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Managing Open Innovation:

How and What to Open

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Foreword

Innovation has often been driven by partnerships and collaboration. While the concept of using sources that are not part of formal, structured relationships is rapidly becoming more attractive, "open innovation" can be frightening and disconcerting to those comfortable with the more traditional approach.

This IBIT report will reduce that fear because it provides specific suggestions on how open innovation can make significant contributions and provide unique insight and solutions. As detailed in the report, effective leveraging of open innovation requires thoughtful decisions on the style of leadership, processes and technology, and incentives and culture. This, together with the appropriate selection of the model of open innovation, and the clear establishment of the architectural control points that define the ownership boundaries can provide a very successful innovation strategy.

Bruce Fadem
Editor-in-Chief
March 15, 2010

Introduction

The fundamental idea of open innovation is not new. Firms have always collaborated with partners in many different ways. But open innovation has only recently emerged as a viable strategy for innovation across a variety of firms and industries. The recent spread of open innovation is based on the insight that, with the help of information technology, distributed individuals can contribute to complex innovations without necessarily being part of, or controlled by, a hierarchical firm. An open innovation strategy is an explicit attempt to expand and systemize such collaborative contributions and often to accept fewer controls than might be common in more traditional partnerships. At its best, open innovation promises creative, robust solutions to complex problems. At its worst, open innovation threatens managerial and ownership headaches as firms try to reconcile openness with control.

Inspired by the success of legendary open source communities such as Linux, Apache and Symbian, many organizations are exploring some type of "open innovation" to serve as a catalyst for their own innovation efforts (Chesbrough et al. 2006). This interest has been stoked further by the rapid development of Web 2.0 technology that enables knowledge sharing among distributed individuals. Already, internet sites such as Google, Wikipedia, DiggIt, YouTube and Flickrs have demonstrated that it is possible to collect and harness the collective knowledge of distributed individuals who do not necessarily share the same interests or organizational affiliations (Malone 2004; Tapscott and Williams 2006). Based on the potential demonstrated in these sites, new firms such as Threadless and Innocentive have launched. Threadless allows anyone to submit T-shirt designs and asks its more than 500,000 community members to select the best design. Innocentive enables firms to pose scientific and engineering questions to its community of more than 165,000 members. Similarly, corporate giants like P&G, Johnson & Johnson, Nokia and GSK have begun to experiment with open innovation as part of their corporate innovation strategies.

Based on the authors' research and work with several such firms, this paper proposes guidelines to help managers think through the trade-offs involved in designing open innovation strategies. In particular, we offer principles for open innovation; a checklist for determining readiness for open innovation; and a menu of ways to manage open innovation from which managers can draw when designing their own open innovation strategies.

Principles of Open Innovations

To frame the opportunities and challenges faced by firms embarking on an open innovation strategy, this section reviews key insights about how open innovation works. Fundamentally, open innovation involves explicit attempts to leverage external knowledge resources in order to facilitate innovation process in the firm. According to Chesbrough (2003), open innovation

is "a paradigm that assumes that firms can and should use external ideas as well as internal ideas, and internal and external paths to market, as the firms look to advance their technology" (p. xxiv). In contrast to traditional innovation in which most innovation activities are conducted within the boundaries of the firm, open innovation spans boundaries to engage with external actors (whether individuals, other firms, or on-line communities) to mobilize their knowledge resources and integrate these with the firm's products and services. Open innovation promises tremendous creativity while raising fundamental questions of ownership, control and the ability for firm's to appropriate the value created by the open innovation.

There are three principles to keep in mind when considering how to incorporate open innovation into a firm's innovation strategy.

1. **Not all open innovation strategies are the same. Open source models solicit variations on a theme; open platform models encourage peripheral developments around a core; and crowd sourcing invites solutions to defined problems.**

Open innovation can take many different forms, and it means different things depending on the particular model the firm adopts. In particular, there is an important distinction between the open-source models pioneered by Linux and Apache, open platform model used by Google, Nokia and Apple, and the crowd-sourcing models used by Innocentive, Threadless, P&G and Johnson and Johnson. One critical difference between open-source, open platform and crowd-sourcing models is *the direction of knowledge flow*.

