

Product innovation rumors as forms of open innovation

Timothy Hannigan^{*1}, Victor P. Seidel^{2,3}, Basak Yakis-Douglas^{4,5}

¹Alberta School of Business, University of Alberta, 11211 Saskatchewan Drive, Edmonton, Alberta T6G2R6, Canada; email: tim.hannigan@ualberta.ca

²F.W. Olin Graduate School of Business, Babson College, 251 Forest St., Babson Park, Massachusetts 02457 USA; email: vseidel@babson.edu

³Harvard John A. Paulson School of Engineering and Applied Sciences, 29 Oxford Street, Cambridge, Massachusetts 02138 USA; email: vseidel@seas.harvard.edu

⁴King's Business School, 30 Aldwych, London, WC2B 4BG, UK; email: basak.yakis-douglas@kcl.ac.uk

⁵Saïd Business School, University of Oxford, United Kingdom. Park End Street, Oxford OX1 1HP, UK; email: basak.yakis-douglas@sbs.ox.ac.uk

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*corresponding author

Abstract: Prior studies of open innovation have highlighted the effects of different flows of knowledge between firms and external partners—such as flows of software code, technical solutions, or new product ideas—and how firms face a “paradox of openness” about how open to be to external sources while also appropriating value. There are increasingly flows of more provisional knowledge as well, in the form of product innovation rumors exchanged within online technology blogs. Our study objective was to understand how product innovation rumors are used by firms as both inflows and outflows of provisional knowledge and their effect on the innovation process. Using interview data within a high-technology firm whose forthcoming products were the subject of rumor within technology blogs, we develop propositions regarding how inflows of product innovation rumors affect innovation decisions (while addressing concerns about appropriability and intrafirm knowledge flows) and how outflows from firms may affect stakeholders outside the firm (through selective revealing and influence of technology blog editors). Product innovation rumors in part address the paradox of openness by forming an informal means of open innovation alongside formal processes, and we suggest further research opportunities in this domain.

Keywords: Product innovation rumors; open innovation; organizational legitimacy

1. Introduction

Prior studies of open innovation processes have highlighted the choices firms need to make regarding knowledge flows between firms and external sources and the implications of such choices (Dahlander and Gann, 2010; Felin and Zenger 2014). The knowledge that circulates may include inflows to the firm, outflows from the firm, or a “coupled” approach (West et al., 2014; Sims and Seidel, 2017; Tucci et al., 2016). Prior focus has been on the flows of knowledge such as software code (e.g. von Hippel and von Krogh, 2003; Dahlander and Wallin 2006), technical solutions (e.g., Bogers and Lhuillery, 2011; Egger et al., 2016), or novel ideas (e.g., Fabrizio and Di Minin, 2008; Du, Leten, and Vanhaverbeke, 2014). All of these sources of knowledge are validated as coming from legitimate sources, such as from other firms or from identified members of crowdsourcing communities. However, despite rapidly growing interest in knowledge flows from online sources (Afuah and Tucci, 2012; Bogers et al., 2017), some online knowledge flows, specifically product innovation rumors from technology blogs, have received little research attention. This may be in part due to the fact that product innovation rumors come from a source of debated legitimacy (Deephhouse et al., 2017), and they represent what can be called “provisional knowledge” rather than “validated knowledge” (Mulkay, 1979). Our study objective was to understand how product innovation rumors were used within firms as both inflows and outflows of provisional knowledge and their effect on the innovation process.

The study of product innovation rumors is a neglected yet important domain for scholars of open innovation and of innovation processes more generally for three reasons. First, if we only attend to the flows of validated knowledge in open innovation processes, we risk neglecting a significant parallel stream of provisional knowledge that may also serve to influence the trajectory of innovation in organizations. Second, the study of product innovation rumors can

help to further address and expand our understanding of the “paradox of openness” with regard to how open to be with knowledge (Arora et al., 2016; Laursen and Salter, 2014). And third, from a practice point of view for organizations, internet technologies have made the availability of product innovation rumors widespread in technology blogs as “rumor sites”, and the reach and impact of product innovation rumors can be expected to increase over time.

In our study, we drew on qualitative interviews with members of a large electronic-communication consumer electronics firm to inform our development of propositions for how product innovation rumors are used within firms as both inflows and outflows of provisional knowledge. The focal firm was one for which there were many external sources of product innovation rumors on different technology blogs, and so we were able to gain understanding of how members of the firm make use of product innovation rumors for their own forthcoming products. We used interview data from our informants to develop empirically grounded propositions for how product innovation rumors were used as a form of open innovation.

We propose that product innovation rumors can serve as both inflows and outflows of provisional knowledge to firms, augmenting formal models of open innovation. In an inbound mode, product innovation rumors can work in tandem with legitimate sources of knowledge as sources of insight under concerns regarding appropriability and internal knowledge flows. In an outbound mode, product innovation rumors augment the “selective revealing” (Henkel, 2006) processes of validated knowledge from legitimate sources, as a way to spur on further contributions. These propositions developed from our unique empirical focus on product innovation rumors can serve as the basis for further enrichment of models of open innovation.

In providing empirically grounded propositions related to product innovation rumors as forms of open innovation, we make three main contributions with this study. First, we provide a

new way to address the “paradox of openness” in which individuals in firms can turn to product innovation rumors as sources of insight to augment legitimate knowledge sources that may not be freely available. Second, by describing how firms can themselves influence external sources in the process of seeding product innovation rumors, we build on models of “selective revealing” as extended to the realm of provisional knowledge. And finally, we contribute a model of one form of open innovation—in the use of product innovation rumors—that serves to expand the empirical domain for future studies of how external sources influence the innovation process.

2. Product innovation rumors in the context of open innovation

2.1. Knowledge flows in open innovation

Early definitions of open innovation focused on out-licensing of intellectual property (Chesbrough, 2003) and this led to an association of open innovation with knowledge that is most suitable to strong appropriability (West et al., 2014). As the literature developed, interest shifted to the use of both purposive inflows and outflows of knowledge to accelerate internal innovation and expand markets of external use of innovation (Chesbrough, 2006). In the context of technology firms, West and Gallagher (2006:1), in line with the former definition, defined open innovation as “systematically encouraging and exploring a wide range of internal and external sources of innovation opportunities, consciously integrating that exploration with firm capabilities and resources, and broadly exploiting those opportunities through multiple channels”.

