

Full Length Research Paper

Entrepreneurs' networks affecting innovation: Firms in Iran and Denmark

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This article investigated the impact of the owner-manager's network on firm's innovation. The main hypotheses of this study were: total network size, the role model and opportunity motivation, all have positive effects on the firm's innovation. Additionally, it was hypothesized that the impact of total network size on innovation is moderated by the role model and opportunity motivation. For testing the hypotheses, this study used a sample of 1668 owner-managers in the Global Entrepreneurship Monitor (GEM) survey data collected through interviews with adults in Iran and Denmark in 2008, 2009 and 2010. The total network size was measured on a numerical scale in terms of number of different categories from whom a person gets advice. The measure for the role model was personal knowing of an entrepreneur within the last two years. Opportunity motivation got a numerical value based on its category: "motivated because of no better working option" or "no better option and also motivated by opportunity" or "motivated by opportunity" or "have job and seek opportunity". Innovation was measured on a numerical scale based on time that the technologies needed for producing the product or service is available, customers who consider the product as new and competitors who have the same products or services. The method for testing the hypotheses was multiple regressions controlling for country, sex, age and education of the owner managers. Results showed that the total size of networks has positive effect on firm's innovation and the impact of social networks on innovation is moderated negatively by the role model, namely the entrepreneurs who do not have a role model, size of network is more strongly associated with firm's innovation. Maybe networks compensate for the role model.

Key words: Networks, innovation, firms, opportunity motivation, role model.

INTRODUCTION

Nowadays technology is changing fast. Fast changing environment has made the product life cycle become shorter and there is need for replacing old products with new ones. Therefore, businesses have to innovate in order to survive. Innovation is development and implementation of new ideas (Van de Ven, 1986). Innovations are increasingly taking place in networks, in

which actors with different backgrounds are involved (Kallio et al., 2010). Complex and radical innovation process, benefits from a diverse range of partners through sharing of different knowledge bases, behaviors and habits of thought (Pittway et al., 2004). Informal networks of people share knowledge in a creative way and therefore, are important in innovation of organizations (Björk and Magnusson, 2009). Based on the literature review, the most obvious benefits of networks for innovation are risk sharing and gathering different ideas and skills. Although in recent years many studies have examined the relationship between social networks and firm performance and innovation, relatively

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little attention has been paid to the effect of other social variables like motivation and role model in this regard. Furthermore, no research on the role of social networks in the Iranian firms' innovation output has been conducted. This paper examines whether the firm's innovation is related to the size of social networks that the owner has.

Social networks, entrepreneurship and innovation

There has been a great deal of research on networks and social relations in the field of entrepreneurship. Entrepreneurs need different ties to have access to resources: knowledge and information about innovations, investors and markets (Aldrich and Martinez, 2000). The assistance and guidance the entrepreneur receives from his formal and informal networks will affect the nature of his business (Birley, 1985). Entrepreneurs build different networks that vary with respect to phases of entrepreneurship (Greve and Salaff, 2003). The network size and the time spent on networking also are different in various stages of entrepreneurship (Greve, 1995). As firms grow, their networks evolve in a less cohesive and dense manner with lower frequency of contacts (Hite and Hesterly, 2001). Over the time upstream contacts (contacts with suppliers and collaborators) become more commercial while downstream contacts (contacts with customers and markets) become more social (Schutjens and Stam, 2003). There is no particular approach or methodology for studying networks in entrepreneurship and previous researches have used a wide range of quantitative and qualitative methods (Jack, 2010). Hoang and Antoncic (2003) classify social network studies in entrepreneurship into two categories: (1) studies in which the main question is how networking as an independent variable leads to positive outcomes for the entrepreneur (2) researches that study networks as a dependent variable and the main question here is how entrepreneurial process affects networks. Many recent studies have investigated the role of networks in different stages of entrepreneurial process like opportunity recognition, gathering resources and business performance and innovation. Singh et al. (1999) found that the entrepreneurs in information technology sector who had more weak ties discover more opportunity than others with fewer weak ties in a period of 12 months (Hoang and Antoncic, 2003). Jenssen and Greve (2002) on a sample of 100 entrepreneurs in Norway found that the number of relations will increase entrepreneur's access to financial and informational resources and hence increase the success of start ups. Zhao and Aram (1995) on a sample of Chinese entrepreneurs found that the greater range and intensity of networks differentiate between the high growth firms and the low growth ones. Hansen (1995) found that the founder's social network size and its degree and frequency of contacts have a

