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Editorial: The Role of Information Systems in Enabling Open Innovation

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Abstract

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1. Introduction

Proponents of open innovation (OI) advocates that, in today's increasingly boundary-free world, organizations should seek to exploit inflows and outflows of knowledge to accelerate internal innovation, and expand the markets for external use of innovation (Chesbrough, 2003). Open innovation challenges the traditional closed view of innovation where invention and design is restricted to internal resources. Indeed, in the past decade, we have witnessed a flurry of experimentation with different styles of open innovation in industries as diverse as consumer goods, semi-conductors, automotive engineering, and software engineering. IS has played a prominent role in creating the necessity for, and the implementation of, open innovation models. For example, the convergence of cheap personal computers, fiber-optic cable, and powerful workflow software has been attributed to the "flattening" of the planet and the rise in global collaboration (Friedman, 2006). Major corporations such as IBM, GE, Boeing, and Proctor & Gamble have integrated online crowdsourcing platforms as part of their open innovation programs. Likewise, the open source software movement is also often viewed as a role model for open innovation.

Because open innovation is rapidly gaining importance in research and practice, new questions and challenges have arisen that require a deeper understanding of these phenomena from an IS perspective. Perhaps the most compelling examples of IS-enabled open innovation are open source software and crowdsourcing. Despite considerable research on these topics, there is much that has yet to be understood about the role of IS in enabling open innovation and the implications of open innovation movement on the various aspects of the IS field. This special issue expands and advances the state of open innovation research in the IS field by highlighting work that makes significant theoretical and empirical advances to our understanding of IS-enabled open innovation.

In this introductory paper, we posit that IS researchers can contribute most to open innovation research by focusing on the dark side of the paradigm. In this vein, we agree with the sentiments of D'Arcy, Gupta, Tarafdar, & Turel (2014) in that the dark side of IT use presents significant opportunities for conducting high-impact theoretical and applied research. When combined with the power and sophistication of IT, an openness approach can create significant dilemmas for individuals and organizations alike. Before introducing the papers comprising this special issue, we identify three such deleterious issues—information overload, knowledge leakage, commoditization of IP—and suggest how IS researchers can contribute to our understanding of each.

2. Current State of IS Open Innovation Research

Research in the area of open innovation is gaining momentum as is evident from conference tracks (e.g., Openness track at ecis 2013 and 2014) panels (panel on open is: the is discipline as an open community Ecosystem at ICIS 2013) and workshops (e.g., the openness and transparency research workshop also featured at ICIS 2013). Moreover, several papers in these areas have been published in top IS journals such as the *European Journal of Information Systems* (*EJIS*) (see Morgan, Feller, & Finnegan, 2013), the *Journal of Strategic Information Systems* (see Feller, Finnegan, Hayes, & O'Reilly, 2012, and Majchrzak & Malhotra, 2013) and the *Journal of Management Information Systems* (see, e.g., Leimeister, Huber, Bretschneider, & Krcmar, 2009).

While the concept of open innovation is rapidly gaining importance in research and practice, it has also been argued that, to date, the IS field has taken quite a narrow view of this important paradigm (see Majchrzak & Malhotra, 2013). Our knowledge of open innovation's implications is in the embryonic stages. Many new questions and challenges arise that require a deeper understanding of this phenomena from an IS perspective. For example, the ability to capture and exploit external sources of knowledge is a critical element of open innovation. Open innovation communities need to constantly understand the evolving requirements, the relevant tool functionalities, and how to design these into customized sociotechnical systems necessary for sustainable collaboration (de Moor & Aakhus, 2013). Furthermore, the open innovation model's success is very much dependent on a firm's knowledge transfer capabilities and external stakeholders' motivation and commitment to

engage and cooperate. This leads to questions regarding IT's and IS's role in developing the absorptive capacity that makes efficient use of external knowledge. While researchers have suggested that managers need to be cognizant of the important role of IT on addressing different absorption challenges by investing and deploying different IT applications for varying learning approaches (Cui, Tony, & Teo, 2012), to date, the existing literature is limited in this regard. Moreover, effectively governing the open innovation model is paramount to its success because engaging and collaborating with external stakeholders creates risks and tensions. Thus, aspects such as roles and relationships, the development of an IT infrastructure that supports open innovation, economic structures, and the regulatory environments in which firms operate need to be considered.