Through open innovation, firms can manage the inflows of external knowledge that can be harnessed in their own innovation efforts (Chesbrough and Bogers, 2014). Inbound knowledge flows can focus on both pecuniary and non-pecuniary aspects (Dahlander and Gann,

2010), such as acquiring new knowledge through prize awards in online innovation contests or sourcing knowledge from external collaborators through ongoing relationships (Cassiman and Veugelers, 2006). In both cases, the inbound knowledge that flows into the firm is from sources that are well-defined, such as specific members of a crowdsourcing contest or a specific university partner (Laursen and Salter, 2006). Outbound innovation can also contain both pecuniary and non-pecuniary aspects (Dahlander and Gann, 2010), such as selling intellectual property or the revealing of code (Gambardella and Giarratana, 2013). Aside from the inside-out and outside-in approaches, some firms are fully coupled with external partners (Chesbrough and Bogers, 2014; Sims and Seidel, 2017), with simultaneous inflows and outflows of knowledge.

Knowledge flows help organizations gain access to resources they need for developing new innovations as well as to improve on existing products (e.g., Chesbrough, 2003), enhancing firm performance by increasing the productivity of the innovation process (e.g., Arora et al., 2001; Laursen and Salter, 2006). Following the research focused on performance-related outcomes, a contemporary focus within the open innovation literature has been how the flows of knowledge are compatible with appropriating returns from knowledge (Cohen and Levinthal, 1990). The “paradox of openness” was coined to describe how increasing openness as a strategy needs to work in tandem with the need to protect intellectual property (Laursen and Salter, 2014; Arora et al., 2016).

To date, research on the paradox of openness has focused on the control of knowledge that takes the form of code or other well-defined intellectual property (e.g. Laursen and Salter, 2014). Recently, West and Bogers (2017) reiterate that openness can indeed pose a paradox for organizations by drawing attention to empirical research findings that find no complementarity between inbound and outbound knowledge. In one such example using a large sample of

European firms, Cassiman and Valentini (2016) find that inbound and outbound knowledge flows not only increase their sales of new products but also increase R&D costs more than proportionally. While empirical studies of the effects of knowledge flow are at times mixed, we will next consider whether we have been considering all types of knowledge in prior research, with a focus on the difference between validated and provisional knowledge.

2.2. Organizational legitimacy and implications for validated versus provisional knowledge

The focus of prior open innovation research has been on how organizations exchange knowledge among partners that typically view each other as having well-established legitimacy. For example, the crowdsourcing innovation platform “Innocentive” establishes its legitimacy in a relational manner (Deephouse et al., 2017) through sponsorship by well-known names in technology, such as Eli Lilly and Procter & Gamble, and the individuals who provide solutions are identifiable and non-anonymous to the firms (Jeppesen and Lakhani, 2010). In many respects, the open innovation literature has always assumed the importance of legitimacy as a background construct, going back to the classic concern of an organization’s “not-invented-here syndrome” (Antons and Piller 2015; Chesbrough, 2003). However, despite the importance of the legitimacy construct in laying the foundations of open innovation, the literature has not explicitly dealt with it in detail. As a result, past research may be blind to variations in legitimacy among partners in open innovation. This may be reflected in the recently recognized need for open innovation to be better integrated into the wider management literature (Chesbrough et al., 2014).

In one state-of-the-art review in management, Deephouse et al., (2017) defines *organizational legitimacy* as, “the perceived appropriateness of an organization to a social system in terms of rules, values, norms and definitions”. This work describes that organizations

are perceived by audiences in various states of legitimacy. Of note is the distinct variation in legitimacy: *appropriate* organizations are either *accepted* as those that are passively taken-for-granted or *proper* ones as those that are actively monitored by audiences (ie. restaurants that are granted a passing grade by health inspectors), and *debated* organizations as those that are challenged by some stakeholders but not others. These are contrasted to the illegitimate state, where audiences perceive an organization to be inappropriate and should thus be “radically reformed or cease to exist” (Deephouse et al., 2017: 10). Our focus will be on contrasting those that have acquired “appropriate” legitimacy versus those of “debated” legitimacy.

Legitimacy has consequences for organizations in so far as this governs stakeholder relations and is an important dimension of organizational survival. Benefits of legitimacy include acceptance by audiences and a lack of critical questioning, obtaining resources, and sufficient trust amongst other organizations to operate as partners (Deephouse and Suchman, 2008). This follows that legitimacy has a “clear effect on social and economic exchange: most stakeholders will only engage with legitimate organizations” (Deephouse et al., 2017: 12). Suffice it to say, for organizations to maintain legitimacy, they act pragmatically in accordance with accepted norms and seek out positive social valuations from audiences. For example, managers may seek consultancies to legitimate their decisions. Furthermore, a consultancy would maintain its own legitimacy by hiring staff with relevant credentials and expertise, and it would stand behind its work, validating the knowledge it provides. In both cases, organizational actors are likely to be signaling competence to stakeholders, and failure to undertake activities associated with favorable outcomes is likely to result in reputational damage and being treated as providing only debated legitimacy.

While legitimacy is a central concept in organizational theory more broadly (Deephouse et al, 2017), it has been given only minor consideration in the field of open innovation, with exceptions such as the case of studying legitimacy in open source software communities (Dahlander and Wallin, 2006; Henkel, 2006). The focus of prior open innovation research has been on understanding flows of validated knowledge from legitimate sources. This focus on validated knowledge may blind researchers to opportunities to consider more pragmatic ways firms may gather and use knowledge from sources whose legitimacy is debated. Building from the Deephouse et al. (2017) typology distinguishing different states of legitimacy, in the next section we develop one perspective of “provisional knowledge” in the form of product innovation rumors coming from sources with debated legitimacy.

2.3. Product innovation rumors

A rumor is a proposition, passed person-to-person, with “a lack of secure standards of evidence,” representing debated legitimacy (Allport and Postman, 1947: 220). Rumors in general are expected in times of ambiguity about future events (Allport and Postman, 1947; Shibutani, 1966). Product innovation rumors are propositions about forthcoming products for which the source is of debated legitimacy, such as from a contributor to an online technology blog. For example, in late 2009 the technology blog *macrumors.com* suggested—without fully validated evidence—that Apple was going to call its upcoming rumored tablet computer the “iSlate” (Chen, 2010). Additional rumors concerning this tablet computer dealt with its possible features and the timing of its forthcoming release. The “iPad” tablet computer was later released by Apple in April 2010.

