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Processes, Strategies, and Performance Aspects of Open Innovation in Information Technology Sector - Insights from Experts

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Abstract

Open innovation paradigm considers that in order to advance technologies and markets, firms can and should leverage internal and external knowledge, ideas, expertise, and paths to market. This is in contrast to the traditional or closed model of innovation management, where organizations usually leverage the in-house capabilities for innovations. Even though the concept of open innovation has received much interest in management research, majority of the studies on open innovation to date have been mostly exploratory in nature. We used semi-structured interviews to gain experts' perspective on open innovation concepts in the Information Technology (IT) sector. Twenty four interviews were conducted with top management executives in IT firms across India, Europe, and Australia over a period of eight months. A content based analysis of these interviews using open coding was used to investigate experts' perspective of open innovation, strategic relevance of open innovation, and industry perception and trends of open innovation adoption. We developed a framework to classify open innovation projects based on the market knowledge strategy, innovation objective, and stage of the project. We also analysed the existing openness and open innovation project performance measures as perceived by these experts.

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Introduction

Open innovation is a paradigm that is based on the concept of availability of abundant knowledge outside the boundaries of organizations. In order to advance their technology firms can and should use both external as well as internal ideas and also internal and external paths to market (Chesbrough, 2003). Apart from the internal technology/knowledge base within the organization, there is a huge external technology/knowledge base outside the boundaries of the organization, which the organizations do not normally have access to.

Advances in technologies, increased computing power, improved manufacturing techniques, and easier access to global markets have prompted organizations to innovate. As a response, organizations tend to invest more in internal Research and Development (R&D). However, it is impossible for any organization to acquire all the essential knowledge for the required innovations in a sector in which it operates.

Extant research shows that that one key aspect of innovation is that it normally combines different knowledge sets (Nonaka et al., 2003; Tidd et al., 2005). However, such knowledge sources may be frequently found outside the firms' boundaries (Chesbrough, 2003). Adopting open innovation principles allows ideas to flow most efficiently across organizations regardless of its origin, with provisions to avoid conflicts between the partners. Even though importance of inter-organizational relationships, facilitation of open innovation capabilities, the exchange of Intellectual Property (IP) and innovation capabilities have been brought out in earlier studies (Tether, 2002; Lokshin, Belderbros, & Carree, 2008; Lazzaroti, Manzini, & Pellegrini, 2010), organizations are slow in harnessing external cooperation for innovation (Feller et al, 2009). Hence, it is critical to reinforce within firms that open innovation is about elevating R&D to increase technology developers' and researchers' value by expanding their capability and capacity to innovate; and not just an alternative to in-house R&D.

This study investigated open innovation strategies, processes, and implementation aspects using qualitative research techniques. Experts' perspective on open innovation, potential benefits that may be gained by adopting open innovation strategies, current trends in open innovation adoption, and how industry perceives and adopts the open innovation principles were analysed using twenty four semi-structured interviews with top management executives of IT firms across India, Europe and Australia.

This manuscript is structured as follows. A discussion on the current literature on open innovation is provided in the next section. We then describe the research objectives and methodology. The insights and analysis gained from the interviews with experts are detailed in next section. These insights gained from the study will help organizations and managers to

implement open innovation principles in their projects and gain protection from failure of collaborative projects.

Research in Open Innovation Area

The concept of open innovation has gained considerable attention in management research recently. This section provides an overview of the current studies in open innovation area.

Closed and Open Models of Innovation Models

This section compares the traditional or closed model of innovation management with open innovation, describes the terminology related to open innovation, and provides examples of open innovation initiatives.

There is a view that organizations must have some form of control over the innovation process in order for it to be successful in the market. According to this view, to generate ideas for successful innovation, companies should develop, build, market, distribute and support the ideas in-house (Chesbrough, 2004). In this model for innovation management, companies funded large internal projects which formed the basis of new products and services. Once the products created high profit margins, a part of it could be ploughed back into further research for innovation. This vertical integration R&D with business units developed disadvantages for small organizations who could not afford huge investments for the R&D (Chesbrough, 2003). Such a model where all innovation related activities used by the firms were done within the firm boundaries is called the 'Closed Innovation' model for innovation management. The concept is described in Figure 1.

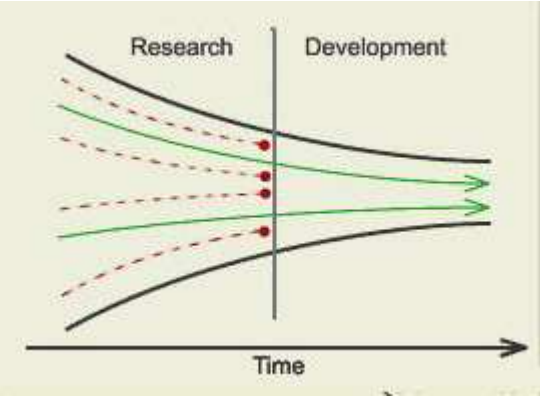

Figure 1: Closed Innovation Paradigm (Chesbrough, 2003)

In Figure 1, the dashed lines represent completed research projects that did not reach the development end phase. These research projects may have generated patents or research value but were never commercialized or used for business purpose. Such situations may arise when an innovation is developed that does not match a firms core business at a point of time. These innovation are normally shelved in traditional innovation management models until a business opportunity arise; a situation which may never arise (Chesbrough, 2003).

Some organizations have successfully used the closed model for innovation management. For example, according to Almirall and Casadesus-Masanell (2010) Apple iPod and Nintendo Wii were developed following a closed innovation model. iPod not only helped Apple survive a near death but was also acclaimed as the product of the year 2009[1]. Nintendo's Wii was considered more innovative than Microsoft's Xbox 360 or Sony's PlayStation 3, for its product features (Almirall & Casadesus-Masanell, 2010).

Chesbrough & Rosenbloom (2002) and Chesbrough (2003) present the case of Xerox corporations Palo Alto Research Centre (PARC), established in 1970, to show achievements and limitations of closed innovation. PARC generated numerous computer hardware and software innovations but most of them did not generate any monetary benefits to Xerox or its shareholders. Some of these projects turned out to be valuable for other firms that used the idea later on. Many of the leading innovations including Graphical User Interface (GUI), Ethernet networking protocol, PostScript, document management software, web searching and indexing technologies were developed in this research lab. However, PARC failed to capture value for Xerox from these projects. PARC was managed according to the best prevailing practices in the industry. These innovations remained within the walls of Xerox corporation, and eventually failed to generate business value for Xerox. Chesbrough (2003) lists 24 "spin-off companies" that were created to commercialize Xerox's technologies out of which a few prospered. The list includes Adobe, 3Com and Documentum. Possibly, if Xerox had followed approaches of letting ideas which were not aligned with its existing businesses, flow out of the organizational boundaries allowing other companies to use its developed technologies PARC could have generated business value for Xerox.

Contrary to the closed innovation view, the emerging view of open innovation is based on the concept of availability of abundant knowledge outside the organizational boundaries. Open innovation strategies try to minimize project failures and enable maximization of value of innovations by exploring new sources of knowledge and new paths to market. Under the concept of open innovation, research results may cross firms' boundaries (Chesbrough, 2003). Organizations that are unable to utilize a technology that is developed may provide it to another firm creating value for that technology. Similarly, any firm may be able to in-source technologies created by other firms. This concept of open innovation is described in Figure 2.

[1] http://revevol.eu/2009/05/29/ipod-touch-max-product-of-the-year-2009/

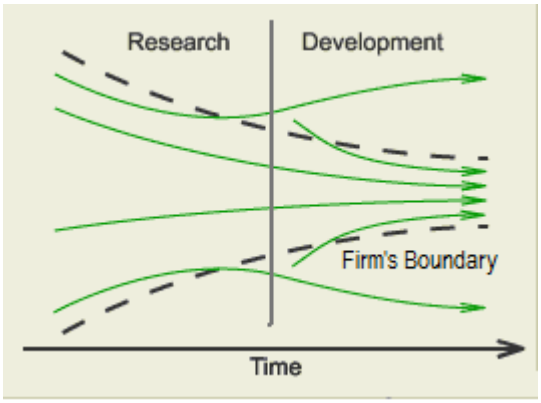

Figure 2: Open Innovation Paradigm (Chesbrough, 2003)

This diagram uses dashed lines to illustrate that the boundaries of the firm are porous. The lines going out of the firm's boundaries represent technologies that are licensed to other firms and that otherwise would have gone unutilized (similar to the dashed lines in the closed innovation model in Figure 1). The lines entering the firm represent outside technologies that are licensed to a firm that did not originate in the firm's own research laboratories; but these technologies were used in the firm's core business.