3. Shortcomings of the Open Innovation Model

The majority of the open innovation literature, across all fields of research, shows a bias towards its favorable aspects. However, to advance the concept, the inherent deficiencies of the open innovation model also need to be brought to both researchers' and practitioners' attention. We believe the open innovation model's most focal shortcomings are: a) lack of clarity, b) lack of theoretical glue, and c) lack of applicability.

3.1. Lack of Conceptual Clarity

One of the most important fundamental attributes of a concept is that it is clearly communicated and understandable (Metcalfe, 2004; Weick, 1989). While early OI research (e.g., Chesborough, 2003) portrays the OI concept as a clear, simple, and cohesive concept, the reality appears to be much different. Firstly, the OI term and its underlying variants, such as open source and crowdsourcing, have been defined in so many ways that the terms are rendered almost meaningless. In terms of crowdsourcing, for example, Estellés-Arolas and González-Ladrón-de-Guevara (2012) explain how diversity in crowdsourcing practices "leads to the blurring of the limits of crowdsourcing that may be identified virtually with any type of internet-based collaborative activity". Anastasiou and Gupta (2012) express concern over the validity of their crowdsourcing definition due to the fact that it is an ongoing "trend" subject to significant change even over a short time period. To state that a particular practice, method, or initiative is or is not open is almost meaningless given the lack of consensus on what the term refers to. In contrast, the lack of clarity is evident from the fact that Doan, Ramakrishnan, and Halevy (2011) take an opposing view that crowdsourcing definitions are too restricted.

3.2. Lack of Theoretical Glue

Behind any good concept or theory there should be strong underlying logic and rationale. Whetten (1989) refers to this "theoretical glue" that should bind all the factors together. However, an analysis of OI research reveals a lack of consensus on this issue, and that the connecting logic behind aspects of OI is not always there. Various theories of the firm offer only a partial explanation of the open innovation phenomenon. For example, the central tenets of Porter's (2003) five forces concentrate on how firms develop impregnable positions against the forces of competition, implying the importance of erecting barriers to competition rather than fostering openness (Chesbrough & Appleyard, 2007). Moreover, Porter's model also assumes that customers and suppliers are threats and have no greater importance than any other aspect of the environment. In the open innovation model, items such as industry rivalry, entry barriers, and so on are of minor importance. Rather, forces that attract the participation of individual volunteers and the construction of value networks are considered more significant (Chesbrough & Appleyard, 2007). Other theories of the firm such as the resource-based view of the firm and the knowledge-based view of the firm are also largely introspective in that they concentrate on those resources and capabilities housed in a firm (Vanhaverbeke, 2006). From an open innovation perspective, durable, valuable, and scarce resources of different firms should be combined to generate new innovations (Morgan et al., 2013). In addition, open innovation differs from the transaction cost economic (TCE) approach in that the theory focuses on minimizing costs in order to create value, rather than maximizing value through cooperative modes in open innovation networks. Such networks bring together the resources of many different partners, while the TCE approach only

considers the interest of companies tied to each other through equity/non-equity alliances, corporate venturing investments, and so on (Vanhaverbeke, 2006).

Furthermore, Trott and Hartman (2009) argue that Chesbrough creates a false dichotomy by claiming that open innovation is the only alternative to a closed innovation model. Mowery (2009) questions whether open innovation is actually a new theory of innovation at all. Groen and Linton (2010) suggest that the concept itself is a communication barrier to theory development. While open innovation may be a growing trend, it is clear that better theory is needed in order to extract the potential value it offers. IS has much to contribute to the development of this theory due to the pivotal role of digital technologies in enabling open innovation initiatives.

