Open innovation for SMEs in developing countries – an intermediated communication network model for collaboration beyond obstacles

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Abstract: The conceptual and potential applications of using open innovation in the small to medium enterprise sector in developing countries are rarely explored. While SMEs in developed countries have learned how to use open innovation, SMEs in developing countries face a range of obstacles that hinder them from innovating openly as much as they could. This paper suggests that in these cases a government agency, using innovation hubs, could help SMEs to connect, communicate and collaborate with independent inventors, marketing agencies and other parties to jumpstart innovation practices. A joint innovation model is presented to address known issues and a number of cases from developing countries are summarized to test the model.

Keywords: open innovation; collaboration; independent inventors; idea generation; communication

1. Introduction

Developing countries around the world are diligently examining the means of growing their local and national economies. Innovation is broadly considered to be one of available means to achieve this desired growth (Jaffe & Lerner 2006), though it stands to be the least explored one, which is partially due to the newness of this field (Gupta 2009). National innovation initiatives hold many opportunities to advance and grow a nation's economic base. The importance and applicable approaches of National Innovation Systems in transition economies and developing countries should be systematically assessed (Kitanovic 2007). These efforts towards advancing innovation at a national scale have proven to be very fruitful, being performed with a combination of macro-economic policy, venture capitalism, innovation management, and regional entrepreneurship initiatives, such as through the use of national innovation hubs (Chen & Karwan 2008; Marceau 2008; Trajtenberg 2002; Wonglimpiyarat 2005). These national innovation hubs have successfully used inventor networks and product consultant support networks.

Most current economic growth is largely a result of small and medium sized enterprises (Nieto & Santamaria 2010; Siu 2005). And, since it is known that growing small businesses have a positive impact on the country's economic wellbeing through the creation of wealth and jobs, such growth also spurs further innovation (Carter & Jones-Evans 2006). Therefore, this paper posits it is a fruitful idea to strive toward improving the innovation processes and frameworks that governments and SMEs employ in developing countries. Studies from developing countries show that innovation cooperation and interaction are becoming more and more important for SMEs to promote their innovation abilities (Biggs & Shah 2006;

Liefner, Henneman & Xin 2006). However, while applying the concept of innovation hubs to small to medium size businesses in developing countries may result in the largest impact on local and national growth, this paper argues that developing countries may face significant obstacles when trying to implement innovation hubs and strategies the way developed countries did.

This paper focuses on creating a model that can help small to medium size businesses in developing countries to invent and produce new products more efficiently, by connecting them with experienced inventors and marketing research teams through intermediary help of government bodies and innovation hubs.

In the literature review section, the open innovation initiatives of SMEs in developing countries will be analysed, as well as their networking preferences and factors affecting them. Also, government agencies' and other intermediary bodies' roles will be reviewed to delineate their function as mediators in developing countries. The next chapter of this paper will present the proposed model, after which, relevant data will be summarized to support the given model.

2. Literature review

2.1 SMEs and innovation

In the increasingly competitive global market, small and medium enterprises have frequently been the engine of countries' economic growth and technological process (Bruque & Moyano 2007). In order to stay efficient in the global market, SMEs must constantly work to innovate and improve their processes (O'Regan, Ghobadian & Sims 2006). Small and medium-size firms can be profitable if they adopt innovative strategies that continually improve operating efficiency, and innovative practices that create competitive advantages and better business performance (Bhaskaran 2006). SMEs are very different from large business in that most of

them lack a formal process for developing new products and services (Nieto & Santamaria 2010). This is partially due to having limited resources (i.e. capital and people) to dedicate to such a process, which creates a vicious circle that prohibits most small businesses from growing substantially; even if SMEs have R&D departments, they typically do not spend as much as big companies do in total, or even as a percentage of overall revenue (Narula, 2004). Therefore, literature suggests that SMEs should innovate differently from large companies, and focus on building networks with other companies, research facilities, customers and suppliers (Kleinknecht & Reijnen 1992; Bullinger, Auernhammer &Gomeringer 2004). This open innovation mostly focuses on early stages of innovation, addressing external sourcing of technology and intellectual property, thus networking SMEs with technology providers (Vanhaverbeke & Cloodt 2006; Chesbrough & Crowther 2006).

