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Full Length Research Paper

Key factors influencing organizational innovation in small rural food industries: Case study of Iran

Shohreh Soltani* and S. Jamal F. Hosseini

Depertment of Agricultural Extension and Education, Science and Research Branch, Islamic Azad University, Tehran, Iran.

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The competitiveness of an organization relies mainly on its ability to adapt to new changes in its environments. Additionally, process and product innovation increase productivity significantly only when accompanied by an organizational innovation. This study was therefore carried out to understand organizational innovation and key factors which influence it in small rural food industries of Tehran Province, Iran. Findings show that radical changes are mostly pursued rather than incremental changes. Factors which influence "incremental" organizational innovations are firms age (negatively), product diversification, and firms' capacity of production (positively). Also the capacity of production, product diversification, managers' experience (positively) and competition intensity (negatively) influence "radical" organizational innovation. Finally, discussions are provided for improving the organizational innovation in the studied firms.

Key words: Organizational innovation, food industries, small industries, incremental innovation, radical innovation

INTRODUCTION

The competitive advantages of an economy are mainly generated by the capacity of the local companies to sustain organizational innovation (Ivan and Icovoiu, 2009). Also organizational pattern is a very important factor in firm's innovativeness. Mehrtens et al. (2001) conducted a case study to determine factors that influence the adoption of internet among small and medium scale enterprises (SMEs) in New Zealand. The study concluded that organizational readiness is one of the three factors which significantly affect internet adoption by small firms. Also Liew (2002) conducted a survey on 39 SMEs to investigate factors that influence e-commerce adoption among Malaysian SMEs and found that the level of adoption is influenced by the extent of hindrances related to organization, infrastructure and technology.

The capacity of a firm to innovate is highly dependent on harmonization between its organization and other elements. Most of the current failures in advanced automated systems have been due to implementation approaches which do not, adequately, take into account interactions between human, organizational and technical elements (Bessant, 1993; Panizzolo, 1998).

Polder et al. (2010) in their study found that process and product innovation increase productivity significantly only when accompanied by an organizational innovation. There is evidence that organizational innovation is complementary to process innovation. The importance of organization in small industries is not questioned, most studies on innovation paid attention to product, process and technological innovation, neglecting organizational innovation. In this study, therefore the organizational innovation was investigated as an important driver for innovative capability of small and medium industries.

The first step in devising the right incentives to support innovation is probing into factors which impact the innovation efforts of SMEs and in which way (Keizer et al., 2002). Considering this fact, the aim of this research was to provide some insights on factors which make firms more innovative. More specifically, we aimed at:

*Corresponding author. E-mail: shohrehsoltany@yahoo.com.

Organizational innovation

Innovation is crucial for business success (Skuras et al., 2008) and no longer concerns only technological changes (Machat, 1999). Since the seminal study "The Management of Innovation" by Burns and Stalker (1961), organizational innovation has been an important area of research (Jordan et al., 2004). It is clear that the appropriate organizational form enables the good performance of some activities, such as basic research or product development (Galbraith, 1994).

The general definition of innovation can be split into four subcomponents of innovation, defined in the Bogota and Oslo manuals as (World Bank, 2009):

1) Product innovation: the introduction of a good or service that is new or substantially improved,
2) Process innovation: the introduction of a new or significantly improved production or delivery method,
3) Marketing innovation: the implementation of a new marketing method involving significant changes in product design or packaging, product promotion or pricing, and finally
4) Organizational innovation: involves the creation or alteration of business practices, workplace organization, or external relations.

Theoretically, organizational innovation (OI) is a broad concept that encompasses strategies, structural and behavioural dimensions. Organizations must change in order to survive (Cronquist, 2006). The competitiveness of an organization depends on its ability to continuously adapt to new environments, develop new products, and create innovative ideas (Kay, 1993; Martensen and Dahlgaard, 1999; Politis, 2003). The structure of an organization is important to innovation as it supports innovation in small and medium enterprises (Ngah and Ibrahim, 2009).

