

Evaluating the Characteristics of Knowledge-Based Companies

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Abstract: Knowledge-based companies are recognized as important sources of income, employment and also a considerable factor in economic development that reduce inflation and increase revenues with the aid of productivity. Current research has been carried out in order to further understanding of a knowledge-based company. This will help define the main dimensions of a knowledge-based company and provide methods to evaluate to what extent are the companies considered knowledge-based. Therefore, the aim of this study is applicable and is of descriptive research category. For this purpose, after reviewing the related literature, a model consisting of 6 dimensions, 23 components and 40 indexes was presented to evaluate the knowledge-based companies at Fars Science and Technology Park. The non-probabilistic statistical sampling method was used including companies at incubators of Fars Science and Technology Park. A series of hypothesis were formed and a study questionnaire was developed. The results of our analysis indicated that knowledge-based companies at Fars Science and Technology Park were in a desirable position in terms of the characteristics of being a knowledge-based company. Afterward, the weight of dimensions and criteria were calculated using the analytic hierarchy process and simple additive weighting used to score the extent that companies at Fars Science and Technology Park were knowledge-based.

Key words: Knowledge-based companies, knowledge-based characteristics, Fars Science and Technology Park, employment, dimensions, probabilistic

INTRODUCTION

Knowledge has become the most valuable driver for companies in the last decades (Wu *et al.*, 2008). In industrial era, land, capital and labor were the main drivers of competitive edges. However, knowledge plays a more critical role in the knowledge-based economy era and knowledge has also become the most valuable asset in companies. For example, since the 1980s, some economists such as Romer (1999), Machlup (1962) and Drucker (1999) predicted the emergence of a new economic era in which knowledge is the main source of wealth and economic production. In other words, the economy in the new era has moved away from the resource-based economy and has become closer to the knowledge-based economy which was first, introduced by the Organization for Economic Co-operation and Development (OECD) in 1996. According to OECD's definition, a knowledge-based economy is an economy based on the production, distribution and application of investment in knowledge and information

(Magnier-Watanabe and Senoo, 2008). The Asia-Pacific Economic Co-operation (APEC) economic committee extends the OECD's idea of the knowledge-based economy and considers it an economy in which the production, distribution and use of knowledge are the main driver of economic growth, wealth generation and employment in all industries (Memarnejad, 2005). Activities of knowledge-based companies are considered as the engine of economic development and are considered as the main source of employment creation and facilitating the entrepreneurial environment and has the potential to accelerate the creativity, innovation and opening up of new commercialization opportunities. Therefore, knowledge-based companies have become the dominant structure of most public and private companies (Gottschalk *et al.*, 2009). In Iran, the formation of knowledge-based companies has been accompanied by a growing trend. Currently, more than 3700 Iranian companies have been listed as knowledge-based companies (<http://pub.daneshbonyan.ir>). Like any other organization, knowledge-based companies must have set

of needed features and characteristics (aligned with their goals and needs) to be classified as knowledge-based companies. These characteristics are the main factors behind the performance of a knowledge-based company, the absence of each can block the way to success and are in fact the essential requirements that should be achieved as an intermediate goal for achieving the main purpose.

Concepts such as knowledge-based organization, intelligent or knowledge creating company have been talked about in many studies related to them (Neagu, 2007). While types of knowledge management, knowledge measurement and organizational learning have been the most challenging research topics in the past decade, relatively few methods have been proposed in order to identify and evaluate knowledge-based companies. Therefore, this study attempts to define the main dimensions of a knowledge-based company according to a literature survey and expert interviewing; additionally, this study emphasizes on analyzing whether companies at Fars Science and Technology Park are knowledge-based or not. We provide methods to evaluate to what extent are the companies considered knowledge-based.

Literature review: In knowledge-based companies, economic growth and job creation are realized in line with innovation capacity (Mohammadi and Jafarpanah, 2014). This means that research and development achievements are continuously transformed into a product, process or system through investment. As such, R&D is an important factor in innovating and exploiting the potential of technology in the economy. These companies have grown at an extraordinary rate in recent years (Khyatyan *et al.*, 2015). There are numerous definitions of the knowledge-based organization in the case of intangible assets. From Franklin's point of view, knowledge-based companies are companies that create, develop, deploy and leverage information and knowledge as a way to maintain their competitive advantage (Franklin, 2000).

