

Research Article

The Development of Evaluation Model of Development for Industrial Clusters of Markazi Province

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Abstract: The objective of present study is to analyze the possibility of developing an evaluation model of development for industrial clusters of Markazi Province. The present study is applied in objective and descriptive-mathematical in its methodology. The statistical population of present study consists of industrial clusters of Markazi Province. A questionnaire is used to collect the essential data. Due to limitedness of statistical population, the questionnaire is distributed among thirty reporters and experts. The measures of evaluation of different industrial clusters as presumed in numerous papers are extracted and then they are categorized through balanced scorecard method. Apaired-comparison questionnaire is used to compare the proper and present status of the intended industrial clusters through paired-comparison test. For final ranking of measures, Friedman test and SPSS Software are used. The final model is extracted through Dematel method and determination of associations among the measures of development of industrial clusters. The results show that there is a reverse association between proper and present conditions in finance, internal processes and learning but there is a relatively positive association among these two conditions regarding customer-orientation. Based on the developed conceptual model, one could say that learning, finance, internal processes and customers are the top four priorities for the industrial clusters of Markazi Province.

Keywords: Balanced scorecard method, development, industrial clusters, markazi

INTRODUCTION

One of the issues of transition from economic backwardness to a developed economy is a definite strategy in which the small and large industries are prioritized. This strategy was called "Small is Beautiful" which first developed by Schumacher (1973) who was an eminent German economist. This strategy points to the high rate of unemployment in developing countries and its inevitable consequences such as immigration of villagers to urban regions which necessitates attention to small industries as the solution to provide inexpensive job opportunities in villages and small cities. This strategy is based on this principle that the most important problems of third-world countries are unemployment and increasing immigration of people from rural to urban areas. Therefore, the industrial plans and policies should endeavor to reduce unemployment and improve the economic status of the public. Therefore, four points are noteworthy. First, job opportunities should be created in rural areas and small and medium cities. Second, these job opportunities should be sufficient. Third, due to lack of proper education in developing countries and high level of illiteracy, the production methods should be relatively

simple. Four, the production methods should use local resources. Based on the above points, development of small and medium industries should be paid attention to. In recent years, there has been increasing attention to minimalizing these industries and the development of small and medium industries has significantly increased. These firms have numerous advantages compared with large industries of which one could point to higher value-added, innovation, employment and flexibility compared with large industries. One of the basic solutions in the scientific circles to regulate small and medium industries is to integrate and organize them into industrial clusters. The concept of "industrial clusters" has numerous ambiguities in definitions and applications due to its novelty and lack of rich theoretical background. Based on different studies during 1980s in Italy, one might say that the investigation of industrial clusters in their present form started in 1990 with the work of Porter (1998) on the competitive advantages of different countries. The latest definition which Porter (1998) has introduced states that: "Cluster is the geographical concentration of the associated entities and companies in a distinctive domain". The definition which Altenberg and Schumer developed based on quantifiable variables so as to introduce qualitative variables such as trust,

dependence upon society and moral states: “Cluster is a relatively large set of companies in a distinctive area with definite expertise in which there is a significant level of business among companies”.

Markazi Province is one of the major industrial poles in the countries and it has the top rank among the industrial provinces of Iran. The presence of major industries in Arak Town has made it one of the industrial poles of Iran. These province includes the most important industrial activities such as automobile, tire production, cable manufacturing and HEPSCO, profile, aluminum and basic metal production, metal bars for power transfer, rolling aluminum, color, fineries and thermal plants. One of the influential factors upon the industrial production of this province since 1990s is petrochemical products and exports and Markazi Province has had significant success in this regard. The prominent industrial centers in Markazi Province are Arak, Save, Delijan and Mahalat. The above descriptions of industrial conditions show the industrial diversity of Markazi Province. In this regard, it is necessary to do comprehensive studies so as to develop the industrial clusters of this province based on its industrial potentials and provide proper evaluations.

LITERATURE REVIEW

The discussions on small and medium firms date back to a century ago in concepts developed by classic theorists. In the past few decades and during the influence of neoclassic theorists, the discussions on entrepreneurship had a rise. Due to the potential opportunities of globalization and access to international markets, small and medium firms increasingly endeavor to attain a position to use such opportunities but numerous complications inhibit the realization of this objective (Beyene, 2002).

