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Collaborative Research (CR) as a reduced transaction cost in Open Innovation

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ABSTRACT

In this conceptual paper, open innovation is considered from the point of view of collaboration between the Industry and the Academy. However, if considered under the framework of the Resource Based Theory, specifically regarding Transaction Cost, it can be shown that the two parties (Industry and Academy) are in fact compatible. The discussion on Transaction Cost is mainly focused on the aspect of the management resources available for the activity and the cost incurred compared to alternative management activities. It has been observed that small and medium enterprises (SMEs) are faced with the ever increasing stress of intensive competition and limited by their resources (e.g. managerial capabilities, financial etc.) in their abilities to deal with the transaction cost, and thus effectively turn to collaboration as a solution. The discussion synthesizes aspects of open innovation based on a theoretical model and a case study of the User Association of Advanced Technologies program in Israel, and emphasizes on collaboration as an open innovation activity within the Resource Based Theory. It further concludes that collaborative research reduced the transaction cost in terms of utilizing open innovation in entrepreneurs, especially in case of SMEs, before providing a few research hints. The research piggybacks on the acquired knowledge on open innovation and thus strengthens further the concept of reduction of transaction cost through collaborative research.

INTRODUCTION

Collaborative research¹ can be any sort of research in which two or more researchers work in a team towards achieving a common goal and in which all of the members of the team are supposed to contribute equally, importantly and substantially (Pimple, 2005). This form of collaboration has been accepted as success regarding specific goals, such as cost reduction, knowledge acquisition or value addition (Rahman and Ramos, 2012), and many organizations globally are collaborating successfully, including large corporate houses, research institutes and academics. Various collaborative research models exist across the industries (EU, 2006).

While open innovation, as a recently coined term, includes collaboration as a main element of its strategies to promote product, process, service or organizational enhancement (Chesbrough, 2003; Rahman and Ramos, 2010). This paper synthesizes on utilizing collaborative research as a means of open innovation, applying to the specific business sector of the entrepreneurs, such as the small and medium

¹ <http://www.wisegeek.com/what-is-collaborative-research.htm>

enterprises, and through a government sponsored program, namely User Association of Advanced Technologies, from now will be known as UA.

As a conceptual paper based on two recently published book chapters (Porath, 2012a; Porath, 2012b), focusing a governmental instrument for encouraging Open Innovation via Collaboration between Industry and Academy; one as a case study and the one as a model this study discusses the effect of transaction costs in entrepreneurships as a means of open innovation. The instrument namely, the User's Association (UA) is an association supported financially by the government of which surveys, selects and helps small and medium enterprises (SMEs) assimilate technologies or technological solutions to problems identified as interesting for specific sectors. The UA recruits an academy to do the screening identification, and selection of the solutions, and later to aid in the integration of the solutions by the SMEs, while managing the funds and the activity on behalf of the SMEs.

The UA is an ad-hoc activity defined by quantified goals, term and funds. It has been found to be very successful and helps a large variety of SMEs, ranging from sectors with little or no research and development (R&D), to high-tech sectors.

In the next sections the paper provides the background focusing on three main themes, and then the methodology followed by discussion regarding the main finding following the mentioned methodology proceeding to summarize before giving a few research hints.

BACKGROUND

The theoretical background focuses on three main themes;

Firstly, the Open Innovation – describing the development in research in specific field such as, with recent developments regarding the SME relevance within Open Innovation. Further, a brief discussion on collaboration as a source of innovation has been given;

Secondly, the Economic Theory and Resource Based Theory – focusing on the transaction cost, and the impact of the limitation of resources on the selection of activities in entrepreneurships. However, before discussing the resource based theory, it discusses the Economic theory behind the collaboration; and

Thirdly, it discusses the scarce resources of SMEs and their impact on collaborative research in terms of transaction cost.