Rumor is often used when other information from legitimate sources is not readily available. The requirement to act compels managers to make decisions under time pressure, relying on pragmatic forms of knowledge. Mintzberg (1989) noted that “Managers seem to cherish ‘soft’ information, especially gossip, hearsay, and speculation. Why? The reason is timeliness; today’s gossip may be tomorrow’s fact” (1989: 13). From this quote, we see the pragmatism that guides individuals to use rumor to act. Rumors may turn out to be untrue, but the manager may need to draw on knowledge from sources of debated legitimacy under time pressure. While many rumors will turn out to be false, in one study, 43 percent of merger rumors published in the “Heard on the Street” column in The Wall Street Journal turned out to be true (Fine and DiFonzo, 2011:19), further demonstrating the pragmatic value of rumor. Indeed, rumor is seen as having a significant impact on share price (e.g. Oberlechner and Hocking, 2004; Pound and Zeckhauser, 1990). While rumor is often seen as something to be eliminated within firms (Houmanfar and Johnson, 2004; DiFonzo and Bordia, 2000), there is a more pragmatic aspect of rumors in how they contain a degree of knowledge when other information is absent.

In the context of firms developing new innovations, individuals may find themselves with the pressure to draw upon information such as product innovation rumors that have an uncertain provenance. As Nonaka (1994: 15) observes, “information is a flow of messages, while knowledge is created and organized by the very flow of information, anchored on the commitment and beliefs of its holder.” Given the uncertain anchoring of information carried as rumor (Fine and DiFonzo, 2011), we will term the flows of product innovation rumors as *provisional knowledge*, and this will be contrasted to *validated knowledge* (Mulkay, 1979). The process of pragmatically making use of product innovation rumors as provisional knowledge is enabled by sources that have a *debated* state of legitimacy, such as technology blogs, which are

not considered wholly *appropriate* sources at the level of the firm. However, these external sources are also not fully illegitimate. Debated legitimacy implies acceptance by some audiences and not others, as in the case of rumors on technology blogs. The use of product rumors from a source of debated legitimacy is central to our theorizing about the understudied flow of provisional knowledge within open innovation.

The view of product innovation rumors as provisional knowledge reflects what has been termed an extra-organizational level of analysis for open innovation (Bogers et al., 2017). As people collectively attempt to gather information on the direction of forthcoming innovations, rumors may fill this gap (Rosnow and Fine, 1976). For example, there could be several sources of validated and provisional knowledge sought by individuals working within firms for various purposes, as we outline in Table 1. Product innovation rumors about forthcoming features, for example, may be used by individuals in advance of a product becoming available on the market. Once details of a product feature are announced by a firm, it may lead to a rumor being discarded in light of this validated knowledge.

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In summary, while open innovation research typically attends to flows of validated knowledge from appropriately legitimate sources at the organizational level, we can expect flows of product innovation rumor from technology blogs—a form of provisional knowledge from sources of debated legitimacy—to also take place by individuals in firms. Product innovation rumors may serve pragmatic means to make decisions as well as to inform others about forthcoming innovations, yet there is no established research in this domain. Our study objective was therefore to understand how product innovation rumors were used within firms as both inflows and outflows of provisional knowledge and their effect on the innovation process.

3. Methods

Given the lack of prior research on the role of product innovation rumors in the context of open innovation, we conducted a qualitative empirical exploratory study. We conducted thirty interviews with members from a single firm with a high reputation in the consumer electronics industry to understand how they made use of product innovation rumors in their work practices. Our focal firm, which we term “Omega,” had been the subject of many product innovation rumors over the past decade, with discussion of its forthcoming products appearing on a series of technology blogs that were also termed “rumor sites.” In such technology blogs, rumors appear around forthcoming product innovations, and contributors would trade propositions around details such as functionality, price, and material form factors for forthcoming products. Omega had a product portfolio that ranged from consumer devices to enterprise connectivity, and it had offices around the world, producing both hardware and software with major product line updates approximately every eighteen months.

We negotiated field access with Omega to interview product development teams with an eye towards exploring how product innovation rumors were used within firms as both inflows and outflows of provisional knowledge and their effect on the innovation process. An “Innovation Manager” within the firm was committed to assisting our research team, and he was particularly helpful in enlisting interview participants. As our project champion, he was interested in the research questions, but did not influence the design of the study. He also had access to the overall outcomes of the study but not to transcripts or detailed data. We took care regarding the potentially sensitive nature of this data, and we granted participant anonymity to everyone we interacted with.

To select interviewees, we worked with the innovation manager to reach out to a mix of functions across engineering, marketing, and legal departments. Our intent was to gather a broad sample horizontally with senior managers. In doing so, we interviewed senior managers based in the headquarters in North America and across two additional countries in Europe (United Kingdom and Germany). We also used a purposive snowballing technique (Miles and Huberman, 1994) during our interviews to get a sense of those in the firm that might be most likely to consult technology blogs for product innovation rumors.

We then generated the final set of interviewees through multiple emails sent by the innovation manager who invited individuals to take part in our research. Our interviewees included the chief scientist, a core product development manager, an innovation manager, a director of systems engineering and a senior hardware systems designer.

Our interviews followed a simple protocol structured around how firm insiders conceptualize rumors and made use of technology blogs (see the Appendix for our interview protocol). We asked semi-structured questions to support our inductive exploratory method. The range of topics covered included which technology blogs organizational actors follow, individual and team involvement in technology blogs, impressions about company-wide involvement, exploration of the social network of Omega, and views on innovation within the company. We recorded and took detailed notes during interviews, and the interviews were transcribed verbatim.

Results from interviews indicated that a consistent collection of technology blogs calling themselves “rumor sites” were well known to interviewees across the company. Every interviewee except for one mentioned visiting at least three of the same technology blogs. Examples of technology blogs in the realm of electronic-communication devices are *Macrumors*,

Engadget, *BoyGeniusReport*, and *Crackberry*, as summarized in Table 2. These technology blogs differ in terms of their specializations: some focus on specific brands of technology products whereas others are interested in technology products more generally. For instance, Macrumors is a site dedicated to rumors surrounding Apple products. Engadget is a blog designed for the wider audience of technology enthusiasts who frequent social media, listed in 2010 as one of TIME magazine's best blogs (Fletcher, 2010). BoyGeniusReport, originally an offshoot from Engadget, was selected by aggregator Technorati as fourth highest 'technology authority.' Crackberry is a site dedicated to reporting on Blackberry products and has a similar profile to Apple in the smartphone market.

