A supply chain design for organizations working towards sustainable growth

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Abstract

For businesses to succeed and grow sustainably, supply chain design is essential. The supply chain's orientation and design are shaped by the mutual relationship between networks and innovation. Networks serve as a means of obtaining access to resources, knowledge, and assistance. Several studies that have looked at the connection between networks and innovation have found that there is a positive association between the two that leads to growth. It is a complex phenomenon for an entrepreneur to determine their ideal location in the web of networks and properly master it in order to give a sustained presence in the market due to the contingent nature of networking in the literature. In order to demonstrate the interdependence between networking and innovation, this study looks at various forms of networking in a broad sense and innovation in the context of organisations. By examining the major layers of networks, innovation, and their interrelationships, a conceptual framework for supply chain components is developed using an in-depth analysis of the existing literature and grounded theory. This paper makes recommendations based on this model and reviews various research to help readers understand how the network and innovation reciprocal relationship affects performance.

Keywords: Supply Chain, Networks, SME.

1. Introduction

In today's market, competition has intensified. In order to gain a competitive advantage, businesses must prioritise customer satisfaction over corporate efficiency (Kannan & Tan, 2005). Timely product delivery at lesser prices will increase the competitiveness of the businesses. (2000) Tan et al. Putting more emphasis on the supply chain will improve businesses' success (Childerhouse & Towill, 2003). Supply chain management increases a company's ability to compete in the market (Kannan & Tan, 2005).

The goal of this research is to examine the relationship between networking and innovation to achieve sustainable growth for SMEs and to present a conceptual model to look at networking and innovation in the context of SMEs supply chain. This research will focus on the economic aspect of a sustainable supply chain in small and medium sized enterprises in order to design a sustainable supply chain regarding economic growth. The first section elaborates on the function of innovation in the expansion of SMEs. The construct of inventive competency is then introduced following the definition of the invention. The connection between networking and innovation will be covered in the third section. In the fourth section, four layers of networks are defined after a discussion of various network types. The article's key contribution is the description of several network kinds and how they relate to creativity in a mutually beneficial way. A conceptual model for the supply chain of SMEs is created based on this section, and its components are addressed. This framework will aid in a better understanding of how networking affects SME growth, and the suggested model is compared to the existing studies in this field.

Most economies have a large number of SMEs, which contribute to growth, innovation, and employment. Governments encourage them as a result of this ability by enacting various laws and regulations. In many industrialised and emerging nations, SMEs reach a notable share of the GNP (Jutla, 2002; Poon, 1999; OECD, 1993). The notion that different circumstances affect small and large businesses is crucial. Models used by major companies, such as network models, should be distinguished from those used by SMEs. A SME's business model is not a smaller version of a large one (Storey, 1994; Wynarczyk, 1993; S. Konsti-Laakso, 2012).

While being young, this field has recently caught the interest of scholars. One of the appealing areas of SME study has been the interaction between networking, innovation, and these three factors. Despite numerous studies, this field of research has not been developed properly, concerning SMEs (Brown, 1998; S. Gronum, 2012). According to several studies, innovation has both detrimental and beneficial effects on the growth of SMEs (Simpson, 2006). Even though there is extensive literature on networks, the connection between networks and creativity is being examined (Powell, 2005; Siano, 2014). The issue of networking is just one of several elements that influence creativity in SMEs.

It is widely acknowledged that innovation is crucial to business success and broader societal development (OECD, 2001; Holmund, 1998; Kuratko, 1995; Tomlinson, 2013). According to estimates, entrepreneurial businesses are responsible for more than half of the growth of the American economy (Valry, 1999). In order to thrive in a hypercompetitive, increasingly globalised market, one must create some competitive advantages (McGrath, 1996; B. Schoonjans, 2013). Hence, innovation serves as the fundamental cornerstone of SMEs and is what most clearly distinguishes small from large businesses.

Many studies demonstrate the value of innovation and its indisputable contribution to the expansion of SMEs. As most markets are dynamic and competitive, it is impossible for businesses to avoid innovation (Salavou, 2004; J. H. Love, 2015). SMEs have demonstrated a crucial role in national innovation systems, according to (OECD, 2004c). SMEs have the power to disrupt the existing quo and provide new goods or services to the market through innovation.

Businesses can introduce novel products and services (Timmons, 1998). Although liability of smallness (Aldrich H., 1986) and liability of newness (Stinchombe, 1965) are challenges that smaller enterprises must overcome, they must develop their competences to outperform strong market competition based on their agility and creativity.

2. Innovative Competency in SMEs

Innovation is the implementation of new combinations of different resources in the firm (Schumpeter, 1967; M. D. Parrilli, 2010). Innovation has also been defined as the creation of competitive advantage (Porter, 1999). Hult et al, (2004) defines innovativeness as "capacity to introduce new process, product or idea in the organization".

Based on the definition presented by Hult, innovation is a capacity or competency for new idea generation, and it seems that this definition is simple and comprehensive. So in this article innovation competency is applied as a construct to represent this definition. As it will be presented later, the process of improving innovative competency, especially in SMEs, is sophisticated and the main point in this article is to examine the mutual relationship of innovation and networking.

There are five aspects of innovation within small firms: Product or Service innovations, Market development innovations, Marketing innovations, Process technology innovations, Administrative innovations (North, 2000). Improving innovative competency in these aspects needs delicate management. The question that arises here is whether improving this competency is internal or external. The available researches show that it is rather internal than external.