Open Innovation and Collaboration

The growing pressure on organizations to innovate and the limitation on that capabilities have pushed organizations towards seeking innovation out-side their boarders (Smith et al., 1991; Dodgson, et al., 2006; Rahman and Ramos, 2010; Lee, et al., 2012). Organizations are increasingly relying on external sources of innovation (e.g. research centers) via inter-organizational network relationships (Perkmann, 2007). Thus SMEs are viewing external innovation as a viable alternative to that of

internal innovation (Rahman and Ramos, 2012). External innovation for SMEs in that case is the one that is found outside the borders of the firm. Redefining the borders of the firms due to the changes in the environment of the firms has been going since Penrose (1968) defined them. Furthermore, the advent of collaboration in R&D and innovation activities has been opening the definitions to be re-examined. (Kirk, 1995; Spender, 1996, Laursen and Salter, 2004). Significant developments have been made in recent years, such as the change in the perception of cooperation and competition (Brown and Eisenhardt, 1998) all the way to collaboration in research (Porath, 2010).

Open innovation is a phenomenon that has become increasingly imperative to both practice and theory since the 1990's (Gassmann and Enkel, 2004). The open innovation paradigm introduced the concept that firms can benefit from research and innovation coming from external sources as well as internal (Chesbrough, 2003). That need is becoming important not only to SMEs but also to larger organizations (Chesbrough, 2003). The capability to manage that knowledge and innovation on the outside as well as on the inside is an important element of the firm (Naqshbandi and Kaur, 2010). This study observes that open innovation and collaboration in research provide sustained impact on specific sectors of entrepreneurships, which is based on a veteran operation (Porath, 2012a; Porath, 2012b) that has been practiced since 1994.

Recent work has shown that open innovation is a critical source of innovation for SMEs (Rahman and Ramos, 2012). There are claims that it is not only a growth mechanism related to the entrepreneurial phase of the firm, but it is also an important innovation source for SMEs (Porath, 2012a; Porath, 2012b). Furthermore, it has been observed that external innovation management capability is important in order to maintain competitiveness even in sectors that are not R&D intensive (Porath, 2012a).

Economic Theory

Economic theory supplies important input regarding the collaboration towards innovation. Since the work of Katz (1986) many economic models have been defined. Starting with early models (Katz, 1986; D'Aspremont, and Jacquemin, 1988) that dealt with simple symmetrical two sided cooperation, in pre-competitive R&D, and tried to establish its benefit, while assuring that the competition in the market place was not reduced, or damaged in any way – no breach of anti-trust. The following models strived to describe the collaboration in an ever more increasing detail and resemblance to real world cooperation (D'Aspremont, and Jacquemin, 1988; Kamien, Muller and Zang, 1992; Kamien and Zang, 2000, Fontana, Geuna and Matt, 2006). Such models established the economic rationale for the collaboration by showing that the collaboration provided a benefit to the participants and to society (defined as the social benefit).

However, models developed at later stages added asymmetry in the contribution and ability to enjoy the proceeds, and additional more lifelike parameters (Kamien, Muller and Zang, 1992; Yun, Park and Ahn, 2000; Pastor and Sandons, 2002; Miyagiwa, and Ohno, 2002; Fontana Geuna and Matt, 2006; EU, 2006). The economic models mentioned above, also presented the benefits of performing R&D for the firm and the value of different modes of that R&D, alone or in collaboration, and different modes of collaboration (Rosenberg, 1990; Audretsch and Feldman, 1996; Katsoulacos and Ulph, 1998; Cabral, 2000). It has been demonstrated that the firms benefit from R&D

(Rosenberg, 1990) and that they benefit mostly from doing it in collaboration (Kamien and Zang, 2000) in the mode best described as Collaborative Research (Olk, 1991; Doz, Olk and Ring, 2000; Porath, 2008; Porath, 2010). The economic analysis started with collaboration stemming from free will (Olk, 1991; Doz, Olk and Ring, 2000), and progressed towards government supported collaboration (Porath, 2008). At this point the authors like to mention shortly that the role of the government (local, national or super-national) also evolved from a general discussion regarding the role of the government as analyzed by Luukkonen (1998, 2000) claiming that the government support was intended to induce the firms to try riskier research that would lead to breakthroughs, and in a more general way involving the Industry-Academy-Government Triple Helix by Etzkowitz and Leydersdorff (1997).