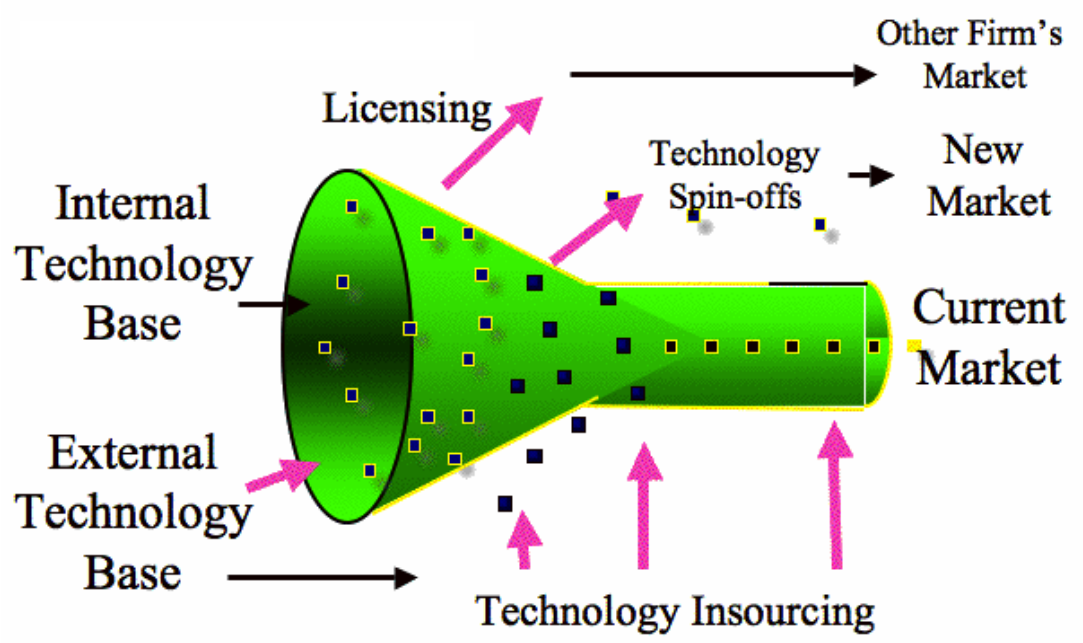

Figure 3: Open Innovation Strategies (Chesbrough, 2006)

Apart from the internal technology base that organizations possess, there is a huge unknown/inaccessible external technology base outside the boundaries of the organization. Open Innovation strategies could give access to such technologies. By licensing-in, buying Intellectual Property (IP), or engaging in co-development, technology in-sourcing is made possible. The in-sourced technologies may create new markets for the organization or

effectively address the needs of its existing market. A developed idea not aligned with the current business model or one for which current capabilities of the organization do not support commercialization prospects, may be shared with external agencies. The idea or corresponding IP may be licensed out or sold to an external partner, which could address the needs of the external partners' current market, if it exists. Alternatively, a spin-off organization may be created targeting a new market. These strategies are explained in Figure 3. A comparison between the principles of closed and open innovation is summarized in the Table 1 given below.

Table 1: Principles of Closed and Open innovation

Closed innovation principles	Open innovation principles
Smart people in the field should work for us	We cannot get all the smart people. We need to work with people outside and inside our company
To profit from R&D we must discover it, develop it and ship it ourselves	External R&D can create significant value. Internal R&D is required to claim some portion of it
We discover it and we get it to market first	We don't have to originate the research to profit from it
Company that gets an innovation to market first will win	Building a better business model is better than getting to market first
Creator of most and best ideas in industry will win	If we make the best use of internal and external ideas we will win
Intellectual Property (IP) should be controlled as competitors don't profit from our ideas	We should profit from others' use of our IP, and we should buy others IP to advance in our own business

(Source: Chesbrough, 2003)

Defining Open Innovation

According to Gassmann and Enkel (2004), "*open innovation means that the company needs to open up its solid boundaries to let valuable knowledge flow in from the outside in order to create opportunities for cooperative innovation processes with partners, customers and/or suppliers. It also includes the exploitation of ideas and IP in order to bring them to market faster than competitors can*". Chesbrough (2003) defines open innovation as a "*paradigm that assumes that firms can and should use external as well as internal ideas, and internal and external paths to market, as they look to advance their technology"*. Open innovation studies have asserted that co-developing and knowledge sharing are its essential aspects. One of the major critique for the principles of open innovation (Trott & Hartmann, 2009) is that these principles are old concepts presented in a different way. Hence, it is essential to identify open innovation in terms of its pre-requisite characteristics and how it is actually different from collaboration and co-development. Chesbrough (2006) further defines open innovation as *"the use of purposive inflows and outflows of knowledge to accelerate internal innovation,*

and expand the markets for external use of innovation, respectively". We adopt this as the closest to the definition we used in this study.

Examples of Open Innovation Initiatives

Intel's approach to R&D was unconventional. It decided to decentralize its R&D through creation of three labs namely Intel Architecture Lab (IAL), the Microprocessor Research Lab (MRL) and the Components Research Lab (CRL) in specialized areas. These labs coordinated with external agents such as universities, suppliers, and research consortia for the R&D process. They also connected with other companies like IBM and Microsoft. Chesbrough (2003) described this approach as an open innovation initiative.

Dittrich and Duysters (2007) described how Nokia accessed and managed a huge number of new external partners to develop its third generation mobile telephone. They illustrated that Nokia effectively used an open innovation strategy in the development of new products (3G handsets) and services, and in setting technology standards for the use of mobile communication applications. Nokia also collaborated and acquired several R&D firms when Nokia could not develop software or when it was not possible to build it in the required time. Tie-ups for after sales service were also developed. Nokia also tied up with competitors like Ericsson and Siemens for protocol development. Dittrich and Duysters (2007) showed more than twenty five connections in the Nokia network.

Another notable example is that of Procter and Gamble (P&G), who extended its internal R&D to outside world through its initiative called *Connect + Develop* to reach out to external parties for innovative ideas. P&G took ideas from outside and also made available to other firms, including competitors, the ideas generated internally. P&G defines *Connect + Develop* "*as the practice of accessing externally developed intellectual property in your own business and allowing your internally developed assets and know-how to be used by others*"[2].

InnoCentive is an example of web sourcing initiative (Allio, 2004). Through its website InnoCentive allows solution seekers to post the problems. Solutions may be provided by anyone. It has emerged that solutions have been provided by individuals from other disciplines. InnoCentive follows a prize based incentive to solve problems. Any innovation that gets accepted is given a prize by the solution seeker. Hence, the problems that may have remained within an organization get solved with the help of external partners and this may also provide a case of successful commercialization though open innovation initiatives.

Innovation Exchange (IX) is another online innovation marketplace. According to IX, diverse community members from all over the world respond to challenges sponsored by Global 5000 companies and not-for-profit organizations. Companies called 'sponsors' may get ideas from the online community and 'innovators' may generate innovative ideas[3].

[2] https://secure3.verticali.net/pg-connection-portal/ctx/noauth/PortalHome.do

[3] http://www.innovationexchange.com

Access to skills outside to an organization, shared benefits and risks, and innovative problem solutions are the characteristics of these instances.

Selection of Information Technology (IT) Sector

IT sector is an area which has high scope for open innovation due the inherent characteristics of the globally distributed network of solution providers and clients. IT applications also create the possibility of open innovation in other sectors by creating platforms that enable collaboration. There are several studies which show how IT adoption and improved IT capability have positively influenced firm performance (e.g. Bharadwaj, 2000; Melville, Kraemer, & Gurbaxani, 2004). So understanding the factors that influence open innovation adoption in this sector will have wider implications for other sectors.

The biggest challenge for IT providers is to develop solutions that will generate revenues for them along with creating profits/increasing efficiency aspects for the customers. The concepts of open innovation fit in here and the outcomes of open innovation adoption provide a cost effective way to find particular solutions for the customers. It is essential to identify what factors shape open innovation and influence the adoption by IT organizations.

Since it is necessary to leverage the value generated by partners, specialists, and experts outside the organizations for remaining competitive, exploring the network characteristics of IT firms we can see contributions from several partners may be involved in projects, showing that the sector is more amenable to open innovation. However, even after IT being a sector characterized by active capitalization of external knowledge, no studies have described the benefits that may be achieved through collaboration with specific external sources of knowledge.

It is also essential to understand the difference between IT outsourcing and open innovation. IT outsourcing is defined as *"as a process undertaken by an organization to contract-out or to sell the organization's IT assets, staff and/or activities to a third party supplier who in exchange provides and manages IT assets and services for monetary return over an agreed period of time"* (Mahnke, Overby, & Vang, 2005). While outsourcing refers to particular form of supplier relationship organizations take part in, by acquisition of services from specialized external service providers (Grover, Cheon, & Teng, 1994), open innovation refers to a range of strategies that allow valuable external sources to be incorporated in solution development. Open innovation strategies involve appreciation of both inbound and outbound knowledge flows while outsourcing refers to solution provision by an external entity. Even though open innovation strategies may involve existing collaborations, it is essential to reinforce open innovation is about designing internal process so that external capabilities and resources may be accessed. Hence, adopting open innovation includes a set of strategies, processes, and IP management rather than just a licensing or partnership agreement.

