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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. Open innovation being an emerging area of study, the current body of literature is not extensive enough for posing causal questions. Two in-depth case studies at SAP Co-Innovation Lab and IBM India Research Lab were conducted in this research to explore the operationalization aspects of open innovation principles in Information Technology projects. These cases were used to explain how firms identify, assimilate, and integrate external knowledge. As an output of this study, a model was developed to explain the organizational rationale to collaborate, partner selection process, and execution aspects of open innovation projects.

Key words
Collaboration, Open Innovation, Information Technology

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I. INTRODUCTION

Open innovation is a paradigm based on the concept of availability of abundant knowledge outside the boundaries of organizations. Open innovation asserts 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" [1]. This study focused on analyzing degree of openness and understanding operationalization aspects of the open innovation principles in Information Technology (IT) projects.

Majority of studies on open innovation have built considerable conceptual knowledge. There are gaps and inadequacies of research on open innovation in the IT sector. Research in exploring underlying facilitating factors of open innovation performance is limited. In this study, we used case studies to explain how open innovation in practiced in the industry by analysing open innovation implementation across the complete life cycle of the projects.

The method of case study is defined as "an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between the phenomenon and its context are not clearly evident" [2]. Case study research can be used in Information Systems (IS) research when

1. *the phenomenon is broad and complex*
2. *the existing body of knowledge is insufficient to allow posing of causal questions*
3. *a holistic in-depth investigation is needed*
4. *a phenomenon cannot be studied outside the context in which it occurs* [3]

Open innovation being an emerging area of study, the current body of literature is not extensive enough to explore the causal research problems and the study follows all of the above four conditions. According to Yin [2], case study method may be appropriate to empirical assessment of phenomenon when it cannot be separated from the organizational context as in the current study.

This manuscript is structured as follows: next section gives an overview of open innovation literature and the identified gaps. The research objectives and methodology used are described in the later section. Case summaries and analysis are detailed in the following sections. The paper concludes with the contributions of this research.

II. LITERATURE REVIEW

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

A. Open Innovation

Innovation may be defined as the application of new ideas to the products, processes, practices, or any other aspect of firms' activities [4]. Innovation and investment in Research & Development (R&D) has helped firms create a barrier against competition. Traditional models for the management of innovations assumed successful innovations required all the capabilities in-house. R&D activities were organized inside the firms and outcomes were shared with no one until the products or services that resulted from the

innovation activities went to market. In this 'closed' approach to innovation, organizations had to either exploit existing internal capabilities or acquire these from outside. On the other hand, recently some firms have innovated through knowledge sharing and co-creation with customers and other value chain partners. This paradigm was termed open innovation by Chesbrough in his seminal work published in 2003 [1].

Open innovation is defined 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"*[5]. Open innovation strategies enable firms to access technologies outside its boundaries and share internal technologies with external firms when business prospects are higher outside its boundaries [1]. By licensing-in, by buying Intellectual Property (IP) or by engaging in co-development technology in-sourcing is made possible. A developed idea may be licensed out of the organization when it is not aligning with the current business model or for which current capabilities of the organization do not support commercialization prospects. The IP may be licensed out or sold to an external partner, which will address the needs of the external partners' current market or create new markets. A spin-off organization may also be developed targeting a new market. The in-sourced technologies may create new markets for the organization or may effectively address the needs of its existing market. Open Innovation strategies aim at maximizing utility of developed technologies aiming at commercial success [1] [5].

B. Measuring Openness

The measures of openness across current studies are based on factors such as partner characteristics, permeability of boundaries, and extent of usage of external sources of knowledge (extent of exploitation of external sources by acquisitions and extent of internal technology licensing) [6]. Two variables representing the degree of openness: the number and type of partners (partner variety), and the number and type of phases of the innovation process open to external contributions in and/or out (innovation phase variety) were used by Lazzaroti and Manzini [7]. An additional measure, intensity of collaboration (depth of collaboration) to measure openness was used by Laursen and Salter [8]. While measuring phase openness van der Meer [9] explains usage of different openness mechanisms in the stages of concept, development and commercialization. This is in line with the study of Boscherini et. al [10] which mentions the stages as conceptualization, realization and transfer of results.

It is at the project level that firms identify, assimilate, and integrate external knowledge. In order to measure openness of firms, firm level analysis should be complemented with project level analysis to measure the extent of external knowledge involved. However, none of the existing studies explore openness at a project level within a firm.