Resource Based Theory

Another specific economic aspect is the scarcity of resources, especially management resources in SMEs causing reduced relative capacity (Naqshbandi and Kaur, 2010) expressed as a reduced capacity to manage external resources. For open innovation the Transaction Cost includes the search for and identification of the Innovation options, selection of the most promising option and adopting it. That activity would strain the management resources in a small organization dealing in a small management team with various needs of the firm, compared to the ability of larger organizations to either raise additional management resources, or re-allocate existing ones.

The Resource Based theory and the Transaction Cost point of view would recommend that firms prefer paths of actions that would present the smallest transaction cost, and that they prefer actions with immediate and evident benefit (preferably in the near and foreseen future or present) to other more benefit obscure actions in the distant future (Parkhe, 1993; Audretsch and Feldman, 1996; Kline, 2000). Furthermore, Resource-based theory implies that firm resources and capabilities influence the growth and performance of the firm (Park and Lee, 2011).

As described by Chen (2010) Open innovation archetype focuses on “technology uncertainty”, while transaction theory focuses on “behavior uncertainty” and resource-based theory focuses on “demand uncertainty”. Hence, synthesizing the transaction theory, open innovation theory and resourced-based theory, we can get an integrated analytical structure. However, these different theoretical perspectives do not conflict; they can be complementary to each other.

Therefore, while the limitation of resources would drive SMEs to search for innovation external to them rather than utilize their limited resources to develop that innovation, the same reason would drive them to seek paths of actions with the smallest possible transaction cost to manage that external innovation

SMEs Limited resources and their impact analysis

The CR, as a partnership between technological partners each performing their compatible research and gaining access to the results of each other (with limitations in disseminating to third parties), would seem to solve the Technology uncertainty

problem dealt with by open innovation. It would also seem to solve the demand uncertainty as the CR, in its government supported form (Porath, 2010) would rule that out, as well as the behavioral uncertainty. The CR would seem like the perfect solution, but there is one important point to bear in mind – it is very resource draining, financially, HR wise and also management wise. The problem becomes clear when dealing with organization that has no R&D management capabilities. In such a case the need to manage the firm's own R&D and liaise with the partners creates enormous strain on the management resources. Therefore, for firms with no R&D management capabilities on open innovation, where the innovation management is done by partners or sub-contractors seem optimal.

However, in spite of increasing interests in open innovation, discussion about the concept and its prospective application to the SME sector has been rather excluded from mainstream literature (Lee et al., 2010). The limitation on the resources compels firms to consider the benefits derived from innovation compared to the cost of transaction versus the benefits and costs of transaction of other more directly linked towards generation of income activities (production, marketing, purchase etc.).

Another aspect is that the need for innovation which, while evident and persistent (Ring and Van de Ven, 1994; Audretsch and Feldman, 1996), is rarely as urgently evident as other needs such as production marketing etc. The lack of evident urgency makes it easier to postpone acting towards innovation in favor of other activities, while in parallel the innovation is deemed more costly when compared to the benefit (e.g. a producer would always prefer to promote the next batch order that he already sold than search for new production technologies that may or may not be suitable and that would cost to implement, before any benefit could be seen).

The need for management resources expressed as the availability of managerial capabilities, as well as the allocation of these capabilities towards specific needs of the firm is an important constraint for SMEs. In sectors where R&D is a vital capability, the management of R&D projects and their results is a vital managerial capability without which firms in these sectors cannot survive (e.g. high-tech, bio-tech and nano-tech sectors), and in many cases the firms in these sectors start with that capability (start-ups) which stays with them for the life of the firm. However, it has been observed that the same managerial capability deemed of less importance in sectors with little or no R&D (e.g. Jewelry industry) and would, therefore, develop later in the firm life or not at all. Other managerial capability, such as purchase, finance or marketing would be deemed more important.

