Is Open Innovation imperative to Small and Medium Enterprises?: A Comparative Study

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ABSTRACT

The newly evolved trends of transformation in the entrepreneurships, their establishment, operation and management, and subsequent alterations in the entrepreneurship's knowledge arena has brought out the idea of open innovation, suggesting that ideas for innovations can transpire or go to market from outside the company as well as inside. Leaders among the global entrepreneurships, among others including researchers, academics and agencies acting as intermediaries are thriving to achieve success in accommodating open innovation (OI) strategies in their business processes or researches or activities leading to additional value gain. OI strategies, accepted by relatively large corporate business houses through their very nature, but as time passes and strategies mature, seemingly and gradually they are being adapted by the small and medium sized enterprises (SMEs) for the benefit of economic and knowledge gain. This paper through a comparative study has tried to incorporate ideas of open innovation that are suitable for SMEs and find answer to the question on the acceptance of OI strategies in SMEs.

Keywords

Innovation, open innovation, SMEs, entrepreneurship, entrepreneurship development

INTRODUCTION

Enterprises are increasingly considering innovation as a major engine to enhance their performance and strengthen their competitive position in the market (Van de Vrande et al., 2008). Large corporate business houses were extending their internal capacities to cope up with the situation, but with the advent of the Internet and opening up of the horizon rather by partnership not competition, enterprises are eagerly accepting open innovation (OI) for their growth and sustenance.

Despite the questions, how open is innovation? (Dahlander and Gann, 2010), or to what degree have firms across industries adopted the open innovation paradigm? (Lichtenthaler, 2008), or be taken as misaligned perspectives among entrepreneurs, academics and policy makers (Massa & Testa, 2008), more and more organizations are trying to improve their performances through intensifying collaboration across industry networks and partnerships by opening up their innovation processes in line with the open innovation framework (Van de Vrande et al., 2008). The other question remains pertinent to this research as, why is the open innovation important for small and medium sized enterprises (SMEs)?

Majority of the literature has been focusing on analysis of large, multinational and technology based firms on their utilization of open innovation framework (Chesbrough, 2003), and only a small number of studies have been carried out on adoption of OI in SMEs (West et al., 2006). In terms of accepting SMEs in the mainstream of open innovation, there are arguments (Lee et al., 2010) based on their inability to access external resources (Narula, 2004), differences in organization and culture between the individual partners (TIEKE, 2009), lacking in managerial and technological competencies (Del Brío and Junquera, 2003; Edwards et al., 2005), naïve in fundamental innovation (Hölzl, 2006a; b), limitations towards strategic alliances with larger firms (Rothwell and Dodgson, 1994), organizational and cultural differences (Rahman, 2010) and outsourcing via other SMEs (Rothwell, 1991). However, considering above facts as their discrepancies SMEs have been recognized as earlier adaptor of OI strategies (Cervantes, 2009), can act as starter or catalyst (Telemetica Institute, 2008), can better position themselves in the market (Grant, Laney and Pickett, 2002), has the ability to adopt quickly with new products (Parrilli, 2006), are flexible to open innovation (Design Council, 2005), and tends to be more adoptive in networked paradigm (Rahman and Ramos, 2010).

In recent years, the contribution of SMEs to economic growth, job creation, innovation and promotion of enterprise has been widely recognized (Rahman, 2010) and the debate on the adoption of OI in SMEs, somehow, can be responded by above arguments. However, there is another continuing debate about the role of SMEs in introducing fundamentally novel innovation than the large firms (Storey and Sykes, 1996) (which will go on and deserves a fresh look into this aspect and perhaps another research dimension), but they do have a greater ability to take incremental role in open innovation to position

themselves in better environment (Storey, 1994). Furthermore, SMEs can be a starting place of important innovations, which would then be commercialized by large firms (Smallbone, North and Vickers, 2003).

This paper has tried to find the answer to the research question that it has put forward and towards that end, the paper has synthesized various researches carried out within the context of open innovation by learning about the sources of innovation and at the same time, practices and trends of adoption of OI strategies in SMEs. The study tries to find any general trend exists within these researches or whether they are separate initiatives carried out by the researchers aiming the existence of open innovation in SMEs. Arguments for selecting these research papers are as such to serve a dual purpose; to learn about the behavior of SMEs on open innovation in Europe and at the same time, strengthen the basis of a new survey to be carried out in a few European countries to find out the pattern of open innovation that are being adopted among selected SMEs. Later on the paper has pointed to a few future research hints before making the conclusion.