Lilie's definition of a knowledge-based company is that a knowledge-based system or company is said to be a central part of its internal processes for the exchange of information, the creation and discovery of new solutions and coordination with other companies and systems. Compared to industrial systems that produce tangible outputs, the output of a knowledge-based system or company is widely conceived with significant intangible components such as innovation, creativity, exploration or innovation (Philip, 2001). A knowledge-based company could also be defined as a company where

problem-solving is addressed to project teams where each team is composed of people belonging to different task areas with different kinds of knowledge (Tan, 2002). According to the Law on Supporting Knowledge-based Companies and Institutions for Research and Innovation in Iran, a knowledge-based company is defined as a private or cooperative company or institution that is formed in order to develop knowledge-based economies, substantiation of scientific and economic objectives (such as inventions and innovations) and commercialization of research and development (including designing the production of goods and services) in the field of high-tech and high value-added technology.

The growth and sustainability of knowledge-based companies in a highly competitive environment is due to the existence of knowledge workers (Xinqing *et al.*, 2010). In a knowledge-based economy, more and more of knowledge a company needs to create economic value will be possessed by knowledge workers (Dimovski and Penge, 2004). These independent, highly skilled and flexible workers form the backbone of the knowledge-based economy. Knowledge workers are versatile, autonomous and can build and leverage knowledge to do useful actions with their analytical skills. They are flexible and have a high ambiguity tolerance (Mustapha and Abdullah, 2004).

Drucker's have identified several dimensions but one fundamental aspect of his discussion is the matter of "increasing productivity through the use of science in management and the necessity of rationality and purpose in the workforce (Romer, 1999). He split up the workforce which was more useful than the division of labor force against non-productive forces or workers against supervisors at the time. In his categorization, some employees and in particular the manufacturing staff, dealt with physical objects while other employees worked with immaterial objects. He called these "knowledge-based human capital" (Romer, 1999). And as Drucker predicted, knowledge-based resources are becoming the largest group of the workforce in any developed country (Drucker, 1999).

Knowledge-based company's characteristics: Since, the knowledge-based company is one of the important strategies for the growth, development and prosperity of any country, many companies consider it essential to become knowledge-based in order to act effectively in today's economy. Nevertheless, few companies understand the meaning of being knowledge-based and how to make the necessary changes to achieve it.

Maybe the most common mistake companies consider is that the higher the knowledge content of their

products the closer they are to be knowledge-based. However, products and services are only the visible and tangible reality (the tip of the iceberg) that they show to their customers (Zack, 2003). Grant describes that the principles of organization design, the determinants of the horizontal and vertical boundaries of the firm, organizational innovation and management practices as the basis of organizational capabilities toward being knowledge-based (Grant, 1996). Chase examines the drivers and approaches to building knowledge-based organizations from the view point of entrepreneurs who are responsible for implementing knowledge management as a business strategy. Three general outcomes were obtained which are the following: firstly while organizations have recognized the importance of creating, managing and transferring knowledge they have been unable to translate this competitive need into organizational strategies, secondly, successful implementation of KM is generally, related to “soft” topics such as organizational culture and employees.

The final point is that most organizations have some difficulties in using knowledge management tools and techniques effectively (Chase, 1997). Zack (2003) describes the characteristics of a knowledge-based organization in addition to the product including the process, purpose and perspective and states that any organization, regardless of what it produces can be knowledge-based as long as it takes the knowledge seriously. He also believes that in order to evaluate the degree to which knowledge is an internal part of the organization, the four characteristics including the process, place, purpose and perspective can be used as the basis for evaluation (Zach, 2003). Neagu (2007) identifies the characteristics of knowledge-based organizations.