Open innovation R&D processes have been examined in a variety of commercial settings such as consumer electronics (Chesbrough, 2003), pharmaceuticals (Lane & Probert, 2007), automobiles and computer hardware (Gwynne, 2007). However, there are gaps and

inadequacies of empirical research in the IT sector. We have selected IT sector because of the scope and productivity aspects of open innovation in the sector, characteristics of globally distributed network of IT firms and their partners, and based on the nature of current studies.

Research Methodology and Objectives

We used semi-structured interviews to gain experts' perspective on open innovation, potential benefits that may be gained by adopting open innovation strategies, current trends in open innovation adoption, and how industry perceives and adopts open innovation principles, the challenges experts see, and the perceived drivers and barriers of open innovation.

Twenty four interviews were conducted with top management executives in IT firms across India, Europe, and Australia from August 2011 to March 2012. Details of the interviews conducted and firm details are provided in Appendix 1. The interviews were structured around the protocol given in Appendix 2. We did content analysis using the methodology of open coding on the transcripts of the conducted interviews, based on which we identified recurring themes. This stage also helped us validate the measures and scales developed for the quantitative analysis and perform a preliminary analysis for the predicted relationships.

Findings

This section provides detailed description of the insights gained from semi-structured interviews conducted with the experts in the IT industry. The insights are structured around the following major themes:

1. Enablers of open innovation in the IT sector.
2. Innovation practices currently adopted in the IT sector with focus areas and summary of projects.
3. Details of different open innovation practices and models.
4. Changes in innovation and partnership models with the transition to open innovation practices.
5. Outcomes and future trends in open innovation adoption.
6. Insights derived regarding existing measures of openness and open innovation project performance.

Enablers of Open Innovation in Information Technology Sector

IT solutions and consulting has become significant in all forms of businesses and no operation (for any organization) can efficiently function without IT or IT support. IT enables businesses to scale up, and improves operational efficiency and effectiveness. NASSCOM report 2010 estimated total IT spending of 1.62 trillion dollars across the globe. The Indian share was around 76 billion. However, total IT spending in the fiscal year 2009 was around

1.61 trillion dollars which shows IT business is witnessing only linear growth and with no significant changes, the trend may not change.

Innovation is the key to grow beyond sustenance in IT firms and current models of growth require maximizing manpower for increasing revenue as the current model works on charges per human hour. IT providers need to understand organizational context while providing software support. IT organizations should innovate like owners of the applications and drive transformational innovation from IT organization side. The change in business model will help IT organizations explore new operational areas and help the IT application owners with novel and efficient solutions. Innovations in the business models may change the existing model and IT firms are moving in this direction.

IT organizations have had collaborations and academic alliances for the last few decades. Strategic partnering, technology support, and business relations have been regularly getting established for collaborative innovations in the last decade across IT firms. For example, the shift from academic 'inventions' to business 'innovations' gave birth to the Co-Innovation Network (COIN) of Tata Consultancy Services (TCS).

External collaborations provide multiple channels for marketing products and solutions, thereby increasing the chances of success for innovation activities. As shown in Figure 4, infrastructure, resources, and skills outside organizations across partners in open innovation networks provide platform for commercial viability of innovations.

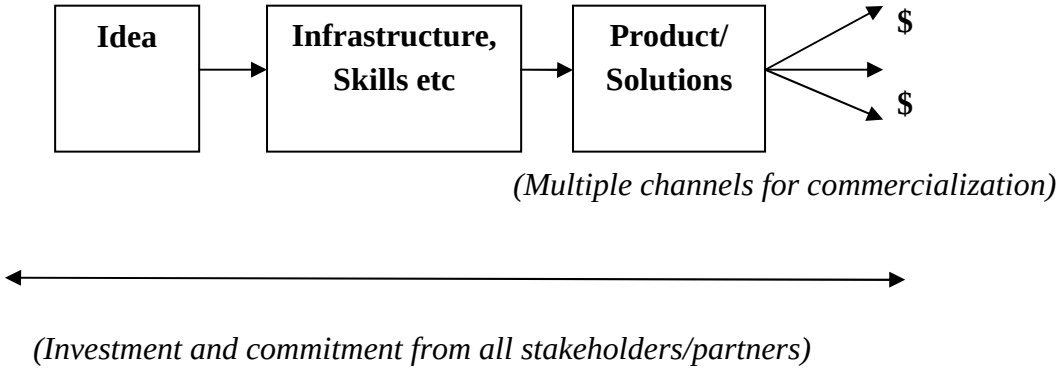

Figure 4: Platform Provided by Open Innovation (Source: Interview with Mr. Vasanth Kumar)

A framework is essential to engage with the ecosystem for successful collaboration. Collaboration identifies the context for innovation and in many of the cases may lead to unprecedented results. According to Dr. Manish Gupta[4], Director, IBM India, smarter planet initiative by IBM along with Institute of Business Value found out there was 15 trillion dollar wastage in world business of which at least 4 trillion could be saved using better IT usage/solutions; for example, by applying IT to non-traditional areas like electricity, water

[4] Interview conducted on 25-10-2011 at IBMIRL, Manyata Tech Park, Bangalore from 10:00AM to 12:30 PM

management, etc. This will require effective partnership, which may be achieved through open innovation.

According to the experts, apart from the business needs for sustenance and growth, open practices were mentioned to help organizations in the following aspects:

1. Recognition in market place
    a. Organization will be recognized as the adopter of latest practices in the industry.
2. Access to top talent across the globe
    a. Open innovation creates a multiplayer effect with access to talented people available anywhere in the world. A community of researchers and practitioners across multiple fields may be created during the process to promote inter-disciplinary research.
    b. Tapping outside talent may help in making external agents (currently outside the focal firm's network) feel the need to interact with the firm.
    c. A framework to engage in associations may get developed in the process.
3. While developing solutions (especially for client problems), open innovation practices help in creation of better understanding of the problems.
4. Help organizations to handle innovation activities in a context when complexity of products and solutions are increasing.
5. Help organizations realize that innovation is not a monopoly of a single company.
6. Globalization: Organizations realize products/solutions are to be developed for world market, and open principles provide access across geographies, platforms, customer requirements, and disciplines.
7. Understand the need to know areas, markets, economies and culture in which external sources work.

Current Practices and Focus Areas

Specific details of open innovation initiatives adopted by some of the firms and their focus areas are described in this section.

Tata Consultancy Services (TCS) Co-Innovation Network (COIN)

TCS COIN has successfully completed more than 30 projects creating 50+ customer instances using the principles of open innovation. One of the projects was for developing software to convert television as a personal computer (PC) (with essential features). Along with 8 other partners (in communication sector, academia, and hardware sector) the solution was developed in the COIN network aiming to serve 23 million English speaking household

who were not able to afford PCs. Another instance was the e-transform project, for supporting changes in organizational infrastructure by developing software tools and techniques for infrastructure management (no extra money to be invested for infrastructure) there by creating innovative ways to manage with current infrastructure.

IBM

IBM has systematic programs fostering open innovation. *First of the kind* is a connection program with the clients by which IBM solves problems for its clients for which no solutions exist in market. IBM makes the investment for the project and only nominal investment is required from clients to take part in the program. The solutions are normally replicated with additional customers to gain commercial viability for the model by IBM.

IBM had adopted open innovation principles in lot of their open source projects including Linux development, Apache project, and development of platforms like Eclipse which had been a huge success based on adoption factor (a non-financial open innovation success factor). These projects involved collaboration with organizations and used Websourcing techniques to connect with individual contributors. Open innovation removed barriers of IP in such collaborations as no one owned the IP and results were published in public domain.

Philips

Philips open innovation activities are basically in the healthcare and consumer electronics sector. The Philips Innovation Campus India established a BOP (Base of the Pyramid) chair in Manipal with partners including Intel and GE. The developed ecosystem attempts to provide healthcare for masses and helps in the validation of developed solutions at Philips. The Manipal eRMCWH (Electronic Rural Maternity and Child Welfare Home - Health centre) connected rural centres to main hub, which in turn was connected to the health ministry. The turnaround time which used to be 1 to 2 months for getting government support was reduced to few days. The medical college got patient data (for research), repeat patients, and ICICI Lombard medical insurance was provided to all customers (at nominal charges improving revisits). This was also one of instances among the IT organization initiatives studied where there was a government partnership.

Philips has also setup an embedded systems lab at JSS Engineering College, Mysore, Karnataka. The collaborating partners are Philips, NXP Semiconductors (NXP), ARM Systems, TCS, and Eckstein Summers Armbruster (ESA). Concept to product development happens at this lab. Processors are provided by ARM, SoC (System on Chip) by NXP (Chip coding), Philips are the whole system integrators (System design) while service component (Customization, Integrated Development Environment (IDE) creation etc) is provided by TCS. Tool chain (marketing, promotion etc.) is done by ESA. Academic participants are given internship in respective organizations and selected for jobs later according to performance.

SAP Co-Innovation Lab (COIL)

SAP COIL (Bangalore labs) network has completed more than 25 projects creating incremental innovations on the SAP delivery platform. Association with other Co-Innovation labs, delivery platform partners, and business partners are the characteristics of this network. Detailed description of SAP COIL is provided in the case study section.

