



# Explanation of Factors Influencing Business Clustering in Iran

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## Abstract

In developed and developing countries, business clusters are considered as a critical tool for economic development. Aiming to explain the business clusters in construction consulting companies in Mazandaran, Gilan and Golestan provinces, this study presents a model including four qualitative variables; innovation, interorganizational relationships, expert-orientation and participants. Data from 43 companies with more than 3 years of experience (113 questionnaires) were used for quantitative analysis. The whole model (SEM) is accepted, because RMSEA is 0.02 and GFI, NFI and AGFI are also more than %90. Also a binomial test confirmed the null hypothesis. In the end, it is concluded that the possibility of creating business clusters for construction consulting companies centered in the City of Rasht is highly possible.

**Keyword:** Innovation, Business Clustering, Construction Consulting Companies, Interorganizational Relationships, Expert-Orientation.

## Introduction

Nowadays, clusters play a pivotal role in formulating economic and industrial policies in developed and developing countries. As providing services and facilities individually to firms costs a lot, clustering helps provide services by governments, big companies, universities and other development supporting organizations (Tambunan, 2005). Clusters can be considered as a competitive tool for networking which not only simplifies achieving regional development strategies but helps (enables) companies to achieve competitiveness in international marketplaces (Felzensztein, 2001). European countries' experiences showed that clustering is a suitable means to overcome the problems. Clustering can bring success in a competitive market and companies can solve problems regarding the risks of large shrink of

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demands and market information (Tambunan, 2005). Construction consulting companies play special roles in the activity cycle of the construction industry. As most of the construction consulting companies are project-based, it is needed to evolve the traditional structure of these corporations to provide systematically reliable, qualitative, modern and economic services to the construction industry. For that purpose and also to substitute competition with cooperation accompanied by competition, clustering is proposed for these kinds of corporations. Accordingly, the objective of this study is to investigate and explain the roles of four variables including; innovation, inter-organizational relationships, expert-orientation and participants in business consulting of construction consulting companies in Mazandaran, Gilan and Golestan.

## Literature Review

### Business Clustering

One of the development models which has attracted the attention of governments during the recent three decades is the development model of business clustering. It is more than a decade that economic development based on development of clusters is regarded as a new strategy by policy-makers of industrial countries. Currently, in small and medium businesses, accountability to increased competition among these units, improvement and upgrading network communication, focusing on indirect support, promotion of cooperation level among small and medium enterprises are increasingly taken into account (Van Hulsen, 2005). Cluster is a social-economic essence comprised of commercial and non-commercial enterprises whose characteristics are ascertained by the population of the economic people and organizations located in a specific geographical region (Perry, 2007). In other words, clusters are groups of companies and enterprises located in a specific geographical region which develop an inter-group connection of products and services by such interdependencies (ketels, 2004).

### Background of Formation of Business Clusters

For the first time in the literature of economics, geographical concentration of industrial activities emerged under the title of “industrial areas” in the events introduced by Marshal (Marshal, 1920). This framework presented a connection between geographic agglomeration and efficiency where firms form clusters in geographic regions to utilize the benefits of positive externalities created by other interrelated firms operating in similar fields. Over time, in the literature of industrial organizations, relationship between regions, interaction among economic participants and innovation are examined. Perroux (1950) introduced the concept of regional growth by introducing growth poles and abstract economic space theories. Later on, Perroux and others developed the regional growth concept based on externalities, integration and links generated by integration. Over time and by moving toward post-Fordism economy, attitudes like flexibility and savings from economies of scale were taken into account. As shown in Table 1, the result of business clusters is presented briefly.