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The interviews revealed some tensions around the appropriateness and legitimacy of the interaction between individuals in the firm and the technology blogs. On the one hand, it was deemed officially illegitimate to formally involve members associated with technology blogs with discussions over internal product decisions. On the other hand, there was a recognition of the existence of technology blogs and their potential value, putting the blogs in the realm of debated legitimacy. We next discuss how our interviews informed our analysis and development of propositions regarding product innovation rumors as forms of open innovation.

4. Propositions regarding product innovation rumors as forms of open innovation

In this section we use data from our interviews in the context of relevant prior theory to develop propositions regarding how product innovation rumors are used as both inflows and outflows of provisional knowledge in firms. An illustration of how inflows and outflows of product innovation rumors connects with a focal organization is given in Figure 1. In this figure,

the bottom portion diagrams the flows of validated knowledge as traditionally found in open innovation studies, such as flows of software code, technical solutions, or product ideas. The top portion diagrams our main contributions: the flows of provisional knowledge in the form of product innovation rumor. The focus of each of the propositions we develop are also indicated in this figure. We next turn to each main proposition that result from our interviews and theoretical development.

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4.1. Product innovation rumors shape perceptions inside and outside the firm

While it is known that individuals inside organizations work to gather new knowledge from external sources of validated knowledge (e.g. Dahlander and Magnusson, 2005; Jaspers and van den Ende, 2010), we found use of provisional knowledge—in the form of product innovation rumor—shaped perceptions and informed decisions among a range of stakeholders both inside and outside the firm. We provide some examples of product innovation rumors shaping perceptions and their effects in Table 3, and we discuss examples in more detail next. While on the one hand the use of new information sources in general may seem plausible, the use of rumors to shape perceptions is surprising because individuals could be expected to privilege validated knowledge and ignore provisional knowledge (see for example, Bitektine, 2011; Bitektine and Haack, 2015).

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We first focus on product innovation rumor shaping perceptions inside the firm. One market intelligence specialist at Omega reflected on the use of both validated knowledge (in the form of market reports) and provisional knowledge (in the form of product rumors) in the firm's innovation process, stating that, *"I need to check [rumor blogs] more often... Innovation is a difficult process... [and] decisions [here] are often reactionary...innovation shouldn't necessarily come [merely] from market research."* This quote also highlights how time pressure can lead to reactionary initiatives, promoting more use of rumors such as the new features that a competitor had under development or the timing of a competitors' product launch.

Rumors thus helped to focus management attention under time constraint. The management of attention is a key factor in shaping perceptions and decisions within a firm (Ocasio, 1997); especially during the pressure and uncertainty of product development, a manager's attention shapes how they make decisions about product features (Benner and Tripsas, 2012). In Table 3, we provide an example of how a rumor's shaping of perceptions would have an effect on the innovation process, for example in informing what features would get slotted into a hardware or software release. Another Omega staff member related how a rumor about a competitors' feature and timing changed perceptions about release plans for their own features, recalling a rumor about a software application that *"got leaked early and it was a different timeline for shipping; it was [originally] in a later time line, and the feedback [within TechBlog] was so immensely positive that it shipped way earlier."*

Product innovation rumors shaped perceptions regarding overall product evolution in the market, with one Omega interviewee relating: *"...this industry moves so fast; nobody can accurately predict what's happening six months out...there is [therefore] a scarcity [of information]. There is no other data out there [other than rumors]. Honestly, there isn't."* As

this quote highlights, staff were subject to great ambiguity about the evolving market. One of the basic laws of rumor in social psychology is that ambiguity drives the exchange of rumor (Allport and Postman, 1947), as people attempt to make sense of new situations (Rosnow and Fine, 1976). Therefore, product innovation rumors are expected in contexts associated with high ambiguity about forthcoming product innovations and related markets. In summary, considering both time pressure and ambiguity, we state the proposition:

Proposition 1a. *Product innovation rumors shape perceptions inside the firm with regard to forthcoming product features and product evolution, especially under time pressure and market and technical ambiguity.*

Product innovation rumors also shaped perceptions outside the firm. One interviewee stated very clearly that nearly everyone outside the firm in marketing or product development positions in the industry also checked technology blogs on a regular basis, offering that: *“I think everybody...checks these [rumor] sites... I think you’d be hard-pressed if you didn’t have a single person in product marketing or development that didn’t read those [rumor] blogs.”* One example of the use of product innovation rumors outside the firm was by suppliers to Omega, and we provide an example in Table 3, where it was related that suppliers would approach Omega having already heard rumors about new developments. We can understand how individuals outside the firm pay attention to product innovation rumors due to perceived information asymmetries. In general, there is information asymmetry between outside stakeholders and managers (Ambarish et al., 1987; Myers and Majluf, 1984) and considerable evaluative uncertainty (Fiske and Taylor, 1991). One likely circumstance in which outsiders face high levels of evaluative uncertainty is during the early stages of product innovation (Chesbrough, 2004), when firms are least likely to share information, and so outside stakeholders would be expected to pay particular attention to product innovation rumors. Under the

development of new technical features and corresponding new markets, there is also great ambiguity that would further lead individuals outside the firm to consult rumor (Allport and Postman, 1947; Rosnow and Fine, 1976). In summary, we can state the proposition:

Proposition 1b. *Product innovation rumors shape perceptions outside the firm with regard to forthcoming product features and product evolution, especially under information asymmetry and market and technical ambiguity.*

4.2. Inflows of product innovation rumors in the context of appropriability

Within an innovating firm, individuals draw on new knowledge generated internally or externally as a part of an open innovation process—such as through partnerships with suppliers, universities, or crowdsourcing platforms. The use of product innovation rumors might be expected to be shunned as illegitimate and avoided as part of decision-making within the firm. However, as we outline in Table 4, product innovation rumors were used alongside legitimate sources of knowledge in making decisions.

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In our interviews at Omega, we found that individuals were referring to insight from technology blogs and helping them to make decisions about their own forthcoming products. One related that “*Most [technology blogs] seem to know what they’re talking about...*” while also noting that the final veracity of the rumor was uncertain, as “*the product rumors can be true or false.*” This corresponds to rumor as being provisional knowledge.

Even with the uncertainty of the eventual truth of the rumor, it was surprising to find rumor used widely in the decision-making process within the firm. Sometimes, information

from a technology blog was used to confirm a direction already taken, with one informant describing how *“product rumors reassure your existing views.”* We were given examples of how quotes from blogs helped to justify a direction already anticipated within the organization.