The quality of available Infrastructure has an important role in creating innovation (Van de Ven, 1993). Small businesses must improve their internal competencies for innovation rather than external circumstances (Forsman, 2011; Griffith, 2003). They should develop in-house competencies to have team work and improving innovation and change culture (Perry, 1995). Human capital as an internal source of knowledge and special expertise is linked to innovation (Freel, 2005). So, one of the competencies that SMEs must enhance is the innovative competency. In other words, improved innovative competency will lead to better positioning in the market. Ofcourse, its positive outcomes will reinforce this competency. This is in line with Chesbrough findings that innovation is not generated independently; instead it is a complex process which is developed through interaction between the firm and external actors (Chesbrough, 2003). Based onthis, at the center of the model of this article, as the most important position, innovative competency is considered.

Innovation can be incremental or discontinuous, radical or novel (Tushman, 1986). Radical or novel innovation is related to the SMEs who introduce at least one process/product new to the industry within a three-year period. Incremental innovation is related to SMEs who introduce one new process/product within their company, during the same time (Freel M. a., 2007). Both types of innovation are vital for SME survival and growth. But the radical one is related to the rapid growth and requires a profound innovative competency. Small firms achieve most of their innovative competency through incremental steps than radical steps (North, 2000). There is a close relationship between networking and these types of innovation. Based on internal innovative competency, proper network management will lead to SMEs' growth.

The positive outcomes of innovation are related to employee, market and operational advantages and the negative aspects of innovation are: increasing cost, risk and stress, unrelated to core competency of the firm and idea imitation by others (Simpson, 2006).

Having a clear picture of above mentioned advantages and disadvantages of innovation, the managerial team and/or founder(s) of a SME will select their strategies, especially strategies related to networking, in order to have a sustainable growth. Without considering mentioned disadvantages, networking may waste the limited resources of SMEs in a wrong way and weakensthe market presence of the SME.

3. Networking and Innovation relationship in SMEs

Limited resources available for SMEs need a suitable management and exploitation of resources. Networking is a common strategy traced by the managerial team to compensate these limitations. Networking has positive impact on overall performance of the firm concerning innovativeness, growth and survival (Utterback, 1994; Dittrich, 2007; Littunen, 2009). SMEs tend to form strategic alliance with key suppliers or customers (Oakey, 1999; Mazzarol, 2008). To compensate the lack of economy of scale of SMEs (Mohannak, 2007), such networking with key stakeholders helps small firms to have access to the resources such as finance, knowledge and support. Specially, they can get access to the resources that they have no control over (Johannisson, 1986). It also reduces the costs and the risks are shared (Dodgson, 1991). Networks help the SMEs to discard the disadvantage of big size enterprises and make use of their advantages (Nootboom, 1994). Networking may be a continuum of loose affiliations based on informal interactions to more formal or tight structures such as merger and acquisitions (Jarratt, 1998).

Studies show that networking has various effects on innovation (McAdam, 2004; Chandler, 2000; Barnett, 2000; Laforet, 2011). When innovation is at the beginning stages of initiation, because of its openness and variety, the role of networking is very important (Westphal, 1997). Networking provides SMEs the chance to have radical or sustainable innovation (Bos-Brouwers, 2009). On the basis of the above studies, the relationship between networking and innovation is almost undoubted.

How can a small firm open its corporate border to the outside entities and commence a successful networking? This strategy needs intra-competency to scan the environment for information and share it among the personnel (Bougrain F., 2002). In other words, innovative competency of the firm plays a vital role for practicing this strategy and opening the doors to outsiders. Factors such as fear from information leakage, unsuitable partners or distrust of outsiders inhibit some SMEs to incorporate outside help (Dean, 1997). Also, managing the networks will improve this competency in reciprocal way. SMEs should make a balance between their networking and independency to improve innovation in their firms (Kotabe M., 1995). Also, firms with high absorptive capacity tend to network globally, and firms with lower absorptive capacity will network locally (Drejer, 2007; Cohen, 1990).

Customers, Suppliers, local government, financial institutions, employees and national or regional government are the six major groups that form strategic networks of a SME (Jennings, 1997). Customers can help SMEs through new ideas for products, services, processes and cross-functional team working (Laforet, 2009). Networking with universities and suppliers are positively related to process innovation and with customers and public sectors are positively related to product ovation

(Freel M. a., 2007). Also, good relationships with universities and R&D centers have effect on higher innovation performance (Lasgani, 2012).

Based on the literature review, in this research, networking is applied as a broad construct representing all types of external ties that a firm could have, to show the reciprocal or mutual competency in a SME to innovate within intra and inter firm which leads to develop connections and the web of networks. In a synergic positive loop, networking will lead to increased innovative competency of the company. This subject is somehow linked to the term networked innovation (Low, 2007; Swan, 2005). In the model presented in this article, customers, suppliers, local government, financial institutions, universities and R&D centers, regional and international government are embedded. Also, advisors, relatives and friends, brokers and media are added to the model. The role of cultural, political and industrial environment is also considered and will bediscussed.

Because of the liability of smallness, SMEs must efficiently use their limited resources to gain more. The picture of the networks considering SMEs is gloomy and complex. The contribution ofthis article is providing more clear view of networking and innovation relationship. Before that, the literature about the types of the networks is reviewed. Then, the conceptual model is provided to better comprehend the picture and shed light over the ambiguity.