positive relationship with the size of the business after the first year. Uzzi (1996) based on firms in the New York apparel industry found that, using embedded ties will decrease probability of failure but this effect will have a threshold. Brüderl and Preisendörfer (1998) in a sample of 1700 firms in Germany found that the businesses whose founders have more supports from their networks will be more successful. Honig and Davison (2003) in a sample of Swedish individuals found that, being a member of business networks will increase the probability of the first sale of the entrepreneur's business.

Ahuja (2000) found that, the firm's subsequent innovation output relates positively to the number of its direct and indirect ties. Tsai (2001) investigated 2 multinational corporations and the results suggest a positive relationship between network position and innovation of business units and the absorptive capacity moderates this relationship. Ruef (2002) by analyzing more than 700 startups found that the entrepreneurs who use diverse ties are more likely to engage in innovative activities.

Elfring and Hulsink (2003) based on 3 high tech firms in the Netherlands found that, the firms with different levels of innovation (radical versus incremental), benefit from different mixes of strong and weak ties during different stages of entrepreneurship. Burt (2004) based on survey data on managers of a large corporation found that, people whose position in the networks are near structural holes are more likely to have good ideas. Chen and Wang (2008) found that social networks have positive effect on the ability of a new firm to innovate while the trust among entrepreneurs will moderate this effect. Björk and Magnusson (2009), based on the data from a Swedish company, found that the interconnection of networks of individual idea providers has a significant relationship with the quality of innovative ideas.

Another construct that has gained a lot of attention in entrepreneurship research is the role model. Exploiting entrepreneurial opportunities is involved with decision making in uncertain situation with limited information about future outcomes, markets, resources and the like. The Information needed for such decision making is not codified. According to Reynolds (1994) and Storey (1997), the tacit knowledge needed for exploiting entrepreneurial opportunities can be obtained with close observation of other entrepreneurs (Shane, 2003). There are several studies that show empirically that the probability of being an entrepreneur with a high anticipated business performance is higher for people who have entrepreneur role models. Another variable which plays a critical role in entrepreneurship process is motivation (Shane et al., 2003). Many quantitative and qualitative studies have been performed on the role of different motivations in the entrepreneurial process. None of the previous studies in the field of entrepreneurship has investigated role model and opportunity motivation simultaneously with the role of social networks in a firm's