There are different theoretical discussions regarding the way that small entities might help in development. The main concept behind these theories is that small companies, despite their natural competition with each other, are members of an independent internal network that are able to make decisions, create jobs and develop proper conditions for technological innovations (Babkin *et al.*, 2013; Tao, 2012).

The most interesting approach to these forms is their networking or clustering which generally is an integration process. This process is essential to attain economical scales. The factors of networking small and medium companies revolve around identification of innovation potentials. Most of small companies are inclined to cluster and connect with each other so as to use the knowledge and technologies of other companies. This phenomenon is intended for those units located in a geographical area in which skills of human resources exists (Fayyaz *et al.*, 2011; Xu and Li, 2011).

Most of researchers associate the theoretical roots of industrial cluster to Marshal's theory despite of the fact that Porter (1998) in “*Competitive Advantages of Nations*” developed a theory of industrial nations. He regarded clusters as a result of improvement in business and explained that an industrial cluster is the result of geographical-social closeness of a group of companies and their associated entities which manufacture identical or complement products (Porter, 1998).

Humphrey (2002) defined cluster as: “regional and geographical concentration of companies. Such a concentration leads to of external savings (Humphrey, 2002). The presence of these clusters leads to associations with remote markets and specialization of companies' services in technical and accounting domains. Altenburg and Meyer-Stamer (1999) believed that there is no consensus regarding the definition of industrial clusters but one could presume that the term “cluster” in its most general denotation refers to the local concentration of economic activities in a definite field.

The formation of a cluster is self-stimulated phenomenon which is observed in developing and developed countries but the clusters will experience industrial development when they are connected to relatively large and remote markets through efficient business networks and there is sufficient and stable level of trust among the companies (Majocchi and Presutti, 2009).

In developing countries, most of small and medium business units attain the primary objectives of development along with playing a major role in development and diversity of industrial products, employment and proper distribution of incomes as well as satisfaction of fundamental requirements of a country. Despite of their high potential in generating consistent economic development, small industries face numerous complications in their development. Nasiri (2007) in his book called “*The role of clustering in increasing competitiveness of small and medium firms*”, stated that factors such as lack of access to information on market and new technologies, low quality of human resources, insufficiency of access to capital and weak policy-making are the most important inhibitive factors of development of industrial clusters (Zhang *et al.*, 2011).

Porter's diamond framework is used in the analysis of competitiveness of a local industry and it is one of the few frameworks in the studies on international business which shows the elements of national competition in a definite industry. In this framework, Porter (1998) considered competitiveness as the result of interactions of four primary factors: internal factors, conditions of internal demand, associated, supportive and strategic industries and competition of companies. Porter (1998) believed that these four factors reciprocally affect each other and modification of each

factor might affect the other factors. In addition, two external factors of state interventions and unpredicted events might indirectly impact these four factors and competitiveness (Ardakan and Motamedi, 2013).

In sum, the influential factors upon development of industrial clusters have been analyzed from different aspects. Some studies investigated the influential factors upon the success of clusters to overcome temporal challenges and problems while some others analyzed one of the influential factors upon evaluation of industrial clusters. The approaches of these studies are generally qualitative or case studies based on their subject and field of study. In these studies, the common methodology and instrument were respectively theoretical/meta-analytical methods and interviews. In Iran, there are insufficient number of studies due to novelty and comprehensiveness of cluster development. For instance, Nasiri (2007) investigated the role of clustering in increasing competitiveness in small and medium firms in regard to marketing. A general look at these internal studies shows that the influential factors determined in different fields are relatively similar. Their findings showed that progressive factors are more than inhibitive ones and there is no unique and common framework to analyze these factors (Ardakan and Motamedi, 2013; Haji and Pasbani, 2010; Valizade, 2007; Naserbakht, 2004).

Research questions:

- H.1:** What are the evaluative measures of development in industrial clusters?
- H.2:** What factors and measures are influential upon evaluation and what is their level of significance?
- H.3:** How should a conceptual or operational mode of development of industrial clusters be?

