Occupational Invocation:

Managing Experts through Occupational Norms

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ABSTRACT

Using data from a 16-month ethnographic study of a pharmaceutical company research unit, I examine how managers can successfully manage expert contractors. These expert scientists perform essential work in advancing drug development projects. However, they often complete work late, refuse to perform requested work, and act in other ways that managers believe impedes project progress. Although the literature on expert management suggests that these challenges can be overcome by rewarding, punishing, and socializing experts, these practices are difficult to implement when expert workers are contracted from outside of the organization. I show how managers can manage expert contractors through a process I label occupational invocation. In this process, managers first publicly highlight experts' breaches of shared occupational norms. Managers then reintegrate experts by providing them with an opportunity to display a correction of their actions such that they align with the community's expectations as well as the contracting organization's interests. By referencing common norms, occupational invocation helps enable the management of expert contractors.

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INTRODUCTION

Organizations rely on experts for the completion of complex and essential organizational tasks (Abbott, 1988; Van Der Vegt, Bunderson, and Oosterhof, 2006). However, managers often struggle to manage expert workers. Managers may lack the requisite knowledge and skill to monitor experts' work, and experts often ignore or resist managerial requests in lieu of pursuing professional or personal interests (Jermier, 1998; Kellogg, 2009; Huising, 2014). To overcome these challenges, managers may incentivize experts through instrumental rewards and punishments, such as granting or withholding promotions (Guillén, 1994; Alvesson, 2004; Obloj and Sengul, 2012). Alternatively, managers may influence experts through identity-altering socialization processes such as formal training and immersion in coworker interactions (Martin, Knopoff, and Beckman, 1998; Pratt, 2000; Bartel and Dutton, 2001; Michel, 2007).

The literature on expert management finds that these practices are effective in managing workers *within* the organization. However, organizations increasingly rely on expert contractors from outside the firm to perform work tasks (Matusik and Hill, 1998; Kunda, Barley, and Evans, 2002; Clark, Huckman, and Staats, 2013), and there are reasons to suspect that these practices are less effective in influencing external experts. Managers may struggle to socialize contractors who work remotely or are employed by the organization for only a short amount of time (Kalleberg, 2000; Ashford, George, and Blatt, 2007; Briscoe, Wardell, and Sawyer, 2011). Managers may also face challenges in incentivizing contractors with rewards and punishments. For example, contractors are generally external to an organization's job ladder and therefore cannot be incentivized with promotions (Mayer and Nickerson, 2005; O'Mahony and Bechky, 2006; Bidwell, 2009).

This raises the question: how can managers successfully manage expert contractors? In this paper, I describe a 16 month ethnography of Pharmaceutical Research Unit (PRU), a research unit in a large pharmaceutical company.[1] PRU outsourced many of its drug development tasks to 52 expert scientists. PRU depended on these contractors for specialized experimental processes, complex chemical compound design, and other highly skilled and essential work tasks that PRU managers believed would result in marketable drugs. However, at times, scientific contractors impeded PRU's drug development projects, for instance, by completing work late or refusing to respond to managers' requests.

1 Pseudonym

Yet despite these difficulties, PRU managers were able to influence expert scientists' actions, and in turn, overcome contractors' hindrance of project progress. In this paper, I show how experts can be managed through a process of invoking occupational community norms, which I label occupational invocation. In this process, a manager first publicly points out an expert's violation of a well-established community norm, thereby potentially undermining his or her claims to community expertise. Following the exposure of the professionally deviant behavior, the manager provides the expert with an opportunity to demonstrate a correction of his or her actions such that they align with both the occupational community's expectations and the organization's goals. Through this process, occupational invocation enables managers to redirect experts' actions, and by extension, advance organizational objectives. Therefore, by relying on common occupational norms—which cross organizational boundaries—managers may be able to influence the actions of experts.

MANAGEMENT OF EXPERTS

Whether it is an orchestra relying on professional musicians (Glynn, 2000; Maitlis and Ozcelik, 2004) or a technology firm relying on engineers (Kunda, 1992; Perlow, 1999), organizations often depend on experts' knowledge and skills to complete essential work tasks (Gouldner, 1958; Mechanic, 1962; Abbott, 1988). However, experts may be less concerned with organizational demands than with the subject of their expertise. For instance, experts are often more focused on enacting their professional identity than meeting organizational goals (Glynn, 2000; Pratt and Foreman, 2000; Pratt, Rockmann, and Kaufmann, 2006). Given this, experts may impede managers' attempts to ensure work completion, for example, by ignoring or actively resisting managerial requests (e.g. Perlow, 1998; Kellogg, 2011). Managers, in turn, may struggle to supervise experts given the high level of knowledge and skill associated with their work. For example, managers may lack the knowledge required to specify and oversee experts' tasks (Kirsch, 1996; Newell et al., 2002). Although managers may enact control by stripping experts of work assignments—for instance, by codifying and transferring their work practices to other employees (Brivot, 2011; Huising, 2014)—in some cases this is not possible because the expert work is difficult to systemize (Abbott, 1988; Barley, Bechky, and Nelsen, 2016).

Previous research on how managers successfully influence experts reveals three common practices. First, managers may selectively provide rewards to experts, with the aim of aligning

experts' actions with managerial goals (Friedson, 1994; Alvesson, 2004; Frey, Homberg, and Osterloh, 2013). Thus, managers may offer bonus pay or an increased base salary to experts who positively respond to their requests (Dirsmith, Heian, and Covaleski, 1997; Obloj and Sengul, 2012). Similarly, managers may provide experts with opportunities to enact valued professional identities (Anteby, 2008; Bunderson and Thompson, 2009) or grant promotions, and correspondingly increases in status (Wallace, 1995; Alvehus and Spicer, 2012). Conversely, when experts fail to meet their requests, managers can punish experts to influence behavior by withholding raises, bonuses, and promotions (Marx, 2011; Gardner, 2012; Sewell, Barker, and Nyberg, 2012).

In contrast to these instrumental tactics, managers may instead orient experts through socialization (Ouchi, 1980; Barley and Kunda, 1992; Ashforth and Saks, 1996; Michel, 2011). Socialization may take place through formal training programs aimed at shaping experts' organizational commitment (Kunda, 1992; Alvesson, 2000; Michel, 2007) or through the appointment of mentors who educate experts about organizational expectations regarding employee behavior (Chatman, 1991; Covaleski et al., 1998). Managers may also rely on coworker interactions to teach experts about organizational norms and expectations (Saks and Ashforth, 1997; Martin, Knopoff, and Beckman, 1998; Solinger et al., 2013). These socialization processes may increase experts' conformity with managerial requests by creating a sense of organizational community or transforming employees' identities such that these requests are not viewed as burdensome (Pratt, 2000; Alvesson and Willmott, 2002; Robertson and Swan, 2003).

The extant literature on expert management thus suggests that rewarding, punishing and socializing are common and effective managerial practices. However, these tactics are deployed by managers supervising experts within the *same* organization. These findings may not hold for one growing class of experts, namely, expert contractors.

Contractors and Contracting

As the literature on contracting reveals, organizations increasingly rely on experts external to the firm (Matusik and Hill, 1998; Kunda, Barley, and Evans, 2002; Bidwell and Briscoe, 2009). For example, many companies outsource their IT work to contractors instead of maintaining in-house IT departments (Barley and Kunda, 2004). And increasingly, firms externalize tasks such as engineering, research and development, and product design (Manning, Massini, and Lewin,

2008). This rise in the outsourcing of expert work reflects a broader movement towards contracting and the erosion of traditional employee-employer relationships (Ashford, George, and Blatt, 2007; Davis-Blake and Broschak, 2009; Bidwell et al., 2013).