Small and medium-scale enterprises (SMEs) are the backbone of the industrialization process of many countries and play a crucial role in increasing a country's economy (Yusuff et al., 2005). SMEs are considered to have greater flexibility, an absence of bureaucracy, less rigidity in decision-making, and can respond more quickly to new opportunities and threats (Carlsson, 1999; Kuratko et al., 2001; Gray et al., 2003). With flexible structures in production, SMEs can overcome the economic crisis easier than the large enterprises and adapt to new situations easily (Duygulu et al., 2008).

Radical and incremental organizational innovation

Scholars from various disciplines have explained innovation from different perspectives. Plenty of research have investigated different natures of innovations via probing into different levels of innovation adoption, for example, radical vs. incremental, evolutionary vs. revolutionary, discontinuous vs. continuous, and so on (Garcia and Calantone, 2002). Innovation process may take the form of an improved organization of work or the promotion of relations between suppliers and consumers (Ciemleja and Lace, 2008).

From Lin and Chen (2007) point of view, the nature of innovations would be a dichotomous categorization, encompassing radical and incremental innovations. The distinction between these two different types illustrates how organizations approach innovation in different ways.

A cumulative series of minor changes or introducing something similar to previous organizational practices is called an incremental or routine innovation, whereas an abrupt major change or doing something markedly different from what the organization had done before is called a radical innovation (Nord and Tucker, 1987; Urabe et al., 1988; West and Farr, 1990).

Adopting radical innovation has mixed results. Various scholars commented that radical or breakthrough innovations provide the engine for long-term growth (Leifer et al., 2001).

Leifer et al. (2001) provided some evidence about the radical innovation-performance linkage. Deowar and Dutton (1986) and Ettlie et al. (1984) in their study examined two natures of radical and incremental innovations.

Lin and Chen (2007) in their empirical study of SMEs in Taiwan found that about 80% of the surveyed companies engaged in some kind of innovation. Among them, 53.5% had implemented both incremental and radical innovations, 21.2% had incremental innovations only, and 5.1% had radical innovations merely. Also they found that both radical and incremental innovations are positively related to organizational performance of SMEs.

Some studies pointed to the preference of incremental innovation to radical innovation. For example Ebrahim et al. (2008) research guided them to come to this conclusion that managers of company should invest less in tangible assets, but more in their employees' creativity to stimulate incremental innovations in already existing technologies that will directly generate their future competitive advantage (Ebrahim et al., 2008). In this study of organizational innovation, we adopted the dichotomous nature of innovation, including radical and incremental innovation.

Innovation and organizational ties

Organizational ties help SMEs to establish their network. There can be at least two types of inter-organizational and intra-organizational ties for any organization. Many authors recognize that inter-organizational ties (dependency on customers and on various information networks) play an important role in the adoption and implementation process of small firms (Panizzolo, 1998). Facing fast technological changes and global competition, inter-organization collaborations have become increasingly important for firms to enhance their

competitiveness. Inter-organizational collaborations are critical for a firm's innovation, particularly when firms lack sufficient internal R and D resources (Lin 2003 in Huang and Yu, 2010).

Intra-organizational ties are also very important for innovation. Literatures have shown that collaboration is as a meta-capability for innovation. It is necessary for organizations to put together different capabilities and services with the goal, through cooperation between suppliers and customers, service providers and scientific institutions to achieve innovations of high quality (Ebrahim et al., 2008). Some studies confirmed the fact that intra-organizational ties are effective in innovation and performance of firms. For example the results of Nguyen and Mothe (2008) study show that cooperation with customers has a positive impact on performance. Moreover, Tomlinson (2010) studied the cooperation ties and innovation in Unite Kingdm manufacturing. This study confirmed the positive significant relationship between the inter-firm cooperation and innovative performance. Also the relationship between cooperation with suppliers, cooperation with buyers, and competitors was confirmed. Zeng et al. (2010) studied the relationship between cooperation networks and innovation performance of SMEs in China. Their findings showed that cooperation with government agencies do not have impact on innovative performance of firms. There has been a significant positive correlation between inter-firm cooperation and innovation performance of SMEs. Also close linkage and cooperation with customers and suppliers have a direct and significant positive impact on the innovation performance of SMEs.