Cognizant Technology Solutions (CTS)

One of the open innovation projects handled by CTS concept lab was the 'BigData' project for faster data browsing from mobile devices. CTS had tied up with Indian Institute of Technology (IIT), Madras in developing the solution and later developed a business context for the same. The discussion on the CTS concept lab is provided in the next section.

Ericsson

Ericsson Global has been involved in open innovation projects in the areas of Networks, Infrastructure, Standardization, and Mobile Applications. The Indian counterpart had developed more than 30 projects in Business Intelligence area. In this case, the collaborating partners were academic partners such as IIT Madras, Thyagaraja Collage of Engineering, Madurai, Tamil Nadu and PSG College of Technology, Coimbatore, Tamil Nadu.

Siemens

Siemens has collaborated with partners across the globe including different Siemens companies. Open innovation network of Siemens include innovation brokers who manages connection with universities and research institutes. When Siemens identifies technologies and products that are aligned with the technology road map of Siemens, they collaborate with universities in making these technologies commercially viable. Around 10 university collaborations exist as of now. Open innovation networks are also used to get feedback for ideas and emerging technology trends. Siemens engages in open innovation networks for a sustainable future and for developing an engagement platform.

Open Innovation IT Project Classification Framework

Different parameters were found to influence the openness and performance aspects in the open innovation IT projects. It was found to be essential to classify different types of projects in order to identify how degree of openness and performance aspects may vary. Based on the responses from the experts we developed a framework to classify the projects based on three parameters:

- Market knowledge strategy (Exploration or Exploitation)
- Innovation objective (Differentiation or Expansion of the Scale of Operation)
- Stage of project (Research, Development, or Delivery)

The framework is given below in Figure 5. This is in line with the existing research. Studies such as Li, Vanhaverbeke, and Schoenmakers (2008), Gatignon, Tushman, Smith and Anderson (2002), Boscherini, Chiaroni, Chiesa, and Frattini (2010), and Van der Meer (2007)

explain different technological and collaboration characteristics for projects with different knowledge strategies, innovation objectives, and stage of project respectively.

The market knowledge strategy and innovation objective need not be aligned always in the same way. For example, exploration projects were expected to create differentiation in market places. However, exploration projects may also be executed to increase the scale of operation. Similarly, exploitation projects may result in differentiation. We found it was also necessary to analyse the partnerships at various stages of the project in order to identify how openness in innovation process varied across the stages and its influence on the innovation outcome. The organizational objectives may also vary based on the stage of the innovation project. Hence, it is essential to analyse projects based on these three parameters.

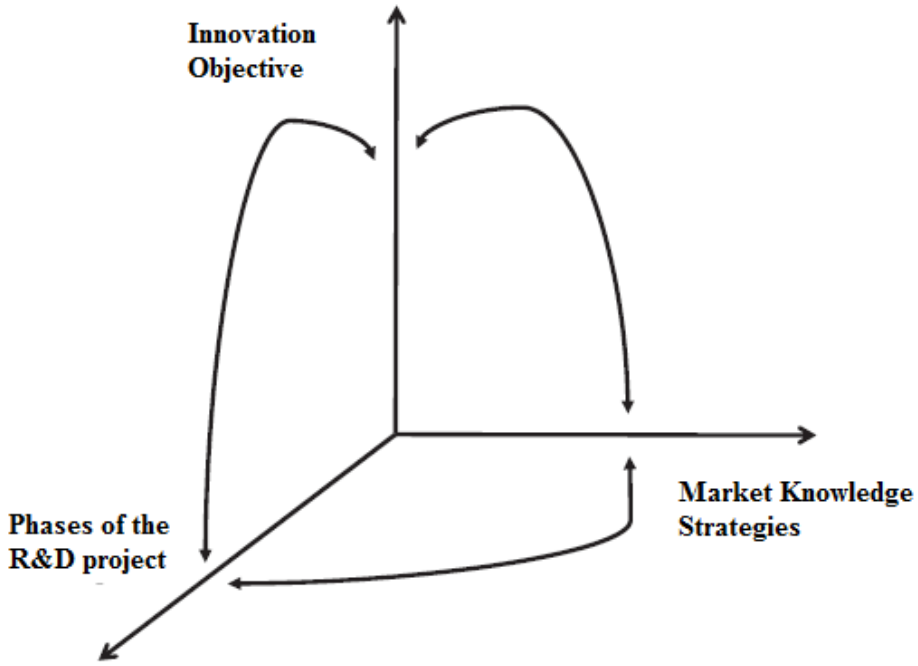

Figure 6: Framework for Classifying Open Innovation Projects (Source: Author's analysis based on multiple interviews)

Classification of few projects handled by firms according to the developed framework is given in Figure 7. Research labs like Microsoft R&D were focussed on differentiation aspects and always carried out exploration projects in the research or conceptualization phase. Organizations like HP labs and Infosys labs that had counterparts (HP and Infosys) focussing on the delivery aspects, carried out a mix of exploration and exploitation projects aiming at both differentiation and improved operation scale. However, the activities were focussed on developing the solutions. Firms such as TCS, SAP, and Infosys focussed on open innovation activities in the delivery phase in order to exploit the identified markets and reduce the time to market solutions.

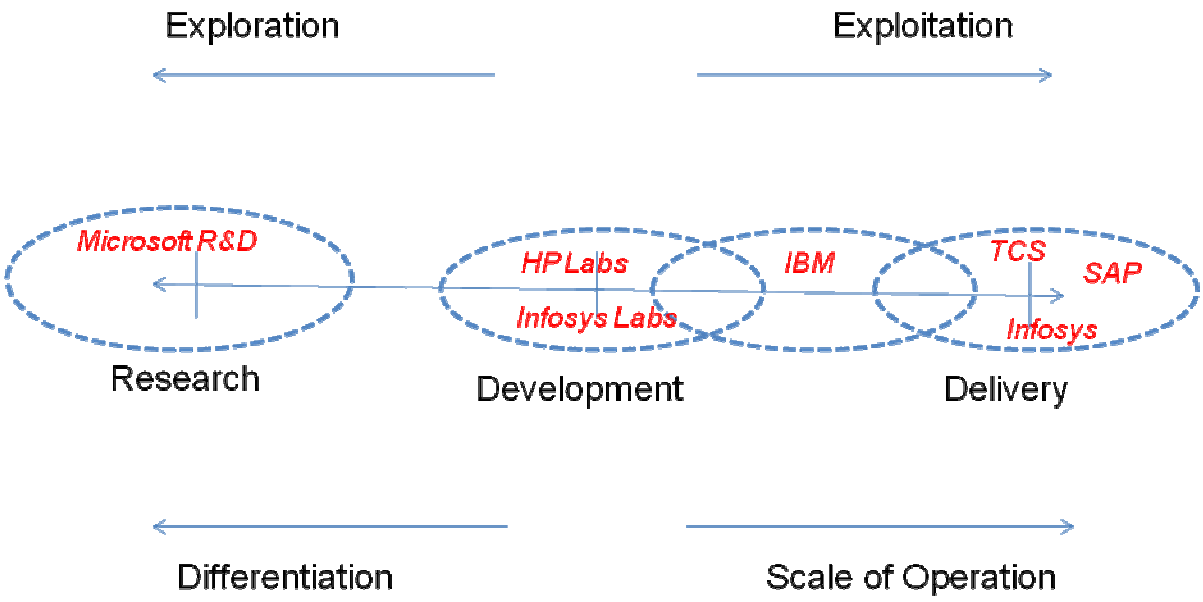

Figure 7: Framework for Analysing Open innovation IT projects (Source: Developed from Multiple Interviews)

Implementation Aspects in Open Innovation Networks and Projects

In this section, we try to explore how the network structures, models, and support for open innovation networks has evolved in IT organizations. We identified both exploration and exploitation models of market knowledge strategies are followed in the open innovation networks.

TCS Co-Innovation Network (COIN) and SAP Co-Innovation Lab (COIL) networks use exploitation models for knowledge search. TCS COIN and SAP COIL identify appropriate partners corresponding to ideas that they are exploiting and come up with innovations that create commercial value. The COIN network is different compared to COIL in the type of partners involved. COIN has both academic and business partners, and the network focus areas are widespread while COIL partners are generally business partners and all the projects are based on SAP technologies. The TCS COIN and SAP COIL models are described in Figure 8 and 9 respectively.