The contracting literature suggests that existing findings on managing experts may not apply to expert contractors. For example, it is often cumbersome and time-consuming to alter external workers' contracts—which enable the provision of monetary incentives—because renegotiation requires the intervention of company lawyers (Argyres and Mayer, 2007; Mayer and Bercovitz, 2008; Cappelli and Keller, 2013). Contractors may also be motivated by rewards or punishments the organization cannot provide due to the nature of the employment relationship (Neff, Wissinger, and Zukin, 2005). For instance, because contractors are excluded from internal job ladders, managers cannot provide promotions and, correspondingly, status rewards (Mayer and Nickerson, 2005; Bidwell, 2009; Osnowitz, 2010).

Additionally, managers may struggle to socialize expert contractors because they are often physically situated outside of the organization or hired only for a short period of time (Kalleberg, 2000; Kirsch, Ko, and Haney, 2010; Briscoe, Wardell, and Sawyer, 2011). Contractors may also be shunned or mistreated by permanent employees who are jealous of their higher wages or concerned that external workers might take over their jobs (Davis-Blake, Broschak, and George, 2003; Koppman and Mattarelli, 2016). Such ostracism, in turn, may decrease contractors' identification with the organization by foreclosing opportunities for daily socializing interactions (Bartel and Dutton, 2001; Vaiman, 2010).

In sum, managers supervising expert contractors may have difficulty implementing the practices described by the expert management literature. This leads to the question: how can managers successfully manage experts external to the organization? To answer this question, it is helpful to understand concepts from the literature on occupational communities.

Occupational Communities

Occupational communities are comprised of individuals engaged in a common type of work while guided by a shared set of norms (Van Maanen and Barley, 1984; Orr, 1996; Bechky, 2003; O'Mahony and Lakhani, 2011). In the scientific professions, for instance, it is expected that workers support knowledge claims with empirical evidence and judge others' claims by impersonal criteria (Weber, 1946; Merton, 1973; Cohen, 1980). Scientists are also generally

expected to act on the basis of intellectual curiosity rather than personal or material interest; share authorship of findings with those who have contributed to the relevant work; and provide mentorship and tutelage to lower status members of their laboratory (Merton, 1973; Gibbons et al., 1994).

Occupational norms are often aspirational and thus are generally incompletely achieved by professionals (Mitroff, 1974; Haas and Park, 2010; Silbey, 2013). Additionally, in recent years, changing bases of employment have altered traditional normative orders in a variety of occupations (Adler, Kwon, and Heckscher, 2008; Gorman and Sandefur, 2011). Academic scientists increasingly interact with those outside of universities, as professors engage in consulting relationships and graduate students leave academia for industry (Nowotny, Scott, and Gibbons, 2001; Stuart and Ding, 2006; Lam, 2010). Patenting activities—a challenge to traditional scientific principles—have increased exponentially (Owen-Smith and Powell, 2001; Murray, 2010; Sauermann and Stephan, 2012).

Nonetheless, occupational norms still capture something fundamental and widely shared, if incompletely realized, about a community's practices. These expectations often guide professionals' actions (Cohen, 1980; Jarzabkowski, 2004), and expert status remains to a large extent dependent on perceived normative conformity (Goode, 1957; Fauchart and von Hippel, 2008; Barley, Bechky, and Nelsen, 2016). Therefore, experts who wish to maintain their professional standing—for instance, to receive career rewards or to enact their vocational identity—generally respect occupational norms (Whitley, 1984; Vough, 2012; Ashcraft, 2013). This suggests that influence over experts may be realized by exposing experts' normative violations and, in turn, potentially challenging their claims to expertise.

However, as criminologists have emphasized, individuals who have been shamed in this manner may end all contact with their community, even if other members wish to maintain relations (Van Ness and Strong, 1997; Zehr, 2002). To address this tension, the criminologist Braithwaite (1989) developed the concept of reintegration, which refers to the provision and clear communication of an opportunity for a transgressor to publicly correct his or her actions. The aim of reintegration is to bring violators' behaviors into conformity with community expectations, and by extension, restore both their public standing and relationship with the community (Braithwaite, 1989). Collectively then, the literatures on occupational communities and criminal justice suggest that one mechanism for expert management may be a process which

highlights experts' normative violations while also providing an occasion for experts to correct their actions.

METHODS

Research Setting

This paper focuses on managers at Pharmaceutical Corporation and the expert scientific contractors these managers supervised. Pharmaceutical Corporation is one of the world's largest pharmaceutical companies as ranked by revenue. I collected data from one unit of Pharmaceutical Corporation, which developed drugs in a specific therapeutic area. Therapeutic areas, such as oncology, cardiovascular disease, and immunology, demarcate the units of many large pharmaceutical companies. Within this work, I refer to the unit I studied as Pharmaceutical Research Unit (PRU).

While PRU employees worked on projects in various stages of drug development, this paper focuses on PRU's early-stage projects. At this stage, chemical compounds are examined through experiments in animals and cells. The results of these experiments identify compounds that potentially have the properties to become marketable drugs. While most units of pharmaceutical companies rely primarily on internal laboratories for early-stage research, PRU contracted out most of its laboratory work to academics, biotechnology firms (biotechs) and contract research organizations. Academic and biotech scientists performed high-skilled work, designing complex experiments and new compounds. In contrast, contract research organizations completed low-skilled tasks such as routine, standardized laboratory experiments. As described below, PRU managers supervised relationships with these contractors.

Managers. PRU managers oversaw PRU's early-stage drug development projects, with each project focusing on a particular disease and a particular biological approach to curing that disease. Two to eight PRU managers were assigned to each project. These managers determined what work to outsource, and after examining this work's results, determined additional tasks to contract. Managers were typically scientists who held PhDs and supervised contractors whose work related to their own functional background (e.g., biology, chemistry). All managers worked on multiple drug development projects and supervised relationships with more than one contractor.

Managers' final deliverable to PRU was expected to be a package of results from contracted work. These results either provided evidence that their project identified a developable compound and thus that the project could transition to clinical studies, or lacking such evidence led to the conclusion that the project should end. For each drug development project, PRU managers also tried to publish papers, which helped PRU secure patents by reinforcing its claims of having discovered novel chemical compounds.

Expert Scientists. PRU managers supervised relationships with high-skilled academic and biotech scientists, who had typically spent one or more decades performing research in a particular area of biology or chemistry. When PRU contracted work to experts, it was usually junior laboratory personnel such as postdocs who carried out day-to-day tasks in the contractor's lab. However, PRU managers expected experts to supervise their lab personnel's work and meet with PRU managers to present, explain, and discuss this work. For each contractor, PRU typically paid for one to three fulltime junior lab personnel, the materials required for the research, and a base fee that did not go towards PRU's laboratory work. Therefore, PRU's funding enabled experts to maintain a few extra laboratory personnel, but was not critical in sustaining the labs.

Each expert was generally assigned to one PRU project. The contactor's work on this project usually took place over one or more years because managers hired experts to perform interdependent, sequential tasks. PRU managers and expert contractors met approximately once per month, and these meetings were the two groups' primary form of interactions. Meetings were usually held through teleconference, with the managers assigned to the project assembled in a PRU conference room and contractors calling into meetings. During these meetings, expert scientists usually presented their laboratory's work and then managers and experts discussed the experts' next work tasks. In addition to meetings, PRU managers emailed, texted and called contractors, usually one to three times per week. Through these short interactions, PRU managers checked the status of experts' work and answered their questions.

Data Collection

The data for this paper come from a 16 month ethnographic study of PRU. During the study, I tracked the progress of 11 early-stage drug development projects in which 21 PRU managers

supervised 52 expert scientific contractors, including 43 academic and nine biotech scientists. For each project, I sat in regularly on project meetings, which were typically attended by PRU managers and the expert contractor(s) assigned to the project. Some experts also had their junior lab personnel regularly attend these meetings. In total, I sat in on 163 project meetings. While expert scientists and their lab personnel usually teleconferenced into these meetings, occasionally they attended the meeting in-person or PRU managers (and myself) visited the expert's laboratory.