Regarding incremental process and product innovations, small firms in developing countries often do not have in-house technical support or maintenance support, and will typically seek assistance from subject matter experts only when they're attempting to address an immediate issue, where as large firms intentionally enhance their long-term innovative capacity via joint research initiatives with external universities (Laursen & Salter 2004; Fukugawa 2005).

We believe there are many challenges facing small to medium size businesses when it comes to inventing or generating new product and service ideas and some of them are: 1) limited resources, 2) fewer inventive employees, and sometimes 3) lack of understanding about the idea generation process (Vossen 1998; Olander, Hurmelinna-Laukkanen & Mahonen 2009).

Firstly, because of SMEs' limited cash and resources, in most cases they cannot afford to create product development departments, or fully dedicate people to the creation of new products and services (Woy & Wang 2007; Woy & Qing 2007). Furthermore, because of their limited resources, SMEs have limited ability to conduct the customer research that can be a good method to generate purposeful ideas targeted at specific market segments or

opportunities (Woy & Wang 2007; Woy & Qing 2007), although they have a strong motive to involve their customers in innovation processes and market research (Van de Vrande et al 2009). Hence, SMEs need a lower-cost method to generate, research and ultimately realize ideas, where we suggest networking with independent inventors pools and marketing agencies.

2.2 SMEs networking

Networking is found to be a good form of collaboration for SMEs, mostly as a possible method to innovate as much as large firms do (Narula 2004), where there is evidence that the success of SMEs in comparison to large companies is based on SMEs' ability to utilise external networks more efficiently (Rothwell & Dodgson 1994). Van de Vrande et al (2009: 434) summarize their research stating "External networking to acquire new or missing knowledge is an important open innovation activity among SMEs". SMEs can clearly benefit from collaboration networks that are well constructed and managed (Inkpen & Tsang 2005), helping them to strengthen their competitive advantage (Bougrain & Haudeville 2002), to facilitate their innovation capabilities (Lee et al 2010), and to be significantly more productive in developing countries (Biggs & Shah 2006). These collaboration networks help SMEs co-develop products and services (Gulati 1998), and also helps all the network members to share experience, yielding learning effects for future innovation (Lundvall 1993; Argote & Ingram 2000). Since SMEs generally face more uncertainties and barriers to innovation, networks are found to be a complementary response to insecurity arising from development and use of new technologies, while reducing uncertainties in innovation (Diez 2000). A signficant growth in the use of external networks by firms of all sizes is evident in last 50 years (Hagedoorn 2002). These networks of collaboration and communication

networks are also shown to be relevant when researching policy development and evaluation in innovation (Van der Valk & Gijsbers 2010).

2.3 Partners for open innovation

Who do SMEs collaborate with? Innovative SMEs are shown to be more likely to communicate in external networks with other SMEs and various social networks, than with institutions such as universities and private research establishments, or larger firms. (Rothwell 1991; Massa and Testa 2008; Todtling, Lehner & Kaufmann 2009). For example, there is evidence from European SMEs that there is a limit to how much of R&D activities can be externally acquired by partnering with a large company, mostly due to various technological and strategic considerations (Narula, 2004). Additionaly, most SMEs have relatively little to offer for collaboration, and even if they do they can face a strategic threat of being overtaken, or face the loss of intellectual property. In big developing countries (such as China, Brazil and India) that often accommodate big transnational companies, SMEs are indeed often contacted to innovate for their larger partners, and hence have no need to network with local companies. Assistance received through this subcontracting is beneficial enough and it promotes technological innovations of these SMEs (Kumar & Subrahmanya 2010). However, small developing countries may lack the presence of many transnational companies and therefore cannot have their innovative efforts jumpstarted this way; these countries must find other partners and methods to initiate innovation, preferably through collaborative networks. Collaboration with other SMEs is therefore considered to be crucial for SMEs' innovation efforts (Radas & Bozic 2009), but in order for that collaboration to succeed, the other SMEs must have relevant knowledge and experience to help (Zeng, Xie & Tam 2010). If none of collaborative SMEs have that knowledge, how can they innovate?