C. Networks and Partnerships

An open innovation ecosystem may result in a complex network of relationships with other organizations, serving different purposes during different periods [11]. Table I provides possible inter-linkage options between firms. The importance of process change and networking to capture value from innovation is mentioned by Gassmann, Enkel, and Chesbrough [12]. When technology is uncertain and proprietary rights are also uncertain networks open innovation initiatives can be the most successful option.

TABLE I: NETWORKING POSSIBILITIES (AUTHORS' ANALYSIS)

	Proprietary rights certain	*Proprietary rights uncertain*
Technology certain	In-house/Outsourced	Sponsored research
Technology uncertain	Vertical transfer	Networks

D. Reasons for Collaboration

One of the major reasons for collaboration is to complement the capabilities of the organizations. Based on its strengths and collaboration strategies, organizations look for firms with complementary strengths, resources, and capabilities [13]. This is in line with the Resource Based View (RBV) strategies of firms [14]. Another view on collaboration based on transaction cost economics theories, is that the rationale to collaborate centres on minimising the sum of transaction costs and production costs [15].

Higher technology intensity creates higher propensity to collaborate and leads to more collaborative arrangement between the firms [1][5][16]. It is also expected different types of partners would contribute to different aspects of open innovation. Research partners including research labs, academic institutions and government agencies and market partners including customers, suppliers and other market chain partners may be expected to contribute in different ways as explained below.

Specific reasons for collaborating with research partners include access to better scientific know-how and improvement of the knowledge infrastructure, reduction of internal Research and Development (R&D) cost, support of R&D personnel [1] [17] and reduced chances of R&D project failures [18].

Reasons for collaborating with market partners include reduced time to market [19], improvement of IP management [20], creation of niche markets [21], establishment of partnerships and support of external communities [1], complementarities development [22] [23], creation of venture capitalist support [1], improved product diversity, new products, product innovation [18][24] and improved creativity and creation of possibility to share risks [7].

E. Literature Gaps

The majority of studies on open innovation have built considerable conceptual knowledge in this emerging area. Studies like that of Lazzarotti and Manzini [7] has developed conceptual framework to analyze the principles of open innovation while Boscherini et. al [10] and Hwang, Kim, and Kim [24] has studied a particular aspect of open innovation. No specific researches on benefits of specific external sources of knowledge are developed yet. There exists need to identify various factors from the open innovation networks and project management methods in open innovation initiatives to measure openness and performance of the projects. Moreover, identification of factors that facilitate openness at different stages of innovation projects need to be identified. A granular analysis on the type of partners, phases of projects, and classification of contributions should address some of the identified gaps.

III. RESEARCH OBJECTIVES AND METHODOLOGY

In this research, case studies are used to explain how open innovation in practiced in the industry by analysing open innovation projects across the complete life cycle of the projects. Since this study looks at the process aspects, case study method is appropriate and inducting theory using the methodology adopted

by [25] is followed.

We investigated the following research problems using the case studies:

- What is considered as open innovation in the IT sector and how open innovation model differ from the traditional models of innovation?
- How are open innovation principles operationalized in IT projects?
- What processes are adopted for partner selection and opening up of organization boundaries happen in such contexts?
- What are the influences of environmental, firm level factors on the open innovation projects?

IV. CASE SUMMARIES

Case selection is critical activity in case based research [25] and sampling techniques need to be theoretically validated to ensure appropriate selection. The generalization in inductive studies is based on literal replication (same pattern) or theoretical replication (different patterns, but explainable based on the contexts) [25]. For validity, theoretical replication was done in this study based on contrasting cases on the basis of the following factors which provided maximum variation across the cases:

1. The type of projects based on the knowledge search strategy: exploitation and exploratory projects
2. Pre-defined versus continuous transformation of collaborations
3. Technological characteristics associated with projects
4. Presence of context to compare with traditional models of innovation management

Two instances of open innovation IT projects were investigated in this study. The cases were selected to capture diverse practices adopted by firms in the same sector. The first case study was that of the open innovation projects handled at the SAP Co-Innovation Labs (COIL) with special reference to projects in which Arteria Technologies had collaborated with SAP COIL. This case showcased open innovation principles in exploitation mode of knowledge acquisition strategy. The second instance of open innovation was the Spoken Web project by IBM India Research Lab, which was an exploratory project.