4. Modelling and Data Verification

Grounded theory is the core concept to develop the model and its tools are used for data verification. By applying constant comparative analysis data are collected from the extant literatureand analyzed. In this method, the concepts are compared and contrasted with others (Corbin, 1990). Comparative analysis is applied to compare between concept, data and categories to reachlevels of abstraction and better conceptualization (Gregory, 2010).
In this research, all the literature is investigated and data related to supply chain design in small and medium sized enterprises pertaining relationship between networking and innovation are gathered. Simultaneously, the collected data are compared and the relationship between data and the defined categories are tested. After all, the related subjects and their relationships based on iteration in the literature are specified and the model is developed.

5. Types of Networks - Exploration vs. Exploitation

There are two type of networks available in the literature, one is the exploration and the other is exploitation (March, 1991). Networks of exploration are related to incremental innovations. The latter is related to radical innovation. In exploitation network high cohesive relationships betweenpartners is reported (Arranz, 2008). As there is a risk to become bounded in the limited chain of strong ties and loosing innovation (Caplado, 2007), firms can have two layers of networks, one layer is a large circle of weak ties and a limited groups of strong ones (Freel M. a., 2007).

Cohesion or strong ties provide SMEs a sheltered environment (Williamson, 1983) and bring about resource sharing between firms (Coleman, 1988). Through strong ties the frequency of relations increase and thereby tacit knowledge develops (Dekker, 2004). SMEs that have strong relationships with customers and suppliers have higher innovation performance.

Diversity or weak ties is another aspect of networking that has positive effect on information accumulation and achieving new opportunities (Burt, 2005; Granovetter, 1973). Wider range of

networks supports innovation (Sullivan, 2011). Diversity is a widespread relation with institutions, organizations, people, advisers and so on which may be within industry or beyond that (Lin, 2001; Zahra, 2000). Also, SMEs can fill the gap of structural holes via brokers to access the other sources of information (Burt, 2005). These studies show that the number of strong ties is limited (Alderich,1989).

There seems to be some contradictions between the functions of the networking for SMEs in literature at different conditions. Some researches indicate that cohesion may have negative or positive effect on innovation and entrepreneurship.

Sequeira et al, (2007) state that strong ties will promote the chance of starting a new business. If strong ties are not limited to a specific industry, geographical position or way of working and provide SMEs with information, opportunities and resources, they could be very beneficial (Kristiansen, 2002). On the other hand, numbers of bridging diverse ties are linked to innovation (Elfring, 2007). One of the notable characteristics of weak ties is low commitment and trust of the involved firms (Granovetter, 1973; Burt, 1992), but because of the reciprocity of strong networks, the level of commitment is high (Krackhardt, 1992). Also, strong ties will help acquire complex forms of knowledge while weak ties will facilitate simple forms of knowledge (Sorenson, 2006).

However, properly managing networks can bring about suitable results for the firms (Kastelle, 2010). To manage network it is necessary to have a deep knowledge about its challenges (Das T.K., 2002). In order to be innovative, it is necessary to repeatedly monitor the networks and change the configuration and members of the network (Lechner, 2003). For example, it might be necessary to change the tie from informal to formal based on contract (Almeida, 2003). By using strong ties as a bridge to reach partners ties, SMEs can turn their strong ties into multiplex ties and make their ties more beneficial (Lowik, 2012).

6. Four Layers of Networks

Within this part of article four layers of relationships which vary between very strong ties and very weak ties are offered:

Very strong tie or contextual tie, is an unwritten strong relationship with a high level of commitment which is somehow in relation with psychological contract. This type of relationship is usually in the context of the culture, keen friendship and relatavity. This type of ties are limited in numbers but its force is serious to some extent that neglecting its powerful norms is almost impossible for SMEs with low levels of innovative competency. Its power to hinder innovation is high, but securing support for reaching to the resources is valuable. Considering the duration of the tie, one can say it is long lasting or exit for life time and the redundancy of information is high.

The second type of relationship are *strong tie or contractual tie*, which are in written mode and contractual or legal. This type of relationship has legal liabilities and commitment with more frequency. Contracts with customer/ clients and suppliers and relations with authorities, financial institutions or consultancy agreements with legal advisors are in this mode. The intensity of the obligations is not the same as the previous one, but it may reinforce innovative competency of the SME by providing mutual relationship, information and resources and support. Via contractual ties, firm can make new connections and provide multiplex ties. The duration of the tie, in this mode, is long but it is not the same as the contextual tie. Also the redundancy of the information in this mode is moderate.

The third category is the *weak tie*. In this category, there is somehow written memorandum of understanding usually with the universities, R&D centers, communities and NGOs. The level of commitment is lower than the above mentioned ties but the frequency is higher. This type of relationship will provide information and resources for the company but the level of support is lower. The need to face to face communication is lower than contractual ties and duration of the tie is short. Innovative capacity may increase with this sort of tie and the redundancy of informationis low.

The last group of ties is *very weak tie*. They are not written, without any obligation, and may happen through media or brokers. There is no commitment, with high level of frequency and the lowest level of redundancy. This type of connection provides intelligence for the company to be adjusted in the market.