Organizational innovation and firm's characteristics

Characteristics of firm can potentially influence the level of innovation in firms. Firm's characteristics in this research includes firm age and size, R and D, capacity for production (tons), sector (grain and cereal, meat and dairy, and fruits).

Some studies confirm the influence of firm characteristics on innovativeness. For example Polder et al. (2010) in their study found that doing more R and D had a positive effect on product innovation in manufacturing while it is unimportant for organizational innovation. Mohamad et al. (2009) in their study of organizational performance found that information technology, training, and incentives are directly affecting the organizational performance. The study of World Bank (2009) show that firm size had a strong positive effect while competition had a strong negative effect, on organizational innovations. Moreover, diversification was associated with more innovation. The effect is only present for product and marketing innovations, and not for process and organizational innovations. Also they confirmed the general view that heavy competition is negatively associated with innovation, and show this is more the case for process and organizational innovations than for product and marketing innovations.

In the study of Tomlinson (2010) significant relationships between innovative performance and firm size, R and D, and firm age were confirmed. Dhamvithee et al. (2005) studied product innovation in Thai agro-industry. Their study showed a significant difference between agro-industry subsectors such as meat, fruit, and dairy fat/oil... in terms of innovation. The meat, fruit, confectionary and fish-based subsectors all had higher rates of innovation compared to grain subsector. The effect of increasing firm size on innovation was confirmed. They found support for a Schumpeterian hypothesis that lowered competition encourages innovation.

Organizational innovation and manager's characteristics

Perry et al. (1993) research found the role of managers central in deciding to adopt an innovation. The success of the project depends on management's correctly positioning the R and D to fulfil a need or fill a niche. Managers need to be technically competent and able to orchestrate new ideas through the organization (Jordan, 2004).

Managers should take advantage of different methods for staff encouragement to innovate. Though there are practices of giving awards and certificates of recognition to innovators, they are not adequate or timely enough to motivate the employees to take up innovative projects. The common view among the staff is that it is not worthwhile to get involved in innovations (Manimala et al., 2006).

As the discussions in the literature review shows, organizational innovation in this research has two types of incremental and radical. Factors which can potentially affect radical and incremental innovation were classified in 4 main factors of firms' characteristics, managers' characteristics, inter-organizational ties and intra-organizational ties. The conceptual framework which is outlined according to literature review is presented in Figure 1.

MATERIALS AND METHODS

This research is a quantitative study which is conducted in rural areas of Tehran Province, Iran. The research area is limited to one single province since findings from different studies show that in innovation area generalizations are difficult due to the complexity of the system and therefore, one way to learn more about determinants of innovative efforts in SMEs is to conduct a variety of studies under diverse economic conditions and in different geographical areas (Radas and Bozic, 2009). Tehran province - the capital of Iran- was studied, mainly because the most recent formal national statistics published by Statistic Center of Iran (SCI, 2008) show that more than 27% of all SMEs are working in Tehran (Total number of provinces: 30).

"Small rural food Industries" are manufactures in food sector

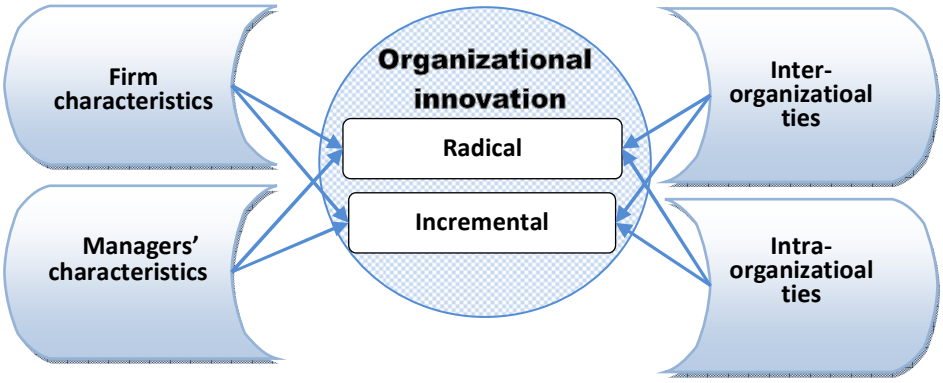

Figure 1. Conceptual framework of the study.

which have less than 50 staff, are located in rural areas and are certificated by Ministry of Agriculture. To date, 104 firms in the food industry have registered in Ministry of Agriculture (MoA) formally in Tehran province from which 60 firms were active when the research was conducted (2009 to 2010). Other 44 firms were not in business any longer.