In the **open-source** model, the focal firm or its employees participate in an external open source community to gain access to the community's vast reservoir of knowledge. Firms such as IBM and Sun Microsystems are active participants in such communities. These communities encourage *many to many* transactions of knowledge and are governed by internally generated and policed rules and norms. In an **open-platform** strategy, such as Apple's approach to iPhone applications, the focal firm encourages unanticipated extensions of and complements to its platform[1*] of core products by disclosing a part of its pool of intellectual property under some form *open-standard license regime*. In this way the focal firm establishes *many to one to many transactions* in the form of a two-sided market that takes advantage of network externality effects (Eisenman et al. 2006). On one side, the firm deals with many third-party suppliers who want to create new products based on the core platform. On the other side, the firm deals with many customers who purchase the core platform and the third-party products. Finally, in the **crowd-sourcing** model, the focal firm creates economic and social incentives (such as prize money and public recognition) to encourage external actors to provide knowledge and solutions that helps the focal firm develop or modify specific products (Howe 2008). Here, the knowledge flows from *many to one* transactions.

1 * The notion of a "platform" refers to a foundation (organization and/or technical) on which others can run their own products and services (Gawer, A., and Cusumano, M. "How companies become platform leaders," MIT Sloan management review (49:2) 2008, p 28.).

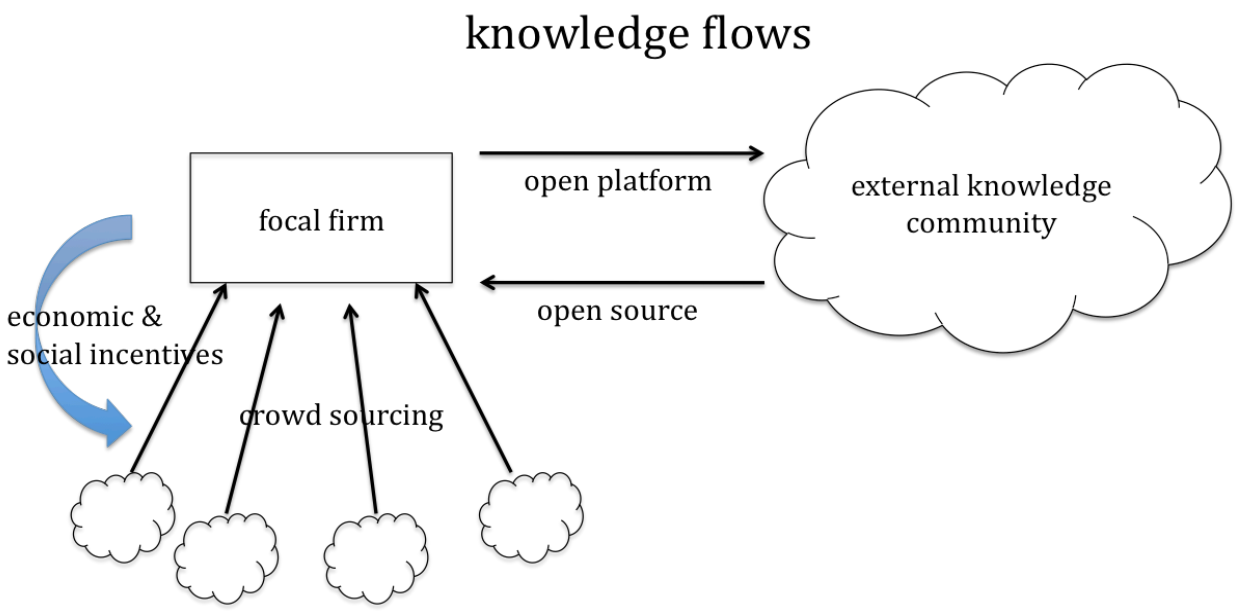

Figure 1: Different Forms of Open Innovation and Knowledge Flows

2. **Open innovation highlights issues of appropriation. Successful strategies require finely tuned balance between openness and control.**

In developing an open innovation strategy, the most strategic decision involves the setting of the architectural control point that defines the boundaries of ownership between a core of knowledge and the community using or contributing to that core (Grand et al. 2004; Stuermer et al. 2009; West and Gallagher 2006; West and O'Mahony 2008). The architectural control point determines the degree to which the focal firm discloses its intellectual properties to the outside world, the degree to which it controls the use of its core, and the profitability from the derivative works at the periphery.