The proposed model suggests that, if there is no relevant workforce knowledge present and there are no other SMEs or research centers that have available knowledge, SMEs should contact independent inventors to harness specific knowledge when trying to innovate their technology, or other subjects such as marketing research agency whey trying to work on a new idea, innovate a service or to commercialize their innovation. Specifically, the model suggests that SMEs should try to match relevant experts and their knowledge through joint pools via virtual networks.

Organizing groups of inventors into network-pools is advised because independent inventors have many problems inventing on their own. Because of lack of knowledge on promotion and advertising they may have limited success in promoting their products, may have limited reach with their promotional efforts, and may have problems translating their inventions into innovations or transferring them effectively to others (Udell 1990). Furthermore, uncertainty about the profitability of their inventions generates a basis for implementing some kind of intermediation, which can help commercialize their inventions (Hoppe & Ozdenoren 2005). Next, inventors often worry their ideas being stolen by the companies they are contracting for, or by fraudulent invention marketing and promotion agencies (Udell 1990). Because of their limited resources they may have no ability to sue the infringer, so the legal concerns and lack of incentives to invent for others is also a major issue; inventors should develop a relationship of trust with their clients in order to collaborate with them. Stories of bad experiences with business professionals often taint their motivation to work with such parties (Meyer 2005).

Lastly, spontaneous communication with the external world is a major issue for some individual inventors (Meyer 2005). Especially, independent and other non-academic inventors are shown to be less central and less connected than academic inventors, where

overall connectedness of the networks further varies across technologies (Balconi, Breschi & Lissoni 2004)

2.4 Obstacles to forming and engaging in direct networks

Possible collaboration between SMEs and experts such as independent inventors should be heavily based on information and communication practices and technologies in order to be efficient. This is based on strong positive effect that network cohesiveness has on the project success, since frequency and diversity of communication between inventor and collaborating organization directly affect project success (Ebadi & Utterback 1984).

Unfortunately, developing countries have myriad of obstacles that could render collaborations between enterprises, independent inventors and other consultants unmanageable.

Some discussions about creating SME clusters to promote innovation approaches to business growth found many downsides of setting up such a cluster (Barclay & Porter 2005). Del Castillo & Barroeta (2006:74) discussed promoting innovation in SMEs via policy, economics, and local initiatives. Since SMEs in developing countries often have limited access to information and lack data sources to gather relevant information (Burgess 2000), it can be difficult for them to search for and decide with whom they should collaborate, and also to create an effective network on their own (Julien 2002). Mostly because of these difficulties, SMEs tend to build post-hoc deep and lasting ties only when they organise a network that fulfills their expectations (Simard & West 2006), which makes them unready to initiate network building. SMEs are found to maintain few external relationships in their innovative process (Kaminski, De Oliveira & Lopes 2008), being careful about picking partners, because they have limited opportunities to fail (Narula 2004). Especially in developing countries, small firms rarely practice cooperative strategies, which results in small

number of integrated business processes between two or more companies (Salman 2004). It is therefore less likely for them to form or turn to collaborative networks spontaneously.

The technological dynamics can mostly be seen in the field of information and communication technologies (ICT) (Bullinger et al 2004). Although there is some evidence of increasing complexity in the adoption and use of ICTs among the enterprises of developing countries (Oyelaran-Oyeyinka & Lal 2006), developing countries could still promote the use of information technologies (IT) via incentives. For example, Pradhan (2002: 6) mentioned that the pressing issues in Nepal are: a lack of appropriate Information technology, qualified IT professionals, an absence of economic incentives and infrastructures, and lack of explicit IT policy. Infrastructure and poor communication with partners, suppliers and customers are also found to be among most significant barriers to SME innovation, for example in Nigeria (Sawyerr, Edbrahimi & Thibodeaux 2000), India (Clancy 2001) and Equador (Karanasios and Burgess 2008). Majority of SMEs in developing countries do not have their IT strategies defined, do not know how to use them, how much to invest in IT and simply believe that information technology will be a problem solver by itself, not a tool to solve problems (Achuama & Usoro 2010). A detailed overview of ICT skills readiness in developing countries SMEs by world regions identifies limited skills, internet illiteracy, bad infrastructure and lack of awareness as main obstacles to greater ICT adoption across the world (Mutula & Van Brakel 2007).

