A Goal-Based Perspective of Knowledge Spillover within Organizations

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This study applies a goal-based perspective to predict when innovation projects will contribute useful new knowledge beyond their original scope to the originating firm (i.e., internal knowledge spillover). Longitudinal data from a cross-section of R&D projects support predictions for perceived goal challenge and implicit learning-goal emphasis as stimuli of internal knowledge spillover. The instrumentality of knowledge spillover is corroborated by its relationship with knowledge-related project outcomes such as patent applications 3 to 5 years post the study baseline. Findings extend empirical support for goal-setting precepts to a real-world innovation context and offer practical implications for performance management.

INTRODUCTION

Knowledge creation is a pragmatic organizational concern in the current knowledge economy. Popular wisdom translates this to a need for innovativeness within firms. However, innovation is not synonymous with new knowledge. Researchers generally agree that innovation may take the form of exploitation or the novel and riskier path of exploration (e.g., Benner & Tushman; He & Wong, 2004). Innovation under exploitation is incremental and localized; it stems from the reuse and refinement of existing routines, relying heavily on the firm's existing knowledge base. Innovation through exploration is more varied and stems from experimentation with new alternatives, relying on the discovery of new knowledge.

Exploitation and exploration are both important to the long-term survival of any organization (March, 1991). However, organizational members seem to struggle more with the latter and may face a bias for exploitation due to risk aversion and the desire to reproduce past successes (the 'success trap'; Denrell & March, 2001). This preference may be overcome by incentives, norms, or other performance management approaches (March, 1991, 1994). For example, Google and 3M allow employees specific time to explore new ideas distinct from their routinized work time, Proctor & Gamble established a business unit with explicit performance standards requiring researchers to seek new ideas from external sources, and some companies offer rewards for employees' novel attempts even if they fail (see Shellenbarger, 2011 for some examples).

The present paper investigates two attributes of project goals as potential influencers of exploration. Specifically, we investigate whether perceived goal challenge at the task level and implicit learning-goal emphasis at the broader contextual level are positively related to new knowledge generated by R&D

projects. While most research focuses on the tangible output of R&D projects as a final outcome, we are interested in when a specific innovation effort contributes useful knowledge to the firm that extends beyond the project scope—i.e., internal knowledge spillover.

The study contributes to research in four primary ways. First, it empirically extends goal concepts to the domain of exploration, building on a recent conceptualization of brainstorming which points to the untapped relevance of goal concepts for directing employees towards exploration or exploitation (Litchfield, 2008). Second, while goal concepts are often empirically evaluated through experimental design and at the individual-level of analysis, this study is conducted with a real-world sample of R&D projects. Further, the data is longitudinal which is particularly relevant to goal concepts in the context of complex tasks since the effect of goals on performance in such contexts likely requires a lag time for learning (Smith, Locke, & Barry, 1990; Weldon, Jehn, & Pradhan, 1991). Third, the study adds to the research stream on knowledge spillover by focusing on *internal* knowledge spillover whereas existing research focuses interorganizationally (Yang, Phelps, & Steensma, 2010). Finally, the study speaks to the recent call for systematic study of antecedents to exploration and exploitation tendencies (Lavie, Stettner, & Tushman, 2010). As described above, organizations are increasingly adopting performance-management practices to encourage employee innovation through exploration; the present study will shed light on aspects of goal setting which may facilitate this process.

BACKGROUND AND THEORY

Exploration and exploitation compete for scarce organizational resources (March, 1991). Within an entire organization, exploration and exploitation may coexist across different functions, levels or other organizational relationships. However, within one individual or a single domain, such as a specific R&D project, achieving both simultaneously is unlikely since each approach is fundamentally different with respect to how learning and existing routines are used (Gupta, Smith, & Shalley, 2006).