3.3. Limited Applicability

The range of applications of a concept is a key criterion for judging its quality (Metcalfe, 2004; Weick, 1989), and so, if they are to be of value, open innovation concepts, frameworks, and practices should be applicable in a wide variety of contexts. Indeed, much research in the open innovation community itself has highlighted the importance of broad method applicability. However, research in the IS field has so far taken a very narrow perception of this business paradigm. In the open innovation movement, IS scholars have primarily directed their attention towards the free/libre open source software (FLOSS) phenomenon (von Hippel & von Krogh, 2003). While IS research has aided in refining and extending open innovation theory by investigating crowdsourcing platforms (Di Gangi & Wasko, 2009; Leimeister et al., 2009), web-enabled innovation brokers (Whelan, Golden, & Donnellan, 2013), proprietary knowledge leakage (Teigland & Wasko, 2003), open IS development (Conboy & Morgan, 2011), and IT's contribution to absorptive capacity (Chatterjee, Pacini, & Sambamurthy, 2002; Chircu & Kauffman, 2000), studies in this vein have been sporadic over the past decade.

4. Setting an Information Systems Agenda

We advocate that the IS community can profitably focus on the dark side of open innovation as a priority for future research. To aid these efforts, we suggest three promising avenues.

4.1. Information Overload

In their recent paper on dark side of IT use, D'Arcy et al. (2014) highlight the significance of the problem of information overload and call for research aimed at understanding the various negative consequences of information overload and multitasking on task performance. We echo this call but also argue that the information overload problem is likely to be significantly greater in open innovation initiatives for the following reasons.

The open innovation model is promoted as paradigm shift from the traditional closed approach to technological innovation (Chesbrough, 2003). For much of the 20th century, R&D divisions relied almost exclusively on their own knowledge base to develop innovations. 20th century R&D divisions had little option but to rely on their own in-house knowledge because external information was scarce and acquiring it was a difficult and cumbersome process. Various factors have since increased the potential and decreased the costs of searching for innovation from external sources. One of the most important factors has been the growing availability of IT systems, which Dodgson et al. (2006) term "innovation technologies". More specifically, the Internet's rise has played an important role in enabling searches for external sources of innovation by facilitating technology intelligence, online communities, crowdsourcing, and Internet platforms such as blogs and virtual worlds (West & Bogers, 2014).

In a series of influential studies conducted with the leading R&D powerhouses of the day, MIT Sloan professor Tom Allen noted the existence of a small number of R&D professionals who acted as a conduit between the R&D division and the external knowledge base (Allen, 1977). These "technological gatekeepers", as he termed them, were essential for keeping firms up-to-date with the latest scientific and technological developments. Before the advent of the information superhighway, such information was scarce and gatekeepers possessed the skills to prize it from the outside world. In the 21st century, the problem is no longer one of information scarcity but rather information

abundance. With the increasing power and plummeting costs of IT, our ability to ubiquitously access and disseminate information continues to grow. In the open innovation context, Whelan et al. (2013) conclude that the sheer volume of technological information accessible through the Web is the reason why the Allen's gatekeeper has separated into specialist internal and external information brokers.

Studies show information overload to be a significant organizational problem because it can adversely affect decision making (Pennington & Tuttle, 2007), productivity (Gonzalez & Mark, 2004), employee morale (Ayyagari, Grover, & Purvis, 2011), and even physical health (Lewis, 1996). R&D organizations today face a substantial information-processing burden, but the relationship between information overload and innovation has received scant attention in the business management literature. In one of the few studies in this vein, Laursen and Salter (2006) found that, beyond an optimal level, firms that rely on an increasing variety of external sources of innovation have decreasing returns in terms of innovation performance. We suggest that an examination of the organizational, cognitive, and technical capabilities needed to process and profit from the massive loads of external information loads in innovation is a fruitful avenue for IS researchers to pursue.