This continuum is not rigid and is compelled to change. Of course, modification in conceptual tiesis almost impossible but other types of networks such as weak ties may change to strong or vice versa. Effective transition from one tie to another is related to internal capability of the firm, consisting of managerial team and/or founder(s) and employees. Via proper transition, outcome of new web of networks will provide useful information, support or resources that reinforce innovative competency in the firm and will result in better performance and prosperity of the SME. As mentioned earlier, network management is an important role of SMEs. In figure 1, the summeryof different networking ties is depicted.

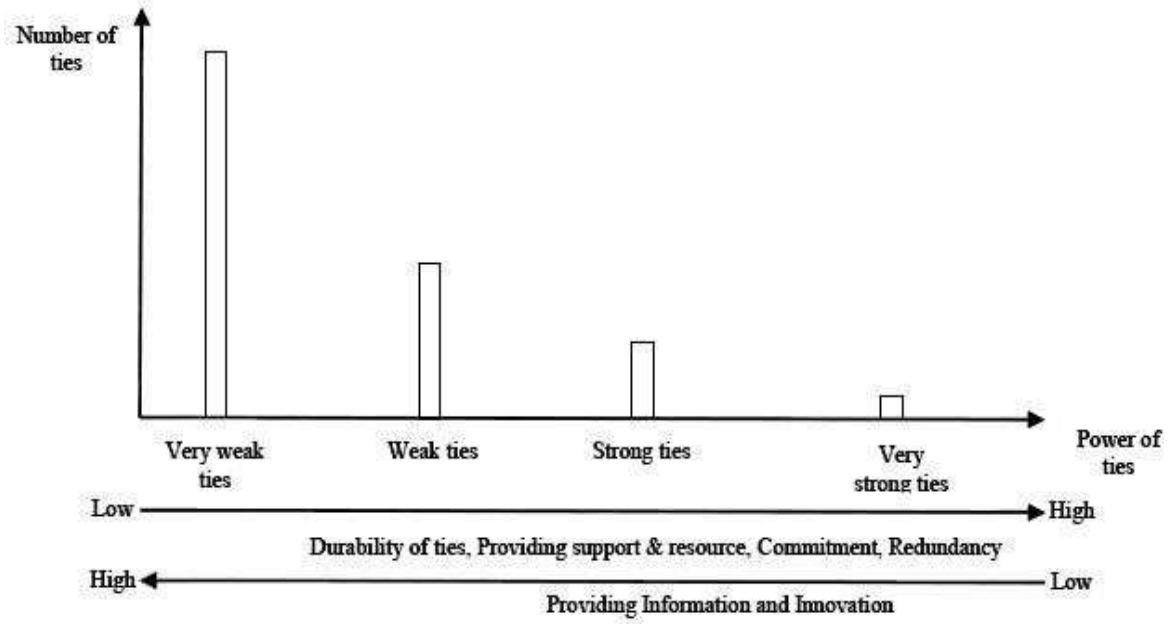

Figure1. Different types of ties

Based on above mentioned categories, this study provides a conceptual model showing different actors in the network of the SME, their type of tie and their relative importance. This conceptual model is not rigid and may be exposed to modification based on various conditions. This model is based on available literature on the networking in SMEs.

7. Literature Gap

As mentioned above this study leans upon the different layers of networks comprising of very strong ties, strong ties, weak ties and very weak ties. Also, there are different sources of innovationincluding customers, suppliers, local government, financial institutions, universities and R&D centers, regional and international government, advisors, relatives and friends, brokers and media.As shown in table 1, there are different studies that covers some aspects of this model. The contribution of this study is to provide a wide spectrum and in-depth view of the different rolls of the actors in the relationship between networking and innovation. The gray parts of the table depictthe relationship between the row and the column in the table.

Table 1: Networking and Innovation Relationship in Different Studies

		Layers of Networks			
		Very Strong Tie	Strong Tie	Weak Tie	Very Weak Tie
Sources of Innovation	Customers		(Xu. Z, 2008); (Aidis, 2008); (B. Schoonjans, 2013); (Bos-Brouwers, 2009); (Caplado, 2007); (Dittrich, 2007); (Gilsing, 2008); (Laforet S., 2009); (Lasgani, 2012); (Lowik, 2012); (M. D. Parrilli, 2010); (S. Konsti-Laakso, 2012); (Sullivan, 2011); (Weber, 2007)		
	Suppliers		(Xu. Z, 2008); (Aidis, 2008); (B. Schoonjans, 2013); (Bos-Brouwers, 2009); (Caplado, 2007); (Dittrich, 2007); (Gilsing, 2008); (Laforet S., 2009); (Lasgani, 2012); (Lowik, 2012); (M. D. Parrilli, 2010); (S. Konsti-Laakso, 2012); (Sullivan, 2011); (Weber, 2007)		
	Local Government		(Xu. Z, 2008); (Aidis, 2008); (B. Schoonjans, 2013); (Bos-Brouwers, 2009); (Caplado, 2007); (Dittrich, 2007); (Gilsing, 2008); (Laforet S., 2009); (Lasgani, 2012); (Lowik, 2012); (M. D. Parrilli, 2010); (S. Konsti-Laakso, 2012); (Sullivan, 2011); (Weber, 2007)		
	Financial Institutions		(Xu. Z, 2008); (Aidis, 2008); (B. Schoonjans, 2013); (Bos-Brouwers, 2009); (Caplado, 2007); (Dittrich, 2007); (Gilsing, 2008); (Laforet S., 2009); (Lasgani, 2012); (Lowik, 2012); (M. D. Parrilli, 2010)		
	Universities and R&D Centers			(Bergenholtz, 2011); (Huggins, 2010); (Arranz, 2008); (Bierly P.E., 2007)	
	Regional and International Government		(Xu. Z, 2008); (Aidis, 2008); (B. Schoonjans, 2013); (Bos-Brouwers, 2009); (Caplado, 2007); (Collinson, 2005); (J. H. Love, 2015); (Laforet S., 2011); (Mughan, 2004); (Siano, 2014)		
	Advisors		(Xu. Z, 2008); (Aidis, 2008); (B. Schoonjans, 2013); (Bos-Brouwers, 2009); (Caplado, 2007); (Laforet S., 2011); (Mughan, 2004);		
	Relatives and Friends	(Alderich, 1989); (Deakins, 2007)			
	Brokers				(Baron, 2009); (De Carolis, 2006); (Laforet S. a., 2006); (Mazzarol, 2008); (Sequeira, 2007)
	Media				(Baron, 2009); (De Carolis, 2006); (Laforet S. a., 2006); (Mazzarol, 2008); (Sequeira, 2007)