Immediately before and after project meetings, I asked questions regarding projects' progress as well as how managers and contractors understood and interpreted their interactions with one another. Outside of project meetings I gathered data several ways. I observed hundreds of conversations between PRU managers and expert contractors, as well as among PRU managers or expert contractors alone. I also received hundreds of emails between PRU managers and expert contractors. These emails included experts providing updates on project work as well as experts and managers figuring out the next steps of this work. Finally, I performed job shadows of 14 PRU managers and completed 35 semi-structured interviews with PRU managers. During interviews, I asked about project progress, difficulties managers encountered when working with expert contractors, and how managers tried to overcome these difficulties.

During the study, I wrote detailed fieldnotes of my observations. Because almost all PRU managers and experts were on their laptops during meetings, and therefore using my own laptop was not disruptive, I typed most of my notes directly into my computer and edited them afterwards to add detail (Emerson, Fretz, and Shaw, 1995). When I could not use my laptop, I handwrote notes and then typed them up on the same day. I tape recorded all interviews except in two instances where permission was withheld, for which I instead wrote detailed notes.

Data Analysis

I performed several rounds of inductive data analysis (Charmaz, 2014; Corbin and Strauss, 2014). In the first round, I open coded all data related to managers, expert scientists, and early-stage drug development projects. While coding, I wrote 36 memos examining themes emerging from the codes. Through this process, I identified two key findings. First, PRU managers believed experts often impeded drug development project progress, for instance, by completing

work late. Second, PRU managers struggled to manage expert contractors and, in turn, overcome these difficulties.

After surfacing these initial findings, I then reread and recoded my data, focusing on the practices PRU managers engaged in to shape expert contractors' actions. I found that common practices used to manage experts such as rewarding, punishing, and socializing did not seem to enable the management of expert contractors. However, I noted that one practice—which I later labelled occupational invocation—was used frequently by managers and seemed to enable the management of expert scientists. I wrote 11 memos analyzing instances in which managers used occupational invocation. In these memos, I focused on the process by which occupational invocation took place as well as the role of experts, managers, and junior lab personnel in this process.

I confirmed my findings regarding occupational invocation's ability to reshape expert action by performing a systematic analysis of all my fieldnotes and interview transcripts. I identified 120 cases in which PRU managers perceived experts to be impeding project progress. For each of these cases, I coded for the type of impediment, the managerial practice used in response to the impediment, and if the impediment was overcome or not. I found that occupational invocation was the practice managers most often engaged in. I then compared the practices used in cases where the impediment was overcome versus not overcome, and found that occupational invocation was the most consistently successful practice.

FINDINGS

PRU Managers Rely on Expert Scientists, but Expert Scientists Impede PRU's Drug Development Project Progress

PRU managers relied on experts to use their knowledge and skills to advance PRU's drug development projects. However, managers often perceived that experts impeded project progress, for example, by completing work weeks or months late. This posed a problem for PRU managers: How could they overcome these difficulties and further advance PRU's goal of drug development?

PRU Managers Rely on Expert Scientists. PRU managers depended on expert contractors' knowledge and skill to advance drug development projects. As managers explained, these

contractors were "world's leading experts" and "world renowned experts." These scientists generally published in top journals such as *Science* and *Nature* and received funding from prestigious grants. Given their high level of skill and knowledge—cultivated from years of research on specific biological or chemical topics— these contractors could not easily be replaced. One manager explained that despite one expert's recurring failure to complete work, PRU continued to contract with him due to his irreplaceability: "I don't think it would be easy to find another [expert]."

Similarly, while most PRU managers were scientists, they lacked the specialized skills and knowledge required to execute expert scientists' studies and fully interpret these studies' results. As one PRU manager explained, "Even if we were at a lab-based function, we might not have that expertise. So we are typically tapping into others." Another PRU manager explained, "We don't have the capability or the technical skills to do the work." As implied in these quotations, codifying and transferring experts' work practices was also not a viable option, given the high degree of training and tacit knowledge required to complete this work.

PRU managers also relied on expert contractors because drug development entailed sequential, step-wise work. Therefore, PRU managers needed expert scientists to not only complete their assigned tasks, but also to enable the work of other contractors. Referring to one project, a PRU manager explained: "In the case of the [project], we are not halted by the biology. We are really more halted by the chemical feasibility. So right now, [the experts], they're key to actually making this a possibility." Until the expert scientists assigned to the project completed their chemical work, other contractors could not complete biological work. In sum, PRU managers relied on expert scientists to advance drug development projects.

Expert Scientists Impede Project Progress. Although PRU managers relied on scientific experts' skills and knowledge, managers perceived that experts often impeded project progress. For instance, these contractors sometimes completed work weeks or months late. Referring to a specific expert, a PRU manager explained, "We can't get anything on time." Similarly, after a meeting in which a group of experts reported that they had not selected a chemical compound for PRU to develop despite over a year of work, a PRU manager stated to his colleague, "I don't see a compound yet… This is recurrent." The manager attributed this

delay to the experts' actions, in particular, their poor time management. He lamented that without a compound for further development, this PRU project could not move forward.

Additionally, experts often opposed PRU managers' decisions as to what should be the next step in project work. Recalling an incident in which managers disagreed with two scientific contractors as to what experimental work they should perform, one manager explained: "There is the nuance of what PRU wants. If left to themselves, [the two experts] might do an experiment a different way." Similarly, one manager discussed a case in which a contractor refused to perform a study. As the manager explained, "[The expert] has a set way of how he wants to run things." But this "set way" did not align with the manager's request, and as a result, the expert refused to complete the study. This, in turn, stalled the PRU project.

Experts also made scientific claims that PRU managers interpreted as "suspect" and therefore inadequate for informing drug development decisions. Although PRU managers did not have in-depth knowledge of experts' work, they did expect contractors' claims to meet basic expectations of all scientific work, such as being backed by relevant data. When these principles were not respected, PRU managers became concerned about the validity of expert scientists' claims and did not want to use their work to make project decisions. For example, after performing an experiment, one expert stated that he identified the best possible compound for PRU to develop. However, the scientist excluded several compounds from his study without explanation. As a result, the two PRU managers supervising the expert's work did not use the experiment's results to select a compound for further study.

In addition to these three most frequent impediments, PRU managers believed experts impeded drug development projects by communicating slowly or infrequently, inadequately supervising laboratory subordinates, and posing legal or contractual difficulties. Table 1 has a full list of the impediments produced by expert scientists.

-------Insert Table 1 about here-------

Occupational Invocation Overcomes Expert Scientists' Impeding of Drug Development Project Progress

PRU managers overcame expert scientists' impeding of projects through a process of invoking occupational community norms, which I label occupational invocation. This process consisted of two phases (Figure 1). Managers first publicly highlighted experts' violations of well-established

scientific norms, thereby potentially undermining contractors' claims to expertise. Managers then reintegrated contractors by providing them with an opportunity to demonstrate a correction of their actions such that they aligned with the normative expectations of the scientific community while also resolving impediments to project progress.

-------Insert Figure 1 about here-------

As shown in Figure 2, occupational invocation was a consistently successful management practice and PRU managers engaged in it frequently. Managers also used alternative practices when trying to resolve difficulties with expert contractors. However, unlike occupational invocation, these practices did not consistently lead to success (Figure 2). After detailing occupational invocation, I discuss these alternative practices.