In per view, knowledge-based organizations should be considered in aspects human resources and work, knowledge creation processes, organizational culture, organization structure management, information and communication technology to determine, if the organization knowledge is based or not. A model of development was developed by Cantu *et al.* (2009). The components of this model are intellectual and human capital, research products and funding and entrepreneurial spin-offs emerging from the research capacities and research-based learning and education. They examined their model on a group of academic researchers. They concluded that this model could be implemented through the diffusion of knowledge assets by solving social and economic needs in different regions and creating value for researchers and for the organization (Cantu *et al.*, 2009). Westerberg *et al.* (2012) investigated

the meaning of the knowledge-based organization and design a model to perception the knowledge-based organization. The model includes resource elements (organizational structure, symbolic tools, material tools), communication processes (learning processes, communication path) and care behaviors (practical experience and theoretical knowledge) (Westerberg *et al.*, 2012).

Houshmand *et al.* (2013) identified four factors that influence the creation and development of knowledge management process including “Human Resources, Information Technology, Education and Culture” and four main sub-processes of knowledge management, “Creation, storage, sharing and application of knowledge” and used a descriptive-survey research method they concluded that the Qom University does not focus much on knowledge management and has a moderate level of readiness for being knowledge-based. Rasouli and Papiyan (2014) extracted 22 concepts of knowledge-based organizations from the literature of the subject and finally developed a conceptual model. The model consists of eight concepts that are: knowledge-based purpose and perspective, strategic factors, organizational factors, knowledge management system, control and evaluation base on knowledge, innovation and creativity and knowledge-based products (Rasouli and Papiyan, 2014).

Abbasi and Eftekhari defined 24 parameters for the monitoring system such as keeping the competitive advantage of the product, pricing the technical knowledge, knowledgeable human capital. Khyatyan *et al.* (2015) in a study “Content Analysis of Knowledge-based Companies’ Characteristics”, based on the analysis of the content of the definitions provided by various researchers as well as the features presented in various studies, identified criteria such as technology novelty and being involved in high-tech industry being new and young businesses, the subject of corporate activity and the characteristics of founders as the main characteristics of knowledge-based companies.

As it can be seen, there are three attitudes toward knowledge-based companies in previous studies. The first view is that if a company creates, uses, shares and transfers knowledge, it is called a knowledge-based company (Chase, 1997; Houshmand *et al.*, 2013). The definition used, here, for the knowledge-based company is the same as the concept of knowledge management. From this perspective, a company that implements and deploys knowledge management in its processes becomes a knowledge-based company. The second approach focuses on organizational design principles and organizational factors such as company size, company’s

age, organizational capabilities (Grant, 1996; Rannikko, 2012; Khyatyan *et al.*, 2015). According to this view, small and medium-sized companies with knowledgeable abilities are considered as knowledge-based companies. The third view holds that the knowledge-based organization has an independent existence and features from other concepts (Rasouli and Papiyan, 2014; Zack, 2003; Neagu, 2007; Cantu *et al.*, 2009; Westerberg *et al.*, 2012). Also, the Ministry of Science and Technology of Iran definition's of knowledge-based companies contains some other criteria in comparison with previous studies. In this study, we are going to define the main dimensions of a knowledge-based company according to a literature survey and expert interviewing; additionally, this study emphasizes on analyzing whether companies at Fars Science and Technology Park are knowledge-based or not. We provide methods to evaluate to what extent are the companies considered knowledge-based.

MATERIALS AND METHODS

In this study, we briefly describe our methodology used to evaluate knowledge-based companies at Fars Science and Technology Park. We describe the identified dimensions and criteria using questionnaires and interviews and briefly describe our data collection. We have used library and field studies as our data collection methods. The library method has been used for reviewing the literature of knowledge-based companies characteristics and the field study has been used for collecting information and distributing questionnaires. This research has three questionnaires. The first questionnaire was developed in order to figure out the dimensions of knowledge-based companies. The second questionnaire was used to identify the degree of companies adherence to the characteristics of knowledge-based companies and the third was used to obtain the weight of the identified criteria and dimensions.