**Table 1: Researches Done so Far on Business Clusters**

Row	Researcher's name	Year	Brief explanation
1	Parkan & Athiyaman	2008	Parkan and Athiyaman introduced an operational framework for identification of business clusters, in Queensland, Australia. In their study, two criteria are used to identify clusters: 1) Examining geographic agglomeration of firms based on analysis of distance model 2) Examining interrelationships between firms
2	Naresh & Pandit & Beaverstock, & Pervez	2008	Pandit and others empirically studied clustering in the service sector and multinational companies. In this study, London is considered the best location to settle a wholesale financial service center. They also suggested stimuli such as time, cost and geographical region for the location of MNCs.
3	Perry	2007	In his study, he provided a comparative evaluation among business clusters and national industrial unions in the jungle section of New Zealand. In this study, some elements were introduced as signs and potential characteristics for clusters and industrial unions, which include: membership effect, ability for operation, development of common and collective resources, information flow, group integration, the ability to impose and influence regulations and membership committee
4	Frisillo	2007	Frisillo dealt with determining the business clusters in the energy sector of Albany. The method of this study was based on a case study whereby the primary information about the active firms in the energy sector in Albany was gathered and this information led to discovery of elements such as: geography, government role, medium-sized firm's investments, trust, cooperation and networks, all of which were required for the success of the clusters.
5	Dewitt, Larry, Horace	2006	Dewitt and others showed the relationship between Porter cluster theory and supply chain management and provided some evidence for their potential positive effects on competition and firm's operation. In this study, data were gathered from the home appliances sector in the USA.
6	Ketels	2004	Studied geographic vicinity, relationships, and active interactions among firms and centralizations.
9	Keeble & Nachumt	2002	Keeble and Nachumt studied the reasons of business clustering of services. They used the data from 300 small and medium-sized construction and management consulting firms in England.
10	Carrie	2000	Carrie presented a research agenda for the change process of integrated firms into regional clusters. At first, this study discusses the nature of the clusters in which Porter's four factors are proposed for competitive advantages. Then, clusters of Arizona are examined.
11	Acs & Audresch	1990	Acs & Audresch studied the roles of regional clusters in assisting enterprises to adapt to globalization pressures in the US cities using econometric estimations and concluded that knowledge overflow driven by proximity of cities would provide the foundation of knowledge for enterprises and this would help to adapt to global situations.

### Theoretical Framework

Paying more attention to the concept of clusters has led to their increased transparency and clarification of the meaning, and ultimately to making practical usage of this term. At the same

time, expansion of public interest in the concept of clusters and attempts to implement it increased not only ambiguities with its precise definition but also ambiguities with its implementation and execution. In this regard, there is a need for an appropriate sectional structure which will lead to a connection between theoretical areas (concept of clusters) and empirical areas (benefits and main stimuli for implementation of this concept). In spite of a diversified and rich literature, it is difficult to provide a precise and clear definition of the concept of clusters and offer the relevant effective factors. Numerous expressions and definitions are stated by analysts and activists in this area based on prevailing conditions and preferences. Therefore an empirical study was designed so that this confusion could be resolved by testing the relationships among research variables. To direct the analysis, figure 1 is used as the conceptual framework of this study.