Although individual differences may influence preference or ability for exploration and exploitation, research suggests that it is more likely influenced by the work context than innate individual qualities, particularly when it comes to project teams. In a study predicting team performance outcomes indicative of exploration and exploitation, the researchers were surprised to see that team knowledge assets such as knowledge diversity, experience and past success did not differentiate innovation type. They reasoned that organizational goals and expectations for the project, not controlled in the study, may play a larger role than team composition in directing team exploration (Taylor & Greve, 2006). In a related vein, perceived organizational expectations for creativity—creativity being a construct generally aligned with exploration—has been found to have a positive association with employee creative performance (Amabile, Conti, Coon, Lazenby, & Herron, 1996; Farmer, Tierney, & Kung-McIntyre, 2003). Finally, firm-level innovation has been empirically linked to the organizational climate for such, which can be defined as employees' shared perceptions of the firm's formal and informal goals and appropriate means to goal attainment (Jung, Wu, & Chow, 2008).

The question remains as to what specific aspects of goals or expectations (i.e., implicit goals) stimulate exploration. For example, all R&D project teams are assigned some form of implicit or explicit goal for innovation, but the knowledge-building process they use to accomplish the objective will, we assert, still vary widely. Goal research points to two attributes of goal content that may have particular relevance in influencing exploration: goal level and learning-goal orientation. Goal level, also known as goal difficulty (see Locke, Chah, Harrison, & Lustgarten, 1989 for distinction between terms), is defined as the degree of challenge perceived and is generally manifested at the task level. A learning-goal *orientation*, as opposed to a specific learning goal, operates at a higher-order level and may be most simply understood for the present purpose as a goal orientation that "draws attention away from the end result to the discovery of effective task processes," as contrasted with a performance-goal orientation which focuses on outcomes or end results (Seijts & Latham, 2006, p. 4). We will subsequently explore these goal attributes in considering how a goal-based perspective can inform our exploration-related predictions. First, we will clarify our outcome of interest, internal knowledge spillover.

Internal Knowledge Spillover

Knowledge spillover in relation to innovation is typically defined from an interorganizational perspective (i.e., external knowledge spillovers) and represents the transfer of knowledge outside its intended boundary (Ibrahim & Fallah, 2005). For example, Firm A invests in R&D and then firm B exploits firm A's knowledge for their own innovative pursuits, thus benefiting from firm A's innovation efforts (see Yang, Phelps, & Steensma, 2010 for further example). Although less considered, innovation knowledge may also spill within a firm. Internal knowledge spillover exists when knowledge generated within one research project contributes to or stimulates other innovation within the same firm (Henderson & Cockburn, 1994).

The drivers of internal knowledge spillover are not empirically defined, although there is an association between the scope of research projects within a firm and ability of the firm to capture knowledge spillover (Henderson & Cockburn, 1994). Conceptually, however, internal knowledge spillover may be explained by exploration. Innovation through exploration relies on the acquisition of new knowledge derived from experimentation with new alternatives. Some of the varied knowledge generated through this approach will not have relevance for the project at hand, but may inform other innovative efforts. Some attempted alternatives will prove unsuccessful, but again may inform other innovative efforts. Some new knowledge generated may have implications for the project at hand as well as other projects. In contrast, innovation under exploitation relies heavily on the firm's existing knowledge base and any learning that occurs is incremental and localized. Thus, we equate exploration as fundamentally aligned with internal knowledge spillover.

Knowledge as a Function of Goal Level

Goals affect performance by directing attention and effort toward goal-relevant activities and away from goal-irrelevant activities (Locke & Latham, 1990, 2002). This is because, since goals refer to future valued outcomes, they serve to highlight discrepancy between current conditions and desired conditions (Locke & Latham, 2006). Challenging goals, relative to unchallenging goals, increase the size, clarity and duration of the discrepancy and thus the likelihood that the discrepancy will be detected and acted upon and that such effort will persist (Austin & Vancouver, 1996; cf., Latham & Locke, 1991; Litchfield, 2008). This rationale is supported by the generally consistent finding over hundreds of studies that performance is a linear function of goal level (Latham & Locke, 1991; Locke & Latham, 1990).

Once high-level goals (i.e., goals perceived as challenging) direct attention and effort as discussed above, they then have distinct implications for knowledge seeking in new and complex task domains such as innovation tasks. "Goals may simply motivate one to use one's existing ability, may automatically 'pull' stored task-relevant knowledge into awareness, and/or may motivate people to search for new knowledge. The latter is most common when people are confronted by new, complex tasks" (Locke & Latham, 2006, p. 265). It is important to clarify that goal level is not synonymous with task newness and complexity (Locke & Latham, 2002). For example, a goal of 100 push-ups is challenging even though the task itself is not complex, nor something requiring new knowledge for most.