4.2. Knowledge Leakage and Intellectual Property Issues

The open innovation model is built on the premise of knowledge exchange; however, a firm cannot obtain the knowledge developed by another firm unless the latter decides to give it away, an essential ingredient often ignored in the open innovation literature. Research shows that, in order to acquire external knowledge, a firm must be willingly to trade away some of its own knowledge assets (Allen, 1977; Bouty, 2000; Teigland & Wasko, 2003; Wasko & Faraj, 2005). In many instances, external knowledge sharing may even include the exchange of confidential organizational knowledge, even with others who might even be working in rival firms (Von Hippel, 2005). Thus, it is argued that knowledge "leaks" across the firm's legal boundaries (Mansfield, 1985; Von Hippel, 2005). A criticism that can be leveled against the open innovation model is that it is too idealist. Many firms would never consider sharing their knowledge assets for fear of losing intellectual property (IP) to a rival. Yet, on the other hand, a preoccupation with hoarding knowledge might actually prevent a company from coming up with new ideas and innovations (Boisot, 2006).

The advances in IT amplify the threats to IP. A scene from Willy Wonka and the Chocolate Factory depicts a Wonka employee in a dark alley handing over secret recipes to a rival chocolatier. In today's world, the employee would just digitize the IP, transfer electronically with a click of a button, and presumably receive payment for the deal through a paypal account. External online communities have proven to be a valuable source of novel knowledge for firms (Whelan et al., 2013) but this comes at a cost. In a study of information trading activities, Teigland and Wasko (2003) suggest that employees are becoming more loyal to their inter-organizational online community and trading proprietary knowledge to gain acceptance.

Should a firm encourage it's knowledge workers to participate in external online communities and thereby expose itself to the risk of company secrets being traded away? Or should the firm adopt a stance whereby it "hoards" the collective knowledge of its individuals? Some scholars question whether a knowledge hoarding strategy is actually possible (Bouty, 2000; Davenport & Prusak, 2006). Knowledge is shared through people and "unless it is feasible to chain employees to their desks, knowledge will always flow outside a company" (Davenport & Prusak, 2006, pg. 21). In fact, attempts to instill a knowledge hoarding culture may have adverse effects. Bouty (2000) notes that individuals could still conduct knowledge exchanges surreptitiously but then choose not to share that knowledge internally for fear of management reaction. Thus, a hoarding strategy would result in knowledge flowing only outwards with nothing coming back. Some scholars have also noted that inter-organizational knowledge exchanges may not constitute an option but a requirement and may represent an important source of competitive advantage (Dyer & Singh, 1998). Bouty's research (2000) raises a very interesting point though: confidentiality is socially constructed, and, as one of her interviewees noted, there are "open secrets", Research by Jarvenpaa and Staples (2001) further touches on this aspect of socially constructed confidentiality since they found that the more

individuals view their knowledge as personal expertise, the more individuals regard such knowledge as their own property and not that of the organization.

One avenue for open innovation IS research is to explore the intrinsic and extrinsic motives for trading proprietary knowledge online. A rich body of extant literature considers individuals' motivations for contributing to OSS projects (Roberts & Hann, 2006), online forums (Wasko & Faraj, 2005) and ideation platforms (Bretschneider, Leimeister, & Mathiassen, 2014), which thus provides a theoretical launch pad to investigate the IP leakage. A second avenue could consider whether the online trading of proprietary knowledge results in a net positive or negative for firms. Some scholars have argued that a knowledge-hoarding strategy is deficient because knowledge depreciates in value very quickly. What a company knows today has diminishing value in the face of rapidly changing customer needs, technology capabilities, and competitor initiatives. Thus, the challenge is how to refresh existing knowledge more quickly. How can IT enable the constant refreshment of knowledge and what additional capabilities and complimentary assets are required to ensure a net benefit?

4.3. Commoditization of a Previously Proprietary Technology

Rather than sharing being inadvertent or undesired, open innovation may involve deliberately sharing the results of innovation, as in the case of an individual or firm contributing code to an open source software development project where the resulting system is publicly available (Henkel, 2006; West & Gallagher, 2006). Indeed, Huizingh (2011) refers to this mode (open inputs and outputs) as "open source innovation". However, open innovation may have the paradoxical effect of improving innovation while simultaneously reducing the value to the producer of those innovations.