-------Insert Figure 2 about here-------

Highlighting. PRU managers highlighted experts' violations of shared norms of scientific practice by pointing out these infringements to other scientists, and in turn, potentially challenging contractors' claims to expertise. Highlighting generally took place during meetings attended by experts, experts' lab personnel, and PRU managers who held science PhDs.

In one example of highlighting, two PRU managers drew attention to an expert scientist's insistence on further studying a compound without providing adequate supporting data. During a project meeting between four PRU managers and two expert contractors, one contractor presented results from an experiment in animals that he recently performed using three chemical compounds. After going through a series of slides illustrating these findings, the scientist then stated that based on the experiment's results, he should use one of the compounds—Compound 524—to perform an extensive follow-up study. He elaborated that he believed this particular chemical compound could likely be developed into a drug.

One of the four PRU managers immediately objected to the contractor performing the additional study using Compound 524. During the meeting, in front of the second expert scientist and three other PRU managers, the manager heatedly pointed out that the scientist lacked data supporting his assertion that the compound was developable. In particular, the manager emphasized that the expert's data clearly demonstrated that Compound 524 did not reach high enough levels of concentration in the studied animals to be effective in alleviating the animals' disease, and by extension, that Compound 524 would not cure the disease in humans. Therefore,

the PRU manager believed the expert was making a claim—that Compound 524 was developable—without presenting adequate supporting evidence.

In response to the manager's statement, the expert scientist immediately retorted that Compound 524 could still be developed into a marketable drug if its formulation was slightly altered. A second PRU manager then stressed that even if the chemical compound was reformulated, there was no evidence that it would reach the levels of concentration required to effectively cure the disease in humans. The first manager also disagreed with the expert, stating, "This compound is not sufficient for development." In sum, while the contractor contended that Compound 524 was developable, he lacked data supporting his assertion. Through their remarks, the two PRU managers publicly highlighted the expert's transgression of a basic expectation of the scientific community, namely, that scientific claims should be supported with valid empirical evidence.

In another example, a PRU manager highlighted an academic scientist's rejection of other experts' work. Four managers and three scientific contractors were in a routine bi-weekly meeting for a drug development project. One manager explained that he received study results from a group of biotech scientists who worked on the project but were not attending this particular meeting. He gave a quick overview of the biotech group's work, explaining that the scientists developed a new technology to identify chemical compounds that were potentially developable into marketable drugs. The manager's description of the technology was brief because the biotech experts had previously explained the technology to the three other scientific contractors. After providing the overview, the PRU manager then stated that the technology had identified several PRU compounds as promising drug candidates. After the meeting, the manager also informed a colleague that the biotech scientists completed the studies at no cost, and were willing to perform several additional studies for free. Thus, the PRU manager viewed the biotech's work as a way to efficiently and cheaply advance the PRU project.

During the project meeting, the PRU manager asked one academic expert in attendance to perform a follow-up study on the identified compounds. The academic immediately resisted the manager's request, stating that the biotech's technology did not produce accurate results and therefore that there was no reason to perform follow-up work. However, the professor did not offer evidence in support of his assertion. After the meeting, puzzling over the academic's resistance with a colleague, the PRU manager suggested that the academic perhaps "didn't want

to be bothered" with an additional experiment. The colleague added, "Maybe there is some bad blood there that we don't understand," suggesting that perhaps the professor disliked the biotech scientists for reasons unrelated to the technology's results. The PRU managers, in sum, saw no justification for the academic's rejection of the biotech scientists' work.

Therefore, during the project meeting, the PRU manager stated that the technology's reliability had been verified through previous studies performed for another PRU project. He made this statement in front of the two other scientific experts and three other PRU managers. In doing so, the manager drew attention to the fact that there was scientific evidence supporting the technology's reliability, whereas the academic's statements were unsupported. In other words, the manager openly displayed the expert scientist's disregard of a common scientific expectation, namely, that claims must be supported with adequate empirical evidence.

In this example and the previous one, highlighting took place with reference to the norm of empirical validity. However, as Table 2 illustrates, PRU managers drew attention to experts' infringements of other scientific norms. For instance, one manager underscored a contractor's failure to adhere to customary expectations regarding the sharing of credit among collaborating scientists. Specifically, the manager wanted the expert to include three additional contractors as authors on a publication that PRU and the expert were writing together. The other contractors each worked for over a year on the relevant PRU project. These three scientists' expert knowledge, in conjunction with a series of experiments performed across their three laboratories, had culminated in a final set of experiments performed by the co-authoring expert scientist. It was this final set of experiments that PRU and the expert wanted to publish.

-------Insert Table 2 about here-------

The three contractors were internationally renowned researchers. Therefore, the manager wanted the three experts' as co-authors to enhance the publication's prestige and, by extension, the possibility of PRU's findings gaining acceptance in the scientific community. This, in turn, would help PRU defend its patent claims. However, the expert, who had taken the lead on writing the paper, did not include the three other contractors' names on the publication when he sent it to the manager. And during a project meeting between the manager, the expert, and two of the experts' postdocs, the contractor did not mention plans to add the three other scientists' names to the paper. Instead of sharing authorship, the expert reserved it for himself.

During this same project meeting, the PRU manager confronted the scientist about the paper's co-authorship in front of the scientist's junior lab personnel. In particular, the manager stated that the three other contractors should be granted authorship as they had contributed to the project: "My expectation is that we are publishing that work together as we started it together. I feel like that has to happen based on the work we've done." Through this statement, the PRU project manager emphasized the contractor's claiming of solo authorship on a project that was in fact collaborative.

PRU managers also highlighted experts' normative infringements with reference to expectations regarding mentorship, that is, the general belief that senior scientists—particularly professors—should give advice and support to their subordinates. In one case, an academic's lab personnel did not regularly provide experimental data to PRU managers. In particular, the professor's three postdocs emailed PRU managers PowerPoint slides depicting study results. However, these postdocs did not send PRU managers complete and organized datasets. PRU managers wanted these datasets because they were needed to write papers that would, in turn, support PRU's IP claims for compounds identified through the postdocs' work. Accordingly, managers repeatedly asked the postdocs to improve their data transmission practices. But the junior scientists' behavior did not change, and the managers realized they needed to adopt a different strategy.

The professor supervising the postdocs did not prioritize data management, as evidenced in his own sloppy presentations to PRU. The academic also set low standards for his postdocs' recording and reporting of study results; he did not teach them about such activities but instead encouraged them to spend time running additional experiments. PRU managers knew about the professor's lax approach to data management, and over the course of several interactions—emails and meetings—two managers underscored that the expert was not enforcing the importance of data recording and transmission among his postdocs. In particular, the managers told the professor that encouraging proper data recording habits was "not bullshit," but rather an essential component of junior lab personnel's scientific training. In doing so, the managers emphasized the expert's failure to properly mentor his postdocs.

Highlighting helped managers overcome expert scientists' impeding of PRU's goal of drug development by potentially challenging contractors' claims to expertise. Contractors wanted to retain their status as experts, as evidenced in the fact that they pursued common markers of

scientific rank such as publications in top journals and large research grants. However, these scientists recognized that their assertion of expertise depended on their public observance of community norms, and therefore made efforts to respect these expectations. For example, a PRU manager requested that an expert contractor ask a high-ranking academic—who did not work with PRU—to give PRU data, which managers would use to choose compounds for further development. However, the expert refused, replying to the PRU manager, "It is quite a lot to ask someone for raw data on an experiment. It is quite rude… If they were collaborators of ours, it wouldn't be an issue." The contractor perceived that the manager's request was contrary to a general expectation of the scientific community, namely, that scientists do not use non-collaborating scientists' unpublished data for private gain. Therefore, the expert refused to comply with the manager's request.