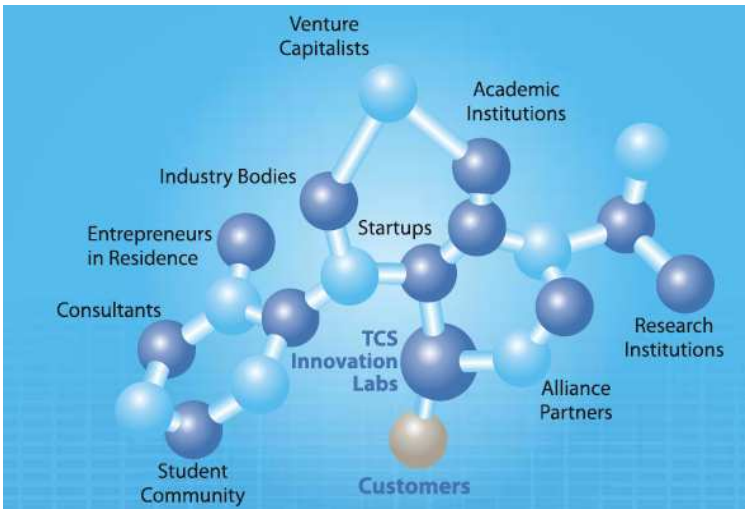

Figure 8: TCS COIN Network (Source: TCS COIN Website[5])

As shown in Figure 8, TCS Innovation Lab is the major player in the COIN. TCS Innovation Labs develop emerging technology trends categories for each year based on analysis performed using number of start-ups, funding, technology areas of existing partners etc. New members are invited to the network based on these identified trends. COIN has several partnerships with academic institutions, research labs, venture capitalists etc. to support the Co-Innovation process between TCS and COIN partners. SAP COIL also follows a similar model. But the area in which the partners collaborate is SAP ERP based technologies and there are varied levels of partnerships in the COIL network. However, both the networks work on pre-defined areas/ projects with partners.

Figure 9: SAP COIL Network (Source: SAP COIL Website[6])

In typical exploration models of knowledge acquisitions, partnerships are established to find out solutions to problems that cannot be solved within the organizations. The CTS model (Figure 10) of opening boundaries is an example for this model of knowledge search. When

[5] http://www.tcs.com/resources/brochures/Pages/CoInnovationNetwork.aspx accessed 8th June, 2012

[6] http://scn.sap.com/community/coil accessed 29th July, 2012

the problem cannot be solved within the organization (or if looking for a better way), CTS concept lab checks for solutions and partners outside the firm boundaries and develops partnerships accordingly. Academic institutions, industry research bodies, and specialized R&D firms are the category of partners CTS normally collaborates with.

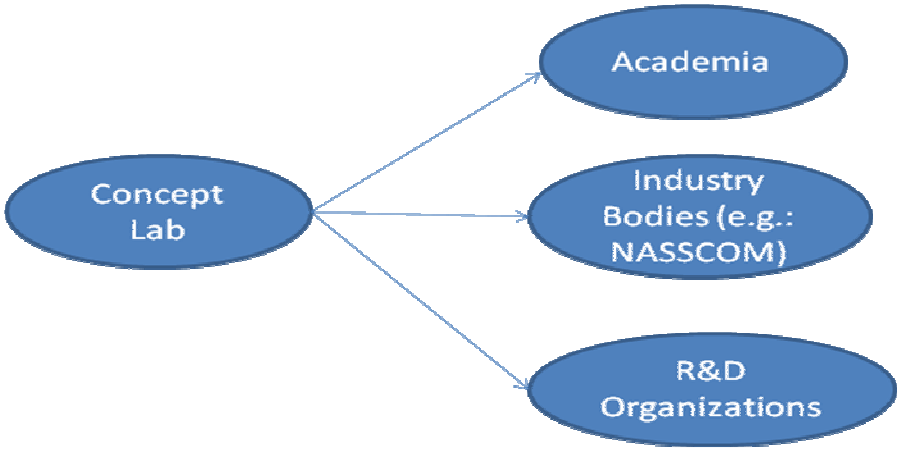

Figure 10: CTS Open Innovation Model (Source: Interview with Mr. Bhaskar Venkatsubramanian[7])

Both exploration and exploitation models have been successful and among the organizations studied, we can see adoption of both the models according to the needs. An extension of the exploration strategy is the web based models for open innovation (Crowd Sourcing). In such models, an innovation seeker gives the problem to an open innovation platform provider who publishes the problem (possibly along with the incentives for solving the problem) and innovation providers across geographies, across different disciplines provide their inputs or suggestions. Best ideas are selected by the innovation seeker and partnerships are formed accordingly.

Technology Support for Open Innovation

It can be seen there are different tools that support collaboration and knowledge sharing. The nature and variety of the support varies depending on the openness characteristics of firms. A common theme that emerged from all the interviews was that IT collaboration tools were essential for the success of open innovation activities in all organizations. The tools for creating and supporting communities were considered essential as partners are normally geographically separated.

For collaboration activities organizations have used community creation tools like the IBM in-house developed social networking products of the Lotus range, systems for connections used by TCS like iConnect, iGTM (innovation Go to Market), corporate technology board, HP in-house developed tool called the Skyroom etc. The common view was that the support of the IT infrastructure was essential for success of any collaborative ecosystem.

[7] Interview conducted on 28/11/2011 at CTS, Chennai from 11:00AM to 2:00PM

Tools for supporting collaboration activities also included software for presentation sharing, joint document editing, audio/video-conferencing, and real time activity support tools. Other tools presently being used were tools to analyse the emerging major themes in the sector (business intelligence tools), effective deployment across stages, and invite partners, collaborators and stakeholders for discussions, and evaluate progress of joint projects. However, connection with different forms of partners varied in the networks we studied. The way organizations connected with academic institutions was different from the way the connected to market partners, and hence used different IT tools.

Changes in the Innovation Management Systems

This section explains how the partnership models have evolved in IT organizations in order to support open innovation.

Partnerships in Open Innovation Networks

According to the respondents, partners and effective partnerships enlarged the scope of business activities organizations ventured into. Apart from the business advantages, partnerships also helped organizations to enhance their knowledge capabilities, improve infrastructure and facilities, and reach market faster with the right skills, hence accelerating the time to innovate. The solutions that were results of partnerships also helped the firms in meeting customer needs in an improved format.

We developed a Partnership Maturity Model (Figure 11) through the interview responses, which highlights how partnerships between entities may evolve to support open innovation. The model was derived by understanding the changes that occurred in collaboration aspects between two or more entities when they partnered as resource centres, outsourcing agents, key competence centres, innovation centres, and finally as critical value chain partners. In order to evolve to the premier level of partnership maturity, organizations should share high level of business responsibilities with the partners. The model shows how partnership may be evaluated for maturity across different stages and highlights key characteristics of each level of partnership maturity. These key characteristics of each stage are the responsibilities partners take up in each of the stages.

HIGHEST LEVEL OF PARTNERSHIP MATURITY

Partnership level	*Key characteristics*
Critical value chain partner	New areas of research, standards, market leadership
Innovation centre	Problem ownership, new product/service development, roadmaps
Key competence centre	Co-development, product domain knowledge
Offshore development centre	Quality of developed artifacts, cost of development
Resource centre	Competencies, cost, customer communication

HIGH LEVEL OF BUSINESS RESPONSIBILITIES

CUSTOMER NEEDS

Figure 11: Partnership Maturity Model (Source: Author's Analysis)

For an organization to adopt open innovation, its innovation management model needs to evolve to support open innovation. The traditional model of innovation management within an organization may be described as shown in Figure 12 (Acquire and Build blocks). Organizations either Acquire (A) IP by buying the IP rights or by acquiring the firm that owns the IP. The second sector shows Building (B) IP rights by creating it within the organization. The open models for managing innovations have a Co-Creation (C) block that promotes innovation across boundaries.

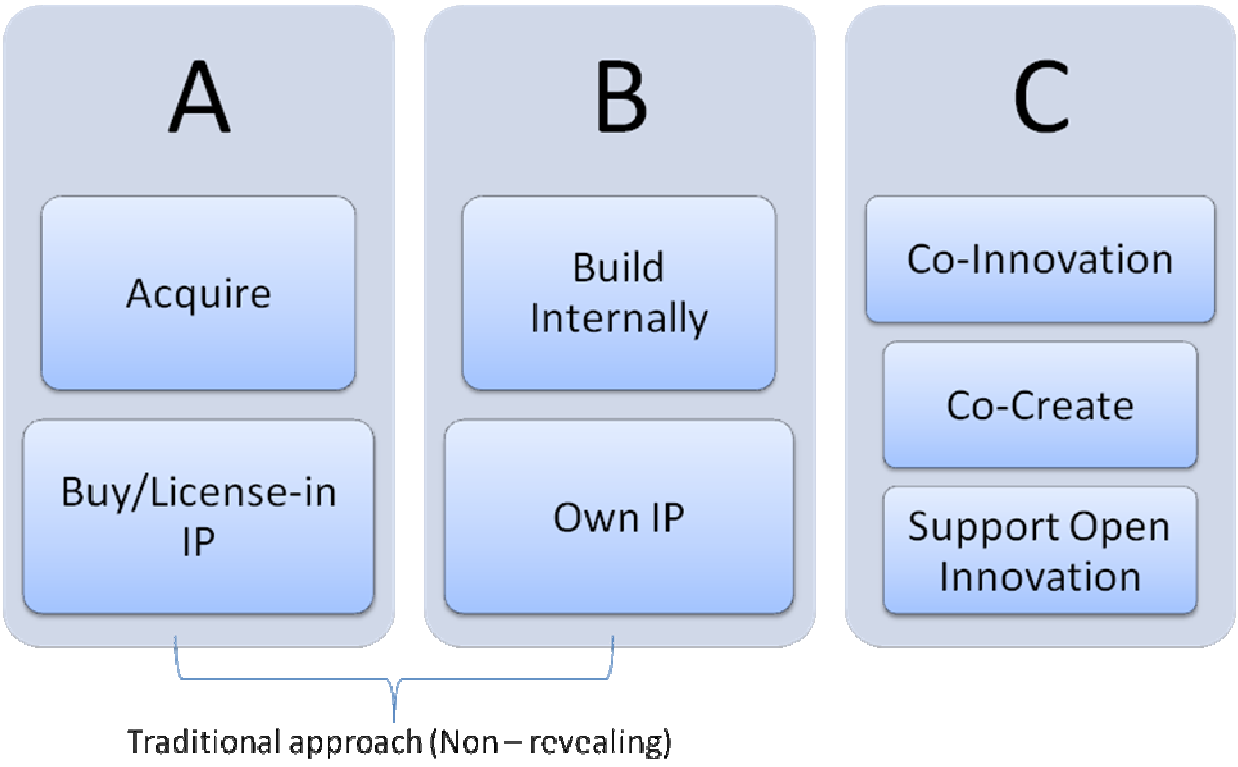

Figure 12: Transition from Traditional to Open Model of Innovation Management (Source: Multiple Interviews)

