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Surveying the Relationship Between Networks of Inter-Organizational Cooperation on Innovation of Small and Medium Business

[1]Siavash Nikraz and [2]Ali Bonyadi Naeini
[1]Department of Management and Progress Engineering, Iran University of Science and Technology, Tehran, Iran

Abstract: The aim of the current research is surveying the relationship between networks of inter-organizational cooperation on companies innovation. To this aim 300 small and medium business owners in electric industries were chosen as the statistical sample by the use of random sampling. Examinees answered a researcher-made questionnaire that its validity and reliability have been confirmed. Firstly, demographical data were surveyed and t-test, binominal test, Friedman test, Spearman correlation coefficient and regression coefficient have been used for surveying variables. Data analysis results showed that creating inter-organizational cooperation results in improving the innovation in small and medium businesses.

Key words: Inter-organizational relationships, small and medium businesses, companies, t-test, indutries, Iran

INTRODUCTION

Now a days, innovation is widely considered as the key factor to success in businesses and companies seek for improving innovation for reaching higher competitive advantage. Generally, companies follow two models of innovative activities for reaching competitive advantage. The first group is the companies active separately and exclusively and the second group is companies cooperating with other companies. Meanwhile, due to lack of financial and knowledge resources, companies have to inevitably cooperate with other companies (Schott, 2011).

This cooperation includes networks, mutual investment, unions, consortium, merging and acquisitions (Soosay *et al*., 2008). In this regard, Pittaway explains that radical and gradual innovation belongs to companies that are able to manage networks of cooperation relations with other companies (Pittaway *et al*., 2004). As a result, entrepreneur activities for improving innovation are not limited to one company (Schott, 2011). Meanwhile, small companies need to enter to these cooperation relations due to lack of having competition ability and for compensating lack of resources.

Also, small entrepreneur companies usually have cooperation with competitors as well as cooperation with partners (Lechner and Dowling, 2003). This is a common concept in advanced countries such as Germany and often due to high flexibility, small companies are able to make cooperation relations with competitors (Lechner and Dowling, 2003).

But the main issue is that according to the index of innovation trust, the innovation trust rate in Iran is 62% (Levie, 2009) whereas, according to the annual report of Global Entrepreneurship Monitor (GEM) in 2010, the actual innovation percentage in Iranian companies have been only 18% (Kelley *et al*., 2010).

Thus, Iranian companies confront the challenge of low innovation rate and due to this only few domestic companies are able to compete at international levels and to compete with Foreign products. On the other hand, lack of paying attention to providing solutions for increasing innovation in Iranian companies in today's competitive world will increase the percentage of falling behind compared to Foreign companies.

Now if we want to survey this issue in electric industry, we will figure out that the challenge of low innovation is observed in this field. Unfortunately, electric industry in Iran is also in crisis and innovation is very little in this industry. In addition to eliminating vitality in business of electric industry, also provides the base for inefficiency and resource waste and provides an undesirable situation for the electric industry whereas, the highest amount of investment on electric industries in the neighboring area happens in Iran. If, we consider innovation, technology and investment as the main

Corresponding Author: Siavash Nikraz, Department of Management and Progress Engineering, Iran University of Science and Technology, Tehran, Iran

necessities of development of electric industry, paying attention to solving the current challenges is very visible (Besharati and Tabatabaei, 2010).

In this regard, the current study tries to answer this question that whether the small and medium companies in electric industry of Iran could have a better policy for increasing innovation in their organization through networking and inter-organizational cooperation.

Answering this question could provide solutions for bridging this gap that how the Iranian companies could increase their innovation so that, they could compete in international markets.

Literature review

Innovation: Several definitions have been provided by different researchers for innovation and in most cases innovation has been defined as extracting new ideas (Pittaway *et al*., 2004).

Rodgers states that innovation is a word used for defining a set of changes in activities of a company and that these changes ultimately result in improving the performance of the company (Rogers, 1998), also these changes could result in improving products or processes, investment on new facilities, marketing expenses, investment on education, creating intellectual assets or buying technologies (Rogers, 1998). Thus, briefly innovation happens in three forms: product, process and organization that ultimately results in improving the companies, performance (Pittaway *et al*., 2004).

