OPEN INNOVATION: A SEARCH FOR A FLEXIBLE FRAMEWORK

The objective of this article is to create a flexible Input/Output process control framework for the collaborative open innovation process based on a literature review of previous research to bridge the gap between academic theory and managerial experience. The framework will be of value as a research tool for future empirical study and as an implementation tool for managers.

Introduction

There has been increasing pressure on organizations to retain sustainable competitive advantage in the face of the fast changing innovative scenario, shrinking product life cycles and rising research and development (R&D) costs under the traditional closed innovation model. More and more firms are reviewing their R&D policies and new product development processes. As organizations begin to discern the shift in paradigm from a proprietary activity based innovation system to that of an open system with multiple possibilities from where ideas may originate, it becomes all the more important to identify and organize the process with which open innovation can be managed. Open innovation is considered to have practical applicability in a wide range of industries and is not limited to those that are traditionally considered high-tech (Chesbrough & Crowther, 2006). It becomes, therefore, all the more essential to introduce a level of control into the varying degrees of innovative processes undertaken by organizations belonging to diverse industrial sectors. This paper contributes in the progression towards controlling open innovation processes by proposing a flexible Input/Output (I/O) framework. The motivation for creating such a framework is the plasmic nature of open innovation. Since open innovation is conducted in a collaborative environment, a flexible framework is conducive to averting the effects of variation produced by the sources identified in the paper, nature of business operations, levels of porosity and nature of innovation.

The paper proceeds first with a literature review of the salient work that provides the motivation for this study. In the next section, the paper begins with an introduction to the underlying concepts which form the foundation for the framework. The paper goes on to define the construct porosity in the context of open innovation. It is hypothesized that the three-stage I/O framework translates innovative ideas to innovative processes, which can be controlled, which in turn lead to innovative results. Four elements that contribute to the control of innovation processes are identified, namely, Business Model Alignment, Intellectual Property (IP) creation/protection, Customer Integration and Technology. The first two of these elements are internal, related to the strategy of the firm, and the next two require external collaboration. The paper then discusses the predominant issues relating to these four elements. Since a substantial portion of the development of the intellectual property is outside the direct control of a participating organization, the framework suggested in this paper concentrates on controlling the elements internal to the open innovation process. It is suggested that by controlling the internal aspects of open
innovation within an organization with precision, greater overall control of the open innovation projects can be achieved.

**Literature Review**

This section of the paper uncovers relevant discourse in the current literature affecting the practice of innovation process control. The first consideration to be kept in mind is that open innovation is not limited to the concept of outsourcing and insourcing of technology and ideas (Chesbrough & Crowther, 2006; Collins, 2006; Lichtenthaler, 2008). Chesbrough (2006) finds that “open innovation is not *ipso facto* a recipe for outsourcing R&D” (p. 229 ). An open or porous innovation model, in fact, calls for the strategic alignment of the business’ business model with new realities in order to access the full benefits of the paradigm change (Chesbrough & Crowther, 2006; Chesbrough *et al.*, 2006; van der Meer, 2007; Chesbrough & Appleyard, 2007). Considering this, the focus of a controlling framework should be directed to breaking down the process of innovation into manageable sets of tasks for the successful completion of the project. The ideal model, according to Collins (2006) is one where the actual process of innovation is conducted as a ‘series of phases’ with the possibility of ideas being incorporated from external as well as internal sources at any stage. The suggested approach ensures that the organization remains receptive to ideas at all stages of the innovation process, without losing the discipline of meticulously assessing and managing their development. The progression from simple speculative research to an optimized execution in order to create growth opportunities is something that the paper will deal in the next section.

The most important elements, as perceived and identified by Chesbrough and Appleyard (2007) for the successful grounding of an open innovation project are the creation of knowledge through an open invention process and the creation of an ecosystem of businesses, arguably in collaboration through open coordination (Iansiti and Levien, 2004). The proposed framework is a valuable tool for accomplishing these objectives. Ultimately, an organization has to choose what combination of tools it wishes to select in order to create the required balance of Value Creation (embodied by ventures such as Wikipedia) and Value Capture (embodied by organizations such as Google) which Chesbrough and Appleyard (2007) suggest to be the perfect strategic-drivers-mix for an open innovation business model. Popular examples here would include social networking and file sharing websites such as YouTube, Facebook and MySpace.