Knowledge-based company dimensions: Following the goal of this study and using the above literature, we needed to develop a list of dimensions and criteria for knowledge-based companies. To decide these dimensions and criteria, we conducted interviews with subject matter with academic experts and managers at Fars Science and Technology Park. These interviews used a predefined questionnaire to avoid bias and capture expert opinion. A group of 10 experts were interviewed to identify knowledge-based companies characteristics and then to

Table 1: Dimensions and criteria

Dimension	Criteria
Purpose	Becoming a learning organization Defining mission and objectives based on knowledge Subject of activity Strategy based of knowledge
Perspective	Culture Following new ideas Knowledge map
Purpose	Knowledge creation Use of knowledge Deployment of processes Team self-management Information and communication technology
Human capital	Creation and Innovation Capability development technical knowledge possession Training and enrichment Education level
Product	Knowledge-based product Commercialization New technology Technology level
Value-added activity	50% of value-added to company's income is from knowledge-based activities

validate both dimensions and criteria of knowledge-based companies. All these experts had both considerable academic background and practical personal experience with knowledge-based companies. Following the expert interviews and the literature study, the following dimensions and criteria listed in Table 1 were identified as the characteristics of knowledge-based companies.

Adherence: Our second questionnaire and data collection was used to identify the degree of adherence of companies to knowledge-based companies characteristics. The questionnaire used a 5-point Likert scale ranging from extremely disagree to extremely agree. The non-probabilistic statistical sampling method was used and it was consist of knowledge-based companies at incubators of Fars Science and Technology Park. According to the number of board members and top managers in each company, at least 2 and at most 6 questionnaires were distributed among them. We used face-to-face approach to hand questionnaires and hence, 90 questionnaires were collected and their data used in statistical analysis using SPSS. Some of the questions are shown in Table 2.

Dimension weights: For obtaining the weight of the dimensions and the criteria, we used AHP method. Therefore, the third questionnaire was made based on the intensity of importance in AHP and was filled by a group of experts including academia and managers at Fars Science and Technology Park. Twenty questionnaires were collected and the data was used in expert choice to calculate the weights.

Table 2: A sample of the second questionnaire

Questions	Strongly	Mildly	Neutral	Mildly	Strongly
	disagree	disagree		agree	
The company's strategy is aligned with the company's knowledge and experiences					
Managers and leaders ensure that the company's activities are in line with the company's values					
The company's mission and goals are defined based on knowledge					
The company uses a knowledge-based perspective to outline long-term goals and objectives					
In the company, the values of innovation and continuous learning are explained and strengthened					
The company provides the opportunity for its employees to experience and learn					
The company has the potential to launch and use knowledge management					
The company has well-equipped systems and technologies					
The experiences and results of researches are documented properly					
The company cares about employee's development and empowerment					
Employees who carry out research and development projects have the necessary capabilities and competencies					
The company is pioneer in designing new products					
At least 50% of the company's revenue in the past financial year has been due to the sale of knowledge-based products					

Hypothesis: Based on the identified dimensions, one main hypothesis and six sub-hypothesis were formed:

- H_0 : knowledge-based companies at Fars Science and Technology Park do not follow the characteristics of being knowledge-based
- H_{0a1} : purpose dimension is not a deciding factor for knowledge-based companies
- H_{0a2} : perspective dimension is not a deciding factor for knowledge-based companies
- H_{0a3} : process dimension is not a deciding factor for knowledge-based companies
- H_{0a4} : human capital dimension is not a deciding factor for knowledge-based companies
- H_{0a5} : product dimension is not a deciding factor for knowledge-based companies
- H_{0a6} : value-added dimension is not a deciding factor for knowledge-based companies

RESULTS AND DISCUSSION

As the questionnaires are based on the existing indicators in the literature. Therefore, there is some qualitative content validity within the questions. Also, validity testing is performed on all variables of the questionnaire using the content validity ratio and the validation was accepted. We tested the internal consistency of each identified dimension using Cronbach's alpha. The results of our test is shown in Table 3. Since, the dimension of value-added activity has only one component in the questionnaire the degree of its reliability is not measurable. As can be seen, the alpha rate in four dimensions of 'purpose', 'perspective', 'process' and 'human capital' is higher than 0.7. The alpha value for the product dimension is also 0.694 and is close to seven. In total, Cronbach's alpha is a total of 0.932 which indicates a high correlation between questions and therefore, it can be said that the questionnaire has an appropriate reliability.