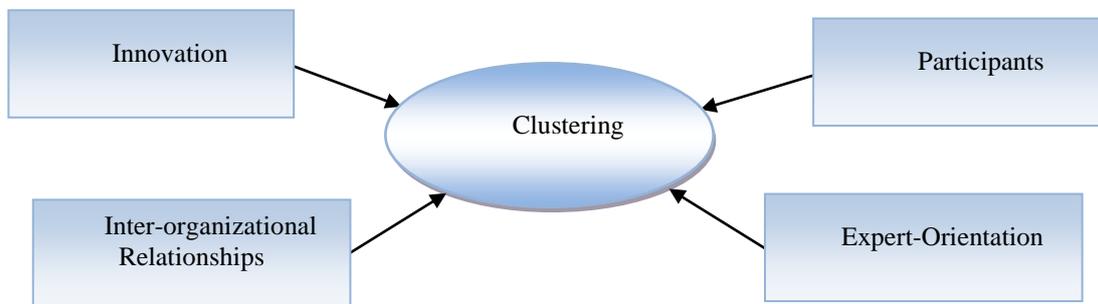


Fig 1. Research Conceptual Framework

### ***Interorganizational Relationships***

Competitiveness has a critical role in clusters. Porter (1998) states that clusters are influenced by competition in three different forms. They increase production of the companies on an internal scale and stimulate innovation and initiatives resulting in the improvement of new businesses. Furthermore, clusters are important in a competitive environment because they allow firms to be more efficient. This happens when more efficient technologies are utilized. Without these factors, companies will not be capable of competing with those rivals who are already equipped efficiently (Porter, 1998). While companies compete inside the clusters, this affects national competitive advantage by clustering improvement. As industries get more involved in international operations, they tend to reach a higher growth to achieve a competitive advantages (Porter, 1998). Additionally, clusters attract foreign investors and exporters. For instance, Silicon Valley obtained national competitive advantages and its reputation is built for the products which are consistent with international standards. This has attracted foreign investors and helped exports on a large scale (Frisillo, 2007).

**First Hypothesis: The factor of interorganizational relationships is effective in business clustering.**

### ***Expert-Orientation***

Clusters are usually known as the central location for specialization which emerges due to convergence and proximity of various activists and follows conquering certain markets or

completion of certain processes. In environments such as clusters, individuals tend to share their experiences and communication is formed officially via professional connections or informally (the Cafeteria Effect). In other words, through this, different kinds of informal ties are formed at the "meeting places" mentioned earlier. Mutual learning processes, transfer of experiences and innovation are the side effects of such communication (Anderson and Napier, 2004). Specialization of the activists within a cluster and their focus on a specific field in the form of complementing each other and eventually creating synergy achieved through mutual learning, are essential to an effective and efficient clustering (Dunning, 2000). The cluster can be developed in different directions, affected by external and internal factors existing in different sectors. Also, the rise of a number of specialized suppliers of goods, services and educated customers will enhance the competition ability of clusters in international markets (Anderson and Napier, 2004).

### **Second Hypothesis: expert-orientation factor is effective in business clustering.**

#### ***Cluster Participants***

In the "The Cluster Initiative Greenbook", participants of the clusters are categorized into four groups: enterprises, governments, research institutions and financial institutions. It is essential that each and every participant show their presence so that the cluster would function properly and effectively. Normally, there are some representatives from each of the groups. Governments, regions, and nations play important roles in forming and keeping clusters. They can act like a catalyst to develop clusters (Birkinsh & Hood, 1998). To be a successful cluster, the common views of governments and private companies regarding the internal and regional economies are very important (Frisillo, 2007). To develop clusters, governments can assist them with reducing the bureaucracy of organizations to make them more efficient for clusters. They can also analyze markets to size up market conditions (Enright, 2000). It is clear that enterprises are natural and essential elements, or main building blocks of clusters. Therefore, we face many enterprises in the clustering process. In the absence of numerous enterprises, the existence of a big company is essential so that other units and enterprises would be its customers or subcontractors. Interorganizational relationships among these enterprises are so efficient and effective that all of them follow a certain goal (Tambunan, 2005). In some cases, companies are formally given a part of their share to the main company and receive a part of the main company's share in return, thus, cross-ownership is created. But, every company makes independent decisions about their costs and benefits (Steinfield & Scupola, 2008).

### **Third Hypothesis: cluster participants factor is effective in business clustering.**

#### ***Innovation***

Enright (2000) states that the relationship between clustering and innovation can be derived from the knowledge existing in social interactions. On the whole, innovation can refer to those attempts which have been made to commercialize new ideas. Evidently, in the prevailing definition of innovation, it is known as a set of new processes by which enterprises are designed and produce products. This process may be used in design and production for the first time, and it might be new, but it does not require the process to be designed for the first time. A process might be designed beforehand but its application in the design and production of a product would be unprecedented (Rosenfeld, 2002). Regarding the complexity and heterogeneity of the concept of innovation, its measuring lacks importance. It is difficult to identify the relationship between innovative activities and their results because many variables of ambiguous nature affect the consequences of innovation (Anderson and Napier, 2004).