Furthermore, small enterprises in developing countries focus on relatively simple uses of the Internet (Moodley and Morris 2004), and rarely communicate with business partners and other associates in forms other than e-mail (Karanasios and Burgess 2008). Even in a developed country, it can be seen that SMEs are opportunistic in the adoption of the internet, and tend to adopt it if it fits their particular communication needs, using “wait-and-see” attitude (Sadowski, Maitland & Van Dongen 2002). There are three factors found that

significantly affect internet adoption by small firms: perceived benefits, organisational readiness and external pressure from competitors and partners (Mehrtens, Cragg & Mills 2001), where SMEs in developing countries may have problems realizing first two. This lack of advanced internet usage is another reason why direct web based contact between SMEs and unknown partners in developing countries may be less effective. If these partners and a SME want their joint project to be successful, their communication should be frequent and detailed (Ebadi and Utterback 1984), and there is evidence that this type of communication is lacking in developing countries (Clancy 2001).

Additionally, growing external networks for collaboration requires complex coordination if optimal benefits are to be provided (Zanfei 2000). These networks are often hard to manage, and require considerable managerial and financial resources, which are available to big companies (Hagedoorn & Schakenraad 1994), but are unavailable to most SMEs, especially in developing countries.

Hence, a moderator such as proposed government agency may help realizing the communication between SME and inventors, by building an organized network structure and by educating SMEs on how to use given ICTs.

The lack of legal enforcement for contract law and respect toward legal contracts make partnerships and strategic ventures between businesses very difficult in these countries. “Inadequate regulation and legal infrastructure” scored 4th place on the list of obstacles facing the private equity sector in developing countries in Middle East and North Africa (Eid 2006). When governments’ in this region were questioned about their priority areas for the improvement in private equity sector in their countries, the highest score was given to “legislative reforms” (Eid 2006). Especially, in the context of joining SMEs with independent inventors, not all countries acknowledge the importance of independent inventors. Even developed countries may develop suboptimal treatment of these inventors – Nancarrow,

Attlee & Wrtght (1999: 3) noted that, while other industrialised countries like the USA and Japan stimulated and exploited independent inventors to a greater degree, the UK showed limitations in capitalising on the innovations from this pool of talent. Developing countries have even more difficulties setting an effective set of laws to support this collaboration and protecting both sides. Most emerging economies face frequent changes in their regulatory frameworks and experience direct interference from various levels of governments (Luo 2002). Developing countries also often lack judicial efficiency when resolving issues when collaboration goes wrong. Local institution problems in developing countries often lead to a low-level balance pitfall, where the interests of government, industrialists and inventors do not converge in collaboration (Forero-Pineda & Jaramillo-Salazar 2002). Surprisingly, developing countries suffer from paradox that they either have weak intellectual property rights regimes which hinder innovative collaboration (Li & Kozhikode 2009), or they have stronger property rights protection, which makes scientific communities (such as inventor pools) vulnerable to limitations of cooperation and access to information (Forero-Pineda, 2006).

Hence, to bypass these legal problems our proposed government entity can provide several solutions. First, they can recommend against partnering with certain inventors or SME which did not follow the rule of collaboration which were set forth. Second, they can recommend trust worthy inventors and SME which can partake in their network. Third, they can provide better legal recourse for SME and inventors by keeping detailed records of agreements and contracts. Nuissl (2005: 76) states that making business together in East German entrepreneurs (between years 1997 and 2000) was a consequence of trust, which is achieved by working together. Social interactions based on trust and cooperation play a major role in coordination of different SMEs' activities (Brioschi et al 2002). Biggs and Shah (2006: 3047) note that SMEs in Sub-Saharan Africa build trust on a history of successful, repeat

transactions, trusting their long-term customers and suppliers. Trust is found to be one important dimension in the development of entrepreneurial relations, evolving from affective to cognitive trust as the relationships of an entrepreneur become extended and more complex (Smith & Lohrke 2008).