Apart from the exploration and exploitation knowledge strategies, the cases were selected such that the type of partnerships and type of collaborations were distinctively present. SAP COIL had predefined collaborations, while IBMIRL Spoken Web project exhibited continuous transformation of collaborations across the stages of execution. Project requirements and open innovation strategies varied across the selected cases due to the technological characteristics associated with the projects. Spoken Web was a highly complex project while SAP COIL projects were incremental modifications to the SAP enterprise platforms. Moreover, both SAP and IBMIRL are two multi-national enterprises, who have strategically implemented open innovation strategies that seemed representative for the technological field. Also for both the organizations, provision to check with the respondents the traditional model of project execution was present.

A. Open Innovation at SAP Co-Innovation (COIN) Lab

SAP's Global Co-Innovation Lab (COIL) Network is a globally distributed set of teams and lab facilities aimed at driving and facilitating innovative projects between SAP and its partners. This case discusses operationalization of open innovation principles in four projects that were outcomes of collaboration between SAP, Arteria Technologies and other partners in the SAP COIL Network Bangalore.

In project 1, Arteria developed a set of secure Adobe forms and workflows for scenarios that were required across various industries using digital signatures and SAP Interactive Forms by Adobe (SIFbA) on mobile platforms. In project 2, Arteria, SAP and Sybase addressed the need for companies need to make relevant business information available on all mobile devices with Sybase Unwired Platform (SUP). Project 3, Partner-delivered Mobile Applications (Padma) developed mApprove as a framework that would enable customers to get SAP and non-SAP workflows on to the hand held devices of their employees. Project 4, Partner delivered Enterprise Services (PdES) enabled partners to deliver their own functionality complying with the enterprise Service Oriented Architecture (SOA) methodology and architecture of SAP.

SAP COIL had cycle of projects in which multiple partners collaborated. SAP decided on the technology platform and category of projects for which it would like to enroll partners, for example a typical project category may be the 'Mobility Solutions'. In the development of phase of projects executed in SAP COIL, partners and COIL Sponsors co-developed the solutions. Once the projects were executed according to the plans through the development stages, the end solution was taken to market jointly by SAP and the collaborating partners. Multiple solutions also resulted from each cycle of the COIL projects. During a cycle, there may be multiple customer end solutions developers like Arteria working in SAP COIL and with successful completion of the projects, each of these partners took to market a new solution. For example, in the Padma phase organizations like CTS, Robert Bosch etc were also partners in COIL and had come out with their own end solutions. As the end result customers would get a new solution that solved a business issue and was based on the SAP technology platform, and allowed them to leverage the investment made by SAP and its partners while allowing SAP to commercially benefit from existing deployments. Detailed description of the functioning of the model is given in Fig. 1.

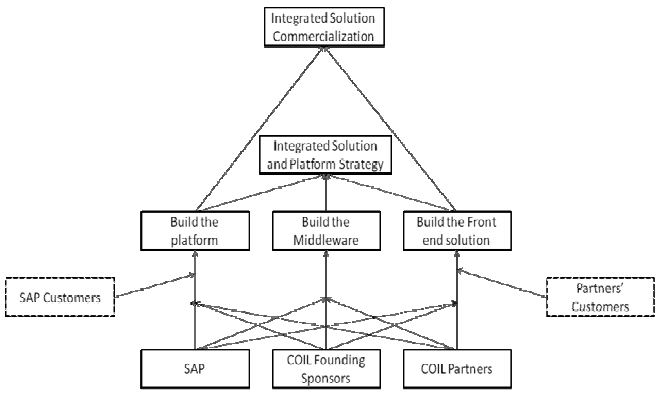

Fig. 1. Process aspects of the SAP Open Innovation Network

B. Spoken Web Project at IBM India Research Lab (IBMIRL)

IBMIRL was recognized with the 2009 National Award for Empowering Persons with Disability, given by the President of India for the Spoken Web technology. The award recognized the enormous potential of Spoken Web for improving the lives of persons with disabilities. The Spoken Web project was a voice-based equivalent of the WWW, primarily designed for semi-literate populations of developing countries. The vision was to create an information ecosystem that provided access to Internet like information services, primarily through voice, to make the medium accessible to the underserved bottom-of-the-pyramid population.