Lichtenthaler (2008) proposes a system of controlled processes involved in ensuring performance in an open innovation environment. He propounds systematic process planning with distinct process phases that include Planning, Intelligence, Negotiation, Realization and Control. Combined with specific organizational controls, these processes give rise to defined performances, which include results such as licensing revenues and success when compared to competitors (Lichtenthaler, 2008). Lichtenthaler’s Planning, Intelligence, Negotiation phases correspond to the first stage of our framework, Realization to the second stage, while control is a component of third stage. Though the system suggested by the author above takes into account a number of phases, Lichtenthaler’s system fails to account for the basic elements and the varying levels of porosity in an innovation process It also fails to define the extent to which an organization may use open innovation.

For the most part, to adjust to the modern market trends and in order to maintain acceptable level of profitability, organizations have had to restructure their activities and focus on short-term results at the cost of long-term research. However, there comes an increasing realization that only intensive innovation can differentiate organizations from their competition. Open innovation has been considered as one of the efforts to profit from collaborative efforts with external research and development (R&D) and innovation without making heavy internal investments (de Wit, Dankbaar & Vissers, 2007).
The literature review finds that though there is a wide ranging research on process control in innovation as well as on open innovation and its attendant measures, which demand the modification of strategic business practises, there is a seeming lack of research on how to control the processes of the less predictable open innovation process in a collaborative atmosphere. This paper creates a framework which combines the theoretical advances of the literature reviewed above, including the seminal works of Chesbrough and Lichtenthaler to create a flexible framework to accommodate the increasing demands to control the collaborative open innovation process.

A Flexible Input/ Output Framework for Process Control

Introduction to the Framework

Since the control of open innovation processes is a relatively new research area, the majority of the literature reviewed offers conceptual approaches rather than empirically reinforced studies. This paper approaches the proposed issue of creating a flexible I/O process control framework based on the literature reviewed in the previous section. It was found that a gap existed between codified theoretic approach to open innovation and the managerial dilemma of handling and successfully controlling collaborative open innovation. This paper attempts to bridge the gap between the theories of open innovation and the managerial viewpoint. Even though, as Olleros (2007) insists, a hierarchical framework can possibly act as a restrictive bond on the actual process of open innovation, this paper suggests a primary process-oriented framework for innovation-oriented firms that do not fall under the extreme end of the spectrum by being driven by the random progression of innovation breakthroughs.

The suggestion of this particular framework promotes the argument that innovation should not remain limited to a particular normative approach. Consequently an inducement to a process-based input/output (I/O) related approach is encouraged. The motivation for creating a flexible I/O framework arises from the fact that the needs of the participants in the open innovation process may vary. This variation is seen to be produced by three factors:

First, the Nature of Business Operations determines to what extent, if any, open innovation is practised in the organization. Chesbrough (2003) finds that there is a multiplicity of organizational and individual players that intermediate the transfer and commercialization of innovation. Arguably these players would be limited by the nature of their business operations in determining to what extent they can take advantage of open innovation. What needs to be determined is, to what level the organization is involved in the development of innovation and where do the benefits of the innovation development stop paying further dividends for that organization.

Second, to be generally applicable, the framework calls for various Levels of Porosity at the various stages of the process. For the purposes of this paper, Porosity in Open Innovation is defined as: the level to which ideas or innovations are allowed, for collaborative purposes, to be shared in an environment beyond the legal confines of the organization and without the restrictive repercussions of Intellectual Property rights.

The third factor is the Nature of Innovation, which the organization deals with, as the nature of innovation itself would determine the process control measures to a large extent. Nature of Innovation is a more intrinsic factor, calling for the analysis of the nature, the development efforts and resources required for the innovation itself and the relative benefits of that innovation. The next section deals with the elements that comprise the framework, allowing its flexibility to dominate, while laying guidelines for process control in innovation.
The I/O Process Control Framework

Based on the literature review and the identification of the factors introducing variability into the innovation process, this paper postulates that there are four distinct process elements which contribute to the successful translation of innovative ideas into innovation processes and there from leading to open innovation results. As discussed above, the process of open innovation in itself finds varied application in industry. Depending on what the level of involvement in the collaboration is; who the participants in an open innovation project are; what type of working relationship the collaboration entails; and what the actual stakes in the project are, various models of the innovative processes can be applied to the development based on field and academic research.

