas from the randomized list of his or her own ideas as well as 20 ideas displayed on the screen that ostensibly came from their coworkers. Following past creativity research (e.g., Nijstad and De Dreu 2002), participants were encouraged to consider the potential impact of an idea based on two components: originality and feasibility. The 20 coworker ideas were generated by pretesting a larger set of ideas to provide sufficient variation in feasibility and originality, but with average scores similar to the mean of the pretest group scores. As an incentive for quality and effort when selecting ideas, participants were told that the best ideas would be considered for implementation. We did not include any other incentives for performance, since prior work has noted that while extrinsic incentives often have little to no effect on performance in experiments (Camerer and Hogarth 1999), they can interfere with creative behaviors, specifically (e.g., Amabile 1996, Girotra et al. 2010).

After finishing the generation and selection of ideas, participants were asked to fill out an online questionnaire that included a manipulation check and questions on satisfaction and difficulty experienced with the tasks. Participants were also asked to evaluate the entire list of his or her own ideas as well as the 20 team ideas in terms of originality and feasibility on a five-point scale (1 = not original, 5 = highly original; 1 = not feasible, 5 = highly feasible).

4.3. Measures

4.3.1. Dependent Variables. For the idea generation measure (Task 1), the total number of ideas (defined as the number of nonredundant ideas; e.g., Goncalo and Duguid 2012) was counted for each participant. For the selection measure (Task 2), the five final selected ideas were coded for their respective rank ordering and source (own idea versus "coworker" idea). We also collected two measures capturing the quality of selected ideas. First, we collected the participants' own evaluations of each selected idea ($Score_{own}$) in terms of originality and feasibility on a five-point scale. Second, two independent raters blind to condition also evaluated the selected ideas on originality and feasibility ($Score_{interrater}$). Interrater agreement was acceptable following the criteria of Cicchetti and Sparrow (1981), with intraclass correlations 0.78 for originality and 0.69 for feasibility.

4.4. Analysis and Results

4.4.1. Manipulation Check. Participants were asked to rate their degree of agreement with the statement, "Your team was hierarchical" on a five-point scale (1 = disagree strongly, 5 = agree strongly). Participants in the hierarchy of authority condition indicated greater agreement with this statement (mean = 3.36, SD = 1.15) compared to participants in the no hierarchy of authority condition (mean = 2.53, SD = 1.06, $t(99) = 3.75$, $p < 0.01$).

4.4.2. Hypothesis Tests. Descriptive statistics are displayed in Table 1. Hypothesis 1 concerned the idea generation task, whereby hierarchy of authority should reduce the number of unique ideas generated. Since the dependent variable for this prediction is a count variable, we use the following negative binomial specification:

$$Number\ of\ ideas_i = \beta_0 + \beta_1 Hierarchy_i + \beta_2 Controls_i + \varepsilon_i, \quad (1)$$

where *Hierarchy* is a dummy variable set equal to 1 for the hierarchy of authority condition and 0 for the no hierarchy of authority condition. The control variables include two measures designed to capture productivity: the average number of words in the ideas they generated and the time each participant spent in the idea generation task (measured in seconds and logged), to better assess the rate of idea generation. As our hypotheses are directional, we use one-tailed tests throughout our analyses. All standard errors are clustered at the individual level.

Because of the substantial variance in the amount of time that participants spent generating ideas, we ran

Table 1. Descriptive Statistics, Study 1 (Experiment)

	Overall	Hierarchy	Flat
1. *Number of observations*	101	47	54
2. *Number of ideas generated*	7.28 [4.20]	6.68 [4.29]	7.80 [4.09]
3. $Originality_{Own}$: Own idea	3.39 [0.94]	3.30 [0.86]	3.47 [1.01]
4. $Feasibility_{Own}$: Own idea	3.94 [0.76]	3.96 [0.71]	3.92 [0.80]
5. $Originality_{Interrater}$: Own idea	2.33 [0.56]	2.27 [0.66]	2.38 [0.46]
6. $Feasibility_{Interrater}$: Own idea	2.88 [0.51]	2.82 [0.59]	2.93 [0.41]
7. $Originality_{Own}$: Team idea	2.60 [0.93]	3.23 [0.70]	3.19 [0.75]
8. $Feasibility_{Own}$: Team idea	3.33 [0.92]	3.38 [0.71]	3.35 [0.64]
9. $Time_{Idea\ generation}$	580.9 [348.23]	606.8 [361.67]	558.4 [337.87]
10. $Time_{Idea\ selection}$	133.7 [88.10]	145.8 [98.75]	123.3 [77.08]
11. *Number of words per idea*	8.59 [5.95]	9.19 [7.06]	8.07 [4.78]
12. *Share of external ideas selected*	56.4% [0.27]	62.6% [0.26]	51.1% [0.27]

Notes. Standard errors are in brackets. Originality and feasibility are calculated at the individual level.

the regression both with and without covariates (see Table 2). Accounting solely for time spent generating ideas to capture the rate of productivity, the effect of hierarchy of authority on the number of ideas generated was negative and significant ($\beta = -0.17, p = 0.03$), indicating that participants in the hierarchy of authority condition generated fewer ideas than those in the no hierarchy of authority condition, in support of Hypothesis 1. Controlling for additional sources of variance, such as the number of words, results in a slightly stronger negative effect of hierarchy of authority on idea generation. In terms of quality of generated ideas (as measured by the two outside raters), we found no significant difference between the two conditions.