Spoken Web constituted of the VoiKiosk, VoiceSites, VoiLinks and the SurfLinks. A VoiKiosk gave the capability of building and supporting an infrastructure that consisted of a whole network of VoiceSites and Voice Links (VoiLinks). Just like websites, VoiceSites can be created for individuals and organizations supporting ecommerce and information. This network of VoiceSites created the Spoken Web. Similar to websites, VoiceSites were connected using the VoiLinks. The SurfLinks connect users with the VoiKiosks and connections to corresponding VoiceSites are created. On the Spoken Web, abilities to search, serve and transact was provided simply by talking. The open innovation model adopted can be conceptually described as shown in Fig. 2.

Spoken Web project being an exploratory project we can identify very little of the IBMIRLs existing knowledge directly being applicable and the objective of the partnership was to gain knowledge about unfamiliar technologies, customers, and areas of operation. In the ideation stage, partnership with research labs and universities helped IBMIRL understand the feasibility of the project they were exploring. There was further collaboration with technology providers during the development phase of the project. Strategic partners and niche players such as NGOs were identified during the market entry phase. The project was finally transferred to IBM for commercialization.

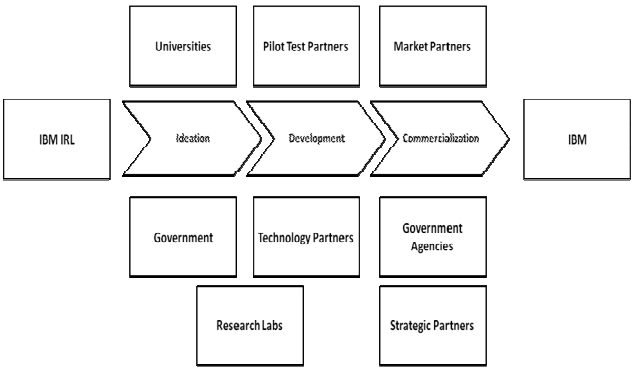

Fig. 2. IBMIRL Open Innovation Model

V. CROSS CASE ANALYSIS

A. Analysis Framework

We analyze the formation and operation sequences in the projects according to the framework given in Fig. 3. The formation stage explored the rationale to collaborate. We extend the operation stage to partner selection, open innovation model development, and execution of open innovation projects. Detailed description for each of the stages and factors influencing decisions in these stages were the analyzed. Summary of the findings is given in Table II.

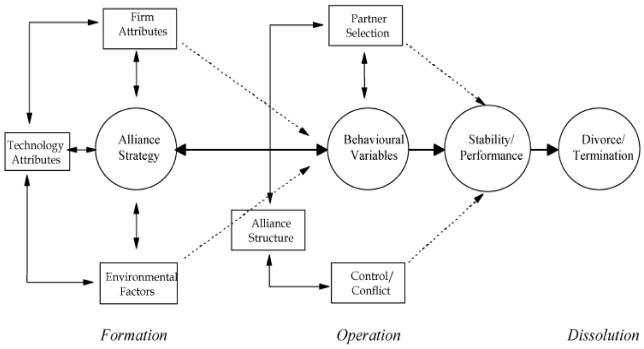

Fig. 3. Strategic Alliance Framework [26]

TABLE II: SUMMARY OF CASE ANALYSIS

Concept Explored	**Identified Factors**	**Specific Characteristics Identified**
Rationale to Collaborate	Project Attributes	Competency Requirement, Technological Complexity, Technological Risks, Project Size
	Focal Firm Attributes	Resource Complementarity, Transaction Cost Rationale
	Focal Firm Environment	Strategic Positioning, Potential Market
Partner Selection	Partner Firm Attributes	Partner Type, Arrangements, and Complementary Capabilities, Partner Commitment
	Partner Firm Environment	Market Commonality, Shared Goals, Proximity
	Trust Considerations	Perceived Trust, Prior Experiences
Execution Phase	Open Innovation Strategies	Outside-in, Inside-out, Coupled Processes
	Perceived Risks and Uncertainties	Potential Competition, Technological Risks
	Need for Appropriability Regime	Contracts, IP Issues
	Project Management/Control	Co-ordination Issues, Level of Control

B. Rationale to Collaborate

From the cases studied we identified the factors that influence firms to collaborate were three, namely: project attributes, focal firm attributes, and the focal firm environment.