However, in the case of innovation via R&D, goal level is more naturally equated with both task complexity and newness since R&D encompasses these qualities by definition. In other words, all innovation through R&D is complex in that it requires some degree of new understanding to determine the specific path to attainment. A more ambitious R&D project implies less knowledge of feasible approaches to attainment, and thus greater complexity rooted in the need for a greater amount of new understanding. This is particularly true for R&D projects at the seed-funding stage, such as the present study sample, where discovery is still underway. Taken together, a challenging goal for an R&D project ultimately leads to greater potential for internal knowledge spillover by first directing attention and effort to the task, and then through its newness and related complexity, encouraging exploratory knowledge seeking.

Hypothesis 1: With regards to R&D projects, there will be a positive association between initial perception of goal challenge and subsequent internal knowledge spillover.

Knowledge as a Function of Inducted Learning-Goal Orientation

A goal's domain or content can be viewed as hierarchical with action-plan goals nested under the higher order of learning or performance goals (DeShon & Gillespie, 2005). As previously noted, a performance goal emphasizes end results and a learning goal emphasizes discovery (Seijts & Latham, 2006). The specific action-plan goal for an R&D project is typically a performance outcome related to the development of a new product or process. However, this does not dictate a distinct higher-order goal of performance or preclude a distinct higher-order goal of learning.

Whereas action-plan goals are generally explicitly identified at the task level, higher-order goals stem from implicit or explicit sources in the task environment (Kozlowski & Bell, 2006). For example, in an experimental study involving both levels of goals, higher-order learning and performance goals were implicitly inducted through differences in the framing of task instruction and reminder wording: errors were either learning opportunities or something to be avoided, and feedback was to be used for learning purposes or to gauge ability (Kozlowski & Bell, 2006). Action-plan goals within the same study were explicitly stated as task outcomes.

As the above implies, identification of the goal domain does not derive solely from an assigned, explicit goal. Irrespective of whether the goal is construed as task-level or higher order, many other studies have inducted a performance or learning goal orientation, respectively, with relatively subtle cues such as instructing participants to score points or creatively explore (Sansone, Sachau, & Wier; 1989), or describing a training activity as an opportunity to test and demonstrate a skill or an opportunity to develop and improve a skill (Roberson & Alsua, 2002). Thus goals can be implicitly defined and activated by the performance norms individuals associate with the task (Earley & Erez, 1991) and implicit task cues (Hassin, Bargh, & Zimerman, 2009). Per the collective findings of these studies, implicit goals may even supersede explicitly assigned goals and direct goal pursuit towards the cued goal rather than, or in addition to, the stated goal.

Relevant to the present study are the performance norms attached to the financing of R&D projects, and the higher-order goal that these norms may implicitly induct. Government grants for R&D in the form of financial awards that do not require repayment convey a different set of goal-relevant norms than typical R&D funding. External knowledge dissemination and broad innovative activity is recognized as an inherent goal of government R&D grant programs (Wallsten, 2000), whereas expectations of instrumental market outcomes accompany typical non-government R&D funding. The R&D projects within the present study all received varied amounts of funding from the U.S. government's Advanced Technology Program (ATP). The ATP funding program's public objective was to encourage the broad dissemination of new knowledge for the social good (see Jaffe, 1996 for details of ATP's public goal). Further, awarded ATP funds were limited in use to the specific awarded project. Thus ATP awards convey an inherent learning-goal orientation, we contend, through an emphasis on broad knowledge creation and through the de-emphasis of opportunity cost (exploratory learning otherwise entails a large opportunity cost because of time spent and greater variation of performance; March, 1991). In relative comparison, other sources of R&D financing—debt, equity and slack resources—implicitly convey a performance-goal orientation since borrowed money must be repaid with interest, capital investments anticipate a return, and investment of slack resources in any one project entails the opportunity cost of other foregone investments.