Similarly, during one meeting between two PRU managers and two expert scientists, one contractor reprimanded himself for failing to properly supervise his postdocs. A PRU manager stated that one postdoc was not producing work at the rate PRU wanted, and the contractor explained how he planned to improve the postdoc's output. While discussing these plans, the expert shamed himself for his previous mishandling of similar situations with his lab personnel: "I am going to approach this differently than when I've had problems like this in the past. I am learning from my past mistakes. I need to be more positive, say 'I want to be here to help you.'" Thus, the expert reproached himself for neglecting his duties as a mentor.

Additionally, as shown in the above examples of highlighting, experts generally did not dispute managers' identification of normative breaches, reflecting their recognition of and respect for scientific principles. As illustrated below, contractors disputed highlighting only when they believed they did not actually transgress a scientific norm. And as expected, managers' identification of normative infractions overcame impediments to project progress only when it was performed publicly through the practice of highlighting, therefore posing a potential challenge to contractors' claims of expertise. In the two cases where managers alluded to experts' normative infractions in private, contractors did not alter their actions.

In sum, expert scientists wanted to maintain their membership within the scientific community, and recognized that this depended on general conformity to scientific norms. Therefore, highlighting helped PRU managers manage contractors because it accentuated

normative infringements. However, as discussed in the next section, highlighting alone did not guarantee that contractors conformed to managers' requests.

Highlighting Alone Does Not Necessarily Overcome Impediments. As shown in Figure 2, highlighting alone did not always resolve expert scientists' impeding of drug development projects. Highlighting alone was effective only when it elicited a defense from a contractor that revealed additional information which, in turn, resolved the impediment. For example, during a project meeting between six PRU managers and three expert scientists, one contractor presented several slides displaying results from a series of experiments he performed the previous week. The scientist explained that the results suggested one compound in particular could be developed into a drug. He suggested PRU hire another contractor, who had knowledge of a relevant area of biology, to perform follow-up studies on the compound.

In front of the five other PRU managers and two other experts, one PRU manager expressed disbelief that the expert's results were sufficiently supported by data. Referring to one particular figure, the manager asked the expert, "Is that number real?" The manager explained that relative to compounds he previously studied, the figure seemed too high. The manager then stated that the contractor needed to perform supplementary tests that would reveal whether the number was valid or not. The contractor responded that he had already completed these additional tests, and therefore, that the manager's comments were unwarranted. The scientist displayed his findings and described them in detail, talking for approximately five minutes. After the expert finished his explanation, the manager replied that in light of the supplementary data, he was satisfied with the contractor's conclusions regarding the compound. The six managers agreed with the expert's suggestion to have the compound examined in additional studies.

However, experts' retorts did not always resolve impediments to project progress. During a project meeting attended by two managers and four expert scientists, one contractor stated that his laboratory's experiments demonstrated how a particular compound functioned in the human body. He contended that PRU could use this discovery to further develop the compound into a drug. However, one PRU manager questioned this conclusion. The manager—who only had rudimentary knowledge of this area of biology—expressed concern that a subset of the expert's data contradicted his assertions, and therefore that he was making claims without sufficient empirical support. The contracting scientist replied with a two minute explanation as to why this

was not the case. After finishing his account, the expert asked if the manager now agreed with his conclusions. The manager replied in an apathetic tone, "Sort of." The contractor provided no more information regarding the experiment and instead moved on to discussing other data, while the PRU manager remained unconvinced that the expert's assertion was valid.

There was an additional reason highlighting did not consistently overcome impediments to project progress. In particular, when PRU managers highlighted without regularly reintegrating, experts became annoyed with managers for referencing their normative infractions while foreclosing possibilities for behavioral adjustments. For example, one PRU manager repeatedly highlighted a group of scientists' failure to empirically support their claims, but he did not regularly engage in reintegrating. At one point, the manager asked a professor to join the project, and arranged a meeting between this academic, the group of experts, and himself. During this meeting, the manager—and, as he hoped, the academic—pointed out when the contractors made unsupported assertions. However, the manager did not provide the contractors with an opportunity to publicly amend actions. For instance, he did not schedule follow-up meetings between the contractors and the academic.

Over several months, the manager continued to engage in highlighting without reintegrating. Although early on in the contractual relationship the manager reported at PRU-only project meetings that he established a friendly relationship with the experts, as months passed, the relationship dissolved. The experts directly told the manager they disliked how he treated them; they viewed him as policing their behavior without giving them a chance to alter their actions. As the manager quipped, "I've turned into the bad cop with [the contractors]." Unsurprisingly, as the relationship eroded, the manager faced increasing resistance from the experts.

In sum, highlighting alone did not necessarily resolve expert scientists' impeding of PRU drug development projects. However, as discussed below, highlighting followed by reintegrating helped managers overcome the difficulties posed by expert contractors.

Reintegrating. The second step in occupational invocation was reintegrating, in which PRU managers provided and communicated an opportunity for an expert to publicly rectify his or her scientific norm violation, and by extension, potentially maintain claims to professional

prowess. As with highlighting, reintegrating generally took place in front of an audience of scientific experts, experts' lab personnel, and other PRU managers.

During the meeting in which two PRU managers highlighted the expert scientist's insistence on developing Compound 524 without providing supporting data, PRU managers also reintegrated the expert. One of the original two managers proposed that the contractor perform the additional, extensive study on a compound that reached a high enough concentration in animals. The manager believed that such a compound might eventually become a drug, unlike Compound 524. Another PRU manager similarly stated that the expert might need to gather and present more data before he could identify which compound to use in the final study. Therefore, both PRU managers suggested that the contractor gather supplementary data, which he could then use to justify his selection of compound to other scientists assigned to the project. In other words, the two PRU managers presented the expert with an opportunity to publicly demonstrate his conformity to the common scientific expectation that assertions should be supported with empirical evidence.

Similarly, the PRU manager who highlighted the academic's rejection of the biotech scientists' work also engaged in reintegrating. During the same project meeting, the manager suggested that the professor organize a series of control experiments to test his contention that the biotech's technology did not produce accurate results. The manager said that he would then ask the biotech experts to perform these experiments, which would openly display the academic's willingness to empirically test his claims. Therefore, the PRU manager provided the expert with an opportunity to publicly support his statement that the biotech scientists' technology was defective. Table 3 contains additional examples of reintegrating, building on two of the examples of highlighting described above. Table 2 also contains examples of PRU managers reintegrating expert scientists.

-------Insert Table 3 about here-------

Reintegrating helped overcome expert scientists' impeding of drug development by addressing two challenges generated by highlighting. First, reintegrating allowed PRU managers to maintain their relationships with experts. This was because through reintegrating, managers pacified contractors by offering them a chance to publicly amend their actions. For instance, during one meeting a PRU manager highlighted that a contractor did not provide enough data to support his scientific claims. The contractor was upset, telling the manager he was "pissed off"

by his remarks. A few days later during another project meeting, the expert answered PRU managers' questions curtly instead of with his usual long explanations. Another PRU manager then took action to reintegrate the expert through a private phone call: "Hey [Name], you sounded really angry. What is the problem?" The expert reiterated why he was upset, to which the PRU manager replied, "What we are lacking is this piece of data, and you need to generate it, and as soon as you generate it we can make a decision on that compound." The manager also reaffirmed that the expert could share this data at a future project meeting, as was the scientist's usual practice. Through his words, the PRU manager thus reinforced the other PRU manager's underscoring of the expert's normative breach, while also providing the contractor with an opportunity to publicly amend his actions. Unsurprisingly, after the conversation, the contractor was no longer angry with the PRU managers.