METHODOLOGY

In the present study, the characteristics of industrial clusters and their developmental measures are presented. The mathematical operations are used to analyze the measures and select the best measure. Therefore, it is descriptive-mathematical in methodology and applied in objective because the objectives are to select the best measure and develop a conceptual model of development for industrial clusters of Markazi Province. In the present study, field study is used to collect data and library method is used to develop literature on the subject. The major method of data collection is questionnaire. To analyze the obtained data, the evaluative measures of industrial clusters were extracted through reviewing associated papers; they were categorized through balanced scorecard method and Dematel method. A questionnaire of paired comparison was used to contrast present and proper

Table 1: Information of companies in industrial clusters

Row	Company's name	Number in sample
1	Wagon Pars	15
2	Ehia Sanat	1
3	Foolad Derakhshan	2
4	Governancy	2
5	Company of Industrial Towns of Markazi Province	3
6	Gijin	1
7	Bitas Sanat	1
8	Metod	1
9	Behine Gostar	1
10	Poyesh Pardazan	1
11	Arak Parand	1
12	Tose-Tejarat Karvand	1

conditions through paired-comparison test and SPSS Software. The proper measures were defined, they were ranked through Friedman test and then this test was used to denote the association between the measures and conceptual model of development for intended industrial clusters.

Statistical population and sampling: The statistical population of present study consists of industrial clusters of Markazi Province the information of which is shown in Table 1.

Reliability and validity: In the present study, content validity is used to define the validity of the measure. The initially determined measures from different papers were categorized through balanced scorecard method and consultations with associate professors and experts.

In the present study, different methods and tables of paired comparison were used to answers the questions. These methods are mathematical and there is no need to verify their reliability.

Data analysis: Evaluative Measures of Development for Industrial Clusters.

To determine the evaluative measures, different papers were reviewed and 31 factors were identified. In the next step, balanced scorecard method and viewpoints of supervisor and experts were used to categorize the indices based on BSC criterion. This categorization is shown in Table 2.

Prioritization of Evaluative Measure of Industrial Clusters: To evaluate the development measures, a questionnaire was distributed among thirty experts of industrial clusters to determine the present conditions of industrial clusters and compare with their proper conditions. Then, Friedman test, SPSS Software and paired comparison test, this evaluation was done.

In Table 3 the results of paired comparison test are shown.

To prioritize of main and secondary measures and indices, the Friedman test was used. The prioritization among main measures is shown in Table 4.

Based on the above results, one could state that the variables of finance, customers, internal processes and learning are respectively the top measures of

Table 2: Results of categorizing measures through balanced scorecard method

Finance	Internal processes
1-Using financial incentives and tax credits	1-Horizontal and vertical cooperation to provide unofficial learning.
2-Provision of financial and credit services	2-Using continuous teaching system to promote the information of best practices in cluster
3-Using governmental cooperation to provide finance	3-Proper growth of physical infrastructures
4-Increase of income	4-Efficient information sharing among companies, entities and inter-cluster individuals
5-Using foreign investments	5-efficient inter-cluster leadership and management
6-Using the cooperation of private sector to provide financial credit	6-Using technical abilities of units for better provision (products/services)
7-Using proper conditions of local economy	7-Presence of skilled and specialist forces to execute the processes
8-Proper Usage of conditions of national economy	8-continuous improvement of procedures
	9-presence of effective sanctions against units that ignore collective agreements
	10-encouraging regional firms to join the cluster
Customer and market	Growth and learning
1-Presence of large regional units	1-Attention to organizational knowledge and knowledge management
2-Using competition in market	2-Proper understanding of intended industry
3-Using marketing relations	3-Attention to competition, quality and innovation
4-Using joint interests in market	4-Using common resources
5-Using business networks	5-Using technical opportunities for proper changes and growth
6-Connection to large markets	6-Business and entrepreneurship stimuli
7-Using the potential of high-level provision in cluster	7-Using educational courses for growth and development
8-Using geographical neighborhoods and available resources and raw materials	8-Sharing ideas on industrial clusters to promote development
9-Using high demand for product	9-Presence of active and independent organizations, principalities and supportive local government