Table 3: Results of data reliability

Dimensions	Cronbach's alpha
Purpose	0.781
Perspective	0.835
Process	0.765
Human capital	0.705
Product	0.694
Value-added activity	-
Total alpha	0.932

Table 4: One-sample statistics

Dimensions	N	Mean	SD	SE mean
Purpose	90	4.2833	0.43141	0.07876
Perspective	90	4.3933	0.40423	0.07380
Process	90	4.0972	0.36164	0.06603
Human capital	90	4.0278	0.39895	0.07284
Product	90	4.0067	0.51591	0.09419
Value added activity	90	4.0333	1.29943	0.23724
Being knowledge-based	90	4.1758	0.36486	0.06661

One-sample t-test: After collecting and encoding the data of the second questionnaire, we performed one-sample t-test thorough SPSS to test the hypothesis of the research. According to the hypothesis test, hypothesis were going to be accepted at the 0.05 significance level. The result are shown in Table 4 and 5.

According to Table 4, since, the significance level of this test is 0.0 and <0.05, the assumption of average being equal with 3 in the 95% confidence interval (0.05 error level) is rejected. On the other hand, since, both upper and lower strips are positive and do not contain zero, it is concluded that the total mean is significantly >3 and therefore, the Hypothesis H_0 is rejected and Hypothesis H_1 is accepted. This conclusion is also true for the other 6 sub-hypothesis which means that the knowledge-based companies at Fars Science and Technology Park are knowledge-based and have the characteristics of such companies.

Analytic hierarchy process: The Analytic Hierarchy Process (AHP) is an effective tool for dealing with complex decision making and can help the decision maker

Table 5: One-sample t-test

Dimensions	t-values	df	Sig. (2-tailed)	Mean difference	95% confidence interval of the difference	
					Lower	Upper
Purpose	16.293	89	0.000	1.28333	1.1222	1.4444
Perspective	18.879	89	0.000	1.39333	1.2424	1.5443
Process	16.618	89	0.000	1.09722	0.9622	1.2323
Human capital	14.110	89	0.000	1.02778	0.8788	1.1767
Product	10.687	89	0.000	1.00667	0.8140	1.1993
Value added activity	4.356	89	0.000	1.03333	0.5481	1.5185
Being knowledge-based	17.651	89	0.000	1.17583	1.0396	1.3121

Table 6: Fundamental scale for pairwise comparison

Intensity of importance	Definition	Explanation
1	Equal importance	Two activities contribute equally to the objective
3	Moderate importance	Experience and judgment slightly favor one activity over another
5	Strong importance	Experience and judgment strongly favor one activity over another
7	Very strong	An activity is favored very strongly over another
9	Extreme importance	The evidence favoring one activity over another is of the highest possible order of affirmation

Intensity of 2, 4, 6 and 8 can be used to express intermediate values. Intensities of 1.1, 1.2, 1.3, etc. can be used for elements that very close in importance (Saaty, 1980)

to set priorities and make the best decision (Saaty, 1980). By lessening complex choices to a progression of pairwise comparison and afterwards synthesizing the results, the AHP captures the subjective and objective parts of a decision (Saaty, 1980). To make comparisons, we need a scale of numbers that shows dominance of one element over another element in relation to the criterion or property with which they are compared (Saaty, 2008) and which is shown in Table 6. The comparison of priorities is measured using comparisons in pairs. The comparison is a sequence from bottom to top which is from choices to factors and factors to goal.

AHP creates a weight for each evaluation criterion according to the pairwise comparisons of the criteria of the decision maker. The higher the weight, the more important the corresponding criterion is. Then, for a fixed criterion, the AHP appoints a score to each option based on the decision maker's pairwise comparisons of the options, according to that criterion. The higher the score, the better the option's performance in relation to the considered criterion. Eventually, the AHP combines the criteria weights and the options scores, thus, determining a global score for every option and a resulting ranking. The global score for a given option is a weighted sum of the results obtained in relation to each of the criteria. There are two ways to calculate the weights through AHP.