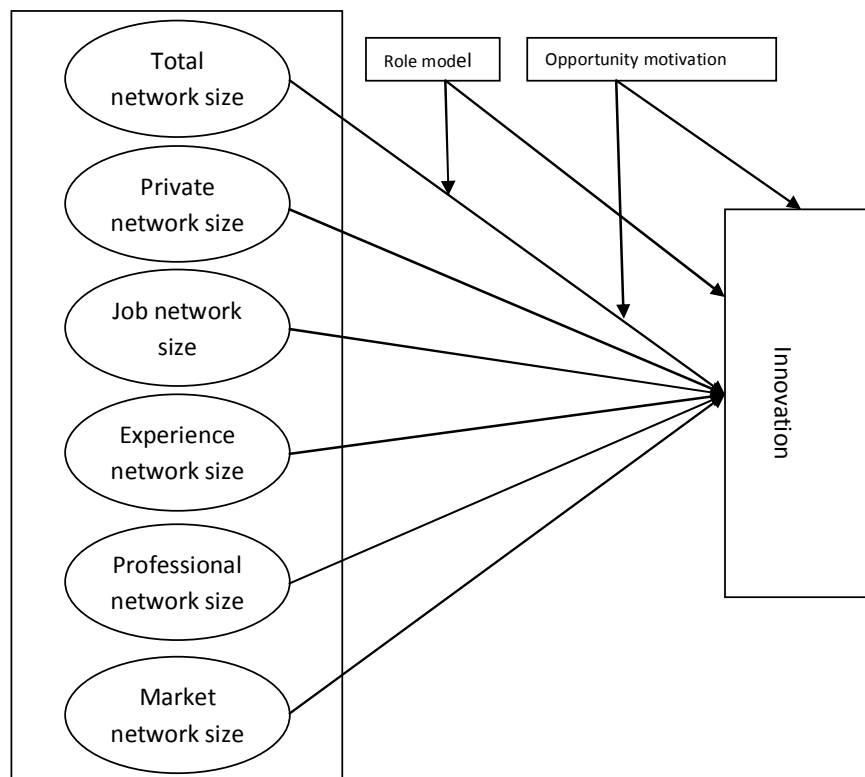


Figure 1. Conceptual model.

innovation. Thus, the hypotheses we propose are listed below:

H₁: Total network size has a positive effect on innovation of the firm.

H_{1a}: Private network size has a positive effect on innovation of the firm.

H_{1b}: Job network size has a positive effect on innovation of the firm.

H_{1c}: Experience network size has a positive effect on innovation of the firm.

H_{1d}: Professional network size has a positive effect on innovation of the firm.

H_{1e}: Market network size has a positive effect on innovation of the firm.

H₂: Having a role model has a positive effect on innovation of the firm.

H₃: Opportunity motivation has a positive effect on innovation of the firm.

H₄: Having a role model positively moderates the effect of networks on innovation.

H₅: Opportunity motivation positively moderates the effect of networks on innovation.

The five network categories (private, job, experience, professional and market) are based on Schott's work on clustering of different networks around a person (Schøtt, 2010).

METHODS

Sample and data collection

For the purposes of this study, we have used the GEM data from GEM database for Iran in 2008 and 2009, and 2008, 2009 and 2010 for Denmark. The GEM is a research program that focuses on a major driver of economic growth: entrepreneurship. GEM has so far been in full operation for more than 10 years, running from 1998 to 2011, and more than 80 countries have participated. The indexes of entrepreneurial activities are identified and investigated in a survey of the adult population. The sample size of surveyed adults for Denmark in each year is at least 2000 respondents and the sample size for Iran is at least 3360 persons 18-64 years old. Therefore, the total size of surveyed adults we used is 12637 respondents. The size of our sample, nascent and established entrepreneurs, is 1668. The conceptual model we have used for this research is shown in Figure 1.

Measures

Measures of independent variables

1. Private network size: Total number of categories including spouses, parents, other family members/relatives and friends, from whom a person has received advice for his business; earns a value from 0 to 4.
2. Job network size: Total number of categories including former colleagues, present colleagues, previous boss and current boss from whom a person has received advice for his business; gains a value from 0 to 4.
3. Experience network size: Total number of categories including

Table 1. Innovation by different measures in Iran and Denmark.

Innovation	Iran	Denmark
Innovation by newness of technology (values from 1 to 3)	1.22	1.17
Innovation by newness of product/service (values from 1 to 3)	1.38	1.61
Innovation by absence of competitors (values from 1 to 3)	1.36	1.93
Innovation index (values from 3 to 9)	3.96	4.26

persons in other countries, persons from abroad, persons with start up experience, persons with experience in business and researchers or inventors from whom a person has received advice for his business; gains a value from 0 to 5.

4. Professional network size: Total number of categories including investors, banks, lawyers, accountants, advisors from whom a person has received advice for his business; gains a value from 0 to 5.

5. Market network size: Total number of categories including collaborators, competitors, suppliers and customers from whom a person has received advice for his business; gains a value from 0 to 4.

6. Total network size: Sum totals of private network, job network, experience network, professional network and market network; gains a value from 0 to 22.

This technique for identifying and measuring the size of network was constructed by Schøtt in 2008.