Hypothesis 2 concerned performance on the idea selection task (i.e., quality of selected ideas). We used linear regression to test our hypothesis that the hierarchy of authority condition would be better at selecting ideas than the no hierarchy of authority condition with the equation below. Since the quality of selection could depend in part on the pool of ideas from which one is starting, we included as a control the average quality of the pool of ideas from which the participant was making the selection. Results are also robust to its exclusion:[2]

$$Score_{interrater} = \beta_0 + \beta_1 Hierarchy_i + \beta_2 Controls_i + \varepsilon_i. \quad (2)$$

While there is no significant effect of hierarchy of authority on the feasibility of selected ideas, the results in columns (1) and (2) of Table 3 indicate that hierarchy of authority has a significant positive effect on the originality of selected ideas, which arguably better relates to judgments of creativity and innovation.

Finally, to investigate the bias toward promoting/selecting one's own ideas as a behavioral mechanism underpinning the effects of hierarchy of authority on selection performance, we used a logistic regression model with the following specification:

$$Selected_{ij} = \beta_0 + \beta_1 Source_{ij} + \beta_2 Hierarchy_i + \beta_3 Source_{ij} \times Hierarchy_i + \beta_4 Score_{ij} + \varepsilon_i, \quad (3)$$

Table 2. Effects of Hierarchy on Number of Ideas Generated and Average Quality, Study 1 (Experiment)

			Quality of ideas			
	Number of ideas		$Originality_{Interrater}$		$Feasibility_{Interrater}$	
	(1)	(2)	(3)	(4)	(5)	(6)
Hierarchy	−0.154^{+}	−0.157*	−0.117	−0.101	−0.107	−0.107
	[0.117]	[0.071]	[0.115]	[0.096]	[0.103]	[0.103]
Time spent (log)		0.123**		0.037		−0.069
		[0.049]		[0.078]		[0.074]
Total number of words		0.006**		0.005**		−0.001
		[0.001]		[0.001]		[0.001]
Constant	2.054**	−0.263	2.383**	0.811*	2.927**	3.547**
N	101	101	101	101	101	101
R^2	−271[a]	−226[a]	0.001	0.289	0.001	0.010

[a]Log likelihood.
$^{+}p < 0.10$; $^{*}p < 0.05$; $^{**}p < 0.01$.

Table 3. Hierarchy and Selection Performance, Study 1 (Experiment)

	Quality of selection				Likelihood of being selected				
	$Originality_{Int}$	$Originality_{Int}$	$Feasibility_{Int}$	$Feasibility_{Int}$	Overall	Overall	Overall	1st choice	1st choice
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Hierarchy	0.116* [0.067]	0.091+ [0.055]	0.014 [0.090]	0.045 [0.073]	−0.174 [0.202]	−0.189 [0.203]	−0.233 [0.194]	−0.482* [0.272]	−0.518* [0.276]
Source					−1.104** [0.211]	−0.912** [0.212]	−0.967** [0.215]	−1.138** [0.321]	−1.251** [0.321]
Hierarchy × *Source*					0.409+ [0.286]	0.422+ [0.282]	0.495* [0.284]	1.012* [0.452]	1.071** [0.454]
$Originality_{Own}$						0.168** [0.045]		0.116+ [0.073]	
$Feasibility_{Own}$						0.332** [0.041]		0.341** [0.087]	
$Originality_{Interrater}$		1.496** [0.237]					−0.503** [0.057]		−0.561** [0.124]
$Feasibility_{Interrater}$				2.068** [0.292]			−0.126* [0.057]		0.005 [0.128]
Time spent $(\log)_{Selection}$		0.070 [0.047]		−0.014 [0.059]		−0.003 [0.080]	−0.118** [0.052]	−0.038 [0.078]	−0.124* [0.053]
Number of words						0.045** [0.014]	0.069** [0.015]	0.044* [0.017]	0.066** [0.018]
Constant	2.251**	−1.887**	3.074**	−3.442**	−0.817**	−3.146**	0.636+	−4.589**	−1.309+
N	101	101	101	101	2,755	2,755	2,755	2,755	2,755
R^2	0.019	0.345	0.000	0.360	−1,263[a]	−1,208[a]	−1,218[a]	−407[a]	−407[a]

[a]Log likelihood.
$^{+}p < 0.10$; $^{*}p < 0.05$; $^{**}p < 0.01$.