2.5 Government bodies as intermediary institutions

When there are no conditions for direct communication between SMEs and their potential partners, it is intuitive to think about intermediary subjects that could foster or manage at least some part of the collaborative communication. Despite their presence, these innovation intermediaries have received very little attention in the theoretical intermediation literature (Hoppe & Ozdenoren 2005); however a detailed investigation of intermediation in innovation and the role of intermediaries in innovation is presented by Howells (2006: 717) where it is shown that intermediation can be observed as an organization or/and a process; Howells (2006: 720) also shows a wide array of possible innovation intermediation functions such as information processing, gatekeeping, brokering, testing, validation, regulation, protecting the results, commercialisation, evaluation of outcomes.

In some cases a government agency can act as a mediator, mostly when there is no collaboration present and where subjects do not show initiative to connect on their own. In these cases, some sort of government body (in both developed and developing countries) can successfully connect SMEs with other subjects (Rosenfeld 1996; Bougrain & Haudeville 2002; Davenport, Davies & Grimes 1999; Ghauri, Lutz & Tesfom 2003), or it can provide SMEs vital information needed for collaboration (McEvily & Zaheer 1999; Moodley and Morris 2004; Fontana, Geuna & Matt 2006; Sousa and Bradley 2009). However, one must bear in mind that some governments in developing countries are behaving predatory in their own demands, or do not have formal institutions that are complex enough. When

governments in developing countries are too weak to act as guarantors for intellectual rights, they have option either to directly build a set of formal Western-style legal institutions to solve some of the problems mentioned above, or either to force an array of cumulative processes of gradually building quality local institutions. One research suggests (Biggs & Shah 2006) that, when country's government is incapable of mediating between SMEs and other subjects, a private governance system as an intermediary subject may get around market failure and the lack of formal institutions protecting property rights. Unfortunately, these informal networks are ad-hoc, built only between subjects that know and trust each other, and these networks have no institutional or legislative support, being based only on trust. Besides that, while subjects inside networks gain advantages from network externalities, SMEs that are not members (outsiders) can be excluded from business transactions. Such networks in developing countries are shown to be successful in supporting SMEs innovation efforts, but, if privately organized, they can be significantly ethnically based in multiethnic countries (Barr 2000; Fafchamps 2000; Fisman 2001; Biggs & Shah 2006).

Relevant intermediary agency can help the open innovation process in at least three separate steps: when inventing or improving a product or a technology, when evaluating whether the invention is profitable or not (Hoppe & Ozdenoren (2005) have proposed a model for intermediation between independent inventors and potential investors), or when commerializing what has been invented (Lee et al (2010) have proposed a model for SMEs networking with marketing agencies). Also, an intermediary agency can manage the network structure itself (Luukkonen 2005) and hold sensitive data about all subjects, evaluating the best partners without disclosing too much.

2.6 Research problem and hypotheses

This paper's research problem is: How can small and medium enterprises in developing countries improve their innovation (research and development activities) when they have no relevant knowledge and have suboptimal conditions to engage in collaborative processes?

Based on the previous literature, the suggested hypotheses are:

H1: SME's in developing countries can benefit from collaboration with independent inventors and marketing companies to improve their innovativeness.

H2: Communication and collaboration between SMEs and other subjects in developing countries should be helped, structured and monitored through some form of intermediate government agency's comunication network.

3. The JIM model

3.1 Purpose

Our model, titled the Joint Invention Market Model (JIM Model) integrates small to medium size enterprises, their potential customers, independent inventors, consultant agencies and market research firms together. The goal of the JIM Model's is to create new products or technologies that have high chance of market success, and to create them at a low cost to the SMEs, while also employing other subjects (when innovating services, model may exclude independent inventors). We suggest networking with independent inventors pools and marketing agencies, rather than with other SMEs, because some researchers reported that SMEs have the greatest positive impact on their innovativeness when collaborating with different types of partners (Brioschi, Brioschi & Cainelli 2002; Bullinger et al 2004, Becker & Dietz 2004; Nieto & Santamaria 2010).

This model is based on previously mentioned researches and open innovation models that tackle only certain parts and subjects of innovative process (Hoppe & Ozdenoren 2005, Lee et al 2010), without considering developing countries specifities. When implementing this

model, certain principles regarding ICT infrastructure should be followed from Redioli's (Redioli et al 2005) model for assessment and development of internet-based information and communication services in SMEs. The model is constructed following principles of emergent theorizing, which partially overlaps with grounding theory approach (Jaccard & Jacoby 2010).