Figure 1 illustrates the three-step I/O framework for the process control of innovation in a collaborative environment. The framework progresses from Innovative Ideas to Innovation Processes and finally to Innovation Results. The four elements affecting innovation process control are: Technology Integration, Customer Integration, Business Model Alignment and Intellectual Property Creation/Protection. The first two require collaboration with sources external to the organization and the latter two are internal processes falling in the area of strategic policy making.

Figure 1

Flexible Input/ Output Framework for Process Control in a Collaborative Open Innovation Environment
The three-stage model suggests decreasing levels of porosity and an increasing level of codification with each stage as we near the completion of the project. With decreasing porosity from the first stage to the third stage, the first two stages show distinct states of porosity while the third stage achieves a relatively stable state. It is posited that the maximum process collaboration potential resides at the second, Innovation Process stage. However, it is hypothesised in the third stage, instead of porous exchange of ideas or process collaboration, formal exchanges do occur which involve the lease/sale of the idea, developed technology, final product or service, as well as the provision of complimentary services.

The Innovative Ideas Stage

This stage is first and most porous I/O stage of the process control framework. Here raw ideas flow in and out of the formal framework based on the level of IP protection they receive (such as in the case of free revealed or formalized legal transfer). Since this is the stage prior to the selection of the few innovative ideas, which would be developed by an organization, the discretion of an established organization is tested by sheer quantity of proposals both from internal and external sources, which could lead to potential strategic gains. Selection of a good idea at this stage could lead to a long term sustainable competitive advantage, while selection of an idea that turns out to be bad would lead to drain of valuable resources and opportunities. This stage sees individual knowledge broker (third party) participants and innovators as well but mostly one can notice maximized dealings with innovation marketers as well as innovation investors and innovation benefactors (Chesbrough, 2003). Simply put, this stage is a virtual marketplace for ideas, which flow in and out of an organization, depending on what level of innovation development or collaboration opportunities the organization offers to other participants.

The Innovation Processes Stage

Here, collaboration amongst parties takes place in what is usually a legally binding atmosphere with defined deliverables and timeframes. The nature of porosity changes and becomes more restrictive. Though there is sustained I/O, this outside influence is restricted to the collaborating parties, and thus is limited in nature.

Four influencing elements, which this model proposes for consideration, are the Technology Integration, Customer Integration, Business Model Alignment and Intellectual Property Creation/Protection processes. The collaboration intensive impulses of Technology Integration and Customer Integration directly influence the development of open innovation. Here the organization attempts to supplement these two elements by the business model alignment, adjusting it to new realities, as well as by defining its Intellectual Property (IP) stance, whether in its creation or protection, with regard to each project.

Customer integration and technology integration: Managing customer integration is one of the most important issues within open innovation paradigm. Balancing the level of risk and actual involvement in order to maintain a working relationship with potential and current customers is a trial for most organizations investing in open innovation projects. Amongst the foremost concerns are A) Ensuring Collaborative Participation B) Risk Management and C) Maintaining Product Quality and Innovative Focus (Chesbrough, 2003; Enkel, Kausch & Gassmann, 2005; Enkel, Perez-Freije & Gassmann, 2005; Collins, 2006; Gwynne, 2007; Lichtenthaler, 2008).

A unique management for open innovation integrative participation, involving customer integration and technology integration, stems from the free-revealing of proprietary information by inventors. The technique used for freely revealing proprietary information with respect to innovative products/services developed is the case of a ‘private collective’ model previously mentioned. The article
argues that free revealing makes good economic sense for innovators and society alike when selective sources are selected for the revelation of the innovation with the specific aims of collaborative improvement and sale of IP (von Hippel & von Krogh, 2006). It can be further argued that free-revealing of ideas related to potential innovative ventures increases the attraction for customer and technology integration by offering the incentive of non-commercial knowledge gain in the integration process. Yet another technique to incorporate customer involvement and to access innovative ideas and solutions from users is Internet-based toolkits for idea competitions (TIC) (Piller & Walcher, 2006). The ideal motivation behind such competitions is to legally open the innovation process wider, to inspire user creativity, and to increase the quality of the submissions. Robert J Allio’s (2004) interview with Darren Carroll, the CEO of InnoCentive, the firm which in Chesbrough’s (2003) terminology would fall in the category of an innovation marketer, thrashes out the issues of inventor insecurity and measures firms can take to avert these fears by a history of good practices and structured, contractually binding deliverables well understood at the time of initiation of the innovative projects.