Innovation needs two factors of novelty and application and based on this an innovative company is a company that runs a new technology or efficiently improves a product through a review process (Pla-Barber and Alegre, 2007). Thus, innovation process needs inputs such as R&D, expert human resources or advanced facilities and creating outputs such as new or improvised products.

Inter-organizational cooperation networks: An inter-organizational network means a set of inter-connected factors doing different commercial activities together. Three factors working at a network include companies, resource and individual providers (Holmlund and Tornroos, 1997). These three factors are called as three network layers (Fig. 1).

Generally, inter-organizational networks could take place for reaching the goals of growth or financial returns, globalization, improving product/process/service and communications at the whole network. The process of development of this cooperation could include 5 levels of definition of goals, choosing a partners, determining

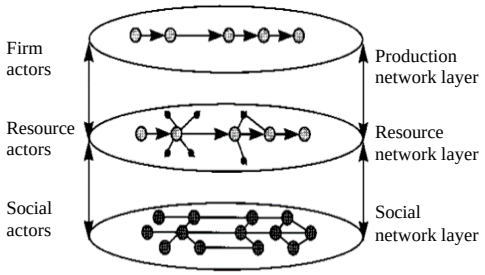

Fig. 1: Layers forming the business networks (Holmlund and Tornroos, 1997)

the appropriate organizational and legal structure, partnership management and partnership checkout (Brass and Burkhardt, 1992). This cooperation is illustrated from different angles and concepts and each of them could take place in different levels of chain of value and in each parts of researches, product development, production, marketing and distribution and after sale services (Bougrain and Haudeville, 2002).

Through creating integrated complementary resources and also effective development of partnership portfolio, inter-organizational networks could create values for companies; due to these senior managers must consider them as the key strategic parts of their companies. In fact, these partnerships act as the growth engine of the companies. In general regarding the inter-organizational features and methods of each company and also the environmental situation and cooperation requirements (goals and content of cooperation and also the partners) it is possible to choose the appropriate partnership method (Coles *et al*., 2003).

The main advantages of forming inter-organizational networks include the following items: risk-sharing (Pittaway *et al*., 2004), access to complementary organizational resources and strategic assets (Andersson *et al*., 2002). Access to new markets, distribution channels and strategic assets (Anderson *et al*., 2002; Huang *et al*., 2012), access to new markets, distribution channels and better protection of individual ownership right (Pittaway *et al*., 2004), reducing exchange expenses (Martin and Eisenhardt, 2010), organizational learning (Huang *et al*., 2012), access to Foreign knowledge spread in the network (Powell *et al*., 1996) an improving the innovation capacity of companies (Barge-Gil, 2010) which is the last case of the main axis of this research.

Regarding the effect of inter-organizational networks on innovation of companies by the use of GEM data (2011), Foroughi surveyed different types of horizontal inter-organizational cooperation (cooperation with R&D units, educational institutions, technological and

marketing companies) and vertical cooperation (customer relationship, suppliers, partner companies in production, distribution and customers on innovation of big businesses in Iran and concluded that in general the inter-organizational cooperation had a positive effect on innovation. The important point is that vertical cooperation has a positive effect on innovation whereas, horizontal cooperation has no significant effect on innovation (Foroughi, 2012).

Pittaway *et al*. (2004) had a systematic review of previous studies in networking and its effect on innovation at micro level (company level). The research findings showed that innovation process and especially, complicated and radical innovation usually happens in the base of union of a set of commercial partners; these unions provide the base for combination of bases of knowledge and ideas, thus, formal and informal relations between individuals with different information, skill and values, significantly increase the chance of innovative combination of knowledge and radical innovations (Pittaway *et al*., 2004).