8. Conceptual Model for Networking and Innovation in SMEs Supply Chain:

Figure 2 shows the innovative competency of the firm based on its networking capabilities. As it is shown in this figure, a complete set of relationships with inner and outer constituents make up the networking capabilities of the firm. Placing founders and employees in the center of the innovative competency of the firm, various constituents can have strong or weak ties. Strong ties have been built with advisors, government, financial institutions, customers and suppliers, while weak ties have been formed with universities, media and brokers. On the basis of the literature, elements of the model are discussed below.

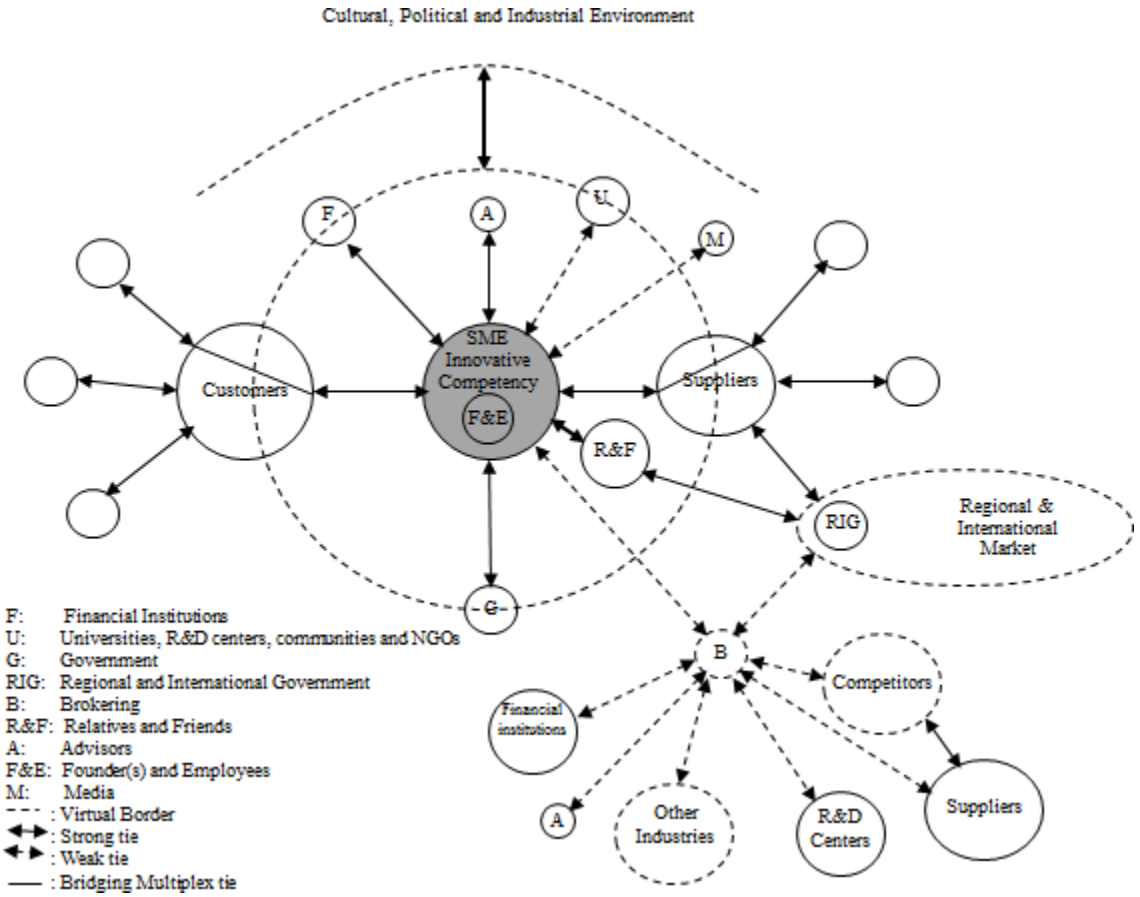

Figure2. A conceptual multiplex for networking and innovation in SMEs

Cultural, Political and Industrial Environment

On the outer side of this relationship model, firms are affected by elements of the cultural, politicaland industrial environment, which will be discussed in the following paragraphs:

When talking about *culture*, the culture that dominates the environment that SME acts within is targeted. Cognitive Social Capital is related to culture which SMEs act on. Cognitive Social Capital is a system of meanings which is shared between actors and enables them to comprehend the information they receive (De Carolis, 2006).