In project attributes competency requirement, technological complexity, technological risks, and project size were the factors that emerged as those influencing the rationale to collaborate. Multiple competencies are required in highly complex projects. Radical innovations take time and involve multi-disciplinary research. Primary motivation for collaboration is reduction of innovation span time and access to complementary technologies [27]. At IBMIRL, the collaborations helped in creating new competencies, deploying the developed competencies, and transferring technology at a faster rate to test in the market. Efficient algorithms for search and retrieval were developed though the collaboration. Achieving economies of scale and quicker ways of acquiring technological capabilities were achieved by collaborations in the exploitation projects studied at SAP COIL. Higher technology intensity will create higher propensity to collaborate and leads to improved collaborative arrangement between the firms. According to [1] [5], a higher technological intensity will lead to a higher propensity to set up co-operative arrangement. The IBMIRL Spoken Web project was highly technology intensive which involved development of a prototype for a network creation using voice, and also involved speech recognition and analysis. In the SAP COIL projects technological factors such as enterprise solution development, middleware, and front end solutions development were involved. Another factor that influenced the

studied organizations to collaborate was the technological risks involved. Adopting open innovation principles helped in sharing risks, achieve economies of scale, and deal with problems related to technology [7].

In focal firm attributes we identified the influence of resource complementarity and transaction cost rationale as the factors influencing firms to collaborate. Resource Based View (RBV) of the firm perceives *"firm as a bundle of resources from which sustainable and rent generating organizational capabilities can evolve"* [28]. Smaller organizations collaborated in the SAP COIL network to access the resources even though they had to share their competencies with SAP India. The organizations also accessed the image and reputation of the bigger firm to gain market access. Direct access to market, reducing the overall effort, and combination of the capabilities were the factors that were driving collaboration of SAP. IBMIRL rationale to collaborate was to identify specialized partners to complement their capabilities. In transaction cost economics based theories, the rationale to collaborate centers on minimizing the sum of transaction costs and production costs [13]. In SAP COIL, collaboration reduced the overall time and cost for all the partners and accelerated of technology transfer across the stages. At IBMIRL minimization of product development cost was not evident.

Strategic positioning and potential market were the factors at the environmental level that increases the propensity of organizations to collaborate. The SAP partner collaborations tried to bring innovations ahead of market through strategic partnerships in which SAP and COIL Sponsors created the backbone software and the partners developed the customer front end based on emerging requirements of the potential customers. These factors were not so evident in the exploratory project studied as the Spoken Web project was aimed at a visionary change in market for the population who did not have basic literacy but had access to a telecom network. The potential market factor was emphasized during the interviews for the data collection of both the cases. SAP COIL network was created to sustain the SAP enterprise solutions business by innovating ahead of the competitors. IBMIRL collaborated in order to meet the needs of the market and partners were identified to work in areas of higher uncertainty.

C. Partner Selection

From the projects studied we identified partner selection was influenced by factors that can be categorized as partner firm characteristics, partner firm environment, and the perceived trust generated with the partners apart from the characteristics of the focal firms and the project handled**.**

Partner type, arrangements and complementary capabilities, and partner commitment were the identified partner firm attributes. Based on an organizations strengths and collaboration strategies, they look for firms with complementary strengths, resources, and capabilities [15]. In the exploratory project handled at IBMIRL we can see collaborations with universities, government agencies, technology providers etc since the need to collaborate was based more on capabilities and knowledge they can bring in, and not just the market potential. We can identify an evolving partnership model in the project. SAP COIL had vertical arrangements in the supply chain along with collaboration with customers. The partner selection tried to reduce market risks and improved clarity of innovation activities. Mechanisms to ensure commitment were present in both the networks studied.

Market commonality and shared goals, proximity and accessibility formed the identified partner firm attributes. If the organization is collaborating with another organization operating in the same

environment the collaboration can result in sharing competencies resulting in dilution of capabilities [15]. The fear of overlap in the potential market was less, as in the case of SAP COIL projects the partners kept their own share of market even after collaboration (improved markets may be created for all the partners). The commonalities in the products and services delivered by IBM and selected technology providers were low.

