

# **GOING OFF-PISTE: THE ROLE OF STATUS IN LAUNCHING UNSPONSORED R&D PROJECTS**

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## **INTRODUCTION**

Creative breakthroughs often result from a recombination of knowledge from different domains that produces unexpected but very valuable solutions (Fleming and Sorenson, 2001; Dahl and Moreau, 2002). Many creative ideas emerge from the margins of organizations as the result of autonomous activities by individuals and teams (Burgelman, 1983a; Burgelman and Sayles, 1988; Rosenkopf, Metium, and George, 2001). However, the individuals and teams involved in these activities may develop ideas that do not fit clearly within the organization's intended set of actions, so that they are not in line with its strategy or resource position (Burgelman, 1983b). In this case, management often attempts to bound these creative efforts in the form of 'official' projects which provides them with legitimacy, and by creating institutions and structures to influence and direct individual creative efforts through training, resource allocation, communication, and coordination (Cooper, 1990).

At the same time, there is a large body of research suggesting that some individuals consciously defy these structures to engage in innovative efforts they consider more valuable or simply more interesting (Unsworth, 2001; Mainemelis, 2010). 'Un-sponsored' innovation projects (i.e., initiatives launched by individuals outside the organization's official R&D program) require time and organizational resources on top of what is required by the individual's regular work, and, if left untended, will produce a garden of weeds and dilute the organization's ability to innovate effectively and efficiently (Kanter, Kao, and Wiersema, 1997). However, such projects may also turn out to be the very harbingers of novelty, creating opportunities for organizations to break away from their routines, filters, and frames (Burgelman, 1983b). Thus, by bounding individuals' creativity, managers may sometimes stifle the very output they desire—innovation—and individuals may take it upon them to purposefully break these rules.

Several authors highlight the importance of studying the individuals that engage in proactive creative activities (Amabile, 1996; Unsworth, 2001; Shalley, Zhou, and Oldham, 2004) such as bootlegging (Augsdorfer, 2005; Criscuolo, Salter, and Ter Wal, 2014), creative deviance (Mainemelis, 2010), leisure time inventions (Davis, Davis, and Hoisl, 2013), and open source (Henkel 2009). Criscuolo and colleagues (2014) show that individuals can increase their innovative output measured as their contribution to their employers' innovation performance by engaging in unsponsored invention efforts. Yet, these works also show that our understanding of the effects of unsponsored invention projects is restricted by our lack of knowledge about who chooses to engage in them, and why. We argue that this is the case as research on unsponsored invention largely examines the effects of individuals engaging in this behavior. In turn, we suggest that in order to understand how and why unsponsored projects eventually may contribute

to the firm's innovative performance, we need a better understanding of why individuals choose to engage in this behavior or not.

To address this issue, we propose to extend existing arguments through an institutionalist perspective. In line with other authors, we conceive of engagement in unsponsored inventions as a form of benevolent proactive creativity (Unsworth, 2001; Mainemelis, 2010), which implies that individuals openly or implicitly ignore the organization's goals, structures and rules, and thus partially violate the norms and criteria against which their behavior is evaluated. Specifically, in line with the idea of creativity as a social process embedded in organizational structures and (larger) networks (e.g., Perry-Smith and Shalley, 2003; Perry-Smith, 2006), we employ categorization and status-related arguments (e.g., Perretti and Negro, 2006) to identify which individuals will be the most likely sources of unsponsored ideas, and to shed light on the contextual factors limiting or boosting this behavior.

We investigate these arguments by drawing on a unique dataset of all inventions recorded by a multinational organization between the mid-1990s and the late-2000s, which provides information on whether the invention was part of a sponsored project or not. We assess the status of inventors based on their position in the inventor network in the years prior to their invention, and examine how this position shapes the propensity for unsponsored invention. We find support for three out of our four hypotheses. Crucially, we find clear evidence of middle-status conformity; we also find that this effect is moderated by the newness of the invention's technological category, and the organization's competitive position. Inventor location and affiliation to a research center have no significant moderating effect.