**Fourth Hypothesis: innovation factor is effective in business clustering.**

## Methodology

The statistical population of this research included all the top and middle managers of (43) active construction consulting companies in Gilan, Golestan and Mazandaran whose job experiences exceeded 3 years out of which 29 belonged to Gilan Province, 12 to Mazandaran Province and 5 to Golestan Province. The total number of top and middle managers whose job experiences exceeded 3 years came to 131 persons, of which 84, 29 and 18 persons belonged to Gilan, Mazandaran and Golestan Provinces respectively. The statistical sample of this research included 131 top and middle managers of construction consulting companies in Gilan, Golestan and Mazandaran Provinces whose job experiences exceeded 3 years and their demographic data are presented in Table 2.

**Table 2: Demographic Data of the Sample**

Perce	Demographic	Combination	Percent	Demographic index	Combination
%3	High School Diploma Degree	Education	%84	Male	Gender
%10	Associate's Degree		%16	Female	
%62	B.S.		%93	Married	Marital status
%15	M.S.		%7	Single	
%10	PhD		%16.2	20-30	Age
%10.1	1-5	Years of Service	%44.6	30-40	
%21.6	5-10		%37.3	40-50	
%25.7	10-15				
%19.6	15-20				
%17.6	20-25		%20	Above 50	
%5.4	Above 25				

### *Data and Measurement Scale*

The tools for gathering data and information included: reference to evidence and documents, observation, and especially interviews and questionnaires (December, 1999, 28). After the library study, based on the information obtained, a questionnaire with standard components in a 5-point likert scale with a common measurement scale, a completely opposite view and a scale of 5 for Strongly agree was developed, to investigate the effect of the four variables on

the business clustering). The research questionnaire with 47 questions was adjusted to include 14 questions for innovation, 11 questions for inter-relationships among firms, 7 questions for expert-orientation and eventually 15 questions for participants. Finally, by using the structural equation modeling which utilizes LISREL and SPSS software, the resulting data were analyzed.

**Validity**

In order to validate the scale of research, components of the research variables are extracted from the literature review, and then localized by adding experts' opinions and a preliminary sample (Sarookhani, 2003, 139). Therefore, the content validity and the measurement scale are based on qualitative judgment (Parasuraman & Zeithaml & Berry, 1998). It means the current research questionnaire has content validity because the components of the measured variables are derived from the literature review and structure of the questionnaire has been understood correctly by the sample members. For this purpose, the questionnaire was offered to 11 professors and experts as a pretest, then it was modified based on their comments. It was then offered to 31 members of the statistical population to ensure that questions were relevant to the statistical population of the study. Eventually, the final questionnaire was designed and used for gathering data.

It is noteworthy that among the various indices to determine the fitness of structural equation modeling (Hooman, 2003, 409-412), RMSEA, GFI and NFI indices are the best and the most famous ones and can determine the best fitness of a model (Hair & Anderson & Tatham & Black, 1998).  $RMSEA \leq 0.05$  showed that this model had an acceptable fitness with the data gathered from the real world (Joreskog & Sorbom, 1998). Fitness indices of the final model and path analysis of the research were extracted by using the LISREL software. Based on table 3, the structural equation model used to determine effective factors in business clustering enjoys the required fitness and the whole model is accepted, because RMSEA is less than %05, and GFI, NFI and AGFI are also more than %90.

**Table 3: Fitness Indices of The Research Model**

Fitness indices	RMSEA	AGFI	NFI	GFI
Accepted domain	$\leq 0.05$	$\geq 0.90$	$\geq 0.90$	$\geq 0.90$
Result	0.02	0.91	0.97	0.98

**Reliability**

One of the numerous ways of estimating the reliability is measuring the internal consistency (Conca & Llopis & Tarí, 2004) which is gauged by Cronbach's alpha (Churchill, 1979) and is used in most of the research activities (Peterson, 1994). Although, its minimum acceptable value is 0.7, but values 0.6 and 0.55 are also acceptable (Van de ven & Ferry, 1979). Regarding the values in Table 4, Cronbach's alpha values show the reliability of the questionnaire.