Take, for example, a open platform approach by Apple as it deals with applications developers for the iPhone. In Apple's platform strategy the architectural control point includes various protections (contracts, procedures, limits on access, software tools that allow development without sharing the core code) designed to protect the integrity of the core technology or intellectual property even while allowing access to that core for purposes of innovation. More concretely:

- The core serves as the foundation of the platform approach. It is the intellectual property that the focal firm provides to other firms. It must have high reusability and low variability. Computer operating systems and certain types of web services (like Google's search engine) are examples of a core.
- The periphery sits on the top of core and features high variability but low reusability. A periphery gives the firm the

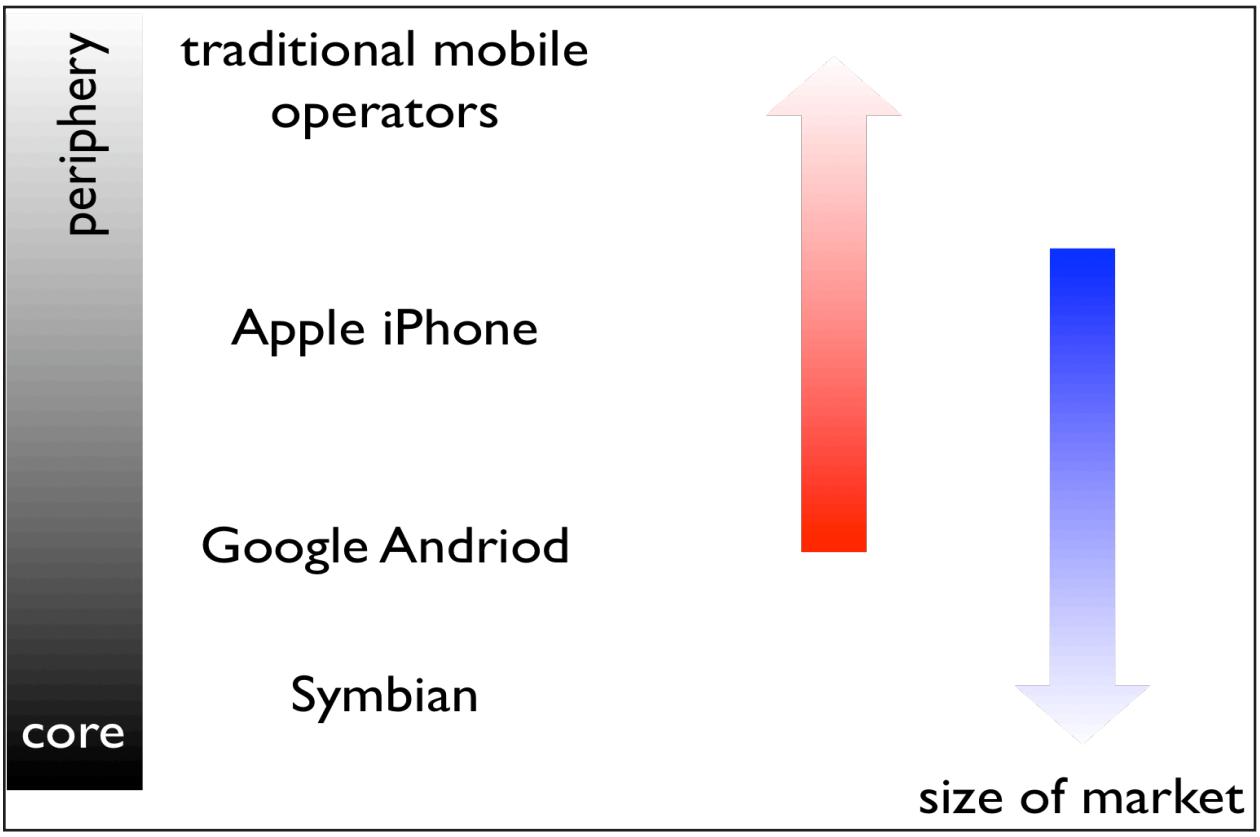

Figure 2: Appropriation v. Market Size in Open Innovation

capacity to leverage its core intellectual property in a variety of different contexts without risking the loss of its control. While the focal firm can and should develop its own peripheries, they are often developed by third-party partners who together with the focal firm build ecology. The many websites that leverage Google's power web search engine or map services are examples of such peripheries.