Zang states that due to the fact that inter-organizational cooperation has a positive effect on innovative performance of companies, the form of relationship of companies with research units are usually an informal relationship about skills and knowledge, exchange or transport of technology, official cooperation (such as R&D unions, transferring R&D activities outside the organization, mutual activities (such as agreements), training innovative staff and expert and trained work force.

Paul states that the reason for improving innovation by inter-organizational networks is that when the base of knowledge of an industry is complicated and vast and resources needed for business are scattered in different places, usually innovation takes place in the form of learning networks rather than individually (Powell *et al*., 1996). Spreading knowledge in different companies and manufacturing productions in different sections causes the companies to make formal or informal cooperation relations with other companies (Fischer and Varga, 2002).

MATERIALS AND METHODS

Based on the aim the current research is a developmental and applied research and it is also a survey studying the statistical sample. The population includes all small and medium production, contracting and commercial companies in the area of electric industry that are active at the time of research. By the use of Morgan table 300 companies were chosen by the use of random sampling as the statistical sample and their owners answered a researcher-made questionnaire designed according to GEM standard questionnaire for measuring innovation and networking questionnaire for measuring cooperation relationships and their validity and reliability were confirmed.

The questionnaire includes three blocks of new entrepreneurs, organizational entrepreneurship and demographic details. The new entrepreneurs block includes sub-scales such as type of ownership, number of owners and age of the company, innovation, size of the company and entrepreneurship motivation. Organizational entrepreneurship block includes sub-scale of inter-organziational relations and demographic details block include sub-scales of gender, age and educational level.

Innovation has items such a novelty of product or services for the customers, competitiveness and novelty of technology. Entrepreneurship motivation includes items such as based on finding an opportunity, based on force, combination of opportunity and force in search for a better opportunity and other motivations.

Inter-organizational relationships include relations for producing products and services, relations for resource providing, relations for selling products and services to the current customers, relations for selling products and services to the new customers, relations for creating products and services for the current customers, relations for creating product and services for new customers and relations for more effectiveness of the business.

The questionnaire was distributed among the owners of selected companies and after providing adequate information regarding the research aim and privacy of the information, the respondents anwered the research questionnaire. Ultimately, the completed questionnaires were collected and they were statistically analyzed by the use of SPSS Software.

RESULTS AND DISCUSSION

Firstly, the frequency percentage of respondents are surveyed based on age, gender, education level, entrepreneurship motivation, age of the company and type of the ownership. Results are shown in Table 1 and 2.

Table 1 shows that firstly, the highest age range of business owners is around 26-35; additionally, the highest educational level range is above diploma and almost half of the owners have established a business for finding new opportunities.

It must be noted that according to the GEM international definition, new businesses are companies

Table 1: Frequency percentage of age, educational level and entrepreneurship motivation of the respondents

Age (year)	Percentages	Educational levels	Percentages	Entrepreneurship motivation	Percentages
<25	13	Less than high school	16	Based on finding an opportunity	45
26-35	36	High school	31	Based on force	36
36-45	23	More than high school	42	Combination of opportunity and force	13
46-55	21	High	10	In search of a better opportunity	2
>55	7	Unanswered	1	Other motivations	3

Table 2: Frequency percentage of gender, age of the company and type of ownership

Gender	Percentages	Company age	Percentages	Type of ownership	Percentages
Female	21	New	46	Total business ownership	65
Male	79	Established	54	Ownership of a part of the business	35

Table 3: t-test

Innovation	Mean difference	t-values	Sig. (2-tailed)
Novelty of the product or service for the customers	1.253	68.664	0.00
Competitiveness	-0.219	-12.598	0.00
Novelty of technology	1.419	139.932	0.00