3.2 Intermediating agency

In order to remove various obstacles found in developing countries, the presented model introduces a government agency which could serve as logistics support to both SMEs on the one side, and experts/consultants/inventors on the other side. The proposed agency should also be responsible for designing, creation and managing appropriate communication network needed for pairing the subjects and collaboration. The role of government intermediary agency in these steps should also be to support and advise SMEs, to teach SMEs how to use ICT to the fullest extent, and also to monitor and mediate the collaboration process (Davenport et al 1999, Bougrain & Haudeville 2002, Kotelnikov 2007) (detailed list is presented in table 1). If this agency is to facilitate cooperation by disseminating relevant information about parties, than this agency must be rich in information, knowledge and referrals; it should also make strong ties with the SMEs (O'Gorman & Evers 2011).

[insert Table 1 here]

3.3 Model steps

Steps for implementing the model will be stated, based on previously analyzed literature, explaining how the parties should connect,.

The process starts by a SME submitting a starting idea for new product/technology or an improvement to the network (Fig. 1). Available and relevant marketing agency, connected to

the network, should pick that idea up and test it in the market, on a relevant sample of potential customers, making sure to ask them for their needs and problems, not for their ideas. Results of that test are brought back to the SME either to push the idea to the next step, or to revise it having market's opinions in mind. In the next step, the idea is posted on the network for an available consultant agency to explore it's feasibility, with results being sent back to the SME again either to push the idea to the next step, or to revise it. If idea is evaluated as feasible, it is pushed forward to network pool of inventors who will post their possible realizations as concepts – ideas for realization; again, many SMEs do not have R&D departments or teams, hence having access to a large pool of inventors at a low cost is of great benefit to them. SME will then, from offered concepts, choose the most appropriate one, thus matching with inventor who proposed that concept. If the SME finds that there is not any appropriate concept offered, it must go back to the first step redefining the idea, or it must seek help from the intermediary agency to try to find another partner, another SME or a research institution. Next, SME and the chosen inventor engage in collaboration, producing an invention. This invention is then forwarded to a marketing agency to commercialize invention, finding appropriate partner to exploit it. With the help on intermediate agency, the profit is shared and patent is protected.

[insert Fig. 1 here]

4. Qualitative study

Number of cases is stated to test the hypotheses. These cases come from available literature, with starting remark that for H2 some cases from developed countries are mentioned as well, since there is not enough available research from developing countries on this subject.

4.1 arguments for H1

H1: SME's in developing countries can benefit from collaboration with independent inventors and marketing companies to improve their innovativeness.

A recent study concluded that networked entrepreneurs simultaneously need and develop their existing relations for both innovation and entrepreneurship (Yli-Kauhaluoma 2009). Independent inventors can be significant contributors to industrial innovation and they can provide an important source of new ideas and products to industry (Udell 1990). They are able to come up with technologically important inventions (Dahlin, Taylor & Fichman 2004), where importance is measured as the influence of a patented invention on subsequent inventions in the same field of technology. Independent inventors who participate in inventor networks are able to make better choices about pursuing good ideas (Hienerth & Lettl 2008, Fleming 2007) and can receive good feedback from their community; Breschi and Catalini (2010: 24) show deep analysis of scientists' and innovators' networks. One research concludes that organizations that want to use open innovation should participate in independent inventors' networks in order to find the best innovation partner (Von Krogh & von Hippel 2006). Lettl (2009: 252) states that "hybrid forms of communities which support collaboration between independent inventors and companies are emerging rapidly", naming cases of Syndicom SpineConnect (www.syndicom.com), an online commnity of innovative spine surgeons and medical equipment manufacturers, and the LEGO mindstorms community (http://mindstorms.lego.com/community/default.aspx) where LEGO enthusiasts as independent inventors (who are also software hackers), sensory technology experts from NASA and ESA, and professors in robotics – collaborate to advance the functionalities of the robot. Cockburn and Henderson (1998) argue that the connectedness to the community of open science is a key factor explaining the ability of firms to tap into scientific developments, suggesting that firms should establish links with these communities if they want to increase

their capacity to exploit experts' knowledge. For example, Hormos Medical Corporation (Finland), founded in 1997, is a SME pharmaceutical company. During its early days of innovation development, Hormos was involved in two essential networks, one of them being "innovation pool", represented by individual researchers. This network provided this company with scientific input for new medical innovations for further commercial development (Partanen et al, 2008)

Customers are often considered to be a more important source of ideas and innovation than suppliers and scientific developments (de Jong & Marsili, 2006), which justifies the need of market input when SMEs innovate. Lee et al (2010: 292) argues that open innovation between SMEs and marketing agencies happens only when the marketing agency contributed through market exploitation, market tests or customer analysis.