In sectors, where the innovation related managerial capabilities would develop later or not at all, even external innovation would be difficult to manage. Managing external Innovation would require the ability to search, identify and select the right innovation components required by the firm, assess their cost and rate them according to a combination of criteria, such as cost, benefit, time to market, legal complexity etc. which would require management capabilities that are not often existing in management teams that have never managed such an operation before. In fact as can be seen from the articles recently published (Porath, 2012a; 2012b), without that capability such SMEs find it hard to assimilate innovation, even when most of the work is performed on their behalf, as there is no other choice than to be able to manage innovation once the SME has reached the absorption stage. A part of the

needs of the firm in management resources is to have the ability to access management capacities, such as management capabilities and human resources (Harison and Koski, 2010). Accessing such capacities is harder for SMEs, especially when competition and market stress are increasing (e.g. in the case study mentioned in Porath, 2012a and 2012b, the SMEs could not either access the expert for the chemical industry case, or the large system houses for their list of complains and problems regarding local sub-contracting without the UA help). This difficulty raises the transaction cost of absorptive capacity and relative capacity and, therefore, the gap between transaction cost and the benefit derived from the activity. The increase in the gap would drive SMEs, in such times of increased stress, to concentrate their efforts on other tasks (for example in marketing, purchase, or efficiency) and lower their innovation efforts.

In such cases, if the firm lacks the managerial capacity to seek, identify and utilize financial aid tools for innovation (e.g. the FP, Eureka) their take-up of such tools will remain low. It could be similar to offering trade show services to a company not able to complete its product development and certification – important help but not relevant to the need.

In order to improve the Innovation Management capabilities, one could either increase the attractiveness of innovation - increase the benefit derived from it, but that is already taken care of by market forces and increased competition. That increase in attractiveness may lure some of the stronger SMEs that have at least some of the capabilities but lack the experience. It would not help those that lack both the experience and the capabilities. The other option is to try and reduce the transaction cost. The reduction in transaction cost would increase the objective ability of SMEs to participate – they would have enough resources – but convincing them to do so would still need to be done.

Methodology of the UA cases

The cases presented by Porath (2012a, 2012b) regarding the open innovation scheme (User's Association) present that specific problem and an answer. These were two case studies, one justifying a general model and the second dealing with a detailed case study, reviewing the finer points of the case, the industrial partners, their innovation needs, the operation of the UA and the results and lessons to be learnt. In the cases mentioned the UA served groups of SMEs without the R&D capabilities or even the external Innovation management capabilities to seek, identify and adopt existing solutions to predefined problems. The UA managed to reduce the transaction cost of managerial capacity required to allow SMEs to manage innovation and even external Innovation expressed in making use of existing technologies. The discussion in these two examples has shown that transaction cost, especially in times of stress makes the choice of allocating resources for innovation management more difficult for the SMEs.

DISCUSSION

Firms are economic organizations, and therefore, they base their decisions regarding actions, development of capabilities and routines on economic basis. As Rosenberg (1990) has shown they would even invest in Generic R&D which is not product

oriented as it can help them. Therefore the economic basis of firms is broader than pure immediate finance. Therefore a leading consideration for management decisions would be the alternative cost of actions. The cost of the management share of mind for specific activity can be described based on the transaction or actions that the management cannot perform due to the lack of management share of mind.

It may have seemed as if the main transaction cost for innovation lay in the research infrastructure, and that it could be overcome by joint R&D, especially utilizing the academic infrastructure (such as, mechanical and human), it would now seem that at least for less R&D intensive SMEs, the problem and solution lay somewhere else.

A potential solution of lowering of such transaction costs would be to find and allocate the tasks to external sources. An improved solution in view of the relative capacity required would be the delegation of the management of the activity to external entities on behalf of the firms. This step is not without complications such as trust, avoiding opportunism and others. These are overcome in the UA example by the long term activity and the role of the governmental agency financing and managing the UA as the “Guardian”. In that role the “Guardian” acts as supreme judge and reduces the fear from the above mentioned dangers.

In the sections above we have discussed an example of the dedicated share of mind of management, used for a specific action thus removing a valuable resource from the "available list" for other actions of the management in the SME. Thus, limiting the number of actions the management can direct. However, if we want to discuss a situation more pertinent to our case we could deal with the following situation. A 30 workers SME, can sustain at most a management team of four members. The four management members need to dedicate at least one to manage the finance, one to manage the production and one to manage the sales, even if the CEO manages one of them in addition to the overall management that still leaves maintenance and purchasing, before legal matters (easily outsourced). The last position can go to fulfill either of the functions or it can be used to direct innovation. In many cases of sectors that are low in innovation and research, the innovation is often left unattended, in favor of more direct income generating activities. Thus the management groups lack the innovation capabilities, including the ability to search, identify and acquire innovation knowledge and ties, the ability to manage the process and to fund it, among others.