Based on our findings, we make two contributions to the literature. First, we draw attention to the drivers of individual proactive creative behavior (e.g., Amabile, 1996; Unsworth, 2001) of which unsponsored R&D projects are a type. By theorizing about how this behavior might be driven by status considerations, we explain which individuals should be more or less inclined to choose to engage in such behavior, and why. We thus pave the way for more elaborate studies of the outcomes of such processes. Second, we contribute to the literature on middle-status conformity (Phillips and Zuckerman, 2001; Phillips, Turco, and Zuckerman, 2013). Notably, we go beyond applying this theory to another context, but use this opportunity to theorize and empirically validate some key assumptions underlying this perspective by showing how idiosyncratic and changing evaluation schemes influence individual status-attainment opportunities. Specifically, we extend the link between work on middle-status conformity and recent work on categories and categorization (Vergne and Wry, 2014; Grodal, Gotsopoulos, and Suarez, 2015), and research highlighting how social norms traditionally considered to be loyalty-inducing (Perry-Smith and Shalley, 2003; Phillips, Turco, and Zuckerman, 2013) may have the opposite effect in the context of unsponsored creative efforts.

## **STATUS AND UNSPONSORED INVENTION**

We argue that individual willingness to break away from the organization's formal structure is shaped by the relative position in the organization's status hierarchy. In particular, individuals in middle positions should be more likely to conform to formal systems, rules, and regulations compared to individuals in low or high positions (Asch, 1951; Blau, 1960). This idea is rooted in the notion of middle-status conformity which reflects social-psychological dispositions that characterize specific structural positions (Phillips and Zuckerman, 2001). Middle-status conformity suggests that individuals in the middle of the status hierarchy have

more to gain from conformance to organizational norms and rules, as they seek to obtain higher status in the organization. In contrast, individuals with high status will be keen to differentiate themselves from others, and have little to gain from conformity. Individuals with low status are not much involved in the struggle for higher status, and their nonconformity generally represents disengagement from the competition over status.

By its nature, unsponsored invention involves two types of risks: *position-related* and *peer-related*. We suggest that high-status and low-status employees will be deterred less by the risks involved in unsponsored creativity: the track record of high-status individuals protects them from these local pressures, while low-status employees operate largely outside the contest for status. However, middle-status employees are likely to fear both loss of position in the organizational hierarchy (i.e., a poor evaluation from their manager) and loss of prestige in the eyes of their peers (i.e., poor evaluation from their peers), and thus may feel pressure to ‘follow the rules’ and conform to the project structure within the organization.

*H1. The network status of the inventor(s) has a U-shaped relationship with the likelihood of an invention being unsponsored.*

We further argue that the effect of middle-status conformity on engagement in unsponsored creative efforts should also depend on the conditions surrounding the inventors considering such behavior. Specifically, as acknowledged by the literature (Phillips and Zuckerman, 2001; Phillips, Turco, and Zuckerman, 2013: 387-390), varying external conditions may lead to status-granting procedures being applied differently to individuals depending on what they do, when they do it, and where they do it. We therefore expect the (U-shaped) effect of middle-status conformity on engagement in unsponsored invention to be moderated by the salience of the rules, norms, and structures imposed by the organization on the work context (also see, e.g., Merton, 1968; Mainemelis, 2010). We focus on three major contextual factors: technology, competition, and location. We suggest that in the case of ideas related to new technological areas, there will be a relaxation of the effects of inventor status on conformity, and middle-status individuals will be more willing to defy the organization’s project structure: as evaluation schemes may be more lenient in new technological areas (Pontikes, 2012) and the additional illegitimacy of working in unsponsored projects in a new category should be relatively small. We argue also that the effect of status on conformity will be shaped by the organization’s competitive position, with the effect of status in relation to unsponsored invention being reduced in ‘good times’ and magnified in ‘bad times,’ as evaluations will become stricter if the firm is under pressure (Staw, Sandelands, and Dutton, 1981; Phillips, Turco, and Zuckerman, 2013). Furthermore, we suggest that the location of the creative effort will have an impact, and will heighten the effect of status in the case of unsponsored invention close to the corporate headquarters where monitoring of categorical conformance can be expected to be high (e.g., Bacharach and Lawler, 1980). Finally, we explore empirically how such behavior may be driven by individual affiliation to a dedicated research center.

*H2. The level of technological novelty of the invention will moderate the effect of inventor status on the likelihood of engaging in unsponsored invention, such that for inventions of high (low) technological novelty, the effect of status is reduced (enhanced).*

*H3. The level of competitive pressure faced by the broader organization will moderate the effect of inventor status on the likelihood of engaging in unsponsored invention, such*

that in periods of low (high) performance, the effect of status is enhanced (reduced).