The classical numerical method Expert Choice (EC): Software which is a collaborative decision support software that facilitates group decisions that are more efficient, analytical and justifiable and structures decisions using the Analytic Hierarchy Process (AHP). In this study, in order to calculate the weights of each

Table 7: Weights of each dimension

Dimensions	AHP weights
Purpose	0.331
Perspective	0.296
Process	0.056
Human capital	0.166
Product	0.112
Value-added activity	0.042

criterion and dimension, the AHP method was used and it was calculated by the expert choice software (<http://pub.daneshbonyan.ir>). The results of weights for dimensions can be Table 7. As it can be seen, "purpose" is the most important dimension and "value-added activity" dimension is the least important dimension from the expert's points of view.

Simple Additive Weighting (SAW): Simple Additive Weighting (SAW), also known as a weighted linear combination or scoring method is a simple and regular multi-attribute decision-making technique. The method is based on the average weighted. For each alternative an evaluation score is determined by multiplying the scaled value given to the alternative of that attribute with the relative weights directly assigned by the decision-maker by summing the items for all criteria. The advantage of this method is that it is a proportional linear transformation of the raw data, meaning that the relative magnitude order of the standardized scores remains the same. The SAW process involves these steps.

Step 1: Construct a pair-wise comparison matrix (n×n) for objective criteria using Saaty's 1-9 pair-wise comparison scale shown in Table 1. In other words, it is used to compare each criterion with the other one by one.

Table 8: Normalized matrix table

Company	Purpose	Perspective	Process	Human capital	Product	Value-added
1	0.919	0.893	0.883	0.872	0.783	0.35
2	0.849	0.924	0.849	0.874	0.860	0.94
3	0.918	0.940	0.907	0.905	0.890	0.96
....
28	0.782	0.854	0.829	0.853	0.839	0.52
29	0.891	0.979	0.911	0.911	0.979	0.97
30	0.867	0.996	0.865	0.947	0.929	1.00

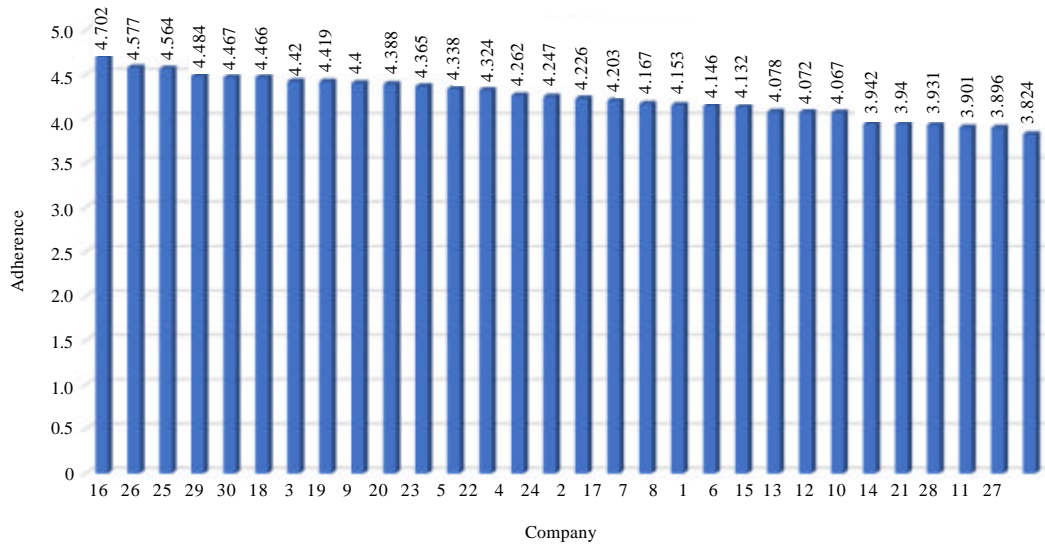


Fig. 1: Knowledge-based companies' ranking (by SAW method)