At other times, product innovation rumors provided new information that was integrated into formal presentations. As outlined in Table 4, individuals scoured technology blogs to help make and justify decisions. One informant related that PowerPoint presentations were prepared with many quotes taken from a popular technology blog, saying *“It was very clear what the [technology blog] source was. I counted the first 50 [comments] and just said there are these many positives and these many negatives...”* Summarizing quotes from a technology blog was something that was used to inform and prioritize decisions within Omega. One of our informants spoke about how they included the logo of the technology blog they were quoting, stating *“oh yeah, I’m pretty sure we ripped it off of the page”* to include in their presentation, and it was acknowledged that *“We routinely include social media quotes, logos, etc. [from rumor blogs]”* in meetings and presentations. One informant related that *“I presented [direct quotes from rumor blogs] as far as the CTO...”*. The range of decision-making actually appeared to span from working-level engineers up to the C-suite, with one informant relating that, *“The VP [Vice President] was the king of looking at social media. He was on (the rumor blogs) all the time.”*

The technology blogs were perhaps not as legitimate as an industry journal or newspaper, yet their information would be circulated within Omega by e-mail to help inform decisions. As one product manager related about one popular blog (which we will call “TechBlog”):

“We got emails about [items on] [TechBlog]. Quite often those...would be forwarded throughout [Omega]... there was never any indication that it was not okay to do it. And we [with Vice President] both emailed each other stuff from those sites. It was never an issue. It would be the same as me taking the newspaper and forwarding an article from a newspaper. There was nothing special given to it other than the fact that it leaked information that reputable sources would. Other than that, it’s [just] data.”

As the above illustrates, rather than being seen as exceptional or deviant, the use of provisional knowledge in the form of product innovation rumors was regularly used across the organization and in concert with information from other more legitimate sources. As per the Deephouse et al. (2017) framework, provisional knowledge is linked to sources with debated legitimacy. Provisional knowledge may be used in ways that may be informing rather than validating, such as justifying a decision with stakeholders. In the quote above, the technology blog was trading in information that employees forwarded within the company. Our data indicated several instances where provisional knowledge was transformed into validated knowledge when senior executives with credibility in the organization lent support and thus validation.

This process of converting provisional knowledge to validated knowledge has been studied in other contexts, most notably in considering the “not-invented-here” (NIH) syndrome. Under the NIH concept, there is an attitude among individuals in an organization constituting a barrier to the use of external ideas (Antons and Piller, 2015; Agrawal, Cockburn, and Rosell, 2010; Lichtenthaler and Ernst, 2006). Antons and Piller (2015), for example, focus on how individuals reject external knowledge for various psychological reasons that are rational at the individual level while being detrimental at the organizational level. Common to research on NIH is that external knowledge is often difficult to integrate in an organization, even if it would be beneficial.

The Deephouse et al. (2017) framework on organizational legitimacy is helpful in conceptualizing how norms of legitimacy can affect how external provisional knowledge can be transferred into an organization. Provisional knowledge may be held at arm’s length due to its

debated legitimacy. Senior managers may alter its status by endorsing the knowledge and thereby changing its perceived legitimacy. For example, Morrison (1966) described an innovation in ammunition technology being rejected by the US Navy because it was developed by a junior officer—and therefore had a debated source of legitimacy amongst the larger organization. However, once President Theodore Roosevelt personally intervened, conferring legitimacy, the Navy then adopted this technology. Social structure can influence how provisional knowledge is treated and integrated into the flow of knowledge in the organization, and a manager’s endorsement of provisional knowledge—such as a product rumor—can provide the legitimacy to enable that rumor to be incorporated into legitimate knowledge flows more generally.

As we have noted earlier, the role of ambiguity and relative lack of information during product innovation is one explanation for seeking inflows of new knowledge, however provisional it may be. For a company developing a new innovation, they can face an ambiguous, nascent market environment that has “unclear customers, undefined product attributes, and no well-established industry value chain” (Santos and Eisenhardt, 2009). Under such conditions, tapping into discussion about the expectations of producers and consumers may be critical to making decisions about the technical features of a product (Rosa et al., 1999; Grodal et al., 2015) yet this conversation may be lacking in more established and legitimate media.

Product innovation rumors fill a gap that may be due to a paucity of other knowledge flows. The constructivist view of rumor (Shibutani, 1966) is based on the idea that exchanging rumors—such as about a forthcoming innovation—is a form of social cognition about possible outcomes (Bordia and DiFonzo, 2004). When we conceptualize rumors as being provisional

knowledge, this enables us to recognize that managers may be utilizing rumor as an input to their own decoding and decision-making processes.

Product innovation rumors may be particularly useful in making decisions under a climate of secrecy and fears about appropriability. One of the great concerns of firms is in how “open” to be to others with regard to the technical challenges they face and the opportunity for outsiders to contribute (Laursen and Salter, 2014). By drawing on product innovation rumors that are circulating outside the organization, managers and other decision-makers have access to provisional knowledge that does not require them to explicitly share their own information, but they can put their stamp of approval on such rumor to make it useful and validated in the organization. Under concerns about sharing information through formal open innovation channels, one would expect the use of inflows of product innovation rumors to only increase. Taken together, the ambiguity of product innovation, ready access to product rumors, and concerns about appropriability lead us to the proposition:

Proposition 2a. *Inflows of product innovation rumors will be used to justify decisions within the firm, with increases under concerns about appropriability and under increased technical and market ambiguity*

4.3. Inflows of product innovation rumors in the context of intrafirm knowledge transfer

The inflow of knowledge to a firm is one of the most researched patterns in open innovation research. Motivations for seeking out external knowledge include the need to access a wider range of possible solutions or to augment internal development with external expertise (Afuah and Tucci, 2012). Our interviews indicated that individuals reached out of the organization to access provisional knowledge in technology blogs to bypass intrafirm knowledge transfer that they found to be challenging or slow to navigate, as is summarized in Table 4.

We heard examples from our informants of bypassing the marketing organization at Omega due to perceived delays with access to information from them. As an example, one informant noted:

“I tried to get the customer insights team to do something for me...and they were like ‘oh minimum two months for any of this information.’ We [in product development] don’t work at that speed, I don’t even know what questions I need to ask until maybe a day before I can make a decision. So you use other data sources [like rumor blogs].”