Total population of respondents in this study was 111 managers (production managers, marketing managers, human resource managers and manager's assistant) who intended to participate in the interview in 60 active firms. Data were collected through questionnaires which were administered using face-to-face method.

Variables

The dependent variable in this research is "organizational innovation". Two types of organizational innovation were studied: (1) Major or significantly improved organizational structure, and (2) a minor change to the work organization within the firm. The first group of organizational innovation are considered as radical innovation and second group are considered as incremental innovation. Similarly, the study of Lin and Chen (2007), adopted the dichotomous incremental and radical innovation as the first layer classification, and labled it the ''nature'' of innovation. To facilitate responses, interviewees were asked to indicate whether their firms had adopted incremental and/or radical innovations in their organization during the last 12 months (the definitions of these two natures were briefly explained to the interviewees). If yes, they were asked to explain two more important innovations in each of the two categories.

A list of firm's characteristics were provided to be included in the questionnaire. This list was checked with experts in MoA. Firm's characteristics in this study includes firm's size (number of employees), firm's age (years), having formal R and D unit (Yes/No), having informal R and D unit (Yes/No), fixed capital (USD), capacity of production (Tons), competition intensity (likert continuum;1: no competition to 5: very high level of competition), diversification (number of other products which is produced other than the main product), sector (1.grain and cereal, 2. Dairy and meat, 3. Fruit), and profitability (1/0: if firm has been profitable during last 12 months).

Managers' characteristics were included the managers' education (1: High school and lower 2: Diploma 3. Bsc. 4. Msc. 5. PhD), age, years of experience in the current managerial job, and training (No. of training courses they had participated in).

Intra-organizational ties are classified in two groups of linkage with customers and linkage with suppliers. The strenght of these linkage is estimated by managers using 5-point Likert continuum (from 1:no link to 5: very strong link). The strength of inter-organizational ties were determined through 5-point Likert continuum, asking about the level of cooperation within firms (from 1: no co-operation to 5: very high level of co-operation in organization). Variables and their construct are provided in Table 1.

A pretest was conducted with 30 managers to determine the reliability of the questionnaire for the study. After deleting the questions with high variances, computed Cronbach's Alpha score was acceptable for different parts of the questionnaire (Alpha> 0.7), which indicated that the questionnaire was reliable. Content and face validity were established by a panel of experts. Some wording and structuring of the instrument were made based on the recommendation of the panel of experts. Data were analyzed using SPSS/win softwares.

RESULTS

Respondents were 111 managers of different managerial levels in the studied firms (for example, owner, general manager, production managers, marketing managers, and human resource managers). The average age of managers was 42.4 years. Fifty-six percent of managers had at least a bachelor degree from university and 23% did not have academic education. From those managers who were educated, 46% indicated that their job is related to their education, while in 11 percent of cases, it was not related to their education. In other cases, their education was somehow related to their job. The average working experience of managers was 19.2 years.

The average age of firms was 7.6 years. Twenty-four firms were profitable in the last year, while other thirty-six firms did not report any profit in the past 12 months. About 20% of the firms had R and D unit, 60% employed a personnel to be in charge of R and D activities (informal R and D) while the rest did not have any R and D activities in their firms.

Responses about competiton intensity (within 5-point likert continuum) shows that from the managers' point of view, competition intensity is near to "high level" (3.87).

Table 1. Variables and their construct.