Second, reintegrating allowed PRU managers to suggest actions that would both remedy the normative breach and—from the perspective of managers—best address impediments to project progress. For example, when the expert failed to include three other contractors as co-authors, he could have remedied his normative breach by sharing credit with many members of these contractors' labs. However, spreading credit widely would "dilute" the credit of the three internationally renowned contractors, whose names were most likely to garner support for PRU's patent claims. Therefore, the manager suggested to the expert that the three contractors' lab personnel did not need to be included on the publication. By suggesting authorship be reserved for only the three famous scientists, the manager thus suggested an action which he believed addressed the impediment to project progress while also amending the expert's normative infringement.

Occupational Invocation Overcomes Impediments. By influencing experts' actions, occupational invocation allowed PRU managers to pursue their goal of developing marketable drugs. In particular, after managers engaged in occupational invocation, experts altered their actions so that they no longer publicly defied scientific norms, and correspondingly, resolved impediments to project progress (Figure 1). For instance, after PRU managers highlighted and reintegrated the contractor who wanted to develop Compound 524, the expert no longer insisted on studying the chemical compound. Instead, during the same meeting in which occupational invocation took place, the expert agreed to perform his next experiment using a compound that

reached the correct concentration level in animals, and by extension, could potentially become a drug. He said to the managers, "Let's wait until we have the perfect compound to do this properly." The scientist then performed and presented a series of other experiments that helped determine what compound he could use in the follow-up study, advancing PRU managers' goal of developing a marketable drug.

Similarly, after the manager highlighted and reintegrated the professor who rejected the biotech scientists' work, the academic no longer resisted the manager's request to perform a follow-up study. During the same meeting in which occupational invocation took place, the professor publicly agreed with the manager's suggestion to design control experiments and share them with the PRU manager and biotech scientists. He also stated that he would perform and report on any requested follow-up studies if these control experiments demonstrated that the biotech technology produced accurate results. The PRU manager thus overcame the professor's resistance to using the technology, and was able to continue contracting studies to both the academic and biotech scientists. Table 3 contains two other examples of how occupational invocation overcame impediments to project progress.

Conditions Facilitating Occupational Invocation. Two conditions facilitated managers' engagement in occupational invocation rather than alternative management practices. First, PRU managers needed a basic understanding of scientific norms to engage in occupational invocation. At PRU, all but one manager had this prerequisite knowledge. Of the 21 managers, 17 were PhD scientists. Of the four managers without PhDs, two previously worked in laboratories for over a decade and another had interacted extensively with his PhD-trained colleagues and regularly read journal articles. Only one manager, whose background was in business, did not understand basic norms of the scientific community. The manager readily acknowledged this limitation: "I just don't understand the science. Someone could do a better job at that than me." Unsurprisingly, while all other managers whom I regularly observed engaged in occupational invocation at least once, this manager never engaged in the practice.

It is important to note that managers only needed a basic understanding of scientific norms to engage in occupational invocation. In other words, managers could engage in occupational invocation while lacking mastery of experts' specific skills and knowledge. Although most PRU managers were PhD scientists, none came close to attaining the level of

proficiency of these "subject matter" experts, who devoted decades to research on a particular disease. As one manager explained, "Getting back into the science at the level of the [experts] is challenging. For all of us here." Similarly, another PRU manager stated, "We don't have the level of expertise that would be useful to be able to direct them." In sum, to engage in occupational invocation, managers needed to understand scientific norms but did not need to fully comprehend experts' work.

Second, managers engaged in occupational invocation when experts' impeding of project progress could be plausibly framed as a normative violation and rectifying this transgression overcame the impediment to project progress. If this was not the case, an alternative managerial practice was engaged in. In one example, a scientific contractor failed to complete studies that two managers requested. The expert informed the managers that she had a serious health issue which prevented her from completing the work. Occupational invocation was not used in this case. Instead, PRU managers and the scientist agreed to end the contractual relationship. Similarly, in cases where legal difficulties were encountered—such as when a professor's university required particular documents to be signed before PRU and the academic transferred experimental materials—managers did not engage in occupational invocation. Instead, they relied on PRU's legal and business specialists to resolve the issue by working with contractors' legal representatives.

Alternative Managerial Practices are Less Effective in Overcoming Impediments

There were three alternative practices that PRU managers regularly engaged in when trying to resolve expert scientists' impeding of projects: altering the formal structure of the contracting relationship, ordering the expert to act in a particular way, and contacting the expert frequently (Table 4). In some cases, these practices resolved experts' impeding of drug development. In one example, a PRU manager struggled to get a contractor to reply to her request to set up a meeting. After emailing the scientist twice, the manager called him. The expert answered, and the two arranged a time to talk about his work. However, as shown in Figure 2 and Table 4, unlike occupational invocation these practices did not consistently resolve experts' impeding of project progress. For instance, as in the previous example, in some cases managers' repetitive contacting of an expert elicited a response. But I also observed three cases in which PRU managers

similarly emailed and called contractors repeatedly, but experts did not reply to the managers and the impediment was not resolved.

-------Insert Table 4 about here-------

Further, PRU managers did not overcome expert scientists' impeding of drug development using common practices for managing experts: rewarding, punishing, and socializing. PRU managers could not easily incentivize experts with additional monetary compensation. In particular, the granting of extra funds required contractual renegotiation, a lengthy process involving lawyers from both parties. As one PRU manager quipped, "There is a lot of bureaucracy." Additionally, most expert scientists were academics, and correspondingly focused on publications rather than profits, a reward that PRU managers could not directly offer.

Punishing experts also did not overcome expert scientists' impeding of project progress. Instrumental punishments were difficult to enact because, like rewards, they often required a lengthy renegotiation process. PRU managers also did not want to risk angering contractors because they were difficult to replace; if PRU managers upset an expert and the expert then refused to work, a project could stall indefinitely. As one PRU manager explained to her colleague, "I do not care if we piss off our [internal] team, I just can't piss off [the expert]." Given their desire to placate contractors, managers eschewed punishments.

Finally, socializing did not overcome expert scientists' impeding of projects. PRU managers interacted with contractors primarily through monthly teleconference meetings, which did not allow for the rich, thick interaction required for socialization. Additionally, many experts were embedded in their own social context of academia and were not interested in immersing themselves in pharmaceutical culture. One academic expert constantly referred to "rival" professors during meetings with PRU managers and often discussed his desire to publish results before these other academics. In contrast to his active engagement in academia, the professor did not regularly attend industry events or contact pharmaceutical scientists. In sum, PRU managers rarely rewarded, punished and socialized experts. And in the seven cases that these three practices were used, none resolved experts' impeding of project progress (Table 4).

DISCUSSION

These findings contribute to the literature the management of experts as well as the literature on contracting.

Management of Experts

Although organizations often rely on experts for the completion of essential tasks, in many cases managers struggle to manage expert workers. Experts may ignore or actively resist requests, and managers may lack the skills and specific knowledge required to supervise these expert workers (Kirsch, 1996; Newell et al., 2002; Kellogg, 2009). The literature on managing experts emphasizes the importance of rewards, punishments, and socialization. However, as shown in this paper, these practices are not necessarily effective when experts are external rather than internal employees. This raises the question: How can managers manage expert contractors?

PRU managers influenced expert scientists through the process of occupational invocation. In this process, PRU managers first highlighted experts' neglect of shared occupational norms, thereby challenging their claims to expertise. Following this exposure of scientists' deviant behavior, managers reintegrated experts by providing them with an opportunity to publicly correct their actions such that they aligned with both the scientific community's normative expectations as well as PRU's goal of drug development. Through this process, occupational invocation helped PRU managers alter the actions of expert workers, and in turn, overcome impediments to drug development.