Provisional knowledge from technology blogs was used by a product development manager to help prioritize a feature list that the team was working on. While he would have liked to have insight from within Omega, he found it hard to work with the culture of the marketing team to provide insight:

(I)t’s not complex to come up with requirements, it’s complex to prioritize them. (I)t was like ‘wow these [Omega marketing] guys are useless’. They were not people who were execution-focused, delivery, let’s kick this out, let’s get onto the next problem. And so you’d bypass them [by going to technology blogs].”

Not only the delay through formal channels also the size and complexity of a large organization made people reach out to technology blogs for information. One informant, a director of engineering phrased it as, *“If you want to know what’s going on in Omega, go to the rumor sites.. It’s not necessarily true, but then again half of what you hear in Omega isn’t either.”* A marketing manager also echoed this saying, *“sitting in a quarterly meeting, folks aren’t aware of what is available”*. The size of Omega as an organization made it difficult for individuals to gain access to information, and one informant said that, *“There was no information flow... It’s like a supertanker, rolling through the ocean on its track, but it’s very hard to bring it off track- to put new things [product features] in.”* Formal channels also affected the push of information pertinent to innovation. The engineering director reflected upon the challenges of pushing

relevant innovation information, “*you can open a change request, and [Vice President of Product] will say no. He’s a gatekeeper, a fountain of knowledge*”.

Taken together, the interview data pointed to the use of provisional knowledge being motivated in part due to organizational factors within Omega and the acceptance of other sources of knowledge due to concerns about intrafirm knowledge transfer. Technology blogs analyze innovations by gathering and processing information from sources outside of published reports or voluntary disclosures. These technology blogs can be instrumental by acting as formidable *infomediaries* (Deephouse and Heugens, 2009). They fulfill the descriptions of prominent information intermediaries in multiple ways. First, contributors to technology blogs collect, process, and disseminate valuable information in contexts where there is a vacuum of information and associated evaluative uncertainty. Second, technology blogs, unlike analysts who use firm-reported information, provide independent and external assessments of innovations. Finally, they possess a pragmatic, though debated, legitimacy with public audiences (Deephouse et al., 2017) through repeated practices where they are seen as useful.

According to Wade et al. (2006), when qualitative judgments need to be made under conditions of uncertainty, opinions of third parties are likely to become an important source of external information. Technology blogs are likely to act not only as platforms where valuable information and opinions regarding product innovations are exchanged, but also as sources with pragmatic though debated legitimacy that grant seals of approval to product innovations. Indeed, in the absence of ‘standards or yardstick against which (an organization) is judged’ (Graffin and Ward, 2010), technology blogs are likely to be rich sources of external knowledge and likely to act as information intermediaries. There is recent research which illustrates how innovating

companies can increase value in external knowledge searches through interacting with such intermediaries and solution providers (Roijakkers et al., 2014; Dushnitsky and Klueter, 2011).

Firms conducting product development become ‘information pressure cookers’ (Graffin et al., 2011) in which stakeholders and constituents are likely to be hungry for information, and will therefore be influenced by product innovation rumors as a source of information. Lack of appropriate information flow within organizations may stem from several reasons: intra-organizational communication may break down as the company expands, the CEO and board of directors may end up with a tight-knit but information-restricted group, and finally the innovation ideas may not percolate to upper levels of the hierarchy. We argue that technology blogs are prominent information intermediaries that are of more significant value the more there are internal challenges to gathering information, which we state as the proposition:

Proposition 2b. *Inflows of product innovation rumors will be used to justify decisions within the firm, with increases under concerns about intrafirm knowledge transfer and under increased market and technical ambiguity*

4.4. Outflows of product innovation rumors as a form of selective revealing

Studies of open innovation have described how “selective revealing” of a firm’s knowledge—such as code or other intellectual property—is at times required in order to gain access to contributions from external actors (Henkel, 2006). While it could be expected that organizational actors may reveal validated knowledge as part of an exchange to access other ideas, outflows of product innovation rumors as provisional knowledge might be expected to be rare. While some literature has covered the “leaking” of material from firms (Hannah et al., 2015), often such leaks are in regard to business moves, not product innovations. Our interview data indicated that product innovation rumors were perceived as part of the outflows from firms, as we summarize in Table 5 and describe next.

-- INSERT TABLE 5 HERE --

Outflows of product innovation rumors can take place even in a context of a policy that discourages organizational actors from leaking information or even merely clarifying and commenting on information that might be found on a technology blog. Indeed, Omega had a well-known internal policy of *“don’t comment on the blogs.”* Despite this, there was a perception of an outflow of information from Omega that could later be found on technology blogs. One of our interviewees related how despite all the control within top management, there was an understanding that leaks were occurring for various reasons. When asked if any colleagues were commenting on technology blogs despite the policy, his reply was: *“I’m sure they are. I’m sure even some of the leaks even come from within the company...”* One example of the outflow of product innovation rumors came from a hardware systems engineer we interviewed. He told us about a salesman who had followed a trail of product innovation rumors about Omega before approaching him: *“a component sales guy came to us and he knew exactly what we were doing; he knew the codenames, he knew the components inside where [company he was selling for] could be a replacement for some.”* Although the engineer was initially alarmed by this knowledge circulating external to the company, he actually found it quite helpful that the salesman had used rumors to pick up on just the right signals so that they were able to offer an appropriate component replacement on a new product line.

When might outflows be most expected? First, it may be due to situations of high competition where there is a need to draw attention to product plans. High-tech companies are known to leak secrets intended to create a buzz regarding upcoming products or discourage

consumers from buying competing products in anticipation of leaked release dates or feature sets (Hannah et al., 2015). Apple, for instance, “was a ship that leaked from the top” according to some press reports covering the disclosure of forthcoming products (Carr, 2010). In addition to Apple, other firms are reported to leak plans when they are about to launch new products, such as in the highly-competitive video game industry where there may be further benefits to synchronize launch dates for games and gaming consoles, with each requiring different product development lead times (McCarthy et al., 2010).

Within an expanded framework of open innovation (Bogers et al., 2017), leaking may be a strategic form of inside-out selective revealing that, as in the case of the supplier, helps to inform stakeholders about a possible direction, especially when such information is hard to come by otherwise. In one study of the effect of outflows, Muller and Pénin (2005) developed a simulation model that showed the role of open knowledge disclosure; they showed that high reputation firms benefited from disclosure in entering new R&D partnerships with other firms. The research acknowledged the short run risks of disclosure, but ultimately argued that in the long run, the firm would benefit from increased access to external sources of knowledge.