Variable	Methods used to measure the variable
Organizational Innovation	
1.Radical organizational innovation	1/0: if firm had any major change in organizational structure during last 12 months number of changes in organizational structure during last 12 months
2. Incremental organizational innovation	1/0 :if there were any minor change in work organization within the firm during last 12 months number of cases of change in work organization within the firm during last 12 months
Firm characteristics	
Firm size	Number of employees
Firm age	Firm age in years
formal R and D	1/0: if firm has formal R and D unit
Informal R and D	1/0: if firm has informal R and D unit
Fixed capital	Fixed capital (USD)
Capacity of production	Firm potential capacity for production(tons)
Competition intensity pressure	5-point Likert scale, 1 = no competition and 5 = very high level of competition
Diversification	Number of other products which is produces other than the main product
Sector	1.Grain and cereal, 2. Dairy and meat, 3. Fruit
Manager characteristics	
Education	1: High school and lower 2: Diploma 3.Bsc. 4. Msc. 5. PhD
Age	Age in years
Experience	Years of experience in the current managerial job
Training	number of training courses in different related fields
Intra-organizational ties	
Linkage with producers	5-point Likert scale, where 1 = no linkage and 5 = very strong linkage
Linkage with customers	5-point Likert scale, where 1 = no linkage and 5 = very strong linkage
Inter-organizational ties	5-point Likert scale, where 1 = no co-operation and 5 = very high level of co-operation in organization

Fourty-one firms produced other products as well as their main products. This shows that most firms prefered to have diversity of products which potentially can reduce the risk of products' failure. These firms in food sector were working in three subsectors of "grains and cereals" (No.; 22), "dairy and meat" (No.:30), and "fruits" (No.:8).

Table 2 provides general information on the studied firms' and managers' characteristics. Number of the firms which introduced radical changes in organizational structure was 30. In these 30 firms, 73 cases of radical changes was applied in organization which was mainly included employing 1 or 2 technical staff (35 cases) and decrease in number of staff because of automation and financial crisis (11 cases), and finally change in the firms' working hours and shifts.

Also seven firms changed their work organization within the firms (8 cases). This is regarded as incremental innovation. These changes included changes in staff position in organization.

The rate of radical innovation has been more than incremental innovation in organization. There has not been any significant difference between subsectors in terms of organizational innovation of both radical and incremental type.

Table 3 shows the number of innovative firms and number of innovations in each of the two categories of radical and incremental organizational innovation in each of the three sectors.

Regression model was applied to find the effective factors on organizational innovation. The results of regression model for factors effecting radical and incremental organizational innovation is presented in Table 4.

Factors influencing incremental organizational innovation

Firm age has a negative significant effect on incremental organizational innovation (Beta Coeff.: -0.338*). This

Table 2. A summary of the studied firms' and managers' characteristics.

Firms'characteristics		Managers' characteristics	
Mean of Firm size (numbr of employees)	24.3	Education	Bsc. (56%)
Mean of Firm age	7.6	Average age (Years)	42.4
Numbr of profitable firms	24	Average experience (Years)	19.2
Numbr of firms with formal R and D	12	Average numbr of training courses per manager	0.32
Numbr of firms with informal R and D	36		
Mean of fixed capital (USD)	161070		
Average capacity of production (Tons)	8344.5		
Competition intensity (1-5)	3.87		
Numbr of diversified firms	41		
Numbr of firms in each sector:			
1.Grains and cereal	22		
2. Meat and dairy	30		
3. Fruits	8		

Table 3. Organizational innovation rate in the studied firms.

Type of innovation	Sub-sector	Numbr of innovative firms	Numbr of innovations
Radical (major changes in organizational structure)	Grain and cereal	13	18
	Meat and dairy	13	37
	fruits	4	18
Incremental (minor change in work organization)	Grain and cereal	3	4
	Meat and dairy	4	4
	fruits	0	0

finding shows that younger firms are more probable to apply incremental organizational innovation.

The significant positive relationship between firms' capacity of production and incremental organizational innovation (Beta Coeff.: 0.224**) shows that the more capacity for production have firms, the more innovative they are in their organizational structure.

There is a positive significant relationship between diversification and incremental organizational innovation (Beta Coeff.: 0.218*). Firms which produced other products in addition to their main producs, were more probable to change the work organization within their firms (incremetal organizational innovation).