Step 2: Construct the normalized decision matrix by the following equation:

$$r_{ij} = \frac{X_{ij}}{X_j^{max}} \quad i = 1, 2, \dots, m$$

Step 3: Construct weighted normalized decision matrix:

$$V_{ij} = W_j * r_{ij}, \quad \sum_{i=1}^n W_i = 1$$

Step 4: Calculate the score of each alternative:

$$S_i = \sum_j^m v_{ij}, \quad i = 1, 2, \dots, n$$

Step 5: Select the best alternative:

$$BA_{saw} = \max_{i=1}^n S_i$$

Where:

BA_{saw} = Best alternative in Simple Additive Weighting (SAW) method

S_i = Matrix score

For calculating the simple additive weighting, first, the amount of each component in relation to the relevant

dimension was summed then the average was taken and the resulting amount was considered as the amount of each dimension for each company. After that, the dimension's score were normalized which are shown in Table 8 and then the weights which obtained by the AHP method were multiplied. Finally, the numbers were rolled together and ranked from the highest to the lowest. Therefore, the sum column in Fig. 1 shows the extent to which companies at Fars Science and Technology Park are knowledge-based and also they are ranked from 1-30 in terms of how knowledge-based they are.

CONCLUSION

Knowledge-based companies are recognized as important sources of income, employment and also a considerable factor in economic development that reduce inflation and increase revenues with the aid of productivity. Current research has been carried out in order to further understanding of a knowledge-based company. Most of previous studies have identified the characteristics of knowledge-based companies (Grant, 1996; Zack, 2003, 2004; Vreja, 2011; Westerberg *et al.*, 2012; Khyatyan *et al.*, 2015) or suggested a model for knowledge-based companies

(Philip, 2001; Neagu, 2007; Tongo, 2013; Rasouli and Papiyan, 2014; but few studies (Chase, 1997; Cantu *et al.*, 2009; Houshmand *et al.*, 2013) have examined the observance of these features in knowledge-based companies. The aim of this study was to define the main dimensions of knowledge-based companies and provide methods to evaluate to what extent are the companies considered knowledge-based.

For this purpose after reviewing the related literature and interviewing with experts, a model consisting 6 dimensions, 23 components and 40 indexes was presented to evaluate the knowledge-based companies. The non-probabilistic statistical sampling method was used including companies at incubators of Fars Science and Technology Park. A series of hypothesis were formed and a study questionnaire was developed. According to the hypothesis test, hypothesis was accepted at the 0.05 significance level.

So, the results of our analysis indicated that knowledge-based companies at Fars Science and Technology Park were in a desirable position in terms of the characteristics of being a knowledge-based company. Subsequently, the weight of dimensions and criteria were calculated using the analytic hierarchy process. "Purpose" was the most important dimension at 0.331 and "value-added activity" dimension was the least important dimension at 0.042 from the expert's points of view. In the end, simple additive weighting used to score the extent that companies at Fars Science and Technology Park were knowledge-based.

ACKNOWLEDGEMENT

This research did not receive any specific grant from funding agencies in the public, commercial or not-for-profit sectors.