Table 3: Paired-comparison test of present and proper conditions of industrial clusters

Item	Mean	SD	Test statistic	Correlation coefficient	Level of significance	Support/Denial of hypothesis
Difference of proper and present conditions of industrial clusters from financial viewpoint	2.375	0.66732	17.795	-0.198	0.000	Supported
Difference of proper and present conditions of industrial clusters from viewpoint of customers	2.06836	0.70489	14.962	0.072	0.000	Supported
Difference of proper and present conditions of industrial clusters from viewpoint of internal processes	2.06836	0.70489	14.962	0.072	0.000	Supported
Difference of proper and present conditions of industrial clusters from viewpoint of learning	2.05128	0.95593	10.942	-0.414	0.000	Supported

Table 4: Results of Friedman test

Friedman	Test	Priority	Mean of ranks	Variables
20z	Number	1	1.7	Finance
16.401	Chi-square statistic	2	2.38	Customers
3	Degree of Freedom	3	2.6	Internal Processes
0.001	Level of Significance	4	3.32	Learning

(H0: the priority of variables are identical; H1: The priorities are different)

development of industrial clusters. Due to the fact that level of significance is less than 0.05, the zero hypotheses are denied and the claim for identical significance of these four measures is rejected.

Conceptual/Operational Model of Development for Industrial Clusters: First, the balanced scorecard method is used to determine the evaluative factors and indices and then the proper conceptual model was defined through Dematel method. In the first step the matrix of mean of primary measures was formed by geometric mean in Table 5.

Then the matrix of initial direct association was formed in the second step in Table 6.

In the next process matrix of collective association of main measures was formed by Matlab software due to the following equation in Table 7:

$$T = X(I-X)^{-1} \tag{1}$$

In the last step deduction of matrix of collective association has been done according to Table 8.

Due to the fact that D+R column determines the level of influence and affection of a factor in a system, “learning” highly interacts with other factors. D-R shows the level to which one factor influences the other ones. D-R values show that “customers” is influential while “finance”, “internal processes” and “learning” are affected by other factors. The interactions of these factors are shown in the Fig. 1.

Due to the quantity of P-value is 1.048 (maximum value in row and column of each measure and the least value among them), one can consider the structure of relations among main factors in Fig. 2.

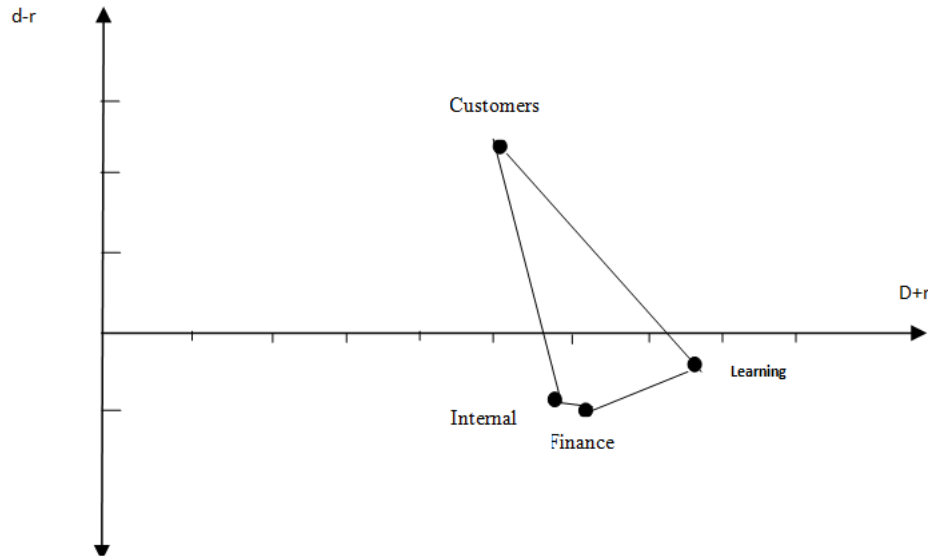


Fig. 1: A directed graph of effect

Table 5: Matrix of means of primary measures

Primary measure	Finance	Internal processes	Customers	Learning	Sum of rows
Finance	0	2.1038	0	2.491562	4.595262
Internal processes	2.070998	0	0	2.289428	4.360426
Customers	2.325666	2.087323	0	2.397705	6.810695
Learning	2.210943	2.070998	2.127742	0	6.409682
Sum of columns	6.607607	6.262121	2.127742	7.178595	