If these distinct funding norms are effective at inducting higher-order learning-goal and performance-goal orientations, as we suggest, then the greater the ratio of government awarded funding to total project funding, the more consistent the goal domain will be with learning. This in turn has logical positive implications for knowledge spillover since a learning-goal orientation is positively related to individual self-regulatory processes associated with learning (Kozlowski & Bell, 2006; Payne, Youngcourt, & Beaubien, 2007). For example, in the above described experimental manipulation of higher-order goals, implicit learning goals were more beneficial than implicit performance goals for trainees' self-regulatory activity such as exploratory practice, and subsequent learning in a complex task (Kozlowski & Bell, 2006).

Hypothesis 2: With regards to R&D projects, there will be a positive association between the ratio of government award to total project funding and subsequent internal knowledge spillover.

METHODS

Sample

Data were collected for 183 R&D projects funded by the Advanced Technology Program (ATP), from 2005 to 2007. ATP was a government grant program facilitated through the U.S. National Institute of Standards and Technology. The program was designed to support innovation in the United States by providing seed funding for R&D projects that were past the basic research stage but not yet ready for commercialization. Funding was targeted to projects within for-profit companies or company-led partnerships, as opposed to universities or other non-profit research centers. Awards were for either product or process technology development, and granted based on business and technical merit. ATP was replaced by the Technology Innovation Program in 2008. Under the terms and conditions of these funding awards, primary decision makers from the awarded firms were required to respond to surveys. We use two of these surveys for the present research: 1) the Baseline report that collected data before project start, and 2) the Closeout report that collected data three to five years after project start upon the funding period end.

Measures

Internal knowledge spillover (Cronbach alpha = .77) was assessed with three items from the Closeout reporting period (i.e., at project completion): 1) *To what extent was useful new knowledge created from your ATP-funded project?* 2) *To what extent has your ATP project enhanced the value of other R&D at your company? 3) To what extent has your ATP project stimulated new ideas for R&D at your company?* Responses were on a scale of 1 (*not at all*) to 4 (*large extent*). Knowledge spillover, external and to a limited extent internal, is often measured based on some form of patent count calculation. We consider our perceptual measure a more direct assessment of internal knowledge spillover and a more comprehensive measure since the maturation of spilled knowledge to patentable development may vary widely, and spilled knowledge may benefit firm innovation in other less tangible ways. However, since this is a self-reported measure, we bolstered validity by preliminarily testing its relationship with project performance in the form of tangible, knowledge-related project outcomes (see Results section and performance measure directly below).

Project performance (Cronbach alpha = .76) was measured using four knowledge-related project outcomes reported in the Closeout survey period: number of patents, conference presentations, number of publications, and number of awards. With a principal component procedure, the four items emerged as a single factor and were thus combined into a single measure by occurrence count.

Goal level was assessed with a single item: "Relative to other R&D initiatives in your industry, how ambitious would you say are the overall goals identified for this project?" Responses were on a scale of 1 (*much less ambitious*) to 7 (*much more ambitious*) and were reported by the awarded firm at the Baseline point of survey. The item appropriately captures the perceived level of goal challenge from the goal pursuer's perspective since goal difficulty is a relative concept defined by the beholder, and the beholder of interest to the present research is the goal pursuer.

Learning-goal orientation was assessed as the ratio of government awarded funding to total project funding, which was previously posed as influential in inducting learning-goal and performance-goal orientations due to the different norms associated with the funding sources. As such, a higher ratio represents greater consistency of the goal domain with a learning-goal versus performance-goal orientation. Project awards ranged from 40 to 100 percent of direct project costs and were restricted in use to the specific awarded project. Funding periods ranged from three to five years.

Several control variables were included to minimize alternative explanations and confounding influences. Industry effects were controlled by dummy variables. Five industry categories were considered: electronics, manufacturing, biotechnology, materials/chemicals and information technology. Also controlled were firm size (number of employees), firm start-up status, and whether a firm is publicly or privately held since each represents variations in human or financial capital that may influence both goal level and knowledge creation.