where i and j capture individual participant and ideas. The dependent variable *Selected* is binary and set equal to one if an idea is selected. *Score* refers to either the participants' own evaluation or the outside raters' assessment of originality and feasibility. *Source* is an indicator variable set equal to one if an idea is external (i.e., coworker idea rather than participant's own idea). The *Source* and *Source* × *Hierarchy* variables are intended to test for potential differences in the self-promotion bias across the two hierarchy conditions. A negative and significant coefficient for *Source* indicates self-promotion bias, specifically that participants favor selecting their own ideas over others' ideas, and a significant coefficient for *Source* × *Hierarchy* would indicate that the tendency to favor one's own ideas differs by condition. In column (6) of Table 3, we find that the effect of *Source* is negative and significant, indicating a substantial bias toward preferring one's own ideas, even accounting for participants' own evaluations of originality and feasibility as well as evaluations by more objective external raters. However, Table 3 also shows that there is a significant positive interaction of *Source* and *Hierarchy*, and probing the interaction revealed that hierarchy of authority mitigates the bias toward selecting one's ideas by approximately 40%. Specifically, when examining the set of five ideas that participants ultimately selected, the proportion of others' (nonself) ideas selected by participants in the hierarchy of authority condition was 11.5% greater than in the no hierarchy of authority condition, $F(1, 99) = 4.56$, $p = 0.018$. To gain a more specific understanding of the observed self-promotion in the no hierarchy of authority condition, we repeated our analysis with the respective ranking of the five selected ideas as the dependent variable. We find self-promotion to be most pronounced in the selection of the first three ranked ideas, with the strongest bias for the first (top-ranked) idea. The results for the top-ranked selected idea are reported in columns (8) and (9), and *Source* × *Hierarchy* indicates that hierarchy almost completely mitigates the self-promotion bias.

4.5. Discussion

Study 1 allowed for direct observation of how behavior in the idea generation and idea selection phases of the underlying innovation process differs as a function of more or less hierarchy of authority in the organizational structure. As hypothesized, hierarchy of authority is detrimental to idea generation but beneficial to selection performance. The experimental design also provided an opportunity to take a closer look at a key behavioral mechanism underlying the effect of hierarchy of authority on selection performance. In the selection task, we found a significant bias toward selecting one's own ideas, consistent with research in behavioral

decision making on discounting the advice and opinions of others (e.g., Yaniv and Kleinberger 2000), even when controlling for participants' own evaluations of idea quality. However, hierarchy of authority reduces the tendency to select one's own ideas, such that people selected a greater proportion of others' ideas in the hierarchy of authority condition.

5. Study 2: Field Study

5.1. Method and Empirical Setting

Our field setting is a multinational fashion retailer that operates more than 15 brands with presence across multiple continents. The fashion industry is uniquely suited to testing our hypotheses in several aspects. First, it is one of the more creative industries where performance depends critically on generating new, fashionable designs. It differs from other creative industries, such as gaming or software, in terms of both the number of new products introduced and the pace of innovation that results in hundreds of unique designs each season across several product categories. In addition, knowledge and technological barriers, such as patents, play a limited role, helping to isolate the influence of organizational structure on innovation performance. To test our hypotheses, we exploit heterogeneity in hierarchy of authority across brands, as well as two unique institutional features of the fashion industry that help to separate idea generation from selection performance within the innovation process: product fashionability and planning mode.

5.1.1. Product Fashionability. Analogous to product categorization based on price in electronics or consumer packed goods, apparel brands divide their products into three categories based on the degree of "fashionability": basic, new-basic/semitrendy, and trendy. The basic category represents simple, basic designs with small modifications from season to season, such as plain khaki pants or white polo shirts. Most items are repeated from last seasons' basic categories, while roughly 20%–30% of styles are adopted from the new-basic/semitrendy category. The trendy category, on the other hand, represents new, fashionable designs that are aimed at creating excitement and freshness in the brand each season and represents the majority of the designers' creative efforts. The apparel in the trendy category forms the core identity of the designers and the brand, which differentiates them from other designers and brands. In terms of the number of styles and revenue, the basic category usually makes up around ~50% of stock keeping units (SKUs) but represents 60%–70% of revenue and profit because of the higher number of sales per design and lower cost of production based on bulk orders. The trendy category represents ~20% of the total SKUs per season and approximately 15% of revenue and profit. The new-basic/semitrendy category falls between the basic and trendy categories in both product and sales characteristics. While the use of these three categories is nearly universal in the fashion industry, the relative share of items in each category varies across different fashion houses and brands.

We exploit the relative difference in the importance of idea generation versus selection to the basic and trendy categories, respectively, to test our hypotheses. Selection is critical to the sales performance of the basic category, as most of these items are selected from the past season's basic or new-basic categories with minor modifications. Despite full visibility into past seasons' sales data, selection in the basic category is a challenging process that is not solely driven by historical sales performance. Designers make selection decisions among the basic and new-basic/semitrendy items from the past two to three years, choosing only one out of three or four potential designs, even if they have all sold well in the past. Moreover, historical sales performance is a modest predictor of future performance, as fashion trends do evolve even in the basic category, albeit to a much lesser extent compared to the trendy category. There also has to be some degree of consistency with the theme or design characteristics of the trendy category, imbuing the brand with a coherent identity. All of these issues emphasize the relative dominance of selection in the basic category.