However, with the development of newer forms of managing innovations, organizations benefit from co-creation and models of open innovation emphasis collaborative activities. The emergence of a new block in the innovation management models, as an outcome of adopting open innovation principles may be shown by the Co-Innovation block (C) in the Figure 12.

The essential aspect of Co-Creation and Co-Innovation as perceived by the respondents is the facility to support effective partnerships. With the introduction of C block, partners may access resources and capabilities of the focal firm. The Co-Innovation models generally give restricted access to partners (thereby providing a mechanism for opening up a firm's boundaries). The C block is perceived to emerge as a key strategic pillar for existence and future growth for organizations. The essential aspects of developing a C block include mechanisms to

- support the C block
- manage IP rights
- manage access to the network

This is shown in Figure 13. The period of association, response time, activities handled by partners, and granularity at which the partners may get involved in activities (and the ability to segregate the same) are considered as factors that influence success of such networks.

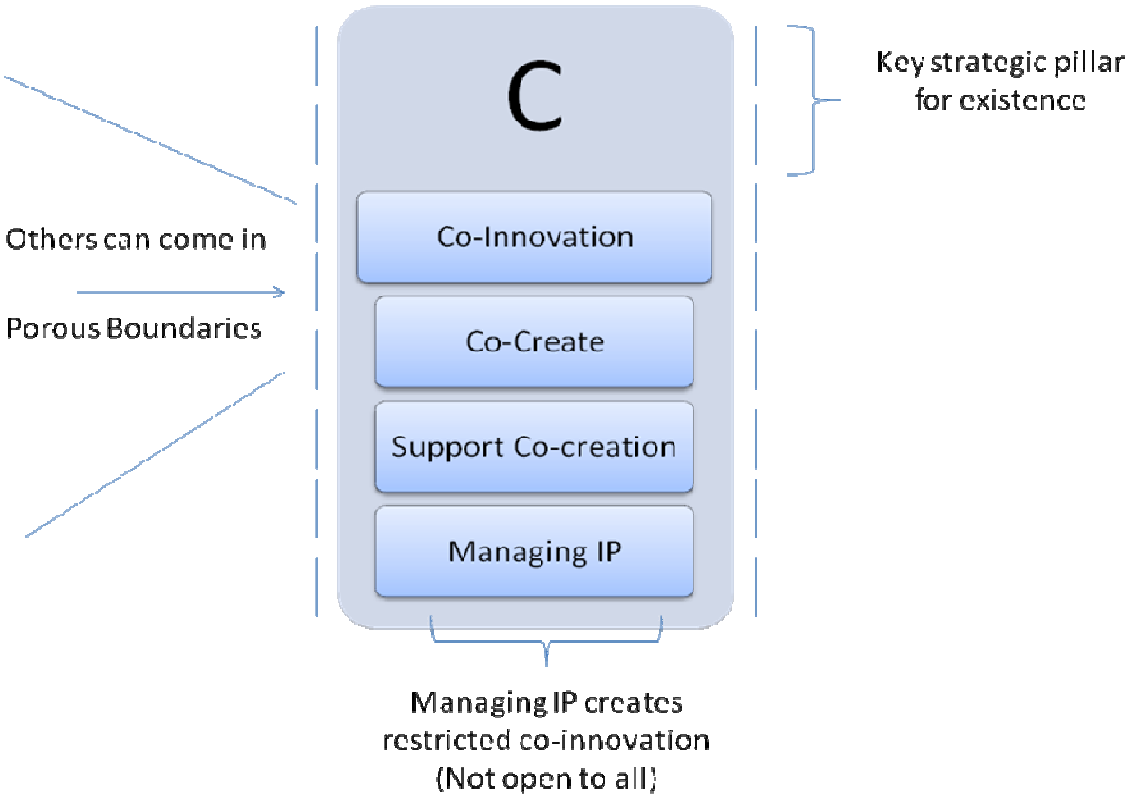

Figure 13: Process of Opening Boundaries in Open Innovation Framework (Source: Multiple Interviews)

Two typical partnerships across the SAP Co-Innovation Lab (COIL) network are described in Table 2 below that distinguish between normal partnership and Co-Innovation. The time investment and resource investment (monetary) reduced considerably in the open innovation network. Type and number of partners in the network varied based on the project requirements. But the depth of skills and capabilities available due to collaboration were high in the open innovation networks. Clear IP rights and model for managing IP promoted Co-Innovation networks. According to the respondents, proper mechanisms to ensure IP protection and contracts were essential to attract relevant partners.

Table 2: SAP Partnership and Open Innovation Project Differences

Project	**Time**	**Partnership**	**Money**	**Risk**	**Skills (required)**	**IP**
DUET (a typical strategic alliance)	Long term*	1:1	High	Managed based on partners	Very High	SAP+ Microsoft (Shared based on contribution)
Co-Innovation	M[#] or S[+]	1:1 or 1:N	Low to Medium	Low to Medium	Medium to High	Project Dependent (Add-ons by partners/ clear IP rights for partners)

*Long Term > 1 year [#] M - Medium 6-12 months [+] S - Short 3-6 months

(Source: interview with Mr. Vasanth Kumar[8], Director, SAP COIL)

Outcomes and Trends in Open Innovation Adoption

In this section we analyse the benefits of adopting open innovation principles, the barriers in adoption, and the future trends as perceived by the experts in IT sector.

Outcomes of Open Innovation Adoption

Outcomes of open innovation adoption essentially determine repeated adoption and improved acceptability of open innovation principles. The notable outcomes mentioned during the interviews are summarized below.

Partnerships

[8] Interview conducted on 15/11/2011 at SAP, Bangalore from 8:30 AM to 10:30 AM

- Access to different partners and skills, including the possibility to collaborate with government.
- Access to organizations through partners who might have otherwise remained inaccessible.
- Understanding the context in which partners' operate.

Research outcomes

- Standardization across platforms, services, infrastructure, and policies.
- Publications, patent applications, and conferences.
- Product/Solution
    - Commercially viable end results
    - Overall cost reduction

Time of innovation activities

- Reduction in technology transfer time
- Improvement in learning time

Development of ecosystem

- Best practices like Knowledge Management were perceived to evolve.
- Proper selection of projects based on risks and returns analysis.
    - Set of possible ideas are analysed using risks vs. returns comparison. This was perceived to lead to improved portfolio management (Measuring risks – investment required may also be performed).
- Role of IP may be understood in a better way.

Barriers to Open Innovation Adoption

According to the respondents, there exist many practical difficulties in adopting open principles for innovation in IT sector, which are common across different sectors. There are also problems specific to this sector. One of major barrier in adopting open innovation principles fall under the category of IP issues. European Union (EU) framework projects have already set clear norms for IP sharing. Apart from this initiative, there are no clear standards or norms for IP sharing as of now in open innovation networks. Since all partners want exclusive rights to IP, collaboration itself might not happen in some cases. The open innovation networks generally set rules during the partnership creation itself about the IP rights to solve this issue. In some cases royalty was paid for contributions to avoid conflicts and the IP was exclusively owned by one partner.

Another major barrier in IT sector is the problem of data sharing similar to the pharmaceutical sector. Openness may be developed at different levels for organizations. Even data related to different projects of the same client may not be shared because of the signed Non-Disclosure Agreements (NDA) and data leakage issues. This becomes even more difficult when data from two different clients need to be shared. External collaborations may happen only after taking prior approval from clients and the benefits have to be clearly understood by entities to open up the boundaries. The problem may also be solved by using

an abstract version of the original objective. A generic problem statement needs to be development so that no business sensitive information will be shared between the partners and the developed solutions will then have to be customized for every client. Practical difficulties make this the only viable model to solve data sensitivity issues.