Because of the strong ties and severe norms that lie beneath, cognitive social capital may hamperflow of new information, innovation and entrepreneurship (Portes, 1993; Jack, 2005). Also, studiesshow that ethnic and minorities' strong ties will help entrepreneurs get access to new ideas (Deakins, 2007). If the innovative competency of small firms improves they can use the positive aspect of the binding culture and discard negative effects. This process needs in-house social skills(Baron, 2009).

Political environment of a nation will have direct impact on the performance of SMEs. Small firms,due to the lack of resources, finance and information, try to create strong connections to the authorities to have access to the immediate and lean strategic resources. This process is called network capitalism (Puffer, 2007). In some countries, at times of economic deregulation, political connection and favoritism may serve as important source of achieving resources (Aidis, 2008; Tsai, 2005). Strong ties with government in such nations will help firms get better access to financial resources (Bartjargal, 2004).

Industrial environment also has a direct impact on SME innovative competencies. Studies show that industry concentration with its entry barriers will have effects on innovation (Salavou, 2004). Also, competition deficiency will hinder innovation (Kraft, 1989). Firms in a turbulent and competitive environment tend to be more innovative (O'Regan, 2005).

As shown in the model, SME's environment is like an umbrella in which the firm operates under its cover. The type of connections is very strong or contextual ties as discussed previously, almost unwritten with high level of commitment. This force may impose the SME to exit the market because of its binding effect and little propensity to change and lack of necessary information andresources to adjust the company in the market.

The environment and its adjoining elements, can work in favor or against the wishes of the firms. As such knowing the elements of the environment and adjusting its activities on the basis of its proven capabilities can serve as an important issue.

SME corporate border

Within SME, there are managerial team and/or founder(s) and employees. The internal culture andthe characteristics of founders, board of directors and personnel will impact the innovative competency of the firm. Some characteristics of an entrepreneur as founder of SME that have impact on the performance of the firm are: internal locus of control (Amit, 1993), risk taking (Casson, 1982), leadership (Peters, 1987) and the need for achievement (Johnson, 1990). Ray (1993) indicates that personality, experience and skills of an entrepreneur are related to their success (Ray, 1993). Graduate founders tend to be more entrepreneurial (Harding, 2003). SMEs top management can be a source of challenge for the firm if they are managed by their owners andmay impede innovativeness (Bougrain, 2002; Dobbs, 2007; North D. a., 2000).

SME internationalization is also related to managerial competencies and networks (Bell, 1998). As mentioned earlier, it has been advised that SMEs should concentrate on internal innovative project instead of external ones. Success within internal innovative projects will provide a better atmosphere for outside projects. CEOs' commitment to innovation and research and promoting innovative culture is strongly connected to organization-wide innovation (Motwani, 1999). There is a negative relationship between formalization and centralization with innovation (Waarts, 2005). So the type of organizing and having competent personnel will help improve innovation.

When talking about innovative competency as a construct, collaborative structure of the firm with delicate process integration to share knowledge within the organization is the goal. Intra-organizational cooperation and open culture, maximizing communication efficiency, job rotation and empowerment have positive relation to innovation (Chandler, 2000; Jung, 2003; Hoffman, 1998; Siqueira, 2008). Firm's ability in utilizing human capital has a strong impact on innovation(Freel M. , 2005). Higher educated personnel and their willingness toward growth are linked to innovation (Gray, 2006). The expertise and experience of the employees is related to innovation (Dimov, 2005). Lack of competent employee is certainly a barrier towards innovation (Scott, 1996;Laforet S. a., 2006).

Leadership style is very important in the context of innovation (Van de Ven A. , 1986; Schin, 1998). Also, team of founders is usually more innovative than just sole founder (Ruef, 2002).

SMEs with high internal innovative competency can make better use of their external networks. This competency will help them manage networks to compensate resource deficiency. In this model, SME corporate border is shown as a big circle to show its important role and impact. It is an infrastructure for the SME to cope with ever changing environment.

SMEs need to continually cope with an ever changing environment in refer to better utilize and manage their networks for continuous innovation.

SME virtual border

Dotted circle around the circumference of the SME shows the constituents that have direct connection via very strong, strong or weak ties with the SME. Within this virtual border, there are customers, suppliers, financial institutions, universities and R&D centers, local government, advisors, and relatives and friends. As mentioned before strong relationships with both suppliers and customers will have benefit for the company's innovative competency.

The model tries to show the importance of each constituent using the size of the circles and the kind of arrows. Bi-directional arrows demonstrate interconnectedness of both networking and innovation. Small business networks to innovate, and based on occurred learning, they reconsidertheir networks.

One superior competency that a SME should acquire is the ability to chain others' strong ties to its networks to get better access to the resources. This is called multiplex ties in the literature and some of its elements have been discussed before.

Here the concentration is on the customer and supplier relationships and also on the impact of friends and relatives network on the growth of SME.

Innovative firms collaborate with their suppliers (Koschatzky, 1999). Suppliers in the supply chain management have access to different valuable information and support so SMEs should develop their competency to have access to this type of information and support. Having competency in cooperation will enhance the innovation power of the firm (Sivadas, 2000). To maintain control over handling numerous ties with suppliers, it has been suggested that a limited number of suppliers should be networked (Fowles, 2005). Schiele (2006) suggests that suppliers must be selected according to their level of innovativeness. Also, close collaboration with suppliers in NPD will bring about radical innovation (Phillips, 2006).