The element of managing risk on the organization’s side remains an issue requiring pre-emptive action on the part of the supervising managers. Enkel et al. (2005) propose five cautions for ensuring a smooth innovation collaboration experience. The first two steps advise the selection of the ‘right’ customers as well as the choice of the ‘right methods’ for innovative customer and relevant technology integration. The third step informs the ‘right’ time to incorporate the customers into the innovation process. The fourth step involves the provision of the requisite environmental conditions such as incentive systems, collaborator management and IP management. Lastly it would be prudent to select those projects which can benefit the most from customer collaboration (Enkel, Kausch & Gassmann, 2005).

In fact, it would appear that new technologies are promoted for the cause of open innovation as well, such as visual representation, data mining and prototyping software. Proctor and Gamble is one of the prime examples industry leaders harnessing this kind of technology for the purposes of open innovation in their popular ‘Connect and Develop’ strategy (Dodgeson, Gann & Salter, 2006). Research indicates that the sourcing of external technology should be considered as a series of approaches, starting with Cost and Supply Chain Management, Strategic Partnering, Extended External Networks and moving through the required number of processes to finally achieve an Integrated External Innovation (Witzeman et al., 2006).

Managing online communities as customer integration process: Online communities are increasingly becoming a vital component for open innovation collaborative ventures. For successful customer integration, it is important to understand these virtual congregations offering immense collaborative potential. These communities range vastly in their purpose(s) for formation, functionalities, size, member compositions and such. Dahlander et al. (2008) find two central factors that affect the management of online communities: governance and symbolic value creation. These factors largely determine what the organizational perception of and hence dealings with these communities (Dahlander et al., 2008). Online communities, for the very reason that they are useful, can become extremely difficult to navigate and control inputs from and generally organization might tend to avoid established communities of general users for more than market research or field testing products. Before an organization can determine which communities they wish to venture into with open innovation projects, the management should deliberate over the constructs which surround the concept.

As determined by West and Lakhani (2008) it is wise to consider what definition of ‘‘community’’ is applicable to the strategic needs of the organization and to consider how the construct applies to networks and associations of firms. The very concept of a network including overtones of “open-ended interdependence and relational coordination” (p. 228) can either offer limitations or enhance for working strategic innovative endeavours (West & Lakhani, 2008). The ideal setting, in the context of this article, is that for a system of firms with complementary offerings and peripheral user populations
constituting a community which enable specific shared objectives and consequently offer effective customer integration.

**Business Model Alignment and Intellectual Property Creation/Protection Processes:** These two elements are intrinsic to the organization acting as a strategic base for process control in an open innovation project. To justify the need for business model alignment and the protection of IP, one must begin by considering the rudiments of the role of open innovation in business aims and its strategic development model. The basic model for the development of open innovation in an organization as proposed by van der Meer (2007) is the one, which moves from concept to development to the business stages. Further, he finds inherent divisions within these phases which inform the formation of the open innovation process. The first stage he submits as that of natural innovation, which develops into the second stage of systematic innovation in a closed system (more popularly known as closed innovation) and the third stage is that of systematic innovation in an open system. In this scenario, he suggests a stage-gate approach to move from haphazard innovation to open innovation in organizations. The first stage involves the licensing in and out of technology, which corresponds to the first stage of our framework. Van der Meer’s (2007) second stage consists of “spin-outs” and “spin-ins” and the third stage is that of acquisition and divesting. These two stages correspond to our third stage, which is Innovation Results. It is argued that van der Meer appears to have missed the important second stage of Innovation Processes.

According to Chesbrough and Schwartz (2007), the context of the relationship determines the character of the relationship during the open innovation project. For a sustainable co-development relationship the invested organizations must define business objectives and align their business models accordingly. They should also gauge whether the innovative capabilities are core, critical or contextual, which might mean different contractual and practical obligations for each of the parties involved.