Measures of dependent variable

Innovation index: It gains a value between 3 and 9. It is measured as the sum of 3 following measures:

1. Time that the technologies needed for producing the product or service is available (less than 1 year, between 1 and 5 years, more than 5 years, coded with 3, 2, 1, respectively).
2. Customers who consider the product as new (all, some, none, coded with 3, 2, and 1 respectively).
3. Competitors who have the same products or services (no competitor, few, many, coded with 3, 2, 1 respectively).

Measures of moderating variables

1. Role model: The measure for this variable is personal knowing of a person who has founded a business within last 2 years (coded with 1 in the case of knowing an entrepreneur and 0 in the case of not knowing).
2. Opportunity motivation: this variable gets a numerical value from 1 to 3 based on its category. "Motivated because of no better working option, coded with 0" or "no better option and also motivated by opportunity, coded with 0.5" or "motivated by opportunity, coded with 1" or "have job and seek opportunity, coded with 1".

ANALYSIS AND RESULTS

SPSS16.0 was used in the data analysis. 51% of respondents to GEM surveys in Iran and Denmark were males and 48.9% were females. The average age of the respondents was 48.5 and the average education of the

respondents was intermediate (between secondary and post secondary degree). From 1668 businesses sampled, only 43 businesses use technologies that were less than 1 year old, 132 businesses use technologies more than one and less than 5 years old and 898 use older technologies. Only 152 of the whole businesses had products or services that were new to all customers, 244 of them had products or services new to some of customers and 777 of them had products or services that were not new. 67 businesses had high level of innovation in terms of having products or services with no competitors, 346 had low innovation with few numbers of competitors and 758 had no innovation according to the third innovation measure we used. Table 1 compares different innovation measures in Iran and Denmark. Innovation in the Danish firms was higher than that of the Iranian firms in terms of new products or services and a low level of competition. But when measured with the age of technology that is used in the business, the Iranian businesses showed higher innovation than the Danish ones. The overall innovation index average in Denmark was higher than that of Iran and this means that the Danish firms were more innovative than the Iranian ones.

The average of total network size of entrepreneurs was 4.17. According to the data, the most common network that entrepreneurs use was private network with the average size of 1.52. The average size of job network was 0.73; experience Network 0.83, professional network 0.52 and market network 0.66. Table 2 compares the size of different networks in Iran and Denmark. Results showed that, the average of total network size in Denmark was 6.1 and in Iran 2.9. This shows that, Danish entrepreneurs use wider networks than Iranian entrepreneurs. Table 3 shows the correlation between the variables of this research.

For testing hypotheses 1, 2 and 3 we used a regression analysis with innovation index as the dependent variable and total network size, country, age, gender, education and role model and opportunity motivation as predictors. The results are shown in Table 4. We found a significant relationship between the entrepreneur's total size of networks and innovation of his firm; so H1 is accepted. Results showed that gender is another important variable in predicting innovation index. According to the coding of gender variable (2 for female and 1 for male) and positive standardized coefficient, females were more innovative than males. There was no significant coefficient for role

Table 2. Size of different networks in Iran and Denmark.

Network	Iran	Denmark
Private network	1.61	1.38
Job network	0.56	1.01
Experience network	0.50	1.32
Professional network	0.12	1.19
Market network	0.32	1.20
Total network size	2.9	6.1

Table 3. Pearson's correlations.

Variables	1	2	3	4	5	6	7	8	9
1. Market network	1	0.526**	0.589**	0.339**	0.223**	0.762**	0.101**	0.173**	0.115**
2. Professional network		1	0.459**	0.321**	0.137**	0.688**	0.136**	0.211**	0.049
3. Experience network			1	0.357**	0.236**	0.773**	0.143**	0.091**	0.089**
4. Job network				1	0.289**	0.681**	0.151**	0.098**	0.096**
5. Private network					1	0.567**	0.061**	-0.053	0.014
6. Total network size						1	0.181**	0.133**	0.107**
7. Role model							1	0.125**	-0.011
8. Opportunity Motivation								1	0.062
9. Innovation index									1

** , Correlation is significant at the 0.01 level (2-tailed).

Table 4. Multiple regression results for predicting innovation index by total network size, N=1668, R²=.036.