RESULTS

Means, standard deviations, and correlation coefficients are reported in Table 1 below. Zero order correlations are significant for the two predicted relationships: goal level and learning-goal orientation are both significantly and positively correlated with internal knowledge spillover. Goal level and learning-goal orientation are also significantly intercorrelated ($r = .20$, $p < .01$). We examined variance inflation factors (VIF) to determine the likelihood of confounding effects due to multicollinearity. None of our variables showed VIF values of more than 1.67, which is well below the suggested threshold of 10 (Neter, Wasserman, & Kutner, 1985).

TABLE 1
PEARSON CORRELATIONS AND DESCRIPTIVE STATISTICS

Variable	Mean	s.d.	1		2		3	
1. Internal knowledge spillover	3.39	.58						
2. Project performance (item count)	8.37	13.73	.07					
3. Goal level	6.04	.97	.37	***	.06			
4. Learning-goal orientation	60.42	16.19	.43	***	-.14		.20	**
5. Firm size (logarithm)	4.95	3.21	-.27	**	.19	*	-.22	**
6. Public company (0=no, 1=yes)	.20	0.40	-.18	*	.01		-.15	
7. Startup (0=no, 1=yes)	.36	.48	.41	***	-.08		.22	**

Variable	4		5		6	
1. Internal knowledge spillover						
2. Project performance (item count)						
3. Goal level						
4. Learning-goal orientation						
5. Firm size (logarithm)	-.49	***				
6. Public company (0=no, 1=yes)	-.32	***	.70	***		
7. Startup (0=no, 1=yes)	.50	***	-.52	***	-.37	***

Note: $n = 162$ due to listwise deletion of missing data.
*$p < .05$, **$p < .01$, ***$p < .001$, two-tailed. Industry dummies omitted from table.

Before proceeding with hypothesis testing, a validity check was conducted for the measure of internal knowledge spillover. One would reasonably expect internal knowledge creation to have a beneficial relationship with objective knowledge-related project performance after controlling for the previously described company and industry influences. This relationship should be detectable but likely modest since the maturation of internal knowledge creation to tangible development may vary widely, and the conversion of such knowledge to tangible outcomes is influenced by intervening external factors such as competition, which were not controlled for in the model. Regression results demonstrated a positive and significant relationship (β = .15, $p < .05$), thus bolstering confidence for the measure of internal knowledge spillover (see Table 2). Had the self-reporting of internal knowledge creation been unduly biased by impression management, we might have instead seen a negative relationship with tangible outcomes (i.e., inflation of intangible outcomes to offset lack of tangible outcomes).

TABLE 2
PROJECT PERFORMANCE REGRESSED ON
INTERNAL KNOWLEDGE SPILLOVER

Variables		
Firm Size	.38**	(0.50)
Public company (0=no, 1=yes)	-.24*	(3.59)
Startup (0=no, 1=yes)	-.02	(2.71)
Industry M	-.02	(3.38)
Industry I	-.10	(3.06)
Industry B	-.02	(3.11)
Industry A	-.07	(3.60)
Internal knowledge spillover	.15*	(2.07)
Model F	1.90*	
Model R^2	.09	

Note: n = 164 due to listwise deletion of missing data. Values are standardized coefficients.
Standard errors in parentheses. *$p < .05$, **$p < .01$, ***$p < .000$, one-tailed.
Industry dummies: M=Manufacturing, I=Information Technology, B=Biotechnology,
A=Materials/Chemicals, E=Electronics (reference category).

Table 3 summarizes the results of the testing of hypotheses through hierarchical regression analysis. Model 1 introduces the control variables and model 2 tests the hypothesized relationships between the goal variables and internal knowledge spillover. Hypothesis 1, proposing a positive relationship between goal level and internal knowledge spillover, was supported (β = .21, $p < .01$). Hypothesis 2, proposing a positive relationship between learning-goal orientation and internal knowledge spillover, was also supported (β = .27, $p < .01$). Together, goal level and learning-goal orientation also demonstrated practical significance in explaining an additional 8 percent of the incremental variance in internal knowledge spillover beyond the controls ($p < .001$).