There are three primary reasons why occupational invocation—unlike traditional managerial practices—enables the management of experts external to the organizations. First, occupational invocation relies upon norms that cut across organizational boundaries. As shown in this paper, PRU managers referenced common expectations of the scientific community, such as those around empirical validity and mentorship, to redirect expert contractors' actions. Therefore, by relying upon an interorganizational normative order, managers may be able to manage expert contractors. In contrast, traditional managerial practices rely on organization-based rewards, punishments, and socialization, which managers may not be able to invoke when interacting with expert contractors. For example, PRU managers did not alter expert scientists' monetary incentives because doing so would entail a lengthy renegotiation process.

Second, managers are able to engage in occupational invocation with relative ease when interacting with expert contractors, provided that managers possess knowledge of the relevant occupational norms. At PRU, managers were able to reference community expectations during project meetings, which were the primary form of interaction between managers and experts. In

contrast to occupational invocation, common managerial practices may be difficult for managers to implement when supervising experts external to the organization. For example, as shown in this study, PRU managers struggled to socialize expert scientists, who rarely visited PRU and only talked to managers on a monthly or bi-weekly basis.

Finally, occupational invocation enables the management of expert contractors by maintaining the organization's relationship with these external workers. Specifically, reintegrating helps preserve managers' relationships with experts by offering contractors an opportunity to rectify norm violations, and in turn, reaffirm their expertise. Relationship maintenance is particularly important for outsourcing organizations when they cannot easily replace expert contractors, as in the case of PRU. However, even when an organization is not dependent on a particular expert, relationship maintenance may have organizational benefits. For example, it allows firms to avoid the lengthy process of negotiating a new contract (Macaulay, 1963; Uzzi, 1997). In contrast to occupational invocation, common managerial practices such as punishing may undermine an organization's relationships with experts by angering these workers, as shown in this study.

This paper also suggests that as organizations increasingly externalize expert work (Smith, 1997; Barley and Kunda, 2006; Kalleberg, 2011), the bases of managerial control may shift from organizational resources and value systems to occupational norms. This implies that as in the case of PRU, organizations may need to hire managers trained in the same occupational community as the experts they supervise. Further, these findings suggest that experts may have difficulty resisting occupationally-based forms of managerial influence. Relative conformity of professional norms is a condition for claiming expertise (Goode, 1957; Fauchart and von Hippel, 2008). Therefore, occupational invocation's highlighting of normative transgressions may force experts to choose between complying with managerial requests and diminished professional status. Many professionals may opt for the former, as claims to expertise may enable workers to receive career rewards and enact their vocational identity (Whitley, 1984; Vough, 2012; Ashcraft, 2013).

This is not the first study to examine how challenges to workers' expertise can be used to manage expert work. For instance, Huising (2014) finds that by labelling expert work practices as problematic in relation to organizational goals, managers can erode experts' power through codifying their work tasks and then transferring these tasks to other employees. However, in the

case of experts external to the organization, common organizational goals cannot be invoked. Further, when an organization's aim is to *outsource* work, allowing this work to remain within the organization is counterproductive. This paper demonstrates that community norms, which cut across organizational boundaries, can be used to manage outsourced work without requiring permanent employees to reinternalize tasks.

Contractors and Contracting

The literature on both expert and non-expert contractors has emphasized the precariousness of these workers' employment situation, in which many qualified individuals compete for relatively few jobs (Standing, 1999; Kalleberg, 2011). In such circumstances, workers lack labor market power, and managerial control can be enacted by replacing or threatening to replace contractors who do not complete managers' requests (Haunschild, 2003; Peel and Boxall, 2005). However, as in the case of PRU, an organization may become reliant on expert contractors who have skills or knowledge that are difficult to replace (Barley and Kunda, 2004: 193-198; Peel and Boxall, 2005). Under these circumstances, managers may not be able exercise control through either exiting or threatening to exit the contractual relationship.

This paper finds that when an organization is dependent on expert contractors, occupational invocation is one practice that may enable managerial influence. Even if an organization cannot credibly threaten to exit a given contractual relationship, highlighting may motivate an expert contractor to alter his or her actions by emphasizing normative transgressions. This is because highlighting may present contractors with the potential diminishment of a valued resource—namely, their expert status. And through reintegrating, managers are able to lessen the harshness of their exposures of experts' normative transgressions and, in turn, sustain the contracting relationship.

The contracting literature has emphasized that as the outsourcing of high-skilled tasks becomes more common, occupational communities are increasingly important in facilitating workers' careers. For instance, contractors may rely on professional associations to receive additional training or identify job opportunities (Kunda, Barley, and Evans, 2002; Barley and Kunda, 2006; Standing, 2009). Further, to facilitate future employment, contractors may try to enact norms of professionalism such as accountability to clients (Osnowitz, 2006; Blatt, 2008). This paper adds to our understanding of the relationship between occupational communities and

contract work by showing how outsourcing organizations may rely on occupational norms to manage contractors. Therefore, while occupational communities may facilitate workers' mobility *between* organizations, they may also enable managerial control over contractors once they enter relations with a given organization.

Future Research

This study suggest several directions for future research, particularly in regards to exploring these findings' boundary conditions. As explained above, occupational invocation requires that managers possess knowledge of community norms and that experts' actions are relatable to these norms. However, there are many situations in which one or both of these conditions are not met. For example, in many emerging occupations, professional norms are highly ambiguous (Fayard, Stigliani, and Bechky, 2017); thus, experts' actions are not clearly relatable to community expectations. Future research can explore the management practices engaged in under these circumstances.

Over the past several decades, organizational employment practices have altered form; some organizations now allow permanent employees to work remotely (Wiesenfeld, Raghuram, and Garud, 2001; Mazmanian, Orlikowski, and Yates, 2013; Kelly et al., 2014) and many firms have eliminated internal job ladders (Cappelli, 1999; Galunic and Anderson, 2000; Bidwell and Briscoe, 2010; Bidwell, 2011). Given these organizational changes, it may be more difficult for managers to engage in traditional managerial practices when supervising permanent employees. For example, with the rise of virtual work, managers may struggle to socialize employees through daily interactions with coworkers. Therefore, managers may need to rely on alternative practices to influence experts both external *and* internal to the organization. Future research can explore if occupational invocation can be used to manage permanent employees.

Finally, this paper suggests that workers may have difficulty resisting managerial control practices that rely on occupational expectations because experts' claims to professional prowess depend on general normative conformity. Future research drawing on our understanding of employee resistance efforts (e.g. Prasad and Prasad, 2000; Courpasson, Dany, and Clegg, 2012) can explore if there are conditions under which experts are able to successfully counter these forms of managerial influence.

Table 1. Experts' Impediments of PRU's Drug Development Project Progress

Impediment	Example	Frequency
Expert opposes PRU manager's decision as to next steps in assigned work	Experts disagree with PRU as to what experiment they should perform next.	30
Expert makes "suspect" scientific claims	Expert contends he identified best compound but has not examined the full set of relevant compounds.	24
Expert completes work weeks or months late	Expert is months late in completing an experiment.	20
Expert communicates slowly or infrequently	Expert does not respond to PRU manager's emails.	12
Expert does not adequately supervise laboratory subordinates	Expert does not provide direction to postdoc who is completing day-to-day laboratory work for PRU.	10
Expert poses legal or contractual difficulty	Expert refuses to attend meeting at PRU unless PRU pays for his flight.	7
Other		17
Total		120

Note: Impediments that occurred five times or less are included in "Other".