Findings of present study

Table 6: Matrix of initial direct association

Main measures	Finance	Internal process	Customer	Learning	Sum of rows	Sum of columns	Sums of columns and rows	Rank
Finance	0	0.2931	0	0.3471	0.6401	0.9204	1.5606	2
Internal processes	0.2885	0	0	0.3189	0.6074	0.8723	1.4797	3
Customer	0.324	0.2908	0	0.334	0.9487	0.2964	1.2451	4
Learning	0.308	0.2885	0.2964	0	0.8929	1	1.8928	1

Findings of present study

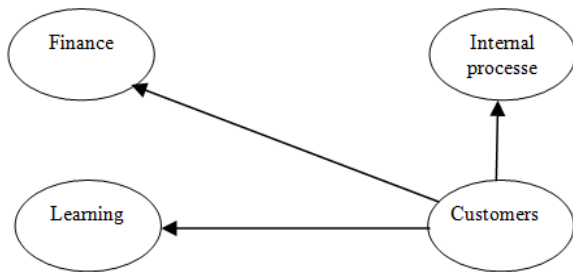


Fig. 2: Conceptual model of development for industrial clusters

Through Fridman method the prioritization among main and secondary measures are shown in Fig. 3.

DISCUSSION AND CONCLUSION

In the present study, the evaluative measures of development in industrial clusters were defined based on the critical comments of experts and review of

Table 7: Matrix of collective association of main measures

Main measures	Finance	Internal processes	Customer	Learning
Finance	0.5956	0.8047	0.2666	0.8995
Internal Processes	0.7938	0.5532	0.2536	0.8555
Customers	1.0970	1.0487	0.3452	1.1645
Learning	1.0456	1.0068	0.554	0.869

Findings of present study

Table 8: Deduction of matrix of collective association

Main measures	D (Sum of rows)	R (Sum of columns)	D+R	D-R
Finance	2.5664	3.532	6.0984	-0.9656
Internal	2.4561	3.4134	5.8695	-0.0573
Processes				
Customers	3.6554	1.4194	5.0748	2.236
Learning	3.4754	3.7885	7.2639	-0.3131

Findings of present study

different papers. Based on balanced scorecard method and viewpoints of associated professors, the main measures of finance, internal processes, customers and learning were selected. In the next stage, the