In contrast, idea generation is critical to the success of items in the trendy category. Designers try to both predict and shape the trends of future seasons through their designs in the trendy category. Most, if not all, of the items are new designs with limited repeats from previous seasons. Generating new samples requires significant commitment of the designer's time, and the material costs and time required further limit generating multiple potential samples to choose from.[3] Thus, a large majority of new designs generated are also selected. For these reasons, the designers that we surveyed stressed that generation plays a dominant role for the trendy-regular category during interviews, especially relative to the basic-regular category. Finally, for the new-basic/semitrendy category, both selection and idea generation play an important role, and we exclude them from the analysis as the relative emphasis on generation versus selection is not clear for this category.

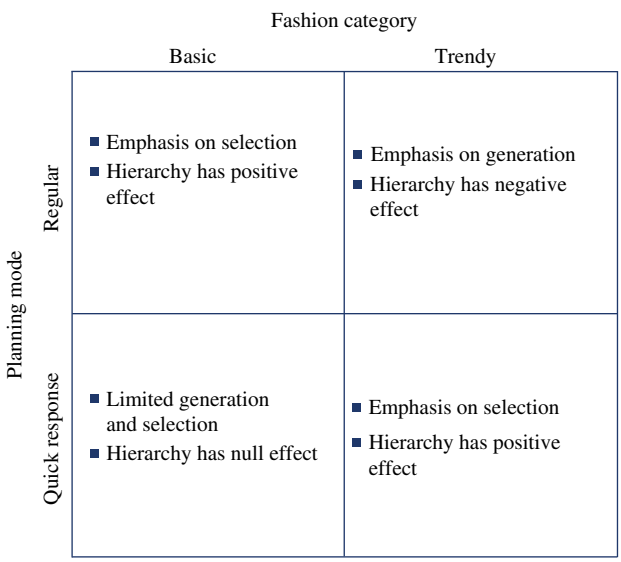
5.1.2. Planning Mode: Regular vs. Quick Response. The second institutional feature exploited in this field setting arises from the long time lag between finalizing the design and the actual sale of the product, resulting in two distinct modes of planning. One of the primary difficulties in developing designs comes from having to predict the fashion trends of the season six to eight months in advance. Because of the time required to secure fabrics and dyes and complete overseas production, designers must finalize designs by the

end of November for a summer season launch in late April. Designs completed in this planning cycle usually comprise approximately 90% of the overall styles and are called "regular." Most brands, however, also reserve some additional production capacity with local suppliers to produce additional styles once the season begins, which is called "quick response" (QR). For the winter season that launches in November and ends in February, QR items are designed by early December and delivered by late December or January to retail sites. While QR planning offers the advantage of being able to observe the season's trends more closely, it suffers from low margins because sourcing sites are constrained to expensive local suppliers. For the trendy category, by allowing designers to observe the popular trends in proximity, QR planning minimizes the importance of idea generation and shifts emphasis to selection among competing trends emerging during the early part of the season. However, for the basic category, QR planning focuses on replenishing low stock items and requires neither meaningful idea generation nor selection.

Taken together, the two institutional features of product fashionability and planning mode provide four predicted patterns associated with Hypotheses 1 and 2, outlined in Figure 1.

For the trendy category, hierarchy of authority is predicted to have a negative effect during the regular planning cycle (when the emphasis is on idea generation), but a positive effect during QR planning (when the emphasis shifts to selection). For the basic category, hierarchy of authority should have a positive impact during the regular planning cycle because of the emphasis on selection, but no clear predicted effect during QR planning.[4]

Figure 1. Institutional Features of the Fashion Industry



5.2. Sample

We were provided with sales data on the fashion retailer's largest 16 in-house brands across three years. Relevant information includes quantity produced, product type, actual sales quantity, and retail price at the level of individual designs (SKU hereafter), providing more than three hundred thousand observations. A few examples of major product types are coats, jackets, shirts, pants, and shorts.[5] While our access to data is limited to the primary market in one geographical location, the market coincides with the location of the headquarters and the planning and design teams. Most of the brands operated by the fashion retailer are not high-fashion brands (e.g., Louis Vuitton, Chanel), but are priced significantly above mass brands (e.g., GAP, Banana Republic) or fast-fashion brands (e.g., Zara, H&M) and are sold at more fashion-oriented department stores. The organization also prides itself on attracting elite designers in the field.

5.3. Survey Design and Procedure

After obtaining the sales data described above, we collected additional information by surveying 13 designers in the organization to assess hierarchy of authority within each brand. The survey was distributed by a point of contact within the organization with a preference for designers with a tenure of more than three years in the organization as well as experience across multiple product types and brands. Although not a purely random sample, the survey sample was selected to be a representative of the retailer's design divisions with respect to the range of tenure and experience of designers in the organization.

5.4. Measures

5.4.1. Dependent Variable. Our dependent variable is sales normalized by sales target, calculated as quantity sold over quantity produced. Quantity produced represents an exogenous sales target set by planning function (merchandisers) prior to the development of designs. It serves as an effective scale to exclude unwanted variation from market-related factors, such as heterogeneity in brand strengths, product type, product price, and market growth. For example, demand for higher priced items can differ from that for lower price items even within a brand, catering to different customer segments. Scaling actual sales quantity by target quantity, which is set considering demand for different price points, brands' historical performance, and even marketing spend, mitigates such concern. While merchandisers may vary in their ability and aggressiveness in setting sales targets, these targets are closely monitored and must be approved by the chief financial officer and the finance function, providing some degree of consistency across brands.