Since the main objectives for an organization considering open innovation are increasing profitability, enhancing innovation capacity, creating greater R&D scope and flexibility, expanding market access and shortening the time to market for products, Chesbrough and Schwartz (2007) suggest a four-step process to determine the business model capabilities for a specific organization, the first step that their article, suggests is a definition of the business objective in undertaking the open innovation collaboration process. The second step involves assessing the capabilities required by the organization investing in the innovation project. The next step is determining the degree of business model alignment with the project partner. The last step involves determining the possibility for future collaboration and accordingly managing the partnership to meet possible future needs. The actual method of implementation for the innovation process appears to be missing from the author’s theory. While the first three steps correspond to the second stage of our framework, the fourth step is similar to the Innovation Results stage and the feedback loop suggested in our framework.

As can be imagined, organizations cannot simply rely on external sources of knowledge. Supplementing open innovation endeavours may not be a popular topic but should be considered while encouraging collaborative efforts (de Wit, Dankbaar & Vissers, 2007). Since heavy internal R&D investment is not entirely suitable in a time where fast moving, low-cost open innovation has the advantage over closed innovation, various levels of collaboration should answer for the need to generate ideas other than simply outsourcing R&D. The organization, in other words, plays the role of a knowledge broker, investing in the development of external technologies, as well as offering its own developed resources for the collaborative purposes and the resultant benefits of the other. While this may not necessarily be ‘social service’, inventors may wish to release their work for improvement and for potential buyers in a restricted revelation of their work, termed as a ‘private collective’ model (von Hippel & von Krogh, 2006) forming a basis for Intellectual Property Creation/Protection Processes.
In a study conducted on IP management in publicly funded research centres (PRCs) in the UK, it was found that the levels and formality of IP protection sought by company based research centres is directly related to the organisational objectives, available resources and the type of technology being developed (Young, Hewitt-Dundas & Roper, 2008). But the authors also found that PRCs based in multinational’s operational core or periphery were more likely to engage in formal IP protection than the research centers in local or smaller-sized firms. Also, it was found that most of the university based PRCs preferred to protect their IP and then either license out that IP to other parties or to create a spin-out company (Young, Hewitt-Dundas & Roper, 2008).

While considering IP creation/protection processes, an entirely different approach needs to be undertaken while considering collaboration with universities and other predominantly research-based arenas that lack strong monetary concerns or clout similar to those of the corporate world. Collins (2006) creates a ten stage alignment guide for similar scenarios in his article on *Opening up the Innovation Process*. The article recognises a need for having strong connections to academic institutions that requires a commitment from senior management and is as far reaching as the mission of an organization. The author then encourages the identification of common interests and needs such as forming and understanding the limits of required strategic alliances as well as the need for forging long-lasting relationships with long-term commitments while trusting in the fact that research results will eventually meet expectations. The author suggests that professional skills should be applied to supplement policies and IP management should remain a constant priority but not a driver for both professionals as well as academics. Collins recommends that collaborations should begin with the clear identification of expectations and working objectives. Communication forms a vital part of his collaborative model, where changing expectations and standard procedure can be plainly laid out and reconfirmed periodically. As far as IP development is concerned, the author purports that management of the projects should ensure that research and IP acquisition is quality driven and not attempting to have an all-encompassing nature. Lastly, the model suggests that the extension of open innovation courses would encourage university students to learn in a controlled environment as well as offer an exploration ground for the discovery of the multiple facets of open innovation inclusive of its technical, design oriented and social aspects (Collins, 2006). On the whole, it needs to be kept in mind that universities offer versatile relationships not limited to services such as research partnerships, consulting and contract research. It is also popularly suggested that firms place value in these relationships for the period of the entire innovation cycle and not just for the initial supply of inventions and ideas (Perkmann & Walsh, 2007). In fact, Minshall, Seldon, & Probert (2007) discuss the appropriation of a “university spin-out firm to bring a potentially disruptive technology to market” (p. 225). The authors argue that an academic ‘spin-out firm’ system can be instrumental in eventually creating a “technology ecosystem of providers of complementary resources” (p. 225) which would enable the participant organizations to build aptitude in various potentially disruptive technologies.