Three control variables were significant in the final model. Start-up status was positively related to internal knowledge spillover (β = .21, $p < .05$), suggesting new companies are more focused than existing companies on exploratory innovation, or possibly they simply have more to learn. The manufacturing and biotechnology industries, relative to the benchmark of the electronics industry, are both negatively related to internal knowledge spillover (β = -.26, $p < .01$; β = -.16, $p < .05$). R&D projects within these industries may require a narrower or project-specific knowledge focus, leaving less room for knowledge spillover.

TABLE 3
INTERNAL KNOWLEDGE SPILLOVER REGRESSED ON GOAL ATTRIBUTES

Variables	Model 1 Controls			Model 2 Goal Predictors		
Firm Size	-.11		(.02)	-.01		(.02)
Public company (0=no, 1=yes)	.04		(.14)	.02		(.13)
Startup (0=no, 1=yes)	.32	***	(.10)	.21	*	(.10)
Industry M	-.29	***	(.12)	-.26	**	(.12)
Industry I	-.00		(.12)	-.10		(.12)
Industry B	-.13		(.12)	-.16	*	(.11)
Industry A	.02		(.14)	-.04		(.13)
Goal level				.21	**	(.04)
Learning-goal orientation				.27	**	(.00)
Model *F*	8.48	***		9.73	***	
Model R^2	.23			.31		
ΔR^2				.08	***	

Note: n = 173 due to listwise deletion of missing data. Values are standardized coefficients. Standard errors in parentheses.
**p < .05, **p < .01, ***p < .001,* two-tailed.
Industry dummies: M=Manufacturing, I=Information Technology, B=Biotechnology, A=Materials/Chemicals, E=Electronics (reference category).

DISCUSSION

This study examined the influence of goal attributes on internal knowledge spillover in the context of innovation. The findings supported our predictions. Perceived challenge of task goals and contextual emphasis of a learning-goal orientation, at the start of R&D projects, both positively predicted internal knowledge spillover three to five years later in the project. We attribute this to the ability of these goal attributes to encourage exploratory versus exploitive innovation. In particular, a challenging goal focuses attention and, in the context of new and complex tasks, increases knowledge seeking. A learning-goal orientation increases self-regulatory processes associated with knowledge development. Goal level and goal orientation typically represent two separate streams in goal research, with the notable exception of recent integrative efforts (DeShon & Gillespie, 2005; Kozlowski & Bell, 2006). The present conceptual development and findings highlight their complementary though distinct influences on knowledge creation. This study is the first, to our knowledge, to explore these known goal attribute effects in the domain of knowledge spillover.

The study also contributes to the research stream on knowledge spillover by focusing on *internal* knowledge spillover whereas existing knowledge spill research focuses interorganizationally (Yang, Phelps, & Steensma, 2010). We use the term internal knowledge spillover in its broadest sense to include any way in which the usefulness of findings from a knowledge-creation project extends within the firm. Identification of indirect and less tangible returns from R&D investment may have important implications for funding decisions, making projects that are high in risk or low in direct return more attractive since knowledge creation that benefits other aspects of the firm is a valued outcome in itself. Thus we suggest future R&D research pay greater attention to internal knowledge spillover as a relevant performance outcome.

In addition, the study offers insights for the inducement of exploration within organizations. Although March (1991) alluded to organizational norms and contextual factors as relevant to encouraging exploration and exploitation, empirical findings are limited, particularly in relation to specific performance-management practices such as goal attributes. Goal attributes have been conceptually posed as relevant in directing exploration in the domain of employee brainstorming (Litchfield, 2008) and exploratory organizational learning (Sitkin, See, Miller, Lawless, & Carton, 2011). Our findings provide *empirical* support for the role of two key goal attributes—goal level and learning-goal orientation—in encouraging exploration. We recommend that future research continue to investigate the relationship between goal attributes and exploratory versus exploitive organizational knowledge creation. One way that future research may directly extend our findings is to induct learning-goal orientation explicitly to determine consistency with our construal of its implicit induction. Finding a non-laboratory context in which to do so would be challenging, but most replicative of the present findings. This inquiry could also be extended to address a call by goal scholars to explore the motivational dominance of situationally induced goal orientation effects over dispositional goal orientation (Locke & Latham, 2004).