5.4.2. Independent Variable. To explain how we measured hierarchy of authority, we first describe the formal structure of design teams in this organization. Each brand maintains an independent design team with designers specializing in one or two specific product types. Individual designers are responsible for both basic and trendy products, as well as regular and QR planning. There are at least three formal layers of hierarchy that are common to all brands—creative director, chief brand designer, and individual product designers. Interviews with designers indicated that differences in elements of organizational structure, especially hierarchy of authority, arise from interactions between the chief brand designer and product designers as well as between the creative director and chief brand designer. Brands also differ in how product designers are organized, creating additional heterogeneity in the measure of hierarchy.

To assess hierarchy of authority in design teams, we surveyed 13 designers using a subset of validated items from Hage and Aiken (1969) that are commonly used in research on organizational structure (e.g., Cardinal 2001, Jansen et al. 2006, Schminke et al. 2000).[6] Each respondent rated hierarchy of authority within each brand with the option to not answer for brands they were unfamiliar with, providing from 5 to 12 responses for each brand ($M = 6.8$). Overall, interrater agreement is quite high following the criteria of Cicchetti and Sparrow (1981), with an average intraclass correlation, ICC(11), of 0.87, which indicates that their perceptions are widely shared and thus accurately reflect the degree of hierarchy in the organizational structure Two former designer employees were also independently contacted and surveyed to test for potential bias. The scale reliability of 0.93 indicated that it was appropriate to average the items and create one measure, where a higher number indicates a greater degree of hierarchy of authority.

5.5. Analysis and Results

Descriptive statistics are provided in Table 4. We tested our hypotheses using ordinary least squares regression with the following specification:

$$Sales\ performance_{ijt} = \beta_0 + \beta_1 Hierarchy_i + \beta_2 Controls_{ijt} + \varepsilon_i, \quad (4)$$

where i denotes brand, j season and year, and t individual design or SKU. Control variables include markdown rate, retail price, and indicator variables for each product type. As sales performance across different years and seasons are pulled, we also include indicator variables for interaction between each season and year. Results are reported in Table 5. Consistent with our experiment, we use one-tailed tests throughout our analyses with standard errors clustered at the level of each brand.

Columns (1) and (2) report results for the basic and trendy categories within the regular planning mode. As predicted, *Hierarchy* shows an opposite effect across the two product categories. While *Hierarchy* is significant and positively correlated with performance in the basic category that emphasizes idea selection tasks, in support of Hypothesis 2, the association is negative and significant for the trendy category that emphasizes idea generation tasks, in support of Hypothesis 1. Columns (3) and (4) report results for the basic and trendy categories within the quick response planning mode. The coefficient of *Hierarchy* for the trendy

Table 5. Effects of Hierarchy on Sales Performance Across Fashionability and Planning Mode, Study 2 (Field Study)

	Regular		Quick response		Leather accessory
	Basic	Trendy	Basic	Trendy	
	(1)	(2)	(3)	(4)	(5)
Hierarchy	0.031**	−0.009**	−0.009**	0.097**	0.017**
	[0.001]	[0.004]	[0.001]	[0.016]	[0.007]
Discount	−0.387**	−0.348**	−0.185**	−0.109+	0.019
	[0.006]	[0.016]	[0.023]	[0.073]	[0.036]
Price[a]	0.078**	0.234**	0.011**	−0.087**	0.045*
	[0.003]	[0.019]	[0.000]	[0.033]	[0.000]
Quantity[a]	0.050**	0.099*	0.015**	0.067**	0.112**
	[0.001]	[0.003]	[0.006]	[0.022]	[0.011]
Constant	0.748**	0.752**	0.839**	0.093+	0.720**
	[0.005]	[0.018]	[0.030]	[0.073]	[0.031]
R^2	0.207	0.258	0.586	0.649	0.270
N	149,193	21,718	26,022	1,930	2,732

Note. Indicator variables for season × year and product category are included.

[a]The coefficients and standard errors are multiplied by 10^3.

$^+p < 0.10$; $^*p < 0.05$; $^{**}p < 0.01$.

Table 4. Descriptive Statistics and Correlations, Study 2 (Field Study)

Variables	N	Mean	S.D.	1	2	3	4	5	6	7
1. $Hierarchy_{Authority}$	143	3.79	0.88							
2. $Sales\ performance_{Basic}$	175,215	0.75	0.24	0.08						
3. $Sales\ performance_{Trendy}$	23,648	0.65	0.27	−0.14	—					
4. $Sales\ performance_{Regular}$	170,911	0.71	0.25	0.07	—	—				
5. $Sales\ performance_{QR}$	27,952	0.96	0.10	−0.11	—	—	—			
6. *Price*	198,863	343.62	327.65	0.03	0.16	0.09	−0.01	0.31		
7. *Discount*	198,863	0.22	0.17	−0.06	−0.27	−0.06	−0.10	−0.58	−0.02	
8. $Quantity_{Produced}$	198,863	568.79	736.52	−0.04	0.07	0.18	0.22	−0.43	−0.34	−0.07

category in column (4) is positive and significant. In the basic category, the statistically significant coefficient of *Hierarchy* is inconsistent with our null prediction. The size of coefficient, however, is only one-tenth of that of the trendy category. With respect to control variables, *Discount* has a significant and negative effect across all settings. This is expected, as there is a higher chance for low turnover items to be put on discount for a longer period of time.