Perceived trust and prior experiences constituted the trust considerations identified. Trust is considered as an important aspect of successful collaboration [29]. In both projects studied perceived partner trust was an important criterion in partner selection. A level of trust and agreement on partnership was formed before the project execution stage itself. After successful collaborations, in both exploratory and exploitation projects focal firms are inclined to collaborate with partners they had worked with before.

Summary of partner selection and factors influencing is given in Table III.

TABLE III: SUMMARY OF PARTNER SELECTION

Factor	**Exploration Projects**	**Exploitation Projects**
Partner Capabilities (Resource Based View)	Knowledge of existing platforms and technology	Complementing Capabilities
Partner Type	Market and Research Partners possible	Only single type of partners usually present
Partner Prior Experience	New partners possible	Familiar and existing partnerships
Alliance Type	Partner contribution/trust enabling mechanisms weaker	Stronger mechanisms to enable contributions

D. Degree of Openness Analysis

Prior research has tried to measure openness based on the number of external collaborations as synonymous to the extent of external sources of knowledge. The number of partners alone cannot provide an estimate of the openness of the project. SAP COIL projects had only the market partners and numbers varied from project to project. The major contributions however are limited to a COIL Sponsor and a COIL Project Member. We can see the Spoken Web Project had a large number of partners across different stages. The partner types varied and also the partners changed across the phases of the project. Moreover, the details of project available to the partners were limited and corresponding to the contribution they were supposed to create. Hence having different types of partners or increasing the number of partners need not improve the openness measure. Another major finding was that the partner contributions were associated with intensity of collaboration. The variables to estimate openness should include the number of partners, partner variety, phase openness, and intensity of collaboration with partners across the phases.

E. Open Innovation Strategies

We use the three process archetype developed by Gassmann and Enkel [30] namely inside-out, outside-in, and coupled processes to analyze the different open innovation strategies adopted by the SAP COIL and

IBMIRL networks.

Outside-in strategies refer to *"processes that will enrich organizational knowledge base through the integration of suppliers, partners, and external knowledge sources which can increase the innovativeness of the organizations*" [30]. In the SAP COIL network we can identify customer co-development and integration of different modules from solution developers at different stages similar to supplier integration in traditional manufacturing industry. The features, requirements, and scenarios were created based on the interaction with customers. IBMIRL collaborated with technology providers; co-development and direct buying-in of the IPs were evident in the prototype development phase.

Inside-out strategies refer to *"open innovation processes by which organizations earn profits by bringing ideas to market, selling IPs, and by transferring ideas and IPs to the outside environment"*[30]. Inside-out strategies were not present in the SAP COIL network. IBMIRL used inside-out strategies in the commercialization phase of the project. IPs were transferred to IBM (the parent organization) and IBM partners with telecom providers (including IP sharing) to commercialize the project.

Coupled processes in open innovation refer to working in alliance with partners of complementing capabilities. Characteristics of firms adopting coupled processes include standard setting firms through collaborations, organizations that try to improve returns and try to form alliances with complementing partners [30]. Coupled processes were prominent in the SAP COIL network. In the projects like mApprove, mSFA and workflow using SIFbA, the partners and sponsors brought in their IPs or technology ideas and all the network partners collaborated together to develop a integrated solution. The locus of innovation and knowledge creation were within the SAP COIL ecosystem. In the Spoken Web project coupled processes were exhibited with academic collaborations and strategic alliances with technology providers.

F. Outcomes

In the networks studied partners' contributions were generally highlighted in the form of publications, showcasing or sharing of monetary aspects. Ailed partnerships were generally terminated and in both exploratory and exploitation projects focal firms were inclined to collaborate more with same partners after successful completion of projects.

VI. CONTRIBUTIONS

This study contributes to open innovation literature by developing measures for degree of openness and by identifying influence of various factors on open innovation implementation across various stages of operationalization. The studied cases had varied types of partnerships, project requirements, and the open innovation. Results of the study will hence be applicable in different contexts and can act as a guide for managers to improve performance of collaborative projects and adopt different aspects of open innovation principles according to the innovation objectives.