4.2 arguments for H2

H2: Communication and collaboration between SMEs and other subjects in developing countries should be helped, structured and monitored through some form of intermediate government agency's comunication network.

When SMEs lack information and resources on who to turn to for help and collaboration, fortunately there is evidence from developed and developing countries that government agencies can help.

In Portugal several government agencies acted as external resources for small firms to gain knowledge and experience about potential partners, thus enhancing the small firms' performance (Sousa and Bradley 2009).

Italian regional initiatives showed public authorities trying to provide new services and collaboration between small traditional firms (Rosenfeld 1996).

McEvily and Zaheer (1999) highlight the role of regional institutions in the United States, where these intermediaries help local firms compensating poor advice network and also help them when lacking bridging ties with other firms.

Since 1980 French national agency ANVAR was successful at developing innovation projects within small firms, helping not only with financial assistance, but through technological advice, playing a key role in regional networks of small firms, academic institutions, researchers and government agencies (Bougrain and Haudeville 2002).

New Zealand's TBG programme, started in 1990. has been the primary government policy mechanism to support technology development in privately owned companies, where a government agency provided financial and developmental assistance to organizations undertaking R&D projects in collaboration with researches from different institutions (Davenport et al 1999).

It is shown (Moodley and Morris 2004) that government business associations in South Africa could act as an information hub by help small enterprises in selecting, synthetizing, obtaining and disseminating data about which e-market-places and web-based information resources may be relevant to the garment exporters.

Malaysian government has had numerous programs and agencies for SMEs' entrepreneurial development and business management trainings, as well as for advisory services and market research. Also, Subcontracting Exchange Scheme was realised to help SMEs match best possible business partners by providing latest information (Abdullah 1999). Unfortunately, a substantial number of SMEs found this help outside their reach (being in rural areas) or were not aware of such assistance.

Zeng et al (2010) find that there are significant positive relationships between inter-firm cooperation, cooperation with intermediary institutions and research institutions and innovation performance of SMEs. On the other hand, they found no significant impact of

linkage with government agencies, but explained that Chinese government had multitude of specifities to hamper innovation performance of SMEs.

Chilean and Jamaican cases (Ghauri, Lutz and Tesfom 2003) confirm that government instigators may successfully act as sponsors for networking projects, but those agencies should not impose government strategies, instead they only should intervene on the basis of request for help from the network (Humphrey & Schmitz 1995; Ceiglie & Dini 1999, cited in Ghauri et al 2003). It must be stressed that for our model the proposed government agency should only provide information about potential contacts rather than actually choosing a "perfect partner" because the government then becomes the decision maker, rather then being a hub and information provider. There is evidence of unsuccessful attempts by Brazilian government to directly establish business partners to small export firms (Da Rocha & Christensen 1994); results could be better if the government had supplied export firms with a list of potential partners and basic data about each of them, with small export firms making the choice.

Also Pradhan (2002) argues that governments can play a catalytic role in developing infrastructure and stimulating the effective use of IT based infrastructures. While in developed countries government policies and strategies may have little or no influence on IT adoption, where government pull is likely to be rejected (Beckinsale & Levy 2004) and customer pressure is central (Beckinsale & Levy 2004), developing countries show a different pattern. Research in Malaysia identified "government support" as a predictor which had a significant and direct positive effect on the adoption of Information and communication technology (ICT) by SMEs. Governments in developing countries can create such an effect via special agencies which can create a better awareness of the benefits of ICT, organize seminars, and provide feedback to identify problem areas in companies (Mutula & Van Brakel 2007; Lal 2007; Alam & Noor 2009; Achuama & Usoro 2010). Governments in

developing countries can also help SMEs by providing information about technologies and related business opportunities (Simpson and Docherty 2004), by investing in infrastructure, ICT education and SMEs' human resource development (Lal 2007) and also by emphasizing the perceived benefits (Mehrtens et al 2001).