Table 4: Binominal test for inter-organizational relationships

Inter-organizational relationships	Reply	Observed possibility	Test possibility	Significance
Cooperation for producing products and services of new companies	No	0.44	0.5	0.032
	Yes	0.56		
Cooperation for supplying resource	No	0.52	0.5	0.536
	Yes	0.48		
Effect of cooperation for product/service marketing	No	0.62	0.5	0.000
	Yes	0.38		
Cooperation for more efficiency	No	0.65	0.5	0.000
	Yes	0.35		
Cooperation for producing products and services of established companies	No	0.32	0.5	0.000
	Yes	0.68		
Cooperation for supplying resource	No	0.69	0.5	0.000
	Yes	0.31		
Effect of cooperation for selling products and services to the current customers	No	0.77	0.5	0.000
	Yes	0.23		
Cooperation for selling products and services to the new customers	No	0.80	0.5	0.000
	Yes	0.20		
Effect of cooperation for creating new products and services for current customers	No	0.84	0.5	0.000
	Yes	0.16		
Effect of cooperation for creating new products and services for newcustomers	No	0.86	0.5	0.000
	Yes	0.14		
Cooperation for more efficiency	No	0.83	0.5	0.000
	Yes	0.17		

Table 5: Ranking inter-organizational relationships of small and medium companies by the use of Friedman test

Items	Rank	Mean
Inter-organizational relationships for producing products and services	1	4.33
Inter-organizational relationships for supplying resources	1	4.33
Inter-organizational relationships for selling products/services to the current customers	2	4.04
Inter-organizational relationships for selling products/services to the new customers	3	3.95
Inter-organizational relationships for creating products/services for the current customers	5	3.80
Inter-organizational relationships for creating products/services for the new customers	6	3.71
Inter-organizational relationships for more effectiveness of the business	4	3.84

with <42 months of establishment and established companies are companies with more than 42 months passed from establishment.

Table 2 shows that a considerable amount of business owners are male (79%); also a higher percentage of companies are at established level and 65% of owners have total business ownership. Then, t-test was used for surveying the mean of innovation variable. Results are shown in Table 3. Binominal test was used for determining the favorable condition of samples according to Table 4. In binominal test, according to null hypothesis, ratio of each of conditions was equal and 0.5. For ranking each of the indices of inter-organizational relationships, the Friedman test was used.

Regarding the Table 5 shows the factors of inter-organizational relationships for producing products/services and inter-organizational relationships for supplying resources generally at the first place

in small and medium companies but inter-organizational relationships for more effectiveness at business is at the 7th place.

Prioritizing the effect of inter-organizational relationships on innovation for new companies in this study is calculated:

- Cooperation for resource supply
- Marketing
- More business effectiveness
- Creating products and services for new customers

Prioritizing the effect of inter-organizational relationships on innovation for established companies in this study is calculated:

- Cooperation for producing products and services
- Resource supply
- Selling to the current customers
- Selling to the new customers
- More business effectiveness
- Creating products and services for current customers
- Creating products and services for new customers

Then, factors related to the innovation were ranked by the use of Friedman test (Table 6). Regarding Table 5, competitiveness is at the first place but novelty of technology is at the second place and novelty of product or service for potential customers is at the third place.

Next, Spearman correlation coefficient has been used for surveying the correlation between inter-organizational relationships in small and medium companies and innovation and the results are shown in Table 7.

Table 7 shows the surveying the correlation between inter-organizational relationships and innovation by the use of Spearman coefficient, the inter-organizational relationships in established group had 15% of correlation and it could be said that the higher the inter-organizational relationships the innovation increases with 15% amount; however the significance level in Table 7 indicates that the relationship between inter-organizational relationships and innovation is significant at confidence level 99%.

Multiple-regression test was used for surveying the linear relationship and it is briefly shown in Table 8. Also, Table 9 results show that there is a linear relationship between inter-organziational relationships and control variables.