Failures may also arise because of wrong time to the market (the case of innovations entering a market earlier than its need). Similar situations may occur in the IT sector; for example, Ericsson developed solutions for prepaid system in early 1990s. It did not have a market then. By the end of 90's around 1.6 billion users started using the system. Now India, Italy, etc has 70-80% prepaid users while USA still lags with around 30% users. Another idea developed, 'caller videos' never had a market until recently when it was success in the Middle East. Hence, a market window is an essential condition for every innovation.

For open innovation adoption across sectors, another barrier as perceived by the respondents was the interest from universities and research institutes. According to them, universities should have genuine interest in the area along with the business partners. The risk associated with business partners in networks were considered to be less and they may be removed easily from network if the contributions were weak. However, finding replacing academic institutes or other research partners was considered difficult. There were also other factors such cultural and facilitation issues in open innovation networks. The overall opinion was that when there were constraints in open innovation networks, outcomes would be influenced, and to avoid this, hindering factors need to be minimized.

Trends in Open Innovation Adoption in IT Sector

Open innovation is considered as a commercially viable option in IT sector by all respondents and according to them the outcomes should attract more firms to adopt open innovation principles. Open innovation adoption will lead to improved results and cost effectiveness in IT sector. Adopting open innovation principles is also considered as a viable option for niche companies solving particular types of problems as partners may help them in additional tasks which are not their core capabilities. Overall, according to the experts more organizations should be attracted to adopt open principles.

Entering an open innovation network needs alignment of

- Confidence in the ecosystems
- Participation and development of open innovation culture
- Creation of processes supporting open innovation

More partners, Co-Innovation with customers, search mechanisms for new ideas, and processes for size and effectiveness improvement should improve open innovation adoption. The trends in global adoption and Indian trends should not vary as the partnerships happen across boundaries and geographies, irrespective on the national context.

Degree of Openness Measures

For measuring the extent of contributions from external sources of knowledge and the extent of usage of these sources, a possible way that was mentioned was to find the number of partners in the networks during the life cycle of the project. Usually every partner contributed to a unique aspect of the project. Hence, the extent of contributions from different external sources of knowledge can be distinguished and was perceived as measurable.

The respondents also mentioned that degree of openness may be measured at different levels, like at the individual project, firm, and inter-organizational levels. Most of the existing measures were financial making the measurement difficult at the project level. Measuring openness at the project level in IT sector may even be more difficult as no particular organization has attempted to measure openness at this level. Moreover, non-financial measures would have to be developed as the immediate financial measures or approximation of future revenue may generate inappropriate measures. Financial performance of one organization measured in terms of revenue generated through open innovation during a particular period is not indicating only openness/performance of projects executed in that period as it is difficult to isolate that influence of open innovation from other factors. A risk-return evaluation at a particular project level may not be feasible for a particular period of time. Returns from a particular project may be derived across different periods and the outcomes and learning from a project may positively influence several other projects; for example, through knowledge management activities the outcomes and best practices from the project may be used across several other projects making the risk-return estimation difficult for a single project.

The measure of openness of projects may also be based on the type of collaboration and objectives of the project. Research collaborations were perceived to be more open while business collaborations were perceived to be limited in terms of openness and sharing of resources between partners. In collaborative projects such as those for developing standards and joint research activities with academic institutions, the level of openness was considered to be high. For sensitive and breakthrough innovations generally, the first preference was given to in-house development by organizations.

Interviewees also considered openness measures based on partner variety and the phases in which open innovation principles were adopted. However the variety of partnership was normally limited; for example, in a particular phase, collaboration with only specific type of partners existed for the studied firms (and normally with the same organizations). Hence, to identify the contributions from different sources of external knowledge, contributions corresponding to phase of the project in which they were involved needed to be measured.

In the ideation stage academic alliances were generally found to be very strong, in development stage, strategic partners, and in the commercialization stage, emerging technology partners and business partners were preferred for collaboration. The role of other partners in each of the stages had not been currently explored by most of the firms.

Existing Degree of Openness Measures

None of the studied organizations actively measured openness at a firm or project level. Experts suggested the following dimensions along which openness may be measured.

Financial dimension

- Percentage of revenue of spinout projects with respect to the total revenue of the firm
- Percentage of revenue generated by licensed-in projects with respect to the total revenue of the firm
- Percentage of total revenue for projects that used open innovation including licensing with respect to the total revenue of the firm

Partner dimension

- Number of connections developed in the network
- Intensity of collaboration with the partners
- Variety of partners
- Contributions from partners as perceived by the focal firm.

Phase variety

- The time period of collaboration and phases of the project those were open to partners.

Outside project selection – how actively an organization looks at innovation activities that happen outside

Possibility of project execution without adopting open innovation principles – analysing the feasibility of executing a project in house and comparing the cost of executing the project in-house and by using open innovation principles.

Level of Analysis

Measuring open innovation at a firm level (developing an open innovation index) may be easier as financial dimensions can be directly applied. An estimate of value addition provided by a firm to another will be most important aspect in measuring the degree of openness. It may possible to develop this estimate at the project level as the extent of contribution by external sources for each of the projects may be directly measured.

Since open innovation principles may be adopted at different levels, measurement issues may occur even while analysing the projects handled by a single IT organization. For a single client there may be multiple IT projects being handled at the same time by one IT provider. As shown in Figure 14, let client A be an insurance firm and client B be a retail store. IT organization XYZ may be handling multiple projects from these clients. Sharing of data between different project teams of a particular client may be considered as the first level of openness, and the second level being sharing of information between different teams across different clients. Third level of openness may be achieved when the organization interacts with outside agents to solve particular issues and goes truly ‘open’.

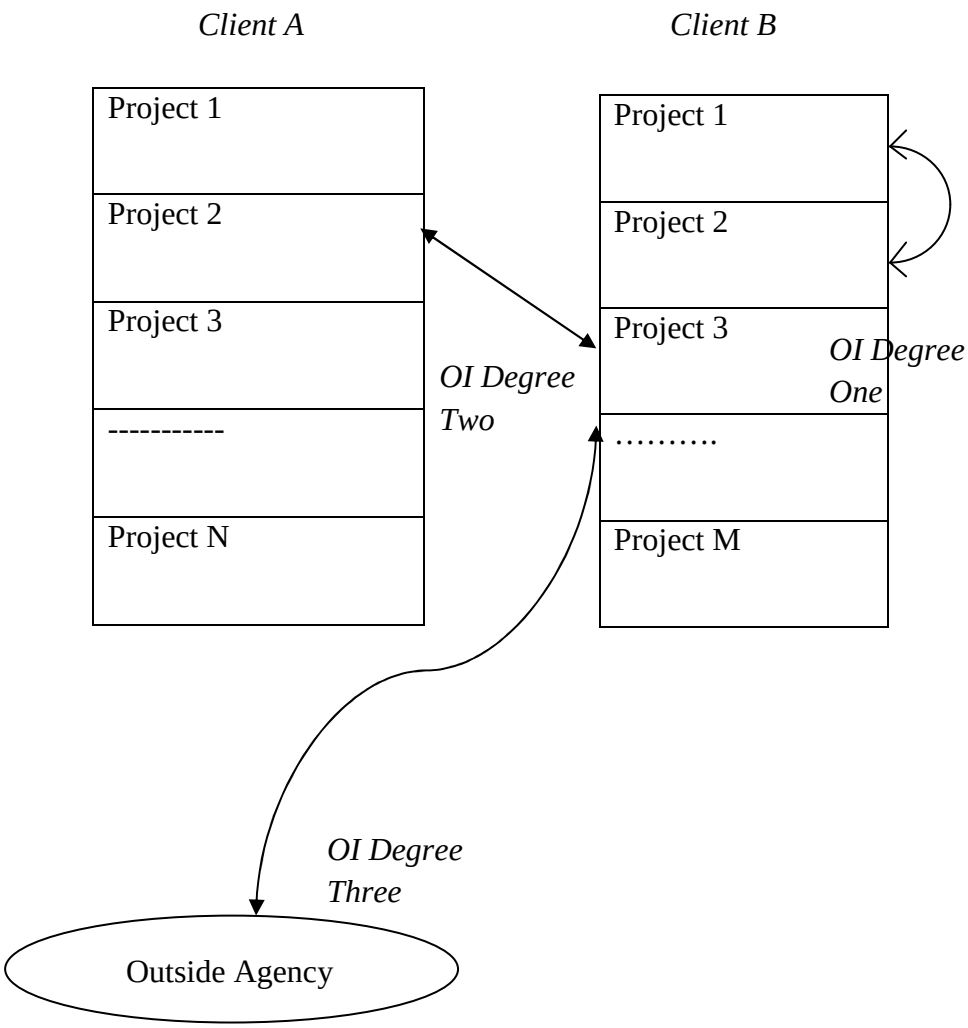

Figure 14: Varied Levels of Openness for IT Projects (Source: Multiple Interviews)

Open Innovation Project Performance Measures

Learning from successful open innovation projects helps in adoption of open forms of innovation management. According to the respondents, there exists a need to identify whether openness actually led to improved performance of project and analyse the commercial viability of the models. Different project performance parameters were discussed for open innovation project performance during the interviews. The variables that emerged from the views of the innovation decision makers included both non-financial measures which are appropriate at project level as discussed before and financial performance measures. The details are given below:

Non-Financial Dimension

The responses included several non-financial parameters for project performance. Apart from the customer satisfaction (as measured for every project) and details of showcase-able assets developed during the projects, like patents and publications, none of the parameters were being currently captured by the firms to measure project performance. The non-financial measures include:

Time to innovate

- Reduction of time for the innovation activities

End result of open innovation

- Usability of the developed solution
- Number of customers for the solution
- Innovativeness of the solution
    - Incremental
    - Breakthrough
    - Platform – change in the solution delivery system (incremental in nature)

Customer satisfaction

- Customer satisfaction scores
- Repeat customers

Showcase-able assets

- Publications, patents
- Improved visibility through media coverage
- Improved accessibility to partners
- Adoption of the technology (by the ecosystem)

People and productivity measures

- Capability improvement
- Employee happiness and feedback
- Organizational ability to create and market new products/services

Apart from the productivity aspects, few measures were found in some of the organizations such as:

Brand impact

- Brand value added
- Impact on organizational image (scientific, leadership contributions etc)

Societal impact

- Number of people who got benefited from the solution
- Number of villages served

The responses also included financial measures captured mostly at a firm level. However, we are not analysing financial measures as discussed in the earlier section.