H4. The physical location of the inventor in the organization will moderate the effect of inventor status on the likelihood of engaging in unsponsored invention, such that the effect of status is enhanced for inventors located at the corporate headquarters.

## DATA AND METHODS

### Research setting

Our study focuses on the entire population of inventors and inventions at Venus, a pseudonym for a large, technology-based company operating in a complex industry. In total, we can draw on a dataset of inventions that consists of around 40,000 invention reports, co-invented by around 10,000 inventors over 14 years. This implies some 80,000 dyadic inventor-invention observations.

### Data

*Dependent variable.* Our dependent variable, *unsponsored invention*, is operationalized (for all individuals per individual-invention dyad) as a binary variable taking the value 0 if the invention is recorded as being associated with an official Venus project, and 1 otherwise.

*Independent variables.* We measure *inventor status* by using the Bonacich (1972) weighted centrality measure, calculated from the one-mode network of inventors within Venus, over the three years prior to the focal invention. Inventors' status is thus determined by the extent to which they co-invent with other high-status inventors in this time window. To identify whether or not an invention is *technologically novel*, we use a binary variable that is equal to 1 if the invention represents a previously unseen (combination of) Venus's internal technology classes at the three-digit level. We operationalize *competitive performance* by a proxy capturing whether the firm is experiencing good (0) or bad (1) market conditions. Headquarters' influence on the inventor is measured using a binary (*HQ employee*) variable equal to 1 if the team member's office address is the same as the firm's headquarters and 0 otherwise.

*Control variables.* *Team size* is an important factor affecting inventive activity and outcomes (e.g., Singh and Fleming, 2010). We control also for inventor team *joint experience*, measured as the number of prior inventions submitted by the inventor team, and the *experience diversity* of the inventor team, captured by the number of technology classes of team members in previous inventions (Singh and Fleming, 2010). Importantly, we also have to account for alternative explanations of individual deviant creative behavior related to access to information and personal skill (see, e.g., Phillips and Zuckerman, 2001: 381f.). To do so, we include inventor *constraint*, operationalized using Burt's (1982) constraint measure calculated for the network of inventors over the three years prior to the focal invention (e.g., Nerkar and Paruchuri, 2005). Additionally, we control for inventors' inventing and patenting experience, using a measure of their *year of first invention* and a count of *prior patents* from Venus's system (Conti, Gambardella, and Mariani, 2014). Since unsponsored invention might be a side effect of other inventive activity, we control for *spillovers* by counting the number of other invention submissions made by the inventor in the two months before and after the date of submission of the focal invention. Finally, we include controls for temporal or technology-related effects: fixed effects for the *month* and *year* in which the invention is submitted, and for the *patent board* to

which the invention is submitted for evaluation.

## RESULTS

To test our hypotheses, we run probit regressions with heteroskedasticity-robust standard errors, with the latter clustered by both inventor and invention to account for non-independence of observations along these dimensions (see Cameron, Gelbach, and Miller, 2011; Kleinbaum, Stuart, and Tushman, 2013).

Our results find support for hypothesis 1. While the estimated coefficient of inventor status is negative and highly significant, the coefficient of its squared term is positive and also highly significant. Following the procedures to test for quadratic relationships suggested in recent work (Lind and Mehlum, 2010; Haans, Pieters, and He, 2015), we find that the null hypothesis of a monotonic or inverted-U relationship is rejected ( $p < 0.001$ ), while the 95% Fieller confidence interval for the turning point is well within the observed range of our data ([0.625; 1.078]). As the value of our inventor status variables increases from 0 to 1 the likelihood of an invention being unsponsored falls from around 33% to around 27%, before rising to around 39% as inventor status increases to 2. Notably, it appears that our effects are driven by a small share of high-status individuals in Venus since the value of the inventor-status variable is less than 1 for over 95% of inventor-invention dyads, while only 29 inventors in our sample have values for inventor status greater than 2.