REFERENCES

- Cantu, F.J., A. Bustani, A. Molina and H. Moreira, 2009. A knowledge-based development model: The research chair strategy. *J. Knowl. Manage.*, 13: 154-170.
- Chase, R.L., 1997. The knowledge-based organization: An international survey. *J. Knowl. Manage.*, 1: 38-49.
- Dimovski, V. and S. Penge, 2004. Creating the knowledge based organization through learning implementation framework: Conceptual model of Slovenia enterprises. *Intl. Bus. Econ. Res. J.*, 3: 73-88.
- Drucker, P.F., 1999. Knowledge-worker productivity: The biggest challenge. *California Manage. Rev.*, 41: 79-94.
- Franklin, P., 2000. Doing strategy through culture in knowledge-based organizations. *Strategic Change*, 9: 129-134.
- Gottschalk, P., S. Holgersson and J.T. Karlson, 2009. How knowledge organizations work: The case of detectives. *Learn. Organ.*, 16: 88-102.
- Grant, R.M., 1996. Toward a knowledge-based theory of the firm. *Strategic Manage. J.*, 17: 109-122.
- Houshmand, H., S. Mirafzal and J. Rezaie, 2013. A lomodel to assess knowledge management in knowledge-based organizations: A case at Qom University. *J. Sci. Technol. Parks Incubators*, 10: 65-77.
- Khyatyan, M.S., S.H. Tabatabaieian, M. Amiri and M. Eliasi, 2015. Content analysis of knowledge-based firms characteristics. *Organizational Resour. Manage. Res.*, 5: 21-47.
- Machlup, F., 1962. *The Production and Distribution of Knowledge in the United States*. Prienceton University, Prienceton, New Jersey, Pages: 436.
- Magnier-Watanabe, R. and D. Senoo, 2008. Organizational characteristics as prescriptive factors of knowledge management initiatives. *J. Knowl. Manage.*, 12: 21-36.
- Memarnejad, A., 2005. Knowledge based economy: Requirements, indicators, Irans performance, challenges and policy implications. *Q. J. New Econ. Commerce*, 1: 83-108.
- Mohammadi, V. and I. Jafarpanah, 2014. Marketing strategies in knowledge-based companies of ICT services. *J. Mgmt. Sustainability*, 4: 199-207.
- Mustapha, R. and A. Abdullah, 2004. Malaysia transitions toward a knowledge-based economy. *J. Technol. Stud.*, 30: 51-61.
- Neagu, C.D., 2007. Knowledge based organization: An identification model. *Proceedings of the IFIP International Conference Summer School on the Future of Identity in the Information Society*, August 4-10, 2007, Springer, Boston, Massachusetts, ISBN:978-1-4419-4629-4, pp: 407-421.
- Philip, L., 2001. Case study of a knowledge-based organization. Master Thesis, Athabasca University, Athabasca, Canada.
- Rannikko, H., 2012. Early development of new technology-based firms: A longitudinal analysis on new technology-based firms development from population level and firm level perspectives. Ph.D Thesis, Helsingin Yliopiston Paakirjasto, Kaisa-talo, Helsinki, Finland.

- Rasouli, R. and N. Papian, 2014. Knowledge-based companies in national media: A model. *Q. J. Commun. Model*, 21: 9-39.
- Romer, P.M., 1999. Beyond the Knowledge Worker. In: *Knowledge and Strategy*, Zack, M.H. (Ed.). Butterworth Heinemann, Oxford, UK., ISBN:9780750670883, pp: 69-76.
- Saaty, T.L., 1980. *The Analytical Hierarchy Process: Planning, Priority, Resource Allocation*. 2nd Edn., McGraw-Hill, New York, USA., ISBN:9780070543713, Pages: 287.
- Saaty, T.L., 2008. Decision making with the analytic hierarchy process. *Int. J. Serv. Sci.*, 1: 83-98.
- Tongo, C.I., 2013. A performance model for knowledge-based firms: Lessons for managers. *Intl. J. Manage.*, 30: 704-716.
- Vreja, L.O., 2011. The concept of knowledge-based organization within the present economic environment. *Euromentor J. Stud. About Educ.*, 2: 53-67.
- Westerberg, K., J. Hjelte, J. Brannstrom and U. Hyvonen, 2012. The meaning of a knowledge-based organization in Swedish municipal elderly care. *Soc. Work Educ.*, 31: 465-484.
- Wu, L.C., C.S. Ong and Y.W. Hsu, 2008. Knowledge-based organization evaluation. *Decision Support Syst.*, 45: 541-549.
- Xinqing, S., W. Pengju and M. Xiaohua, 2010. Research on the competitiveness of knowledge-based workers in knowledge-based organization. *Proceedings of the 7th International Conference on Innovation and Management*, December 4-5 2010, Wuhan, China, pp: 1409-1413.
- Zack, M.H., 2003. Rethinking the knowledge based organizations. *Sloan Manage. Rev.*, 44: 67-71.
- Zack, M.H., 2004. What is a knowledge-based organization?. *Proceedings of the 5th International Conference on Organizational Learning and Knowledge (OLK5)*(Vol. 30), May 30-June 2, 2003, Lancaster University Management School, Lancaster, UK., pp: 1-7.