We next repeated our analysis on the previously excluded leather accessory category and found a positive correlation between hierarchy of authority and sales performance, as reported in column (5). Accessories represent less than 2% of the overall sales, and most, if not all, leather accessories are selected from external producers because of complexities in the manufacturing process. The positive coefficient of *Hierarchy* in column (5) provides additional evidence that hierarchy of authority facilitates efficient selection and helps to address the potential endogeneity concern that each design team has adapted hierarchy based on the strategic importance of the basic and trendy categories.

5.5.1. Supplemental Analysis. To better understand the sources of performance effects, we also examined the effects of hierarchy of authority on the tails of performance distribution for each product category. Internal to the organization, designs selling less than 50% of the produced quantity are generally considered a "miss," whereas designs selling more than 85% are considered a "hit."

Table 6 reports results from the logit specification of Equation (1) with hits and misses as the dependent variables. *Hierarchy* consistently has a positive effect of reducing the likelihood of "miss" designs in columns (2), (4), and (8), with the exception of column (6) for basic/QR, where hierarchy of authority is expected to have a null effect. The effect on the likelihood of a "hit" varies by the task requirement of each category. For the trendy/regular category in column (3) that emphasizes idea generation, *Hierarchy* has a significant and negative effect. In contrast, for basic/regular and trendy/QR categories in columns (1) and (7), hierarchy of authority has small but positive effects, consistent with the importance of selection. In sum, the positive effect of hierarchy of authority on selection appears to be driven primarily by compressing the negative left-tail distribution of performance (misses), whereas the negative effect of hierarchy of authority on generation comes from compressing the positive right-tail distribution (hits).

The results of our supplemental analysis help to articulate the hypothesized behavioral mechanisms. Whereas self-censoring helps to reduce making mistakes in selection, it also reduces risk taking in generation, risk taking that might have led to very popular designs that set fashion trends. The results also help to distinguish our findings from those of prior studies by Csaszar (2012, 2013), where a more decentralized organizational structure increases commission errors but decreases omission errors. While hierarchy of authority indeed consistently reduces commission errors (misses) in our study, we observe an asymmetrical effect on omission error (hits) based on the relative importance of generation versus selection for particular tasks. The asymmetrical effects also help to address the potential concern that selection may also play a dominant role even in the trendy/regular category.

Table 6. Logistic Regression on Likelihood of Hits and Misses, Study 2 (Field Study)

	Regular				Quick response			
	Basic		Trendy		Basic		Trendy	
	Hits (1)	Misses (2)	Hits (3)	Misses (4)	Hits (5)	Misses (6)	Hits (7)	Misses (8)
Hierarchy	0.124**	−0.461**	−0.399**	−0.144**	−0.471**	0.744**	1.826**	−2.075**
	[0.011]	[0.016]	[0.044]	[0.044]	[0.110]	[0.194]	[0.431]	[0.508]
Discount	−3.181**	3.782**	−4.921**	2.631**	−5.550**	12.665**	−9.490**	1.940
	[0.053]	[0.064]	[0.187]	[0.158]	[0.784]	[1.538]	[1.455]	[2.267]
Price[a]	1.042**	−1.051**	3.228**	−1.635**	2.024**	−2.796	−5.898**	2.261*
	[0.034]	[0.044]	[0.221]	[0.210]	[0.354]	[5.470]	[1.046]	[1.049]
Quantity[a]	0.288**	−1.833**	0.814**	−1.842**	−0.049	−0.931**	−0.692*	−4.446**
	[0.009]	[0.035]	[0.046]	[0.103]	[0.108]	[0.285]	[0.351]	[0.625]
Constant	−0.168**	−1.758**	0.316+	−1.399**	1.590**	−9.596**	−6.276**	13.181**
	[0.053]	[0.084]	[0.202]	[0.226]	[0.650]	[1.417]	[1.755]	[2.377]
Log likelihood	−88,338	−56,591	−10,395	−10,663	−1,912	−306	−316	−212
N	148,903	148,691	21,353	21,556	25,927	1,284	724	680

Note. Indicator variables for season × year and product category are included.
[a]The coefficients and standard errors are multiplied by 10^3.
$^+p < 0.10$; $^*p < 0.05$; $^{**}p < 0.01$.

If this were indeed the case, we would expect hierarchy of authority to have negative effects on hits by increasing the propensity to reject potentially successful but risky designs.