Our interview data and past work on the selective revealing of other firm-held knowledge helps to describe how product innovation rumors as outflows can serve as a form of selective revealing. Stated in brief:

Proposition 3a. *Outflows of product innovation rumors can act as a form of selective revealing, with increases in outflows expected under high competition and high interfirm knowledge barriers.*

4.5. Influencing editors of technology blogs

The legitimacy of technology blogs is debated, and one might expect very little acknowledgement or interaction with them by members of the firm. Typically, organizational

actors seek out alliances with those of established appropriate legitimacy (Deephouse et al., 2017). Technology blogs that trade in rumor might be ignored when compared with established media sources that provide authoritative judgment within an evolving market (Rosa et al. 1999). Technology blogs feature contributors who are often anonymous and editors that oversee the blog who typically lack the legitimized credentials of those in traditional media or in established consultancy roles. However, we found that instead of ignoring the editors of technology blogs, individuals in Omega often reached out and got to know them.

In our interviews, individuals noted that Omega had ties to editors, with one stating, “*We know [editors of technology blogs], we actually do interviews with them.*” Another interviewee, the manager of the ‘Analyst Insights’ group for Omega, spoke of meeting with the editor of a technology blog and described him as being similar to a market analyst, recounting that, “*I’ve met [the editor of TechBlog] in person at an [Omega] event.*” In addition to meeting with editors of rumor blogs, individuals at Omega routinely invited technology blog editors to company-run events, including product introductions and quarterly earnings calls.

What Omega undertook was influence through impression management, an action which is carried out with the intent of influencing an audience’s perception of the organization (Elsbach et al., 1998). Impression management is used by firms in general to try to influence their audience’s perceptions in ways that will cast them in a favorable light, and typically the audiences of interest have been shareholders and industry analysts.

Firms developing new product innovations do so in a context of considerable uncertainty, and traditional media sources may not always be up-to-date in covering the changing market. Innovations are associated with information asymmetry because choices regarding the product or process innovations are typically made behind closed doors, and information about the particular

innovation is rarely shared until the new product launches. In this informational void, technology blogs provide news and product innovation rumors.

Organization leaders actively manage their firm's informational environment and do so in ways they hope will favorably affect the impressions of targeted stakeholders (Puffer and Weintrop, 1991; Zajac and Westphal, 1995; Graffin et al., 2011). With technology blog editors able to pick which stories get covered and what product innovation rumors are highlighted, firms may attempt to influence their decisions in ways that promotes favorable coverage and flow of additional knowledge to the firm.

Analysts and investors constantly seek reassurance not only in terms of an organization's financial outlook but also in terms of its strategy (Mazzola et al., 2006), and one way for them to gain an understanding of a firm's innovation strategy is to consult technology blogs. It is therefore in the interest of firms to work to influence the editors of these blogs, especially in the context of ambiguity with respect to the market and technology. Therefore, we propose:

Proposition 3b. *Organizational actors will seek to influence editors of technology blogs despite their debated legitimacy, especially under increased market and technical ambiguity.*

5. Discussion and conclusion

"You know our mantra about rumors: Never trust them. But putting all of them together, we've definitely got some ideas now."

-- Technology blog "Gizmodo" quote from their *"Exhaustive Guide to Apple tablet rumors"*

The quote above is from a technology blog that was active in the time of our study and which contained a 'guide' containing the synthesized rumors about forthcoming tablet computers. The quote stresses how product innovation rumors are not to be individually trusted

as validated knowledge, but taken together rumors can provide provisional knowledge that will be of use to interested audiences. This focus on the pragmatic use of provisional knowledge is a primary contribution of our study, and in the following sections we describe how a focus on these knowledge flows and their use helps describe a new form of open innovation, and we follow with directions for future research and implications for managerial practice.

5.1. An informal form of open innovation addressing the paradox of openness

At the heart of innovation processes is how organizations search for knowledge, and new models of open innovation suggest that organizations should make greater strategic use of external knowledge (Chesbrough, 2003, 2006; Chesbrough et al., 2006; Laursen and Salter, 2014). While past research has focused on formalizing relationships with external partners for inflows or outflows of validated knowledge, we add a new informal set of relationships between firms and the sources of product innovation rumors, primarily centered within technology blogs.

An emergent need to focus on this more informal arrangement of relationships has been anticipated by recent work in open innovation. For example, Bogers et al. (2017:8) propose a multi-level framework for the open innovation literature that begins to consider how “individuals working with external knowledge in the context of inbound open innovation face approval and integration costs”. This recent review moved the open innovation literature to touch subtly on legitimacy concerns but did not expound much further. In our study, we use a focus on legitimacy to understand the role of technology blogs in the innovation process, and we make three main contributions.

Our first contribution is to bring together current research on organizational legitimacy and work on the sociology of rumor, demonstrating that even if from sources of debated

legitimacy, product innovation rumors can function as provisional knowledge. This, in turn, has pragmatic value to stakeholders inside and outside the firm. This helps to advance our understanding of how knowledge flows may work not only within formal open innovation processes but also within this more informal form. In some foundational work on knowledge flows in organizations, Nonaka (1994) challenges researchers to consider a wide range of knowledge flows, and we advance this breadth by considering the role of provisional knowledge in the form of product innovation rumors.

Our second contribution is to use empirical evidence to map out the ways in which product innovation rumors can play a role not only in inflows but also with outflows of provisional knowledge. In mapping the ways in which product innovation rumors flowed in and out of Omega, we describe a process that is akin to “coupled” formal open innovation processes (Bogers, 2011; Bogers et al., 2017; Sims and Seidel, 2017). Coupled open innovation—a type of open innovation that links outside-in and inside-out open innovation processes—is collaborative, and it involves combining purposive inflows and outflows of knowledge to develop an innovation (Chesbrough and Bogers, 2014). Akin to notions of the virtuous cycles of attention managers can provide to online communities (Dahlander & Piezunka, 2014), firms and technology blogs can create cycles of rumor flow between them. While the flows of provisional knowledge are characterized by a source of debated legitimacy, in the form of technology blogs, we have demonstrated how they still serve to shape perceptions and inform decisions. The propositions we develop can be used to guide future empirical research, as we describe in the following section.

Our third primary contribution is to demonstrate how the “paradox of openness” is in part addressed through product innovation rumors. Rumors can be seen as forms of ‘soft’ openness

(Laursen and Salter, 2014) which involves drawing information from external constituents without entering into legally binding agreements or formal collaborations. In this sense, firms are able to engage in both a form of selective revealing as well as gain from inflows of provisional knowledge, without resorting to formal mechanisms of open innovation.