Financial Dimension

- Market valuation of a firm before and after entering partnerships to analyse at firm level value addition by adopting open innovation.
- Average value per project over a time
- Average value per person over a time
- Revenue per engagement (at a project level)
- Economic value added (EVA)
- Venture Capitalists (VC) investment for the adopted technology sector

To sum up the financial dimension, a typical revenue generation mechanism created for the COIN partner by TCS is shown in Figure 14.

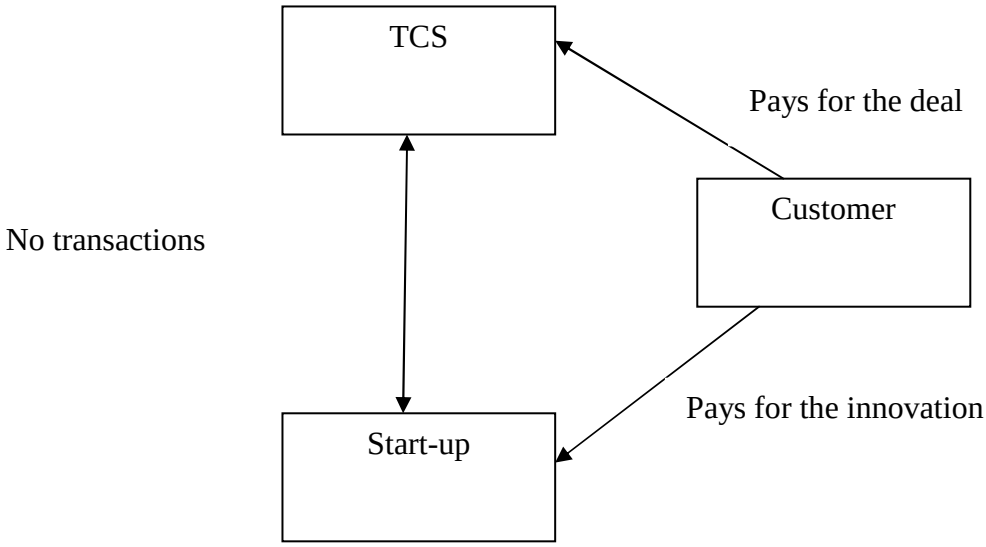

Figure 14: Revenue Mechanism in TCS COIN Network (Source: Interview with Dr. Ananth Krishnan[9])

TCS identifies particular start-ups which have developed unique solutions which TCS partners require (or identifies new partners who may benefit from the solution). The partners get benefited financially with their new products or services or as their clients get new solutions. In the model, TCS gets paid by its client for collaboration (entry to network), while the start-up gets revenue for its solution directly from the client.

Conclusion Summary of Findings

In order to stay alive in markets and/or to create differentiation and thereby generating competitive advantage, organizations innovate. This was evident and was among the major themes that emerged from the interviews with the top management executives. Nature and determinants of openness, the practices that differentiated open innovation from existing models of innovation management, and factors that led to adoption of the principles in the sector were other major themes that emerged from these interviews and the outputs of the stage will help organizations in the sector in understanding perception and adopting the principles of open innovation.

Interview insights showed maturity in partnership models, open innovation ecosystem creation, and acceptance of business problems as shared ones between the partners foster open innovation networks. The importance of partner selection process and the influence of environmental factors were emphasized during the interviews which led to further exploration of these aspects in the case studies. We also developed a framework for classifying open innovation technology projects based on three dimensions namely

[9] Interview conducted on 16/08/2011 at TCS, Chennai from 9:00 AM to 11:30 AM

knowledge exploration strategies, project stage, and the innovation objective. The existing measures of openness and open innovation project performance identified will also help future empirical research. Major themes identified from interviews corresponding to each of the sections discussed above are summarized in the following table.

Table 3: Summary of Findings

Area of Investigation	Specific Factors Identified by the Experts
Enablers of Open Innovation	Recognition, Survival, Sustenance, Business Growth, Commercial Aspects
Specific Open Innovation Project Details	Market Strategy, Innovation Objectives, Stage of the Project, Specific Details of Individual Projects, Differentiation Factors
Partnership between Firms	Different Models, Partner Variety, Strategic Aspects, Effectiveness, Level of Engagement, Influence on Success and Benefits
Technology Support for Open Innovation	Collaboration Platforms, Collaboration Support and Community Creation, Variation across Communities, Validation Processes and Tools
Barriers to Open Innovation Adoption	Intellectual Property Issues, Data Sharing, Market Window, Cultural Aspects, Facilitation Issues
Future Trends in the Area	Confidence in Ecosystem, Highly Viable, Positive Trends, Similarity in Indian and Global Trends
Openness Measures	Financial Dimension, Extent of Use of External Sources, Type of Collaboration, Project Phase Openness, Intensity of Collaboration, Level of Analysis
Performance Measures	Financial Measures, Asset Creation, Innovation Time, Brand Impact, People and Productivity Measures, Innovation Outcome, Societal Impact

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Appendix 1: Details of the Interviews Conducted

#	Date	Name	Organization	Job Profile
1	06-08-2011	Jayesh Badani	Ideaken	CEO and MD
2	16-08-2011	Ananth Krishnan	Tata Consultancy Services (TCS)	CTO
3	16-08-2011	Kishore Padmanabhan	Tata Consultancy Services (TCS)	Vice President, Innovation Offerings
4	24-08-2011	Debasis Bandopadhyay	Tata Consultancy Services (TCS)	Vice President, Head Co-Innovation Network
5	10-10-2011	Jai Ganesh	Infosys	Principal Research Scientist
6	25-10-2011	Manish Gupta	IBM India Research Labs	Director
7	27-10-2011	Sudhir Dixit	HP Labs	Director
8	08-11-2011	Hedwig Baars	Ericsson India	R&D Head
9	14-11-2011	Shyam Vasudevrao	Philips	Director of Innovation
10	15-11-2011	Vasanth Kumar	SAP Labs	Director, Co-Innovation Lab
11	21-11-2011	Parag Jain	Arteria Technologies	CTO
12	28-11-2011	Bhaskar Venkatsubramanian	Cognizant Technology Services (CTS)	Senior Manager, Cognizant Innovation Group (CIG)
13	28-11-2011	Arun Kumar	CTS	Program Manager, CIG
14	30-11-2011	Shourya Roy	Xerox India	Open Innovation Manager
15	06-12-2011	Kapali Viswanathan	HP Labs	Research Scientist
16	16-01-2012	Vinay Deshpande	Encore Technologies	CEO and MD
17	07-02-2012	Pierre Combelles	Orange, France	Director, Open Innovation
18	20-02-2012	Glenn Wightwick	IBM Australia	Director, Research and CTO
19	27-02-2012	Roslyn Sayers	Siemens Australia	Head of Strategy & Performance Control
20	27-02-2012	Carina Jacob	Siemens Australia	Program Manager
21	02-03-2012	Christopher Gates	HP Australia	Client Innovation Executive
22	03-03-2012	Sarah Pearson	ANU Edge	Director
23	08-03-2012	Roland Harwood	100% Open, UK	Co-Founder
24	15-03-2012	Raghuram Krishnarajapuram	IBM India Research Labs	Associate Director

Appendix 2: Interview Protocol

Semi-structured interviews were conducted based on open ended questions on the following topics:

1. Reasons for IT firms to adopt open innovation/ Enablers of open innovation
2. Process aspects of partnership formation and adopted open innovation models
3. Technology support for open innovation
4. Openness measures
5. Open innovation project performance measures
6. Details of open innovation projects handled
7. Outcomes of open innovation adoption
8. Barriers to open innovation adoption
9. Future trends in the Information Technology sector
10. How to measure degree of openness at a project level.
11. How can we measure open innovation project performance.