Factors influencing radical organizational innovation

Capacity of production has significant influence on the radical organizational innovation. Beta coeficients (0.324**) show that the effect of capacity for production on radical innovation is more than its effect on incremental innovation (Beta Coeff.: 0.224).

Diversification has significant effect on the radical organizational innovation (Beta Coeff.: 0.432**). Firms which have other products rather than their main product are more innovative in their organizational structure (radical innovation). Beta coefficients show that the effect of diversification on radical innovation is stronger than its effect on incremental innovation.

Competition intensity has negative significant effect on radical innovation (Beta Coeff.: -0.387**). This finding shows that those firms which encounter more pressure from their competitors are less probable to change their organizational structure radically. This can be the result of the situation in which managers work harder in other areas of innovation such as product and process and have less opportunity or few considerations to radical organizational innovations.

Managers' experience has positive and significant influence on radical organizational innovation (Beta Coeff.: 0.041*). With confidence of 95%, one can say that managers who are more experienced, are more likely fo change their organizational structure redically. Other factors does not have any significant influence on

Table 4. Factors influencing incremental and radical organizational innovation.

Factor	Incremental organizational innovation (Beta coefficients)	Radical organizational innovation (Beta coefficients)
Firm characteristics		
Firm size	NS	NS
Firm age	-0.338*	NS
Formal R and D	NS	NS
Informal R and D	NS	NS
Fixed capital	NS	NS
Capacity of production	0.224**	0.324**
Diversification	0.218*	0.432**
Profitability	NS	NS
Competition intensity	NS	-0.387**
Manager characteristics		
Education	NS	NS
Age	NS	NS
Experience	NS	0.041*
Training	NS	NS
Intra-organizational ties		
Linkage with suppliers	NS	NS
Linkage with customers	NS	NS
Inter-organizational ties	NS	NS

NS: Not Significant, * : P ≤ 0.5, ** : P ≤0.01.

organizational innovation in the studied small food firms.

DISCUSSION

A firm has to adapt itself to the changing environment by altering its organizational characteristics in order to be successful. Small industries are considered to have greater flexibility, a lower degree of bureaucracy, less rigidity in decision-making, and can respond more quickly to new opportunities and threats. Some previous studies show that process and product innovation increase productivity significantly when accompanied by an organizational innovation. Given the importance of organizational innovation, in this study two types of radical and incremental innovation in organization were studied.

Findings show that the rate of radical innovation has been more than incremental innovation in organization. This is in contradiction with the study of Lin and Chen (2007) in Taiwan which showed that the rate of incremental innovation has been more than radical innovation. Therefore, there is a need to improve incremental innovation in the studied firms as well.

There has not been any significant difference among sub-sectors in terms of organizational innovation of both radical and incremental type. Unlike our study, Dhamvithee et al. (2005) found significant difference between subsectors' innovativeness.

Regression model was used to find the effective factors on organizational innovation. The model shows that factors influencing incremental organizational innovation were firm age (negative effect), diversification (positive effect), firms' capacity of production (positive effect). The negative relationship between firm' age and innovation, is in contradition with findings from Tomlinson (2010) study. This difference can be due to this reality that Tomlinson (2010) studied the innovation generally while this study focused on organizational innovation. The positive effect of diversification on organizational innovation (of both types of radical and incremental) was also confirmed by the study of World Bank (2009).

Moreovre, factors influencing radical organizational innovation were capacity of production (positive effect), diversification (positive effect), competition intensity (negative effect), and managers' experience (positive effect). The negative effect of competition intensity on innovation was also confirmed in the study of World Bank (2009) and Dhamvithee et al. (2005). Other factors did not have any sognificant influence on organizational innovation in the studied small food firms.

We suggest establishing advisory and training services for improving organizational innovation in the studied food industries. Such services can training managers and staff on two types of incremental and radical

organizational, so that managers become aware of the importance of organizational innovation of both type, specially incremental organizational innovation.

Regarding the positive effect of diversification on both types of radical and incremental innovation, we suggest disseminating the strategy of product diversification in other firms. Diversification helps firms to decrease the rate of risk in innovation.

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