- The interface is the boundary between core and periphery. It defines the organizational and/or technical boundary – or architectural control point – through which the focal firm controls the innovation. For example, Microsoft maintains full control of its Windows operation system but only limited control over what customers do with Windows. Similarly, Google exercises very little control over how web sites use its various web services, while protecting its key algorithms quite aggressively. While the business models are different (licensing vs. advertising), both rely on the company controlling key intellectual property – in this case code – to protect its ability to charge for use (operating system or search) of this property. If either company set their control point "lower" – e.g., opened access to their code – they would lose their ability to charge.

When setting the architectural control point, there is often a trade-off between the size of the market and the amount of control held by the firm. Figure 2 demonstrates the impact of the ar-

chitectural control point.

When a firm sets the control point high, the firm holds everything within its core and enjoys very strong economic appropriation of the value generated by its intellectual property. At the same time, however, the firm restricts its market size to its own ability to develop innovations. On the other hand, when a firm sets the architectural control point low, the firm will spark a great variety of innovations but may not be able to enjoy the economic benefits from those innovations. Thus, Google gives away its Android OS (mobile operating system) and does not make any profit from other firms innovations based on Android. Google can afford to do this because its core product is search and it profits from expanding the base of users of its search tools. The key insight here is that a firm's ability to lower the architectural control point depends on the complementarity of the firm's core technology with other products and services that the focal firm provides (Yoo et al. 2008). If the focal firm has a strong core technology, it can afford to lower the architectural control point for complementary products, thus expanding its market and putting its competitors in a vulnerable position.

3. **Open innovation can be managed in four ways. The method, or combination of methods, that is most effective depends on the underlying knowledge base and types of exchange.**

Figure 3 summarizes the four management models: Market, incubator, community and clan. Each model thrives under specific conditions of exchange and communication (Hill et al. 2009). The four models are based in two dimensions: the nature of exchange and the mode of communication.

	on-line	**in-person**
transactional	Type I: marketplace	Type III: incubator
relational	Type II: community	Type IV: clan

Figure 3: Open Innovation Management Models

Exchanges can be either transaction-based or relationship-based. Transaction-based exchanges are clearly defined, arms-length and occasional (not part of an ongoing relationship); relationship-based exchanges are part and parcel of an ongoing relationship that is considered more valuable than any given transaction facilitated by the relationship.

Communication can be either on-line or in-person. On-line communication is conducted at arms length across a computer or phone interface; it can occur quickly and include a large number of parties. On-line communication is seldom as "thick" and nuanced as in-person communication. In-person communication is conducted face-to-face; it contains a wealth of nuance, in-

cludes the possibility of transmitting tacit knowledge, and is limited by time and proximity.

***Type I*: Marketplace** is most effective when the exchange is transactional and the communication on-line. The marketplace is a wonderful way to organize many-to-many conversations about well-defined problems and issues and often generates myriad variations on a theme. Crowd-sourcing strategy is most effectively managed as a marketplace. For example, an "Idea Marketplace" can be built to reach out a large population of potential external partners for specific problem-solving opportunities or for identification of new opportunities. To be effective, the firm should be quite active in specifying the market (eg., by inviting specific types of participants); shaping the problem space (much like InnoCentive does when submitting problems to its "solver" community); defining clear and transparent rules and standards; and developing incentives – including both recognition and concrete (if often small) rewards – that encourage competitive problem solving. Marketplace-based crowd-sourcing will be most effective for well-defined projects involving explicit knowledge – such as writing clever bits of software code – that can be communicated and evaluated at arms length.

> Community thrives when the exchange is relational and the communication online.

***Type II:* Community** thrives when the exchange is relational and the communication on-line. Linux and its ilk have demonstrated the power of on-line communities to organize ongoing problem solving and product development.