5. Conclusion

The presented model is applicable for small and medium enterprises, and should be interesting to them because it simplifies many actions necessary for good organizational R&D strategies. This model should be used when SMEs in developing countries have no research centers, multinational corporations or other SMEs that have the knowledge needed for open innovation.

It should also attract attention of a developing country's government as it helps local economy growth in very efficient way, combing skills from different subjects. To success, government must initiate the communication and collaboration process and constantly monitor it, bridging the gap between SMEs and independent inventors, focusing them both on market needs. The communication costs of this project is relatively small, knowing that infrastructure for building a network is not a big expense in 21st century (Burgess 2002).

However, there are two biggest limitations in this model: 1) governments in developing countries may show little initiative to form an intermediary agency and 2) some developing countries, besides lacking research centres, infrastructure and universities, may even lack independent inventors. Further research should obtain some quantitative data about number of developing countries that do not have any of these limitations.

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Table 1. Intermediating government agency's roles

Communication network	Connected parties' skills and collaboration attitudes	Mediating
Managing connected parties database: SMEs, independent inventors, marketing agencies, consultant companies	Teach connected parties how to utilize network (Kotelnikov 2007)	Profit sharing and brokering transactions
Managing context database: trends, market, economic and politic situation	Raise awareness and facilitate collaboration (Maksoud and Youseff 2003, cited in Mutula and Van Brakel 2007; Lal 2007)	Possible legal disputes and patent protection
Construction of the network and physical infrastructure (Lal 2007; Karanasios & Burgess 2008)	Programs to improve various skills: communication, collaboration, negotiation, ICT utilization (Mehrtens et al 2001)	Fundings
Network management (Davenport et al 1999)	Providing information about technologies and business opportunities (Simpson and Docherty 2004)	Gatekeeping
Information dissemination and processing (Moodley and Morris 2004; Lal 2007; O'Gorman & Evers 2011)		

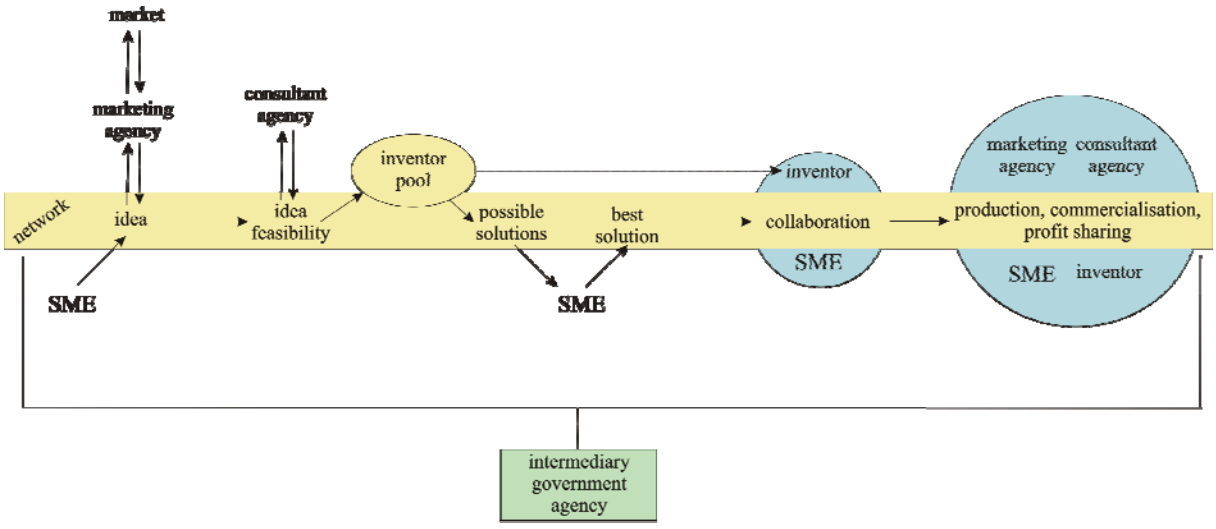

Fig. 1. Joint invention market model for SMEs engaging in open innovation in developing countries