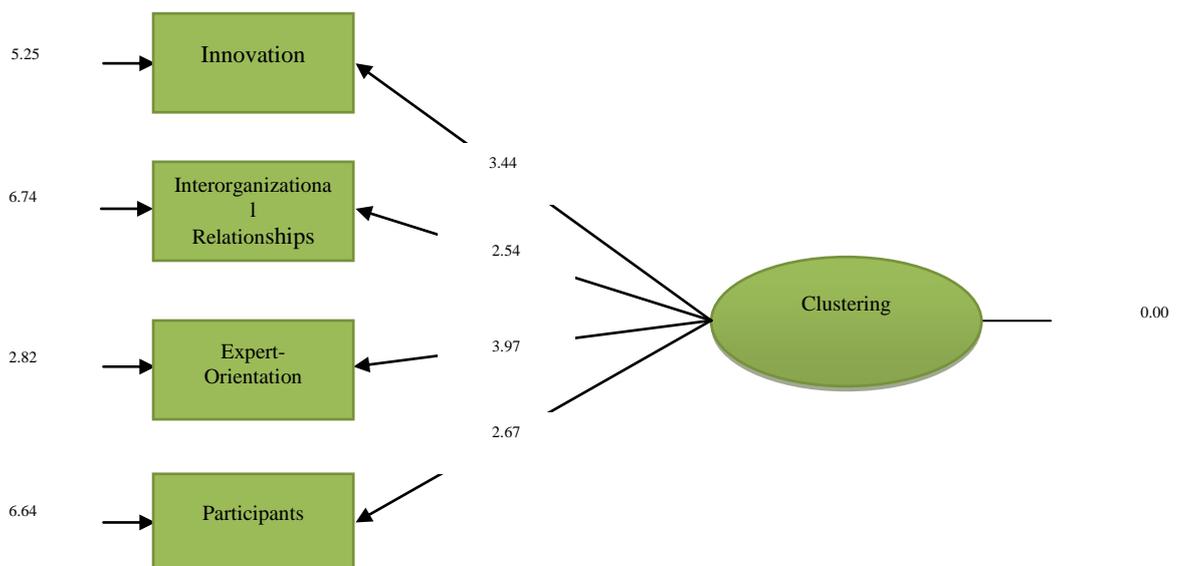
**Table 4: Cronbach's Alpha for Variables**

Factors	Cronbach's Alpha
Innovation	0.793
Interorganizational Relationships	0.710
Expert-Orientation	0.829
Participants	0.734

## Results

### The Structural Equation Model for Determination of Effective Factors in Business Clustering

In this section, the structural equation model of the four variables affecting the business clustering will be shown. With regard to the Root Mean Square Error of Approximation (RMSEA) which is less than 0.05 (RMSEA=0.02), the Goodness of Fit Index (GFI=0.98), Normed Fit Index (NFI=0.98) and Adjusted Goodness of Fit Index (AGFI=0.91), that all are more than 0.9, the following model shows a good fitness of the real data and the whole model is accepted. In the following figures, the structural equation model of the relations of the four observed variables and latent variables effective in business clustering are shown. In this model, the variables have two types of direct and indirect relationships. As it is shown in the T-value figure, direct and indirect effects of all relationships have been proven in both sections because the value of none of them is less than 2 (based on LISREL output, value under two are shown in red color).



**Fig 2. T-Value Coefficients**

In Table 5, there is more explanation about the observed and latent variables, direct and indirect standardized coefficients and T-value of the structural equation. In standardized regression coefficient, all variable measurements are presented based on a common scale regardless of how they are measured. However, the estimated coefficients based on their various measurement scales provide additional data and information for manager’s decision-making.