Since, the Sig. level for this test is 0.00 and smaller than 0.05; thus, there is a significant relationship between independent variables and innovation. Table 10 shows the regression coefficients between all research variables

Table 6: Ranking the innovation items in small and medium companies by the use of Friedman test

Innovation items	Rank	Mean
Novelty of technology	2	2.34
Competitiveness	1	2.51
Novelty of product or service for potential customers	3	1.15

Table 7: Correlation coefficients of indices based on Spearman correlation coefficient

Inter-organizational relationships/innovation	Values
Spearman ρ	0.150
Significance level	0.000

Table 8: Multiple regression test

Estimation of SE of measurement	Adjusted coefficient of determination	Coefficient of determination	Correlation
0.30666	0.328	0.342	0.548

Table 9: Testing the linearity of model

Models	Total squares	df	Mean square	F-values	Sig. level
Regression	39.273	16	2.455	26.101	0.00
Residual	75.703	805	0.094		
Total	114.976	8210			

Table 10: Regression coefficients

Variables	Non-standard coefficients (B)	SE	Standard coefficients (β)	t-values	Sig.
(Constant)	1.572	0.176		8.937	0.000
Inter-organizational relationships	0.124	0.029	0.330	4.266	0.000
New and established inter-organizational relationships	-0.044	0.023	-0.091	-1.954	0.051
Entrepreneurship motivation	0.087	0.023	0.116	3.753	0.000
Logarithm of company age	-0.041	0.012	-0.122	-3.525	0.000
Logarithm of ownership type	0.020	0.015	0.043	1.356	0.175
Logarithm of company size	-0.019	0.035	-0.029	-0.543	0.588
Logarithm of age	-0.036	0.041	-0.029	-0.890	0.374
Gender	-0.011	0.027	-0.012	-0.409	0.682
Education	0.012	0.008	0.047	1.507	0.132
Role pattern	-0.006	0.023	-0.008	-0.265	0.791
Opportunity for starting a business	0.006	0.023	0.009	0.285	0.775
Adequate skills for starting the work	-0.009	0.025	-0.010	-0.349	0.727
Fear of failure	-0.011	0.023	-0.014	-0.488	0.625
Type of ownership	0.061	0.042	0.078	1.438	0.151

and innovation. Table 10 shows the relations between inter-organizational relationships, entrepreneurship motivation, company age with innovation are significant and other relations have no significant relation with innovation.

CONCLUSION

Research results showed that creating inter-organizational relationships is the key factor for solving the problems and challenges of active Iranian companies in electric industry. Also, the current study results showed that cooperation for resource supply had the highest effect on innovation in new companies and cooperation for producing products and services in established companies.

In fact, regarding the limited financial and human resources of small and medium businesses, these types of companies could use networking for creating developing their competitive advantage because cooperation relationships with other companies cause the organizations to be active with less expenses and more effectiveness in competitive market and they could focus on their main qualifications and facilitate the learning process.

In a research Paul figured out that networking of companies is considered as a booster for innovation and also competitiveness in many industries of different countries. In most parts of bio industry, networking is a pre-requisite for innovation (Elg and Johansson, 1997; Streb, 2003). Some other industries in which inter-organizational networks have a positive effect on innovation and Iranian companies could use them as model are services industry (Elg and Johansson, 1997), basic industries, production industries (Pittaway *et al*., 2004) and advanced technology industry (Streb, 2003; Gemser *et al*., 1996) could be mentioned. Networking has resulted in developing clusters in computer industry in the US and developing clusters have resulted in increased innovation and total novelty of this industry in 1980's (Gemser *et al*., 1996).

In fact, inter-organizational companies improve innovation because of two reasons: firstly, it meets the need of access to outside resources; for example, companies could share their assets and resources through union; secondly, inter-organizational companies based on previous patterns of relations of business of a company with another company result in improving innovation (Ahuja, 2000).

Thus, it is suggested to the managers of organizations to make efforts for creating trust in their business relations. They could use tools such as third party in contracts. The role of third party such as professional associations, commercial associations and investment institutions with the aim of improving innovation (such as technology transfer centers) will have a positive effect on development of inter-organizational networks and innovation. Also, in addition to knowledge, financial partners, third party and networking infrastructures, different companies in a network could create a virtual space to improve learning process and could share new ideas toward innovation.

In the learning process section of inter-organizational networks, holding seminars and mutual thinking could also help transfer knowledge and experience and also could introduce new ideas.

On the other hand, many new ideas are achieved through relationship with customers, thus cooperation with customers is suggested for gradual innovation.

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