Table 2. Examples of PRU Managers Highlighting and Reintegrating Expert Scientific Contractors

Scientific Norm	Definition	Example of Managerial Highlighting	Example of Managerial Reintegrating
Empirical Validity	Scientific claims must be supported with valid empirical evidence.	"You need to generate data."	"As soon as you generate [data] we can make a decision on the compound."
		"You need to get some data."	"I guess you will have to do the experiments."
Sharing of Credit	Scientists who contribute substantively and substantially to a scientific project should receive credit for their work.	"My expectation is that we are publishing that work together as we started it together. I feel like that has to happen based on the work we've done."	"We need [the other contractors] as authors. I would resist going broader because there is no other data from those labs."
		"It took a substantial amount of time on my end. It's not like I whipped off a compound. It was rather time consuming. I had to do a lot of thinking about of it."	"I noted that [PRU manager] was not on [the paper] and I would appreciate if he was on there."
Mentorship	Senior scientists must supervise and mentor their subordinates.	"[Recording data] is not bullshit."	"We want to make sure everything that gets in papers is properly documented."
Partnership	When scientists collaborate together, individual partners should complete work in the manner collectively agreed upon.	"You can't just switch the road you are on."	"If we all agree we want to [do the experiment] together, we all agree this is what we want to get done."

Table 3. Examples of PRU Managers Engaging in Occupational Invocation of Expert Scientific Contractors

Impediment	Example of Managerial Highlighting	Example of Managerial Reintegrating	Resolution
Expert insists on performing study using a compound lacking supporting data.	In front of four other scientists, two managers point out the expert's lack of supporting data.	Managers suggest the expert performs and presents experiments using different compounds.	Expert no longer insists on performing study with original compound. He performs and presents experiments that identify potentially developable compounds.
Expert refuses to study compounds requested by a PRU manager, stating that the compounds were selected by a faulty technology.	In front of seven other scientists, the manager emphasizes that the expert lacks empirical evidence that the technology is faulty.	Manager proposes the expert designs and shares experiments that test his claims.	Expert publicly agrees to design and share experiments, and no longer refuses to perform study.
Expert does not add names of three other scientific contractors to publication co-authored with PRU.	In front of the expert's two postdocs, the manager states that the three contractors contributed to the publication's findings.	Manager suggests that all three contractors—but not their peripheral lab members —should be added to the publication.	Expert adds three contractors' names to publication.
Expert's postdocs are not transmitting organized and complete datasets to PRU.	Over several interactions (emails, meetings) two managers publicly state that the postdocs' understanding of data organization and transmission is an important part of their training.	Managers recommend that the expert openly enforce data organization and transmission standards among his postdocs.	Expert enforces standards among postdocs. Postdocs transmit organized and completed datasets to PRU managers.

Table 4. PRU Managers' Use of Alternative Managerial Practices in Response to Experts' Impeding of Drug Development Project Progress

Managerial Practice	Example	Frequency	Impediments Overcome
Occupational invocation	PRU manager points out expert is not actively advising postdocs and suggests she spends more time with postdocs.	42	42 (100%)
Alternative Managerial Practices			
Altering formal structure of relationship	PRU manager schedules regular meetings with experts.	20	11 (55%)
Ordering expert	PRU manager tells expert that he must focus on completing work on time.	15	3 (20%)
Contacting expert repeatedly	PRU manager emails expert twice and then calls expert.	8	5 (62.5%)
Taking no action	PRU manager does nothing.	7	0 (0%)
Other		28	16 (57.1%)

Notes: Managerial responses that occurred five times or less (including rewarding, punishing and socializing) are included in "Other" category. Rewarding, punishing and socializing never overcame impediments. For some impediments, managers engaged in multiple alternative managerial practices.

Figure 1. Process Model of Occupational Invocation.

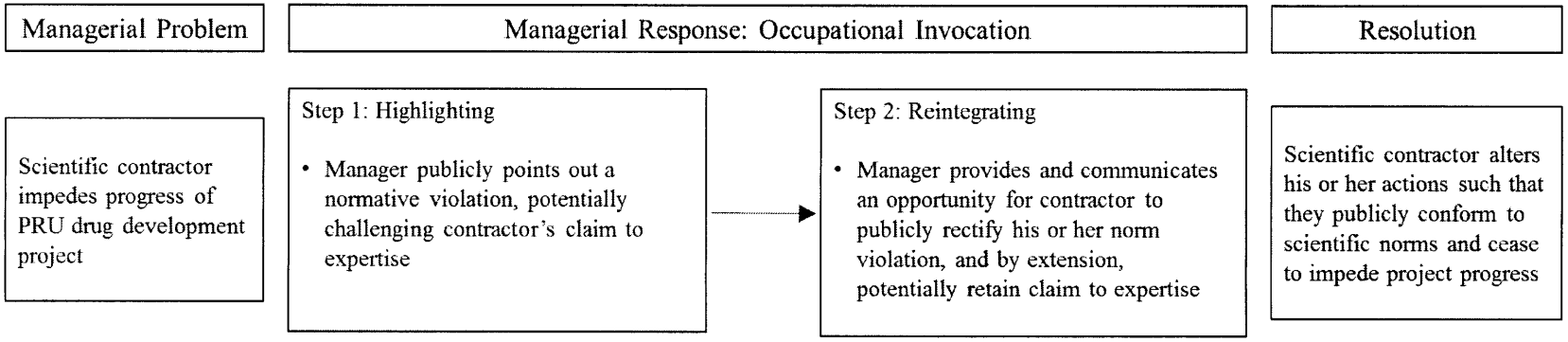
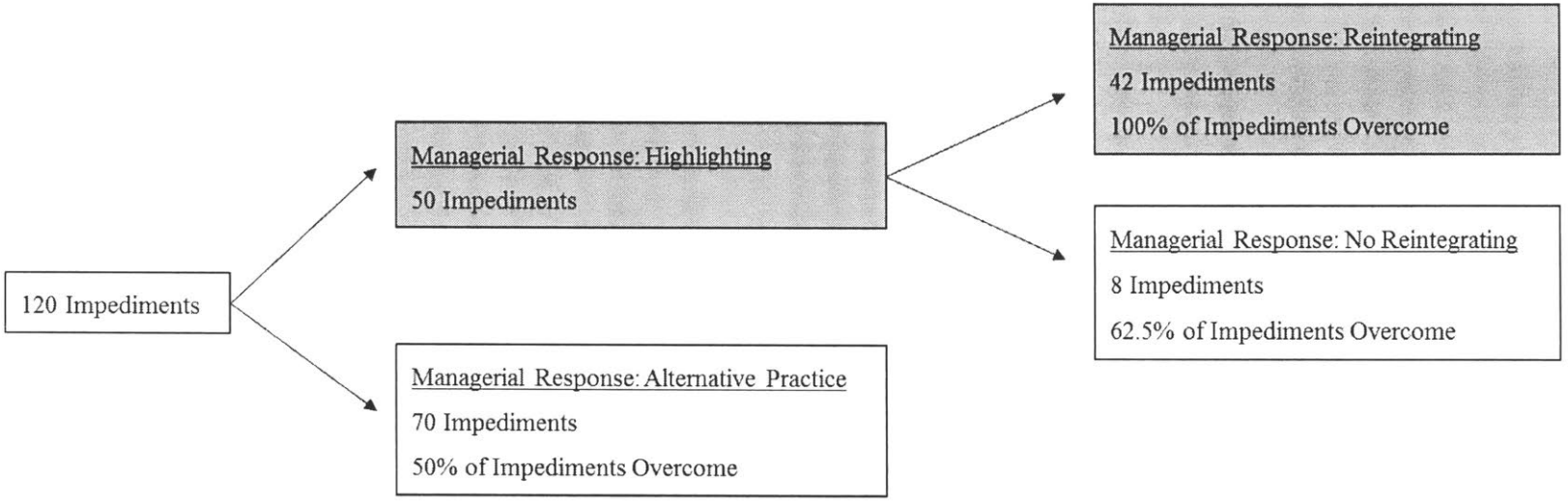


Figure 2. Success Rates of PRU Managers' Responses to Experts' Impeding of Drug Development Project Progress.



Note: Occupational invoking consists of the two shaded boxes, that is, highlighting followed by reintegrating.

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