OPEN INNOVATION IN SMES

It has been observed that a major portion of the business community, despite their justified contribution to economic growth and employment generation, the sector belonging to the small and medium enterprises, are not always in advantageous situations in the arena of open innovation due to many factors, seen, unseen, attended, un-attended, researched, deserves further research (United Nations, 2006). In this context, Edwards, Delbridge and Munday (2005) argue that, in spite of increasing attention being given to the role of SMEs and innovation there is a gap between what is understood by way of the general innovation literature and the extant literature on innovation in SMEs. They further argue that studies of innovation in SMEs have largely failed to reflect advances in the innovation literature.

This research has tried to find out the sources of innovation, trends of innovation and practices of innovation among SMEs following a few concurrent and classical research papers that have been created through using the survey as the instrument. There were four papers on the first theme, three on the second, and four on the third. Selection of these papers are being carried out in the prospective of SMEs development along those three trends, in European context and search methodology was most popular search engines, like Scopus, ScienceDirect and ACM. However, there were limitations on un-subscribed or paid search, but the advantage was there by making search from the university's integrated online digital library.

Sources of Innovation

Using a large scale sample of 2707 manufacturing firms from UK, Laursen and Salter (2006) explore the relationship between the openness of firm's external search strategies and their innovative performance by learning about the innovation process inside firms. While exploring the knowledge sources for innovation, Laursen and Salter categorized 16 external sources and the results indicate that the most important sources were 'clients or customers' (varying from low-medium-high degree of use, this group counts to 66 among 788 responses, thus contributing to 8.4%, though this figure is not so simple to manipulate) and 'suppliers of equipment, materials and components' (varying from low-medium-high degree of use, this group counts to 60 or 7.6%). Both these groups belong to a master category which comprises of six types of channels (market, institutional, other, specialized and average; for explanations see Laursen & Salter, 2006). There were two other dominant sources of innovation, such as 'health and safety standard and regulations' and 'environmental standards and regulations' counted to 63 (or 8%) and 61 (or 7.7%) respectively, but not being the focus of this research they have been omitted from the descriptive statistics. *The researchers of this study argue that U.K. firm's innovative activities are strongly determined by relationships between themselves and their suppliers and the end-users (customers). End users have been found a major source of open innovation and one may term it as 'user-oriented innovation'. The next one is the supplier themselves, acting as another source of innovation. Other recognizable sources are universities, research houses, intermediaries and competing companies (may be termed as 'partners').*

Surveying 1234 small and micro firms in the Netherlands, De Jong and Marsili (2006) tried to identify 4 categories of small innovating firms and to stress the similarity with Pavitt's taxonomy (Pavitt, 1984) they find 291 (23%) are from the group categorized as supplier-dominated (uses process innovation, the role of supplier as sources of innovation and external sources of knowledge); 293 (24%) from specialized supplier group (implying a distinctive prevalence of product over process innovation and heavily rely on understanding customers' needs as source of their innovations); 317 (26%) comprised of science based group (innovativeness is high both in products and process with a prevalence of product over process and these firms are distinguished for using knowledge from universities and research institutions as source of innovation, though draw heavily on customers' needs); and 331 (27%) forms resource intensive group (low tendency in external orientation including consultation with external parties and making formal partnerships for innovation, rather allocate financial and time resources for innovation and try to limit their personnel to be used in innovation so as limiting them from external networks). *This survey finding predominantly points towards the role of supplier and customer as the major sources of innovation.*