In high-tech start-ups or other technology oriented start-ups, the entrepreneurial process demands that the management team becomes an expert in innovation management acquiring all the relevant skills. These management teams are also constructed to grow and change, and add members and capabilities. These SMEs are, therefore, different in their regard for innovation and in many cases for strategic reasons are content with closed innovation and not with open innovation (Porath, 2010). However, they are not the topic of discussion here.

In the cases where the management team lacks the ability to manage innovation, there are different levels of tasks regarding the cost of transaction of managing innovation and open innovation.

For such firms the management of internal or closed innovation would require management capabilities and the establishment of internal routines for the management and later absorbance of the innovation results. The Innovation transaction incurs a cost, in the share of mind of the management, especially its resources, such as time and management skills. However, in the case of open innovation, the task is even more difficult. For an SME to manage internal innovation would require the ability to manage (fund and direct) the innovation process, and to bring the results to fruition. To manage it externally would require more experience and more management resources to monitor the external sources and direct them.

However, to do so, on a remote scope would require remote management capabilities, the ability to negotiate with the external innovation partner and more. Therefore, the challenge would be greater. However, in the case of the UA there are some mitigating aspects. The UA due to its governmental authority umbrella (Porath, 2012a; 2012b) creates a framework that reduces the needs for remote management skills, that assists in the direction of the innovation process – how goals are set, designed and managed. The UA also creates "insurance" like routines in the guise of the authority control and management that help establish relational assets by reducing the fear of opportunism and thus the requirements on the SME management to deal with them. The UA also supplies the funding for the process and removes another aspect of the process from the tasks allocated to the management – they still have to manage internally but not to remotely manage the partners, or create a liaison function internally.

The UA establishes the rules of participation, reporting, there is a central management facility that manages not only the input and output of each partner towards the others, but also controls the division of resources, makes sure the goals are adhered to, and that the partners overcome difficulties. There is also often managerial support, in many cases stronger on the financial side, but usually also extending to the technical management of the project.

The UA, therefore, presents a solution to the increased transaction cost for SMEs and by removing most of the managerial capacity requirements allows the SME to participate in the innovation process. That reduced transaction cost does not come free. However, the lack of demand for managerial capacity means that there is no incentive for the SME to develop that managerial capacity or acquire it in another way. Therefore, while the results of the UA are immediate mostly, they are also short term. In order to innovate again the SME will have to form another UA or find a different solution.

FUTURE PERSPECTIVES

This research recommends that SMEs in low R&D sectors will become more interested in adopting CR in their organic growth engine, as the need to imbed innovation as an economic growth engine in all sectors of the economy increases. However, due to various challenges and reasons described in this study these SMEs may find the management of innovation a heavy burden regarding managing the entire process. In those situations, available tools such as the UA, and more improved versions can be developed.

However, in the development of SME Open Innovation assisting tools, one should bear in mind the observations regarding the management capabilities of the SMEs and strive either to develop these capabilities within the firms, or to remove their need for such capabilities as is done in the UA. These require further study on the behavior of SMEs and their functional growth through a sustained observation and orientation.

SUMMARY

Transaction cost can influence the decision of SMEs in sectors with low R&D, to manage an innovation process. The cumbersome transaction cost for open innovation as well as closed innovation, is a major deterrent for firms to deal with Innovation in either form. Therefore, especially in times of increased competitiveness and market stress, when the transaction cost of innovation also increases, and the immediate benefit is somewhat obscure, SMEs forego the need to innovation in favor of other activities.

The lack in management resources can bring the SME to the point, where it cannot even make use of financial aid tools (lack of knowledge about their availability and relevance, or lack of the management ability to make use of them) for innovation. Effective tools like the UA, offer more than financial assistance, by removing most of the collaboration risks and apprehensions, but more important for our case, the managerial capacity demand. That assistance comes with a price, that it does not encourage the SME to develop the innovation related managerial capacities. It provides the fish but it does not teach the SME to fish. However, the research concludes, in teaching the SMEs to fish one should bear in mind their limitations and needs at the ground reality.

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