5.6. Discussion

Using natural distinctions across four product categories that differ in their relative emphasis on idea generation versus idea selection, the field study provides broad support for our predictions that hierarchy of authority is detrimental to idea generation performance but is beneficial to idea selection performance. Our hypotheses were supported in three different fashionability-planning categories. Our sales data across the four different product categories reflect what customers think about the quality of products, which is similar to the role of external raters in our experiment, but with the added benefit of having real economic consequences. Methodologically, the field study results suggest that the use of more granular field data would be a useful direction for future research examining the effects of organizational structure on performance. Had we not accounted for the difference in the relative importance of generation and selection at the level of individual products, controlling for various output or input characteristics and including a host of fixed effects would still have resulted in equivocal results.

6. General Discussion

The relationship between organizational structure and innovation has been of longstanding interest to organizational scholars, yet the exact nature of the relationship has been elusive. While there has been increasing emphasis on taking a more granular view of the innovation process (Garud et al. 2013, Sheremata 2000), empirical challenges have resulted in little existing research that ties organizational structure to agent performance across different underlying tasks or phases of the innovation process. To overcome this issue, we took a multimethod approach that included an experiment and a field study. We theorized and found that one fundamental element of organizational structure—hierarchy of authority—is detrimental to performance in the idea generation phase, but is beneficial during the selection phase of innovation. We also uncovered that a key reason that hierarchy of beneficial to idea selection is because it reduces the tendency for people to choose their own versus others' ideas.

Our investigation contributes to several streams of literature that have taken a process-oriented approach to studying innovation (e.g., Amabile 1996, Duncan 1976, Mumford and Simonton 1997, Rogers 1962, Shalley et al. 2004, Zaltman et al. 1973) as well as research in the behavioral theory of the firm and broader Carnegie traditions (Cyert and March 1963, March and Simon 1958). Specifically, our findings emphasize the need to disaggregate innovation performance into its constituent phases or tasks, such as idea generation and selection, and to consider the behavioral consequences from choosing a particular organizational structure. Moreover, in identifying the tendency toward promoting/selecting one's own ideas, even after controlling for how one evaluates the quality of the ideas (Study 1), we underscore the need for more research on selection by individual agents that simultaneously controls for agents' evaluations, whereas past process-oriented innovation research has often assumed that evaluation and selection are somewhat interchangeable (e.g., Csaszar 2012, 2013; Girotra et al. 2010; Knudsen and Levinthal 2007; Rietzschel et al. 2006; Perry-Smith and Coff 2011; Yuan and Zhou 2008).

The bias toward selecting one's own ideas that we found in the experiment (Study 1) is also intriguing in light of research on advice taking in the behavioral decision-making literature, which has documented a robust tendency for people to overweight their own initial judgments and underweight the input of others. This tendency is referred to as egocentric discounting of advice and is often detrimental to judgmental accuracy (e.g., Harvey and Fischer 1997, See et al. 2011, Soll and Larrick 2009, Yaniv and Kleinberger 2000). However, we found that hierarchy of authority substantially mitigated this tendency, demonstrating that formal organization-level factors can both enhance and constrain individual behavior. Thus, our investigation should not only be of interest to researchers studying advice taking, but also those interested in creativity and group decision making (e.g., Aime et al. 2014, Amabile 1996, Girotra et al. 2010, Shalley et al. 2004, Tzabbar and Vestal 2015) as well as the performance effects of hierarchy (e.g., Anderson and Brown 2010, Greer et al. 2016, Gruenfeld and Tiedens 2010, Magee and Galinsky 2008).

In addition, our study also highlights the critical role played by organizational structure in the microfoundations of developing dynamic capabilities (e.g., Felin et al. 2012, Gavetti 2005). Our findings indicate that hierarchy of authority negatively influences an organization's ability to generate internal variation that serves as the starting point of organizational learning and innovation (Henderson and Stern 2004, Nelson and Winter 1982). At the same time, hierarchy of authority enhances an organization's capability to select reliably among generated alternatives by reducing the tendency to promote one's own interests. These findings raise important practical implications, and there is some anecdotal evidence that firms intuitively recognize that hierarchy of authority creates such trade-offs in performance and modify the work context accordingly using a flexible hierarchy. In the case of the innovation giant IDEO, the generation of ideas remains completely anonymous without fear of monitoring or scrutiny through the use

of tools like Post-it notes without names to put forth ideas. Yet idea selection takes place through a more hierarchical process with open discussion and voting moderated by a senior consultant that can presumably check a bias toward promoting/selecting one's own ideas. The notion that an increasing degree of hierarchy is required as the innovation process moves toward implementation traces back to Lawrence and Lorsch (1967), yet our findings suggest that a shift to hierarchy should come earlier than previously considered, specifically during the selection phase prior to implementation. In that sense, we recommend caution when attempting to reduce organizational hierarchy as a means of "democratizing" the innovation process (von Hippel 2005), as some firms that rely heavily on selection might not benefit from a less hierarchical design. Rather, when designing or modifying an organizational hierarchy, we suggest that it is important to consider whether a firm depends more heavily on idea generation or selection for its performance, and whether it can leverage external capabilities to compensate for limitations of a given organizational structure in one of the tasks, such as by using crowdsourced idea generation or selection.