Among 412 selected companies in Germany and with 154 responses from them who are mainly medium and large technology oriented firms, Lichtenthaler (2008) made a clustered study with 6 groups. Cluster 1 comprised of firms termed as closed innovators (they follow a rather closed innovation strategy with very limited external technology acquisition and external technology exploitation). In cluster 2 firms are similar to cluster 1, but the only major difference is that these firms acquire a considerable part of their technologies from external sources. In cluster 3 where firms been designated as absorbing innovators (firms rely very strongly on external technology acquisition); while cluster 4 represents firms the opposite to cluster 3 as regards open innovation and termed as desorbing innovators (group of firms partly opened up the innovation process, but in a different direction, thus focusing internally developing new technologies and actively commercializing technology assets in addition to their product business by means of licensing agreements. Cluster 5 comprises firms that use both technology exploration and technology acquisition to a considerable extent and termed balanced innovators; and finally cluster 6 refers to firms that have adopted a very open approach on both dimensions and termed as open innovators (firms use external knowledge by strongly relying on external technology acquisition and at the same time, acquire a substantial part of new technologies from external sources by strongly relying on licensing agreements to bring the products to market). The finding reflects that majority of the firms belong to cluster 1 and 2 (104 comprised to 67%), while cluster 4, 5 and 6 total to 36 (about 23%). *If one looks from the aspect of the source of innovation, clusters 2 to 6 belong to this category and form the major portion of the sample population, which means the external knowledge is the most important source of innovation to SMEs.*

To explore the characteristics of innovation in South Korean SMEs, Lee et al. (2010) examined the 2005 Technology Innovation Survey published by the Survey Science and technology Policy Institute (STEPI), which was conducted from 2002 to 2004. Among 2743 responded firms, 2414 (88%) were SMEs. In terms of finding sources of innovation, the research finds four important sources, such as from within the firm (on an average 70.4% of firms used this information source, which comprises of sources like developing, marketing, research, marketing and sales, and purchase); from other firms and market (on an average 46.6% of firms used this information source, which comprises of sources like customers, competitors, suppliers, non-competitors, business services providers and affiliates); from university and research centre (on an average 33.3% of firms used this information source, which comprises of sources like university, government agencies, non-profit organizations and private research centres); and from public information (on an average 64.2% of firms used this information source, which comprises of sources like exhibition, internet, magazine, conference and meeting, mass media and patents). *This study shows that a majority of the sources are from outside the firm, though the internal source is still a strong competitor*. Regarding the innovation performance, they focus on four types of innovation, such as major product innovation, minor product innovation, service innovation and process innovation. They found that the first three types are related to the depth and breadth of external information usages at the significant level of 0.01. The process innovation was related only to the breadth at the significant level of 0.05. *This shows that effective and broad use of external information is significantly associated with the number of innovation*.

Practices of Innovation

Based on a database of 124 companies in Switzerland (mainly large firms), Gassmann and Enkel (2004) identified three core innovation processes; the outside-in process (integration of suppliers, customers and external knowledge sources), the inside-out process (exploitation of ideas in different markets, intellectual property (IP) selling and multiplying technology by channeling ideas to the external environment), and the coupled process (coupling of outside-in and inside-out processes by working in alliances with complementary companies). While deciding the outside-in process, the company chooses to invest in cooperation with suppliers and customers and also to integrate with external sources of knowledge. This can be achieved by integrating customers and suppliers, listening posts at innovation clusters, applying innovation across industries, buying IP and investing in global knowledge creation. Deciding on inside-out process as the innovation process, the company changes the locus of exploitation to outside the company's boundary and they use IP licensing and or multiply technologies by transferring new ideas to other companies. Companies deciding on using the coupled process usually combine the outside-in process (to gain external knowledge) with the inside-out process (to being new ideas to market) and cooperate with other companies in strategic alliances (joint ventures). *Looking at the flow of practices on OI strategies, one can mention that the trend of IP management as an essential practice is emerging.*

Van de Vrande et al. (2009) in their study through a survey of 605 (27% respondents from a sample of 2230 firms) innovative SMEs in the Netherlands have tried to make a comparative study by segregating those firms into three clusters, such as cluster 1- firms that are most strongly involved in open innovation (they use a broad set of innovation practices to improve their innovation performance and mainly belongs to manufacturing sector), cluster 2- enterprises that nearly always rely on the involvement of employees and customers, and external networking, and cluster 3- firms that rely heavily on customer involvement but most of them are not involved in relatively complex and formalized transaction forms of open innovation activities like venturing, IP-trading, outsourcing of R&D and participation in other firms. Their study reveals that

cluster 2 forms the largest group with 411 firms (68%); while 133 firms (22%) belong to cluster 1 and 61 firms (10%) belong to cluster 3. Their study reveals that, *in terms of adoption of OI strategies, almost cent percent firms are belonging to cluster 2 practices employee involvement, customer involvement, and external networking; while almost fifty percent firms belonging to cluster 1 uses venturing, outward IP licensing and external participation.*