Opening the innovation outcome may be needed to attract other contributors, which enables sharing the effort of innovation and so reducing its cost. Such a strategy may be attractive for parts of a product that do not differentiate it in the market. Van der Linden, Lundell, and Marttiin (2009, p. 78) suggest that "for most products, only a small part (5 to 10 percent) of the software is differentiating". For example, large parts of the Mac OS X operating system are open source but surrounded by a layer of proprietary software (e.g., for the user interface) (West, 2003). Or, the reduced value of an innovation might be offset by increased market share for related products. For example, IBM open sourced its Eclipse development environment, which increased its market for complementary products (West, 2003).

Sharing may also be a deliberate strategy to reduce the value of the particular technology for competitive reasons. For example, Fitzgerald (2006, p. 591) notes that "IBM is a strong supporter of Linux because it erodes the profitability of the operating system market and adversely affects competitors like Sun and Microsoft". However, when multiple players adopt similar strategies, the overall effect may be to reduce the value of innovation in general. Summarizing this situation, West (2007, p. 4) argues that, "in many cases, the use of OSS is a tacit (or explicit) commoditization of a previously proprietary technology". These trends are what van der Linden et al. (2009) call the "ongoing commodification of software" driven in part by the growth of open innovation strategies.

The digitization of products and services is rampant across most industries. Thus, it is logical to assume the commodification witnessed in software development will impact a multitude of industries. IS researchers are in an advantageous position to apply the insights from OSS to understand how commodification will alter business models and theories of competitive advantage.

5. Articles Included in the Special Issue

The three papers comprising this special issue make several valuable contributions to our understanding of IS-enabled open innovation. The first paper, "Organizational learning with crowdsourcing: The revelatory case of LEGO" by Daniel Schlagwein and Niels Bjørn-Andersen, extends seminal theories of organizational learning by incorporating the role of external users in crowdsourcing initiatives. The authors had incredible access to Lego, one of the best firms at incorporating user communities in innovation activities. The authors used a longitudinal case study approach to shed light on how the learning processes at Lego were influenced by the implementation

of a crowdsourcing platform. To resolve the tensions between extant theories of organizational learning and open innovation, the authors offer an ambient organizational learning framework. Future studies could build on this concept to advance our knowledge of how organizational learning occurs in the boundaryless world.

The second paper, "Through the printing press: An account of open practices in the Swedish newspaper industry" by Claes Thorén, Pär Ågerfalk, and Mats Edenius, explores open innovation's impact in the newspaper industry. As is well documented, the global newspaper industry is struggling to adapt tried and trusted business models to the digital world. Against this backdrop, the authors ask the pertinent question "Why has IT-enabled open innovation become such a contentious issue in the context of the newspaper industry?". Combining a broad study of 159 Swedish newspaper websites with contextual in-situ ethnographic interviews, the authors found that openness is seen as a potential threat to journalistic legitimacy and its historical embeddedness. Contributing to the sociomaterialistic perspective in IS, the paper concludes that the conceptualization of "open" is contingent on the critical values and material artifacts that territorialize the newspaper assemblage.

The final paper in the special issue, "IT enabled open innovation for knowledge creation" by Yeliz Eseryel, explores IT's role in creating knowledge in OSS environments. In contrast to previous studies, the authors found that effective knowledge creation depends more on a small number of high-quality developers rather than a large number of users. Using Nonaka's (1994) knowledge creation framework as a theoretical lens and archival data from an Apache project, Eseryel notes that intellectual engagement with knowledge-embedded IT artifacts, such as software code, enables effective knowledge transfer without requiring face-to-face interaction. Such insight extends theories of knowledge creation that assume that the socialization mode can be optimized even when face-to-face interaction is lacking.

The open movement has compelled many organisations to alter their innovation systems. Digital technologies play a central role in enabling open innovation, but we are only beginning to understand the positive and negative implications when innovation processes are opened and digitized. Our hope is that this special issue will inspire IS scholars, and our colleagues in other fields, to explore and navigate the open innovation terrain.

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