**Table 5.Variables and Direct Coefficients of Structural Equation Modeling**

Accepted. Rejected		Acceptance or Rejection of the Model Generality	Estimated Co.	Standard Co.	T Value	Independent Variables	Dependent Variables
Indirect	Direct						
Accepted	Accepted	RMSEA= 0.02 GFI =.98 AGFI= .91 NFI= .97  Model Generality is accepted	0.22	0.48	3.44	Innovation	Business Clustering
Accepted	Accepted		0.18	0.32	2.54	Interorganizational Relationships	
Accepted	Accepted		0.26	0.66	3.97	Expert-Orientation	
Accepted	Accepted		0.09	0.34	2.67	Participants	

***Binomial test***

Due to the directional nature of the research hypotheses, although 0.6 and 0.55 are also suitable, the minimum acceptable value to the null hypothesis is considered 0.70. Thus, in the binomial test of table 6, probabilities of more than 0.70 show that the null hypothesis is accepted. And, if the observed probability is less than 0.70, a level of significance of more than 0.05 shows that the null hypothesis is accepted.

**Table 6: The Binomial Test Results Summary for Gilan, Golestan and Mazandaran-Province-wide**

Variables	Assumptions	Set	Frequency	The Probability of the Observed	Test Probability	The Significance level	Test Result
Innovation	Hypothesis 0 = Absence of variables	$3 \leq$	40	0.4	0.7	0.000	Hypothesis1 Verified
	Hypothesis 1 = existence variables	$3 >$	73	0.6			
Interorganizational Relationships	Hypothesis 0 = Absence of variables	$3 \leq$	65	0.6	0.7	0.003	Hypothesis1 Verified
	Hypothesis 1 = existence variables	$3 >$	48	0.4			
Expert-Orientation	Hypothesis 0 = Absence of variables	$3 \leq$	23	0.2	0.7	0.000	Hypothesis1 Verified
	Hypothesis 1 = existence variables	$3 >$	90	0.8			
Participants	Hypothesis 0 = Absence of variables	$3 \leq$	9	0.1	0.7	0.000	Hypothesis1 Verified
	Hypothesis 1 = existence variables	$3 >$	104	0.9			

Presence of all four variables of innovation, interorganizational relationships, expert-orientation, and cluster's participants are accepted in Gilan, Golestan and Mazandaran Provinces.

### ***Fuzzy Method***

The fuzzy hypothesis test was carried out for each of the questions in questionnaire to accept or reject the hypotheses of research for innovation, interorganizational relationships, expert-orientation and participants (spectrum of mathematical figures defined for verbal phases were used beginning from 1 to represent the least level of variable i.e. Very low up to 9 to represent the highest level of variable i.e. Very high; fuzzy hypothesis test to verify the possibility of the presence of a variable can be defined as the figure approaches 9). With regard to the range of 1 to 9 of verbal phases, decisions, in which the target value exceeds 6, are considered as effective, depending on the test taker's decision. Accordingly, to examine the membership degree of acceptance or rejection, Table 7 is used for decision making in the fuzzy area arbitrarily.

**Table 7. Membership Degree Analysis of Rejection or Acceptance in Fuzzy Environment**

Comment on the Index Theory	Degree of Acceptance
Comment on the index theory	1
Acceptance of the index theory	0.9-1
Very high possibility of accepting the index theory	0.7-0.9
High possibility of accepting the index theory	0.5-0.7
Average possibility of accepting the index theory	0-0.5
Weak possibility of accepting the index theory	0

When the acceptance degree for each and every question and their absence or presence were certified for the four variables of innovation, interorganizational relationships, expert-orientation and cluster participants in all of the three provinces of Mazandaran, Gilan and Golestan, the acceptable degree was calculated so that each variable could be converted into the average of fuzzy data of its questions and its acceptable degree would be calculated as stated earlier. This is shown in Table 8.