Batterink (2009) finds that licensing-in, outsourcing and cooperation are the three most utilized strategies among SMEs (see next sub-section about his data source). His study finds that innovating firms are more inclined to engage in outsourcing or cooperation than in licensing-in. Going in-depth further, his study reveals that outsourcing was for a long time the most common strategy, but in 2004 cooperation became most prominent with over 50% of share. Furthermore, his study finds that in between 1996 and 2004, the propensity of SMEs to engage in licensing-in grew to a level almost comparable to the propensity of large firms.

Trends of Innovation

As one of the classic research in this field, Pavitt (1984) has tried to find out the sectoral patterns of technical changes as revealed by data on about 2000 significant innovations in Britain since 1945. Pavitt further goes on explaining similarities and differences amongst sectors in the sources, their nature and impact of innovations, defined by the sources of innovation, by the size, by the principal lines of activities of firms, and by the sectors of innovations' production. Among 3013 observations, he tabulated the most number of sector based firms who are accepting all the three sources of innovation (intra-firm, other firm and public infrastructure), and find that firms within the sector of instruments with 440 responses (14.6%), textile machinery with 278 responses (9.2%) and machine tools with 231 responses (7.7%). While various other sectors show use of these three channels of open innovation sources, but apart from the mentioned three sectors, responses from coal-mining machinery, electronic components, iron and steel, pharmaceuticals, and plastics are significant (responses between 114 (or 3.8%) and 199 (or 6.6%)). The research also finds 80.8% of the firms belonging to the electrical and electronic engineering (the highest in the usage group) uses innovation and 93.1% of the firms belonging to the instrumentation engineering generate innovation (the highest in the producer group). *The trend shows that high-tech companies are leading in OI adoption.*

Studying the homogeneity of innovative behavior to determine an industry classification of Dutch manufacturing industry, Raymond et al. (2004) classified them into three groups, namely high-tech group, low-tech group and the industry of woods. One may argue about the OI adoption pattern that may relate to local environment depending on catalytic parameters, such finance, policy, skills and customers. However, Raymond et al. find that among 3294 firms of CIS 2 (Community Innovation Survey-2), 225 firms belonging to Chemicals sector are 84% innovator, followed by Machinery and Equipment sector with 77% (384 firms) innovators, Plastic sector with 76% innovators (170 firms), and from Electrical sector 72% were innovators (285 firms). Similar trends were there in their findings for CIS 2.5 and CIS 3 data. The table below shows the findings illustrative top 4 sectors with higher percentage of innovation and revealed that firms in the Chemical sector are more and more adopting OI, which reflects the global picture where *firms in the pharmaceutical sector are one of the leading innovators*.

Data source	**Ranking**							
	First rank		***Second rank***		***Third rank***		***Fourth rank***	
CIS 2	Chemicals		M&E*		Plastic		Electrical	
3294 total firms	225 firms	84% innovators	384 firms	77% innovators	170 firms	76% innovators	225 firms	72% innovators
CIS 2.5	Chemicals		Plastic		M&E*		Vehicle	
3220 total firms	226 firms	77% innovators	171 firms	76% innovators	401 firms	75% innovators	187 firms	64% innovators
CIS 3	Chemicals		Plastic		Electrical		M&E*	
2104 total firms	200 firms	81% innovators	104 firms	76% innovators	134 firms	73% innovators	292 firms	70% innovators

* Machinery and Equipment

Table 1. Highest ranking industry sectors adopting OI

Investigating the impact of technical diversity and organizational slack on innovation, Huang and Chen (2010) collected corporate information and patent information over 10 year period between 1995 and 2004. Their sample size comprised of 2745 cases. Corporate information regarding the moderating variable, organizational slack, and control variables were collected from the database of the Securities and Futures Commission (SFC), Ministry of Finance, Taiwan. Patent information of their selected firms regarding independent variable, technological diversity, and dependent variables, innovation quantity and innovation quality, were collected from the U.S. patent and trademark Office (USPTO). They find that there is an inverse U-shaped relationship between technological diversity and innovation performance. Their findings also indicate that an optimal level of technological diversity for the innovation exists. In their study, they argue that innovation performance would be down as technological diversity increases after the optimum level. However, before the optimal level, the increase of technological diversity would enhance innovation performance. *Hence, the innovation trend could be bi-directional depending on the ground reality*.