At this point it is incumbent upon this discussion to examine the results of an empirical analysis conducted by Dittrich & Duysters (2007) which finds two separate dependency based trends in formal innovation networking. The first is ‘exploration’ which corresponds to the first stage of our framework and the second, ‘exploitation’ which is a possible negative use of Innovation Processes stage. The authors share three important findings, firstly, that the difference between the two networking strategies is the observed capabilities of the partners of the collaborative venture. The second measure they observe to be related to partner turnover, which is usually higher in explorative relationships due to the relatively lower levels of dependency of the relationship. The third trend the authors discover is related to the type of contract undertaken. It is found that exploitation alliances are characterized by legal terms which encourage long-term collaboration. It was found that Nokia converted from an ‘exploitation’ to ‘exploration’ policy in the third phase of its development and benefited from the switch from long-term collaborative commitments to an increased exposure to innovation (Dittrich & Duysters, 2007).
The most popular model currently being suggested for managing the life-cycle of an innovative collaboration is the "Want, Find, Get, Manage" model (Witzeman et al., 2006; Slowinski & Zerby, 2008). The model focuses on the determination of the specific external resources strategically required by a firm; the mechanisms used by the firm to acquire the source of those resources; the structured plans and agreements used by the firm to achieve its goal and the tools, mechanisms and management techniques used throughout the duration of the collaborative effort to achieve the ultimate goals (identified in the first, “Want” phase). Each of the model’s four phases has relevant IP retention and acquisition challenges (Slowinski & Zerby, 2008) similar to the Innovation Processes stage in the framework this paper suggests. The model however, finds comprehensive correspondence in our framework. The “Want” and “Find” steps correspond with the first stage of our framework. The “Get” stage is akin to the second stage and the “Manage” stage is covered by the Innovation Results stage and the feedback loop in our framework.

The second stage of the framework is thus composed of a number of sub-processes that may run concurrently, sequentially or iteratively. This forms, therefore, a comprehensive mode of controlling the collaborative innovation project.

The Innovation Results Stage

The least porous of the three stages, the completion of the formalized product or services is heralded by I/O operations which are characterized by the leasing, licensing or sale of the developed idea, developed technology, final product or service, as well as the provision of complimentary services.

Here the actual contractual obligation plays a major role in different cases while determining the balance of the relationship between collaborating parties as well. Christensen et al. (2005) posit that small technology based firms which start exploring commercial opportunities in cooperation with small yet established players who have the complimentary required assets actually end up having the advantage of a more balanced bargaining position than is thought possible as compared to the start-up pairing with a large sized incumbent. Since niche markets are more conducive for the entry of fairly small to mid-size firms, as in the case of disruptive technology, some researchers consider small organizational partnerships having the advantage in entering into such markets (Danneels, 2004). The collaboration efforts at this stage are also defined by the nature of the transaction, for example the technology training sessions for licensed products or services.

With the stabilization of the third stage or at the discretion of the organization, similar I/O process cycles for various strategic product or service needs can be run at a firm. A feedback from experiences gained in the earlier development cycle(s) would improve quality of the open innovation process. Alternately, it can be assumed that any further development of the innovation results from a previous cycle can be leveraged to launch new innovative projects, using the feedback loop as suggested in the framework.

Conclusion

In the context of open innovation, it becomes clearer with progressing time that stronger formalized parameters would be required as open practices mature. Though literature available today focuses on contextualizing the actions of leaders in the field as well as providing specific models for creating processes to deal with open innovation, more research needs to be conducted to provide academics and managers with tools to create flexible relationship based innovation management. This article adds value by providing a synthesis of salient literature in the field and recognizing the elements contributing to the processes of open innovation endeavours in organizations. The article also defines the
concept of porosity in the context of an open innovation collaborative environment and provides a unique input/output process control framework to help appreciate the constituent elements of open innovation projects. The flexibility of the framework provides for the factors which cause variation in the innovation process and which would render an intensively formalized control framework inapplicable.

The paper is of value to academics because it clearly defines issues faced in open innovation process and proposes a useful framework which can be empirically tested through further research. The paper also identifies the paradigm shift to controlled process based I/O innovation which allows for flexibility, hence outlining new areas for future research. The paper is of value to managers because it creates a practical framework based on the successful elements culled from prior research for the practical handling of open innovation projects to create value for their organization. The limitations of this article call for further research such as empirical and field-testing for validation.

References