For example, rather than throwing well-defined questions into a marketplace, a focal firm might use Web 2.0 technology to organize multiple, external, on-line "Solution Communities" to collaborate with, and learn from, one another on an on-going basis. Imagine, as Vestas has, an ongoing version of a science fair that involves a relatively consistent group of professors and firm researchers who work together (with the help of transient students) to solve a series of problems in the design of effective wind turbines. Community-based strategies are particularly useful when the problem to be solved is ill defined and requires more iterations, and so more coordination and discussion, than would be possible in a marketplace setting. Critical to community success are strict non-disclosure and intellectual property licensing agreements and effective intrinsic rewards based on recognition and belonging.

***Type III:* Incubators** work best when the exchange is transactional and the communication in-person. Usually hierarchically organized, incubators facilitate the codification and passing on of new knowledge. For example, a "Product Incubator" could be designed to leverage a firm's internal innovation group. To expand the creative reach of a successful group, the firm could open its doors to certain promising individual researchers (university faculty members or graduate students) or teams of researchers (a start-up company) and invite them to join the incubator on a temporary basis. This opportunity could be awarded based on some type of idea competition based on new project opportunities that the firm

identified as being promising. Guest researchers would collaborate with the internal innovation group to run their research projects and deliver outcomes. The incubator form of organization is particularly useful when tacit knowledge plays a critical role in the solution of a well-defined problem. In this case, rewards would be both intrinsic (the invitation itself, recognition, permission to publish papers) and extrinsic (lab space, participation in profits) providing invitees followed all incubator processes and contributed to the incubator's overall goal.

Type IV: **Clans** thrive when the exchange is relational and the communication in-person. A clan works best when the goal is to hold together a group of creative types – say a lab or a design group – with the expectation that (more or less) the same group will be assigned a series of problems to solve over the course of time. A clan is particularly effective when tacit knowledge is important and both the problems and techniques are ill-defined; the development of gene-based therapies is an example of a challenge best managed by a clan.

For example, imagine a "Solution Clan" that invites guest researchers to collaborate with one repeatedly, over time, not unlike the Japanese "Ba," or innovation hot zone, designed to maximize accidental fusion of knowledge (Nonaka and Konno 1998; Nonaka and Takeuchi 1995). Rather than invite researchers in for short-term, solution-oriented residencies as in the product incubator, the solution clan would emphasize the building of an extensive, perhaps virtual lab of long-term collaborators. This would require more extensive use of on-line capabilities to enable ongoing collaboration while conducting individual careers. At the same time, occasional residencies could be used both to cement relationships and reward success. Indeed, while extrinsic rewards would be necessary, the strongest rewards are likely to be the development of a strong, accepting culture of respectful collaboration.

Successful Implementation of Open Innovation Strategies

Open innovation cannot be successful on its own. Whatever open innovation strategy the firm might pursue, it must be integrated into the firm's overall innovation process and strategy. Successful integration depends on reinforcing choices concerning leadership, processes and technology, and incentives and culture.

1. **Leadership**

As with all organizational initiatives, the active support of leadership is essential for success. In open innovation, effective leadership is often more facilitative and inclusive than directive; the key is to span boundaries and inspire participation in the democratic process and culture, while ensuring that the appropriate technical, structural, process and incentive infrastructure is in place (Fleming and Waguespack 2007; O'Mahony and Ferraro 2007).

2. **Process & Technology**

The interface between open innovation and internal innovation processes must be explicitly defined and managerial responsibility clearly delineated. Firms can integrate open innovation,

particularly in the form of crowd-sourcing, into one or many of the stages of a typical innovation process. Consider how the following typical innovation process might be elaborated through the use of open innovation approaches.

Information technology, particularly emerging Web 2.0, plays a very important role in implementing open innovation approaches like these.

1. Exploration – in which the firm identifies potential latent needs from the market. P&G uses its web site to solicit new product suggestions from the consumers and then organizes the sections into areas of need.
2. Ideation – in which product ideas are discovered based on the identified needs. GSK uses crowd-sourcing models to identify potential product opportunities by inviting small entrepreneurs or university research teams to contribute ideas to meet pre-defined needs. Similarly, Local Motors uses a crowd-sourcing model to initiate new car model development.
3. Product definition – in which specific solutions are invented or bought to realize the product ideas developed in the previous stage. To refine its wind turbine designs, Vestas maintains a world-wide network of university partners and runs competitions among them to find effective solutions to specific problems. More broadly, Innocentive or other similar services are often used to find specific solutions to problems.
4. Validation and verification – in which the new product is tested before its final launch. User groups work well at this stage, as does Innocentive's competitions.
5. Market entry – in which the product is officially launched into the target market. Companies like Dell use Twitter, a popular social computing web site, not merely to announce new products, but to target individuals who are densely connected to others and so transform spam into guided recommendations from trusted friends.