Before looking at the future aspects, this study likes to point out another research on adoption of open innovation in SMEs. Towards finding the extent of pursuance by different types of innovating firms by size and technology, Batterink (2009) in his PhD research set forth the question, To what extent do different types (size and technology classes) of innovating firms pursue an OI strategy? He goes further arguing, is there a noticeable trend of innovating firms adopting OI strategies? In answering these questions, he uses longitudinal Dutch Community Innovation Survey (CIS) data from five subsequent surveys covering the period of 1994 to 2004. Response rates of firms in the CIS varied from 54% to 71% in this period. Though his study finds that firms with over 250 employees, i.e., large firms' adoption rate was 90% covering the total industry share within 2002-2004, there is a growing trend on the adoption of using external knowledge acquisition strategies among firms with employee class size of 50-249, i.e., the SMEs. Within the entire industry share, 71% of SMEs adopted OI strategies (with cluster separation of high-tech, medium high-tech, medium low-tech and low-tech, and within this cluster, high-tech SMEs took the lead with 82% adoption rate, while medium high-tech 74%, medium low-tech 71% and low-tech 65%). *This trend of adoption is significant and with proper knowledge transfer, participation rate of SMEs can be improved further.*

FUTURE ASPECTS

Referring to a survey of 2003 conducted on 180 Italian SMEs, Massa and Testa (2008) find that for about half of the interviewed companies, innovation contributes to more than 30% of sales. However, in terms of promoting innovation their finding indicates misalignments among the role of intermediaries, universities and entrepreneurs. They find a discrepancy between the respondents' self-reported data about innovation activities and official data provided by Italian Institute of Statistics (ISTAT) and Chambers of Commerce. But, they mention that during the analysis, it became evident that the discrepancy was not due to operational or measurement issue or interviewees bias, rather the conflicting results could be a function of different perceptions of various researchers surrounding the topics. This instigates further investigation aiming to identify the different perspectives on adoption of OI strategies in SMEs.

To match the global demand and at the same time coping with the global competition and the supply of innovation, enterprises are increasingly internationalizing their innovation activities by opening their innovation process through collaboration with external partners (customers, suppliers, universities, intermediaries). However, as De Backer and Cervantes (2008) mention and this study supports, future research dimensions should be carried out along the route, as what drives these global innovation networks across different industries?, or how these global innovation networks are related to companies' overall strategies?, or whether these global innovation networks are at all accessible to SMEs?, or, even if these networks are accessible to SMEs, what would be the consequences?, whether beneficial? Or detrimental?, will remain as questions to future researchers for the coming periods.

CONCLUSION

User oriented innovation benefits SMEs by decreasing the need to generate and evaluate ideas or concepts, by reducing R&D and commercializing costs and by accelerating involvement of customers into the product development and commercialization process (Van de Vrande et al., 2008). Furthermore, factors like strategic alliances (Hoffmann & Schlosser, 2001), and methods like leveraging external researches (Dahlander & Gann, 2010) in SMEs are inclining them more towards joint value creation.

Along these contexts, this research finds a general trend among SMEs in terms of sources of innovation. As a conclusion it can be mentioned that the customers, suppliers, and partners seem to be major sources of open innovation in SMEs, while venturing, outward licensing or IP trading could be mostly adopted OI strategies in SMEs. However, mapping of OI growth pattern in SMEs deserves further exploration and research. There is a gap between theoretical perspectives and practical

aspects of the research, in applying OI strategies. Foremost, an elongated research could be carried out in future to find out any other prevailing pattern of sources, practices and trend, including initiating a new survey of its own.

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