Our study has been focused on product innovation rumors that flow within a context of open innovation, which bounds the scope of our theorizing and development of propositions. Open innovation contexts are defined by new technology frontiers, where firms seek external insight for innovation and may offer insight to others (Bogers et al. 2017). Within these general bounds, and as motivated in our propositions, the higher the technological and market uncertainty in an industry, the greater the expected role of product innovation rumors. For example, rumors were widespread in the electronic communication industry studied here, but they may be less prevalent in an industry defined by less uncertainty in product form and function. Product innovation rumors are also expected to be most useful in the earliest stages of product evolution, when uncertainty is highest, such as when a new technological standard is being established.

5.2. Directions for future research

Our study presents several directions for future research. A first direction is to use the propositions from the current study as a platform for focused hypothesis development, as there are many distinct domains for future empirical research within the context of product innovation rumors serving as a form of open innovation. Each of the six propositions provides scope for the development of different testable hypotheses depending on specific future research domain. For example, within the scope of the first proposition of rumors shaping perceptions inside the firm

with regard to forthcoming features, future research that takes a focus on strategic positioning between firms could develop hypotheses related to how a set of forthcoming product features might be altered to be either more similar or dissimilar to the rumored features of a competitor, depending on the relative market dominance between competing firms. Another future study informed by the same proposition but with a focus on social networks and status within firms might develop specific testable hypotheses related to when product features might be more or less likely to incorporate insight from product rumors depending on the status of an individual or coalition within the firm who monitors and reports on such rumors. These simple examples illustrate how the propositions presented can suggest domains under which testable hypotheses can be formed, depending on a specific research focus within the context of open innovation.

A second direction for future research is to draw on additional empirical methods to deepen our understanding of how rumors are used. For example, our qualitative study can set the groundwork for future quantitative studies that engage directly with textual data from technology blogs. While our interviews provided examples of what rumors were discussed and how this affected the innovation process, large scale empirical studies of rumors on technology blogs might be able to dissect the nature of the rumor discussion and how this changes over the course of a product development process. For example, product innovation rumors might first focus on technical features and later settle into discussion of relative price points. Studies using computational text-analysis methods (Hannigan, 2015; Kennedy, 2008) could track individual rumors over time, providing a longitudinal view of how rumors are taken up and discarded, for example. In addition to such quantitative studies, further in-depth comparative case studies could follow the use of rumor over the product development process within firms and study in detail how certain product innovation rumors are either absorbed or rejected within the

organization (Bogers and Lhuillery, 2011), perhaps dependent on a firm's market position, the roles of those conveying rumors in the organization, or other factors. Now that we have established that product innovation rumors are used within product development organizations, a host of empirical tools and investigations can pick up from our broad propositions to forming narrower focused studies on a range of related topics of interest to management scholars and open innovation researchers.

A third direction for future research is to embark on studies that take into account that product innovation rumors are part of a recursive process, one that involves the repeated interactions of individuals inside and outside the organization. Our suggestion to researchers attempting to study rumors is to take into account both outside-in and inside-out knowledge flows. One needs to recognize that both firms and technology blogs will be reacting to each other and that neither is likely to have full control of this provisional knowledge. While past studies of strategic leaking of information (Hannah et al., 2015) focused on "inside-out" issues such as whether the leak is factual or concocted and whether leaks are conducted overtly or covertly, one avenue for future research on product innovation rumors could instead look at the cycle of knowledge flows in both directions. Such a full recursive cycle would examine how provisional knowledge is recursively transformed through interaction of people participating in discussions on technology blogs and individuals within firms reacting to them in turn—including those in competitor firms and supplier organizations in the industry more broadly. Although rumors can be ephemeral (Fine & DiFonzo, 2011) and temporary, technology blogs capture and them as publicly accessible written artifacts. This serves to amplify and consolidate rumors to enable their flow across organizational boundaries as provisional knowledge, and in turn these rumors may later become updated within technology blogs, providing a recursive process of discussing

rumors that works in parallel to other open innovation efforts. Future research can examine factors that may affect how quickly rumors spread across firms and technology blogs, and how the speed and scope of this process may affect decision-making within firms and across firms in an industry.

A fourth possible direction for future research is to focus on how the processes we have outlined affect not only firms but also technology blogs themselves. Technology blogs and their editors may have reputations gained through how they convey rumors accurately and in a timely manner, similar to how firms themselves develop reputations based on interactions between journalists and individuals within firms (Rindova et al., 2005). Organizational actors selectively release information to influence intermediaries (Washburn and Bromiley, 2014), and technology blog editors as such intermediaries in turn can work to influence both the knowledge available and how stakeholders view that knowledge, but their ability to have such influence may be moderated by their reputations. A future stream of research could examine in more detail how technology blog reputations are developed over time, and studies could also examine the level of influence technology blog editors have in the realm of product innovation as a result of their role in gathering and spreading rumors. The technology blog editor is an under-studied actor in the open innovation landscape but may play a central role in shaping the understanding of new innovations.

5.3. Implications for managerial practice and conclusion

Our study has implications for managers of firms developing new products. Our work shows how even in an environment where there is a policy not to individually interact with technology blogs, engineers and other employees will reference them and make use of the provisional knowledge they contain. As we saw at Omega, product innovation rumors were

incorporated into presentation material and shared widely within the firm. Managing this has implications for the organization's ability to recognize the value of new information and how to incorporate it into their strategic processes (Cohen et al., 2000). Managers may wish to have policy discussions regarding how rumor is used as part of a portfolio of other information—such as by analysts and consultants—rather than just allow this process to unfold without concerted direction. While product innovation rumors can provide insight without explicit open innovation arrangements, managers can also weigh the potential strategic use of leaks from their organization—the surreptitious form of selective revealing we described at Omega. They need to consider how this revealing may help spur on feedback from rumor versus enable competition to understand an emerging product strategy.

Product innovation rumors work alongside other forms of knowledge flows to shape perceptions and inform decisions of stakeholders in the innovation process. We have demonstrated how individuals attend to product innovation rumors in their day-to-day work, as they make sense of an uncertain future that they are in part crafting through their product development decisions. By illuminating the use of this informal form of open innovation, we hope to inspire additional empirical research that helps us to understand how product innovation rumors not only reflect innovative activity but also serve a role in shaping the innovations to come.

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