Turning to hypothesis 2, we find it to be supported as the coefficients on the interactions between technological novelty and inventor status (squared) are significant and of the opposite sign as the main effects of inventor status (squared). Following Haans and colleagues (2015), we also test whether the slope of the U-shaped relationship between inventor status and the likelihood of an invention being unsponsored is significantly shallower if the invention is technologically novel. We find this to be the case, with the difference in slopes either side of the turning points being significant at the 95% level when inventor status is below 0.2 and greater than 1.7.

We find support also for hypothesis 3: the interactions between low firm performance and inventor status (squared) are highly significant and have the same sign as their respective main effects. The results of the test proposed by Haans and colleagues (2015) confirm that the estimated slope is steeper in quarters when Venus performed poorly compared to its rivals, with this difference being significant at a 95% level when inventor status is below 0.7 and above 2.5.

In relation to hypothesis 4, whether or not the individual is working at the firm's headquarters has no significant effect on engagement in unsponsored projects, although coefficient signs of the interaction terms are in line with our predictions. Similarly, we find research center employment does not moderate the status-unsponsored invention relationship: the direction of coefficients suggests the research center employees might be less subject to concerns about middle-status conformity as the coefficients of the interaction terms are far from being significant. Examination of the margin plots and the results of the tests proposed by Haans and colleagues (2015) make clear that these two sets of moderators do not significantly change the U-shaped relationship between inventor status and the probability of an invention being unsponsored.

## DISCUSSION AND IMPLICATIONS

Our results provide some preliminary evidence on how individual engagement in unsponsored R&D projects is driven by status considerations, and how those in turn are subject to firm-level influence and allow us to make two major contributions to theory. First, our paper responds to recent calls for more attention to the non-programmed or even “dark side” of innovation (Anderson, Potočnik, and Zhou, 2014). By drawing on the sociological literature on status and status attainment, we propose a novel explanation for non-conformist but well-intentioned behavior in an innovation context (cf. Gino and Ariely, 2012). Our argument extends discussions of creativity as a networked activity (e.g., Perry-Smith and Shalley, 2003; Perry-Smith, 2006) by highlighting how larger, intra-organizational networks, and organizational norms and design choices come together to influence individual creative behavior. In line with existing work (Ibarra, 1993; Nerkar and Paruchuri, 2005; Perretti and Negro, 2006; Perry-Smith, 2006), we show how differences in individuals’ network positions may explain differences in their proactive creative behavior, and provide a status-based explanation for this variation. In particular, we introduce and elaborate on individuals’ position- and peer-related considerations related to evaluation of this behavior. We show the risk of losing status—through lack of promotion or peer-recognition—contributes to the decision to embark on these efforts or not.

Second, the insights from our paper contribute to the theory of middle-status conformity itself. As Phillips and Zuckerman (2001) aptly describe, this literature started out with the individual as the level of analysis (e.g., Asch, 1951; Blau, 1960). Thus, by looking at individual-level creative behavior, we return to the core of the argument, and also show that it holds in our context. More importantly, however, we pave the way for substantial extensions. In particular, we shed light on what Phillips and Zuckerman (2001: 389) call the “scope conditions”, that is, the environmental conditions (when, what, where) that may affect individuals’ status-attainment process. Extending their insight, we maintain that idiosyncratic and ever-changing environmental conditions lead to individuals of the same a priori status or rank exhibiting different behaviors in the expectation of status-related effects. These effects, so we argue, stem from contextual variables rooted in the place and timing of their behavior and also determine how others around them will evaluate it; most notably, technological novelty and organizational performance.

For practitioners, our work highlights various ways that companies may choose to tackle the issue of unsponsored R&D projects. We make no judgment about whether unsponsored invention is good or bad, but are instead interested in what drives it. Companies could exploit this information to promote or reduce unsponsored invention. Possibly, organizations with scarce resources need to find ways to constrain the unsponsored creative efforts of R&D staff (and inventors). Such firms may engage in rhetoric strategies to label such efforts as malicious and wasting firm resources, ban them and punish transgressing employees. Oppositely, companies that want to encourage unsponsored invention should introduce ways to reduce middle-status inventors’ concerns about position- and peer-related risk. While the ideal is probably somewhere between these two extremes, current examples, such as 3M and Google, highlight that tolerance toward unsponsored invention activity may well be beneficial, and managers may draw on our findings to re-design their R&D organizations so to be able to reap more of these benefits.

## REFERENCES AVAILABLE FROM THE AUTHORS