**Table 8. Summary Calculations in Fuzzy Environment in the Three Provinces of Gilan, Golestan and Mazandaran**

Variables - Hypotheses		Participants	Expert-Orientation	Interorganizational Relationships	Innovation
$X^a$	Fuzzy average	4.12	4.13	3.32	3.41
$X^b$		6.11	6.13	5.23	5.31
$X^c$		7.85	7.88	7.08	7.25
Standard deviation of fuzzy		0.63	1.06	0.76	0.81
low limit $\tilde{X}_L$	Fuzzy average Distance estimate	$4.12-1.99 \alpha$	$4.13-2 \alpha$	$3.32-1.91 \alpha$	$3.41-1.9 \alpha$
high limit $\tilde{X}_U$		$7.85-1.74 \alpha$	$7.88-1.75 \alpha$	$7.08-1.85 \alpha$	$7.25-1.94 \alpha$
The lower limit of acceptance of the hypothesis $\tilde{X}_U + Z_\alpha(\tilde{S} \cdot \sqrt{n})$		$7.95-1.74 \alpha$	$8.04-1.75 \alpha$	$7.20-1.85 \alpha$	$7.38-1.94 \alpha$
The minimum standard numerical of hypothesis acceptable in scale (1-9)		6	$\alpha$	6	6
Membership degree of acceptance of the hypothesis = $\alpha$		1	1	0.65	0.71

Analysis of acceptance of the hypothesis	Definite acceptance of the hypothesis of participants variable	Definite acceptance of the hypothesis of expert-orientation variable	Accepting the hypothesis of the interorganization-al relationships with average possibility	Accepting the hypothesis of the innovation variable with a high possibility
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According to Table 8, presence of the two variables of expert-orientation and cluster participants are accepted definitively and presence of innovation and interorganizational relationships are accepted with high and medium probabilities respectively.

***Ranking of Effective Factors in Business Clustering Using Friedman Test***

To examine which of the variables of innovation, interorganizational relationships, expert-orientation and participants are of greatest importance, Friedman test has been used. The results are shown in table 9. According to experts and results of Friedman test, the variable of cluster participant is the most important one in business clustering.

**Table 9. Friedman Test Results (sig= 0.000)**

Variable	Average Rating
Expert-Orientation	3.20
Participants	3.05
Interorganizational Relationships	1.89
Innovation	1.85

## Conclusions

Despite the similarities in the variables and methods used, restrictions related to the time and place of all disciplines in the humanities and social sciences in general and management in particular have revealed the research findings, to be significantly different. Accordingly, it is first necessary to use spatial and temporal conditions, and then localize research results so that the applications of these results would be accurate. As also shown in the literature review, many researchers (Parkan&Athiyaman, 2008; Frisillo, 2007; Perry, 2007; Naresh & Pandit & Beaverstock & Pervez, 2008; Keeble&Nachumt, 2002) emphasized the importance of business clusters in general. This study has important advantages with respect to the spatial and temporal conditions, in that it covered variables such as innovation, expert-orientation and participants which are effective in appropriate business clustering. In addition, the variables introduced in this research can be measured qualitatively. Clusters provide sharing of experiences and facilities, development of common facilities and doing things together possible. Additionally, one of the main advantages of clusters is the rapid transfer of the knowledge and innovation generated in clusters. Therefore, clusters are effective in different areas of companies' operations yielding these advantages. What matters with clusters is identification of the elements of clusters. In this study, these elements are divided into the four main categories of expert-orientation, participants, interorganizational relationships and innovation. The presence of all elements is not essential in each cluster; also,

the absence of one or more elements does not signify any weakness or a basis for modification or political interference. Another issue addressed in this research is the potential of clustering in construction consulting companies. Based on the results and confirmation of the presence of all of the four variables in the three provinces, there is a high probability of consultancy in construction consulting companies in Rasht City. In sum, studies show that agglomeration and consultancy can solve many problems of enterprises in the marketing area. Therefore it is necessary for SMEs to utilize this concept. After several studies by the authors regarding clustering, the following recommendations are made which can be employed by enterprises and cluster participants, especially the government:

- Focus on and utilization of e-commerce issues in facilitating the development of business clusters in construction consulting companies in Mazandaran, Gilan and Golestan to improve innovation in these provinces.
- Development of a scientific and a localized model to create and develop clusters in the country.
- Government special facilities to support clusters.
- Creation of incremental cooperation between construction consulting companies by the government through holding seminars, training courses and joint projects.
- Formation of apprenticeship courses to improve technical skills of research and education institutions with the purpose of expanding the element of participants.
- Establishment of new construction consulting companies near other construction consulting companies in order to create a certain social homogeneity to facilitate development of relationships.

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