While the present study focused on internal knowledge creation as an important outcome in itself, preliminary consideration was also given to its link with external performance. The relationship between internal knowledge spillover and R&D project performance in the form of external knowledge output (patents and other externally codified project knowledge) was positive, but as expected this relationship was relatively modest presumably due to the varied maturation time and market uncertainties involved in translating organizational knowledge externally. Attenuation may also stem from founded disconnects between exploratory knowledge seeking and performance. For example, exploration leads to wider variation (highs and lows) in performance since it embraces the unknown, whereas exploitation leads to more consistent performance since it attempts to leverage existing success (March, 1991). Relatedly, goal research suggests that for complex tasks that require the acquisition of new knowledge, increased effort alone will not be translated into tangible gains unless effective strategies are developed for deploying that effort productively (see Wood & Locke, 1990; Wood, Mento, & Locke, 1987). Future research should consider how goal attributes may be optimized to more tightly align exploratory knowledge building with performance outcomes. For example, a study that investigated team norms and individual goal orientations for R&D project teams within a pharmaceutical company suggests some combination of learning and performance goal focus produces better results for employee creativity than either focus alone (Hirst, Van Knippenberg, & Zhou, 2009).

Goal specification has also been found to reduce variation in performance by reducing ambiguity regarding what constitutes goal relevant behavior and outcomes (Locke & Latham, 2002). Learning-goal orientation represents a higher order of goal domain specification than action-plan goals, which are explicitly identified at the task level. Future research may consider the relevance of goal specification at the action-plan level to bridging knowledge building and performance. For instance, a study of the influence of organizational control mechanisms on output from R&D project teams across 57 pharmaceutical firms unexpectedly found that degree of goal specificity at the task level was positively associated with radical but not incremental innovation, similar concepts to exploration and exploitation (Cardinal, 2001).

In terms of practice, organizations are increasingly adopting programs aimed to encourage innovation through exploration—e.g., Google and 3M allow employees specific time for new knowledge seeking distinct from their routinized work time. Some have posed that the knowledge economy as we know it is giving way to the creative economy (*Businessweek*, 2005), suggesting an exploratory, versus exploitative, approach to knowledge building and innovation may play an even more important role in firm success going forward. Our findings shed light on aspects of goal setting which organizations may use to direct employee performance towards this direction. A challenging task-level goal and a contextually inducted learning-goal orientation each offer unique beneficial effects for exploration in the domain of R&D projects. Whereas the learning-goal orientation stemmed from project financing norms in the study sample, by logical extension of this finding and previously discussed experimental findings, organizations may convey the same through their own performance standards—by explicitly or implicitly stressing learning as a valued R&D project outcome.

The research design of this study offers the strength of a real-world sample of R&D projects, where much goal research is experimental in design, and a time lagged measure of goal outcomes. The latter is particularly important to the study of goal concepts applied to complex tasks where learning must occur before performance is impacted (Smith et al., 1990; Weldon et al., 1991). However, as with any study, there are limitations of the present research which must also be considered. Even though our sample is comprised of a wide cross-section of R&D projects and industries, the findings are not necessarily generalizable outside of R&D contexts. Second, our measure of goal level and internal knowledge spillover are self-reported, thus potentially subject to common method bias. However, the likelihood of common method bias is lessened by the substantial time separating the measurement of goal level and knowledge spillover. Further, goal challenge is in the eye of the beholder, so a perceptual measure of such was deemed appropriate. And while the perceptual measure of knowledge spillover may be subject to impression management, participants had nothing to gain or lose by misreporting this information since all funding awards were completed at this point of survey. Validity of the knowledge-spillover measure is also bolstered by its significant relationship with an objective measure of knowledge-related performance.

In conclusion, we offer a unique field test of the links between goal attributes and the sparsely researched outcome of internal knowledge spillover. In addition to implications for theory and research, the findings highlight ways in which the process of organizational learning and innovation, as exploration or exploitation, may potentially be influenced. We are hopeful that our findings will contribute to an improved understanding of these important relationships and encourage continued research in the areas noted.

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