We conclude by noting some open questions arising from the present investigation that merit future research. Our investigation characterizes innovation as a linear process that progresses through multiple, distinct phases. The actual innovation process is likely to contain much messier, nonlinear elements that iterate and jump across different phases of the process (Seshadri et al. 2015, Sheremata 2000). We are also unable to tell from our studies whether the effects are driven by the simple presence or absence of hierarchy or whether they are dependent on the depth of hierarchy (e.g., Csaszar 2013, Seshadri et al. 2015). If the positive effects of hierarchy of authority on selection performance can be achieved with the simple presence of one layer of hierarchy while the stifling effects on idea generation require greater depth of hierarchy, it would help justify the movement toward less hierarchical organizations. Moreover, while we limit our focus to the idea generation and selection stages of the innovation process, the effects of hierarchy on the earlier innovation phases of problem or opportunity identification also warrant more systemic empirical research and may be of significant interest to research on entrepreneurship. Such investigation requires the joint consideration of "the triplet of routines, cognition, and hierarchy" (Gavetti 2005, p. 599) and faces significant empirical challenges, but it is critical to developing a more integrative understanding of the link between organizational structure and innovation. We hope that our investigation provides a useful first step in this direction.

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Appendix. Study 1 (Experiment): Hierarchy of Authority Manipulation

Participants in the hierarchy of authority condition were shown the organizational chart in Figure A.1, whereas participants in the no hierarchy of authority condition were shown the organizational chart in Figure A.2. Other details of the procedure are described in Section 4.2.

Figure A.1. (Color online) Hierarchy Condition

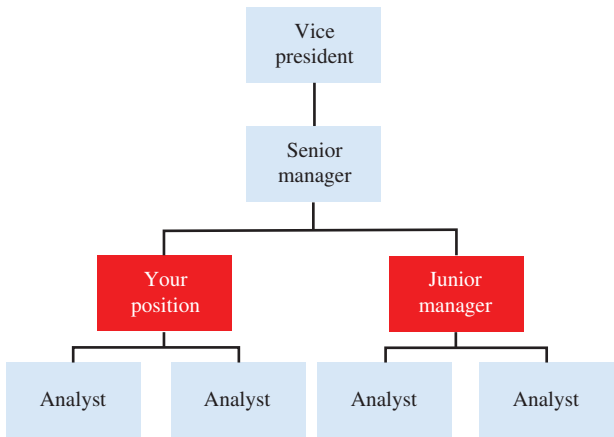
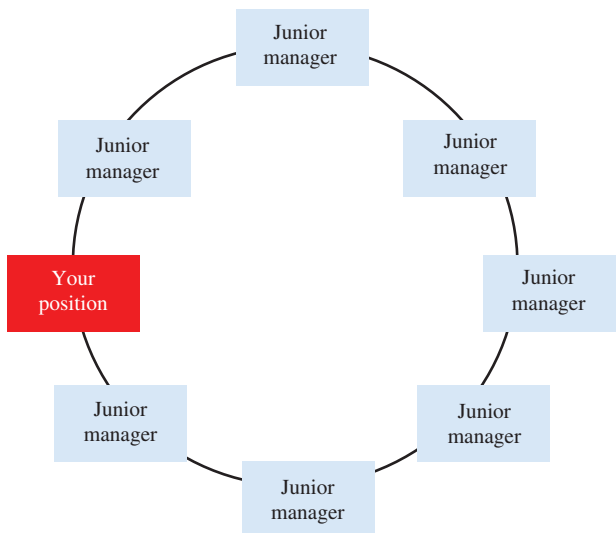


Figure A.2. (Color online) No-Hierarchy Condition



Endnotes

[1] In these computational studies, hierarchy is operationalized as the number of sequential approvals required for the adoption of a project, and all evaluators are assumed to be homogenous and independent with the right to veto a project regardless of their position in the hierarchy (Csaszar 2013, Knudsen and Levinthal 2007, Sah and Stiglitz 1988). This operationalization differs markedly from the treatment of hierarchy of authority in our investigation and much of the other empirical research on organizational structure (e.g., Cardinal 2001, Hage and Aiken 1969, Jansen et al. 2006, Reitzig and Maciejovsky 2015), and, as noted by Reitzig and Maciejovsky (2015), might not easily generalize to real organizational settings.

[2] We also checked for the robustness of our findings to an alternative operationalization of this quality control variable, for example, by discarding ideas that are significantly lower in quality with various cutoff lines. We found an analogous pattern of results.

[3] In particular, the requisite fabrics or associated items (e.g., buttons) are often not readily available for the trendy category and must be custom-made.

[4] Fischer (1997) provides a general discussion of a similar fourfold pattern from the perspective of supply chain management across different industries. See the online appendix for the overall value chain of the apparel industry.

[5] We exclude certain product types, such as socks, ties, and accessories, as these items are often not designed in-house but rather procured from external suppliers to complete the offerings. We also exclude designs with production quantity less than 10, as they are distributed to only a particular set of stores.

[6] At the insistence of the executive-level manager who approved our access to the organization, we used a five-point response scale (1 = strongly disagree; 5 = strongly agree) to replace the original seven-point scale and were restricted to using the following two items from the full scale: (1) even small matters have to be referred to someone higher up for a final answer and (2) I have to ask my boss before I do almost anything.

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