Of course, SMEs may not have a lot of choice in suppliers' selection. Smallness of the SMEs maybar them to fully get benefit from big suppliers but studies show that it is still lucrative for them tostay in relation (Gulati, 2003). There seems to be a trade-off between staying in relation and having their independence. As mentioned earlier, losing independence may weaken their potential innovativeness. Within the presented model, the importance of relationship with suppliers is shownin a big circle. This type of network is within the strong tie category.

Interaction with customers will bring about innovation (Ford, 2000). Customers' demands providebest practices in the supply chain (Porter M. , 1990; Harrison, 1996). Firms, who have close ties with customers, develop new products (Lund, 2004). Von Hippel (1978) emphasizes on the role of customer involvement to provide ideas from outside. He differentiates between customer focused approach toward innovation and product approach and argues that the former is more effective (Von Hipple, 1978). So SMEs engage in collaborative innovation projects with lead customers (Smith, 1991). Some empirical studies show that customers' relations are the source ofincremental innovation (Biemans, 1991).

Among sources of innovation, firms most often switch to customers' networks (Kaufmann, 2001). Customer participation reduces the risks related to innovation (Ragatz, 1997). By development of technology, the consumers have desire to engage more in the firms processes and value creation called co-creation (Bolton, 2009) which shows the increasing role of customers. Based onliterature, the big circle is selected to show the customers' importance and acquired results in the network for SME. This type of tie is strong.

Also, SMEs may expand their network through their strong ties with suppliers and customers and define a new chain of multiplex ties. Each strong tie has its brokerage concept beneath. Having a cooperative relation with customers and suppliers will open a new path for SMEs to broaden their networks and make a new strong tie with a new actor, providing access to resources, information or support.

As discussed before, small firms may have weak ties, based on memorandum of understanding, with knowledge centric institutions or social communities such as universities, R&D centers and NGOs. This type of connection is shown via a thick dotted line to highlight the difference betweenweak and very weak ties. The linkage between academic centers with SME network in acollaborative learning is related to innovation (Sadler-Smith, 2000). Van de Ven believes knowledge should be produced in cooperation between academic centers and business actors (Vande Ven A. a., 2006).

Rowley et al. (2000) puts the R&D ventures in strong category of ties. It depends on the type of the contract. The importance of academic centers may vary between different industries and the size of the firm. But innovative SMEs, due to the lack of internal R&D, may seek to have relationswith this type of network to have more benefit and agility. A medium sized circle is chosen to show that the importance is not the same as suppliers or customers but still is relatively important.

The element of financial institutions and its relationship with SMEs is very crucial. Deficiencies in accessing investment and financial support are one of the major concerns of SMEs. Various sources of finances are available for small firms including equity, venture capital, loans and securities. Managing financial networks will affect the future of the SME. Also, the types of financial resources that are applied have relation with the innovation power of the firm. Venture capital can have effect on radical innovation (Weber, 2007).

Also, studies show that the role of business advisors is notable. They are almost in nearby locationsand they are important for achieving goals (Bennett, 2003). Small firms should improve learning capability to use advice more efficiently (Chaston, 1999). The tie with advisors may be strong or weak as shown in the model.

Relatives and friends have strong connections with entrepreneurs driving a small firm. This type of a tie is considered very strong, especially with relatives and close friends. Having entrepreneurfamily has positive relations with acquiring entrepreneur traits (Kolvereid, 1996). This strong network and role modeling brings about human capital (Coleman, 1988). Strong ties with entrepreneur friends or relatives increase the propensity to start a business (Sequeira, 2007; Davidsson, 2003).

On the other hand, having connection with non-entrepreneurs may impede the chance of starting a new business (Nicolaou, 2003). Some studies show that some elite give access to opportunities to their closest friends (Hartman, 2000). Relatives and friends are one of the many resources for new ideas and connections. Because of the smallness of SMEs their impact is not negligible. Hencethis is shown in a relatively middle sized circle near the SME corporate border with very strong tie.

Since SMEs face lack of experience and skill, they should be aware of their entry route toward internationalization (Collinson, 2005). Having an international network will reduce the risk of facing entry barriers (Collinson, 2005; Anderson, 1986; Coveillo, 1995). Networking is a source of knowledge and competitive advantage for SMEs for entering international markets (Fillis, 2001; Rundh, 2001). Hiring talented people having experience in international markets (Mughan, 2004) or family and friends links (Apfelthaler, 2000) are some sources of access to international markets.In this model, it is assumed that SMEs may have access to the international market via strong tie with suppliers, family and friends or via brokerage weak tie. Various types of alliance for penetrating the foreign market include joint venture, licensing and distribution and production agreements (Bierly P.E., 2007). It should be considered that domestic networking is different frominternational alliances (Sirmon, 2004).

9.4 Brokering

The networking broker has an important role in providing connection between different networksby information or resources transfer and facilitation of interest within different people (Tetan, 2005). Network brokers reduce risks and costs of relationship and support mutually beneficial ties(White, 1996). Also, SMEs can act as a broker for themselves while searching for new opportunities and knowledge.