Variable	Standardized coefficient	Sig.
Country	-0.035	0.439 (two-tailed)
Education	0.047	0.248 (two-tailed)
Total network size	0.088	0.013 (one-tailed)
Role model	0.009	0.408 (one-tailed)
Opportunity motivation	-0.008	0.837 (two- tailed)
Gender	0.128	0.001 (two-tailed)
Age	-0.036	0.333 (two-tailed)

model and opportunity motivation; so Hypotheses 2 and 3 are refuted.

For testing of hypotheses H_{1a} to H_{1e} we used another regression. The results are shown in Table 5. Hypotheses H_{1b} and H_{1e} predicted positive effect of job network and market network on innovation index. These hypotheses were accepted according to Table 4. The results showed no significant positive relationship between other types of networks and performance, so hypotheses H_{1a}, H_{1c}, H_{1d}, H₂ and H₃ were refuted. Again, we saw a significant relationship between gender and innovation index.

Table 6 shows the results of moderated regression. Hypothesis 2 and 3 stated that the effect of social networks on innovation is moderated by the role model and opportunity motivation. According to the results,

there was a significant relation between innovation index and size of market networks and job networks. Furthermore, the role model had a moderating effect in this regard but surprisingly this effect was negative. This means that, for entrepreneurs who did not have a role model, size of networks was more strongly associated with firm's innovation index. The results did not show a moderating effect for opportunity motivation; so hypothesis 5 was refuted.

There is no significance test for the three variables that also occur in the interaction terms (Allison, 1977).

DISCUSSION

This study has used GEM data to investigate the role of social networks, opportunity motivation and the role

Table 5. Multiple regression results for predicting innovation index by each type of networks, N=1668, R² =.046.

Variable	Standardized coefficient	Sig.
Country	-0.044	0.326(two-tailed)
Role model	0.088	0.412 (one-tailed)
Opportunity motivation	-0.011	0.781(two-tailed)
Gender	0.129	0.000(two-tailed)
Education	0.051	0.217(two-tailed)
Age	-0.043	0.242(two-tailed)
Private network size	-0.015	0.355 (one-tailed)
Job network size	0.087	0.016(one-tailed)
Experience network size	0.013	0.387(one-tailed)
Professional network size	-0.078	0.108(two-tailed)
Market network size	0.099	0.020(one-tailed)

Dependent variable: innovation index.

Table 6. Moderated regression, N=1668, R² =.049.

Variable	Standardized coefficient	Sig.
Country	-0.028	0.545(two-tailed)
Role model	0.128	
Opportunity motivation	-0.060	
Gender	0.126	0.001(two-tailed)
Education	0.047	0.247(two-tailed)
Age	-0.037	0.312(two-tailed)
Total network size	0.209	
Total network size * role model	-0.270	0.002(two-tailed)
Total network size * opportunity Motivation	0.11	0.10(one-tailed)

Dependent variable: innovation index.

model in the firm's innovation in Iran and Denmark. The data shows that Danish firms are more innovative than the Iranian firms and their entrepreneurs' average network size is higher than that of Iranian. This means that Danish entrepreneurs use wider networks than Iranian. The results show that the total network size of the entrepreneur improves the firm's innovation. The size of market network and job network has positive effect on the innovation of the firm. We found that the gender variable is important in predicting innovation index. No significant relation was found for other types of networks. Furthermore, the role model moderates the relationship between network size and innovation index and this moderation is negative. For entrepreneurs who do not have a role model, the size of network is more strongly associated with the firm's innovation. Maybe networks compensate for the role model. Surprisingly the results showed no relationship between the opportunity motivation and innovation index and nor a moderating role for opportunity motivation in effect of social networks on innovation index.

The design of our study implies some limitation. In this research only the size of networks has been considered and other characteristics of networks such as density or frequency of contacts for the purpose of advisory have been ignored. Furthermore, other variables which are important in the innovation process from idea generation to implementation and commercialization have been disregarded.

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