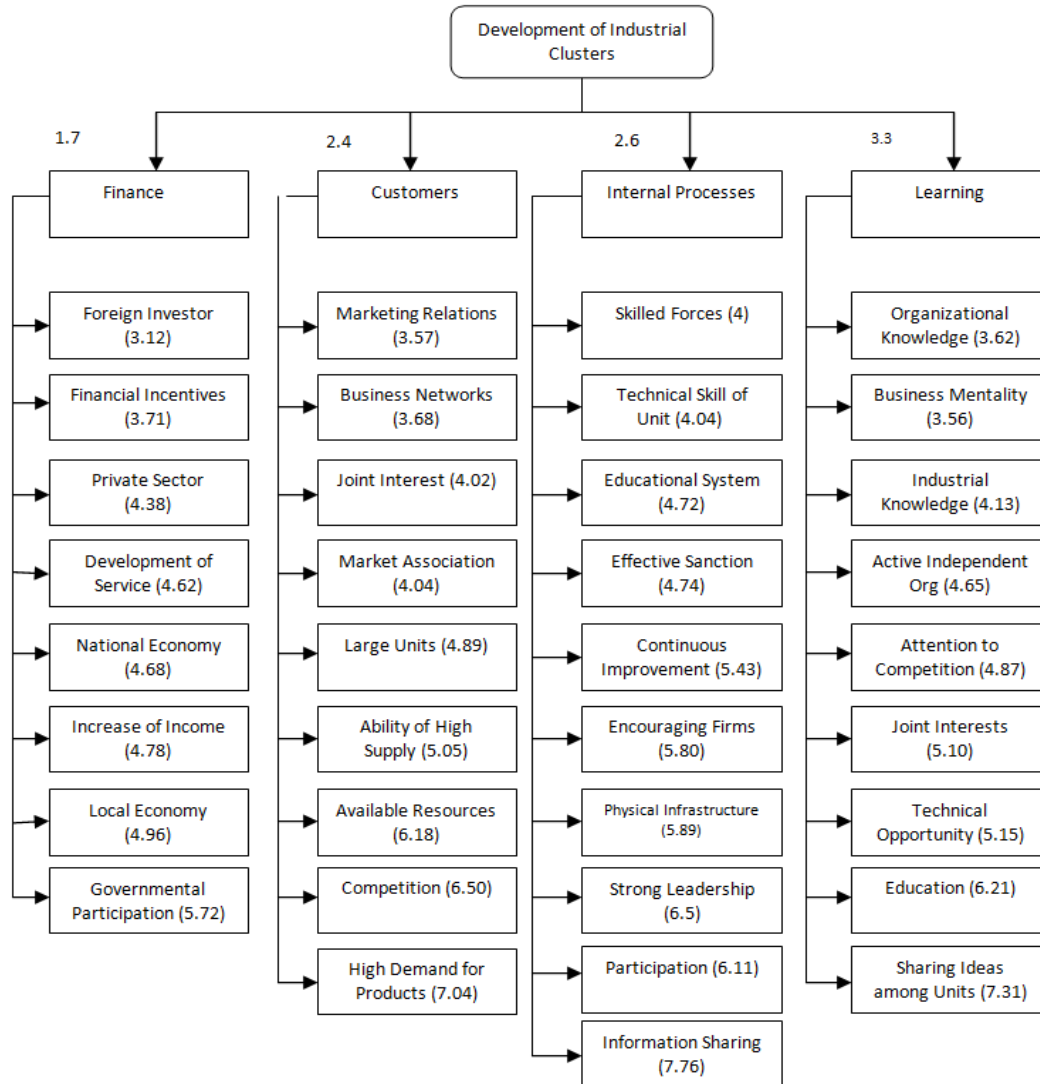


Fig. 3: Structure of relations among main and secondary measures

prioritization of measure and indices, was done through Friedman method the results of which showed that finance (esp. foreign investment), customers (esp. marketing relations), internal processes (esp. skilled resources) and learning (esp. organizational knowledge) constitute the top priorities. To compare the present and proper conditions of industrial clusters, paired comparison test was used the results of which shows that there is a negative association between present and proper conditions of finance, internal processes and learning. Regarding the customers, there is a little correlation between the present and proper conditions of industrial clusters. To prepare a conceptual and developmental model of industrial clusters, Dematel method was used the results of which showed that the measure of “customers” affect the measures of finance, internal processes and learning. In regard to finance, the results showed that the factors of foreign investment, private sector, local and national economy influence the

factors of financial incentives, formation of financial services, participation of government and increase of income. Regarding the measure of internal processes, the results showed that the factors of effective sanction, technical skills of unit, physical infrastructure, educational system and cooperation affect encouragement of firm, continuous improvement, skilled forces, strong leadership and information sharing. In regard to the measure of “customers”, the factors of high demand of products, available resources, marketing relations, competition and large units influence potential of high supply, market connection, business networks and joint interest. Regarding the measure of learning, the results showed that the factors of active independent organization, joint interests and attention to competition, industrial knowledge and organizational knowledge influence the sharing of ideas among the units, education, business mentality and technical opportunities.

In this regard the following suggestions are recommended:

- In regard to finance, the industrial clusters should pay more attention to foreign investment and financial incentives as the top priorities.
- In regard to customers, the industrial clusters should pay more attention to marketing relations, business networks and joint interests as the top priorities.
- In regard to internal processes, the industrial clusters should pay more attention to technical skills of unit, skilled human resources and educational system as the top priorities.
- In regard to learning, the industrial clusters should pay more attention to organizational knowledge, business mentality and industrial knowledge as the top priorities.

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