REFERENCES

[1] Chesbrough, H. (2003). Open Innovation: The New Imperative for Creating and Profiting from Technology. Boston: Harvard Business School Press.
[2] Yin, R.K., (1989). *Case study research: Design and methods*, California: Sage Publications.
[3] Pare, G. (2004). Investigating Information Systems with Positivist Case Study Research. *Communications of the Association for Information Systems* , 233-264.
[4] Rogers, M. (1998). *The Definition and Measurement of Innovation.* Melbourne: Melbourne Institute of Applied Economic and Social Research.
[5] Chesbrough, H., Vanhaverbeke, W., & West, J. (2006). *Open Innovation: Researching a New Paradigm*. Oxford: Oxford University Press.
[6] Gianiodis, P. T., Ellis, S. C., & Secchi, E. (2010). Advancing a typology of open innovation. *International Journal of Innovation Management* , 531-572.
[7] Lazzarotti, V., & Manzini, R. (2009). Different Modes of Open Innovation: A theoretical Framework and an Empirical Study. *International Journal of Innovation Management* , 615-636.
[8] Laursen, K., & Salter, A. (2006). Open for innovation: The role of openness in explaining innovation performance among UK manufacturing firms. *Strategic Management Journal*, 131–150.
[9] van der Meer, H. (2007). Open Innovation – The Dutch Treat: Challenges in Thinking in Business Models. *Creativity and Innovation Management* , 192-202.
[10] Boscherini, L., Chiaroni, D., Chiesa, V., & Frattini, F. (2010). How to use pilot projects to implement Open Innovation. *International Journal of Innovation Management* , 1065-1097.
[11] Dittrich, K., & Duysters, G. (2007). Networking as a means to Strategy Change: The Case of Open Innovation in Mobile Telephony. *The Journal of Product Innovation Management* , 510-521.
[12] Gassmann, O., Enkel, E., & Chesbrough, H. (2010). The future of open innovation. *R&D Management* , 213-221.
[13] Das, T. K., & Teng, B. S. (2003). Partner analysis and alliance performance. Scandinavian Journal of Management, 19(3), 279-308.
[14] Barney, J. (1991). Firm Resources and Sustained Competitive Advantage, Journal of Management, 17, 99-120.
[15] Das, T. K., & Teng, B. S. (2000). A resource-based theory of strategic alliances. Journal of Management, 26(1), 31-61.
[16] Tether, B. S. (2002). Who co-operates for innovation, and why? an empirical analysis. Research Policy, 31(6), 947-967.
[17] Kirschbaum, R. (2005). Open innovation in practice. Research and Development Technology Management , 24–28.
[18] Almirall, E., & Casadesus-Masanell, R. (2010). Open Versus Closed Innovation: A Model of Discovery and Divergence. Academy of Management Review , 27-47.
[19] Chesbrough, H., & Crowther, A. K. (2006). Beyond high tech: Early adopters of open innovation in other industries. R&D Management , 229–236.
[20] Enkel, E., & Gassmann, O. (2007). Driving Open Innovation in the Front End: The IBM Case. Euram. Paris.
[21] Hienerth, C. (2006). The commercialization of user innovations: the development of the rodeo kayak industry. R&D Management, 273–294.
[22] Lokshin, B., Belderbos, R., & Carree, M. (2008). The productivity effects of internal and external R&D: Evidence from a dynamic panel data model. Oxford Bulletin of Economics and Statistics, 399-413.
[23] Christensen, J. F., Olesen, M. H., & Kjær, J. S. (2005). The industrial dynamics of Open Innovation—Evidence from the transformation of consumer electronics. Research Policy , 1533–1549.
[24] Hwang, J., Kim, E., & Kim, S. (2009). Factors affecting open technological innovation in open source software companies in Korea. *Innovation: management, policy & practice* , 279–290.
[25] Eisenhardt, K. M., (1989). Building theories from case study research. *Academy of Management Review*, 532–550.

[26] Vonortas, N. S., & Okamura, K. (2009). Research partners. *International Journal of Technology Management*, 280-306.
[27] Narula, R. (2004). R&D collaboration by SMEs: New opportunities and limitations in the face of globalisation. *Technovation*, 153-161.
[28] Barney, J. (1991), Firm Resources and Sustained Competitive Advantage, *Journal of Management*, 17, 99-120.
[29] Bosch-Sijtsema, P. M., & Postma, T. J. B. M. (2009). Cooperative innovation projects: Capabilities and governance mechanisms. *Journal of Product Innovation Management*, 58-70.
[30] Gassmann, O and Enkel, E (2004). Towards a theory of open innovation: Three core process archetypes. *Proceedings of the R&D Management Conference*. Sesimbra,Portugal.