Information technology, particularly emerging Web 2.0, plays a very important role in implementing open innovation approaches like these. Fundamentally, IT radically reduces the communication cost, making it possible to open the innovation process to external communities (von Hippel 2005). At the same time, IT allows non-hierarchical forms of coordination and control possible in the organizations (Malone 2004). In particular, Web 2.0 technology enables new forms of networks among individuals and contents that provide new innovation opportunities (Benkler 2006). These technologies can be used both internally and externally to promote and facilitate free flow of knowledge among different individuals. While open innovation cannot – and should not – be driven by information technology choices, it is critically important that a firm choose a right IT tools to enable its open innovation strategy. For example, when a firm is using a crowd-sourcing model to support innovation

stages 1 through 3, the firm needs an IT platform that incorporates both a user-created content repository and a distributed voting mechanisms as implemented in sites like digg.com or delicio.us (both of which are popular social bookmarking sites). On the other hand, a firm that wants to create a community will need a social network such as IBM's Beehives or Microsoft's SharePoint to build an open innovation community that acts like Facebook or MySpace.

While an open innovation strategy is often enabled by information technology, open innovation should not be treated as an IT project. Open innovation will only be successful if social, organizational and technological considerations are integrated. Depending on the type of open innovation strategy pursued, the firm must carefully select and design appropriate IT platforms to support its open innovation initiative, paying careful attention to questions of access and security. At the same time, just as the interface between open and internal innovation processes must be defined and managed, the technology infrastructure used to support open innovation must be compatible with existing internal innovation processes. For example, it can be productive to connect a firm's external community with its internal community, typically through a gateway with secure protection from unauthorized access. This way, if the firm runs innovation challenges within several open innovation communities of customers, the results can be made visible to the internal innovation communities so that these members can monitor, follow-up and even participate in the open innovation process in meaningful, creative, and not always predictable ways.

3. **Incentives & Culture**

Because incentives work so well, successful open innovation strategies depend on thoughtful incentive platforms for both internal and external actors. One of the insights behind open innovation is that non-financial incentives such as the joy of problem solving, recognition, and the longing to belong can be powerful motivators alongside of, and sometimes instead of, traditional rewards – although care must be taken so that pecuniary rewards do not compete with or pervert more intrinsic satisfactions (Osterloh and Frey 2000; Osterloh et al. 2002; Shah 2006; Wu et al. 2007).

Similarly, a successful open innovation strategy requires cultural commitment. Even if the firm is successful in finding or seeding a vibrant external knowledge community whose members are willing to engage with the firm, a culture of "not-invented-here" will squelch externally generated innovation. Indeed, the underlying cultural premise of open innovation is often antithetical to the internal, tightly controlled and secretive norms of many firm's existing innovation systems.

Conclusion

While it is important to learn from industry best practices, successful open innovation will be built by leveraging a firm's previous success in using external knowledge resources in its innovation processes. Thus, successful open innovation strategies should start by leveraging existing external relationships. Accordingly, firms considering open innovation would do well to start

with an assessment of their current product lines, intellectual property, capabilities and networks to determine which are likely to be the most accessible, exciting and so productive as foundations for a successful open source initiative.

As with many new initiatives, success in introducing an open innovation strategy depends on skillful management of existing and new capabilities, leadership, incentives, structure, and culture to enable and reinforce the new innovation regime. Thus, successful open innovation initiatives will be those that are well integrated into the firm's overall innovation strategy.

Finally, an open innovation strategy can only be successfully integrated into the firm's overall innovation strategy if the firm's leadership and innovation culture are receptive to new ideas from outside of the firm. The ultimate challenge – and promise – of open innovation is to recognize and capture the sometimes breathtaking creativity of friendly, motivated and well-managed outsiders.

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