As mentioned earlier, there are two types of networks: exploration and exploitation. Brokering and exploration act the same way. Exploration may be an in-depth search for resources or broad one (Larusen, 2006). In broad exploration, more organizations are monitored, and in this type of brokering network weak tie, the likelihood of innovation increases (Larusen, 2006). Also, two enter different new and different technological boundaries, brokering via different organizations and industries will be helpful (Tortoreillo, 2010).

By properly managing the weak ties, firms can be the only entity who can act as broker while not letting others know each other (Gilsing, 2008). Studies show that weak ties (in this article: very

weak tie) has its strength and value in the numbers of the ties rather than the interaction (Friedkin, 1982).

To avoid complicating the model, all of the very weak ties are connected through brokering. The border of the broker has been dotted to show that it is a virtual entity and it is based on managerial decision to choose to connect via brokers or self-brokering. Without brokers, SMEs may directly connect to other actors via potentially infinite numbers of very weak ties. The function of brokers and brokering is to fill the gap in structural holes. It seems that the role of brokers in handling and simplifying the complication of numerous networks for SMEs is notable.

As the number of strong ties is limited, the number of weak ties is potentially infinite. Developing brokering competency in SMEs will help them cope with the lack of resources, information and support. As shown in the model, this type of network will enable small firms to get access to the virtual border of competitors, other industries or even in international markets.

In this model a type of very weak tie with media is considered. Media are one of the important sources of innovation and intelligence. Monitoring media or brokering through them will be helpful for getting access to on-time news and information fostering both innovative competency or being proactive in the market.

9. Summary and discussions

This article attempted to show the complex relationship between networking and innovation within the SME context. There are a lot of factors affecting this process and lots of combinations of ties are available in reality. On the other hand, there is evidence that shows some entrepreneurs may start a business without tie. For example, discrimination toward minorities may lead them to start their self-businesses (Aldrich, 1990).

Considering this complexity, four types of networks in a continuum model ranging from very strong ties to very weak ties were categorized. Factors that differentiate between types of networks in this continuum are: level of commitment, rate of redundancy of information, durability of a tie and acquired benefits such as information, resource and support.

Based on the literature review, exploitation networks have positive linkage with level of commitment, rate of redundancy, durability of a tie and gaining support and resources. But exploration networks have positive relation with innovative capacity of the firm. Due to limited resource availability for SMEs, binding ties will be fruitful for accessing resources and support. But neglecting a wide range of diverse ties will restrict the chance for innovation. Structural pattern of networks is a unique resource for the firm (Gulati R., 2000). Entrepreneurial networking will develop competencies (Westlund, 2003). Also, a personal network is something natural rather than a planned process (Dubini, 1991). Networking has two sides: deliberate and subconscious (AldrichH. a., 1986).

Nonetheless, SMEs, that are facing lack of resources, should develop set of networks' dependencies and manage them to some extent that provides them more benefits, avoiding the loss of innovative competency. Network dependencies are changing from entrepreneurs contacts to some sophisticated networks such as customer and supplier innovation projects or joint development of technologies (Giuliani, 2007; Lechner C. D., 2006).

But the problem for small firms is how to cope with the dilemma of managing the wide variety ofties. This should be done through concentrating on human resources of the firm, restructuring theprocesses in order to monitor and capture innovative ideas and opportunities. Each competent people acts as a broker for the SME to accumulate, digest and share it with others, enhancing absorptive capacity of the firm. Relying on this engine will commence a positive loop between exploration of information and exploitation of resources which leads to sustainability and growthof the SME.

For better network management, it is necessary to have a picture of different factors affecting the SMEs. Here, a conceptual model based on literature review and the proposed categorization of networks was provided. In this model, a broad depiction of different entities is presented with their relative importance in the design of their mutual networks and their types of connections. As discussed, the role of environmental factors is significant and must meticulously be managed by the SME. The high level of cohesiveness of this type of relations both provides support for SMEsbut may hinder their innovative capability. Compulsory high level of commitment may work as anobstacle for the firm and the role of managerial and intra capability is needed to exploit its opportunity and prevent its shortcomings related to the innovation restriction. But, its presence as a cover over the SMEs working space is undoubted.

10.CONCLUSION

The findings of the reviews conducted by academics on the SME corporate boundary were presented, and the significance of internal organisation among the founder(s), management team, and staff was underlined. An extensive examination of the components of the SME virtual border is given in conjunction with the literature, and it is concluded that SMEs have an advantage over large companies due to their solid customer relationships and careful supplier selection. The SMEs' agility and market connectivity will spark creative ideas for them. Moreover, new multiplex linkages may arise through solid relationships with clients and suppliers, allowing for the realisation of access to new resources.

Also, the function of research and development facilities, which fall under the category of weak ties, is explained. Of course, it depends on the kind of agreement the company has with the R&D facilities. Yet, SMEs' lack of resources may prevent them from developing strong relationships with R&D centres. Thus, a letter of understanding is suggested in order to continually access this reservoir of creative ideas.

The relative significance of close relationships with family and friends for inventive potential and its various elements was examined. Strong connections with advisors are also noteworthy. Some nations, like England, offer a department of advisers to aid them by giving them the essential advice in order to boost entrepreneurship and SMEs performance to sustain growth.

Another element of network management for SMEs is the function of brokers and their expertise in that area. For the company, this kind of extremely weak tie is a source of initiatives and creative ideas. Handling the aforementioned relationships requires intra-competency, which implies that while the company focuses internally, these players are watched to see whether new ties can be made or if the nature of the existing ones can be altered.

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