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 at 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.

Keywords: 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 (Memarianjad, 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 (Zack, 2003). Neagu (2007) identifies the characteristics of knowledge-based organizations.

In general, 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. Khayyam et al. (2015) in a study “Content Analysis of Knowledge-based Company’s 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; Khayyam 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; Zaeck, 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 company’s 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 company’s 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 company’s characteristics and then to 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.

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

Adherence: Our second questionnaire and data collection was used to identify the degree of adherence of companies to knowledge-based company’s 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

<table>
<thead>
<tr>
<th>Questions</th>
<th>Strongly disagree</th>
<th>Mildly disagree</th>
<th>Neutral</th>
<th>Mildly agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>The company’s strategy is aligned with the company’s knowledge and experiences</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The company’s mission and goals are defined based on knowledge</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The company uses a knowledge-based perspective to outline long-term goals and objectives</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The company provides the opportunity for its employees to experience and learn</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The company has the potential to launch and use knowledge management</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The company has well-equipped systems and technologies</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The experiences and results of researches are documented properly</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The company cares about employees’ development and empowerment</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employees who carry out research and development projects have the necessary capabilities and competencies</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The company is pioneer in designing new products</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>At least 50% of the company’s revenue in the past financial year has been due to the sale of knowledge-based products</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

- H0: Knowledge-based companies at Fars Science and Technology Park do not follow the characteristics of being knowledge-based
- H1p: Purpose dimension is not a deciding factor for knowledge-based companies
- H1e: Perspective dimension is not a deciding factor for knowledge-based companies
- H1p: Process dimension is not a deciding factor for knowledge-based companies
- H1e: Human capital dimension is not a deciding factor for knowledge-based companies
- H1e: Product dimension is not a deciding factor for knowledge-based companies
- H1e: 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

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>Cronbach’s alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose</td>
<td>0.781</td>
</tr>
<tr>
<td>Perspective</td>
<td>0.855</td>
</tr>
<tr>
<td>Process</td>
<td>0.705</td>
</tr>
<tr>
<td>Human capital</td>
<td>0.705</td>
</tr>
<tr>
<td>Product</td>
<td>0.694</td>
</tr>
<tr>
<td>Value-added activity</td>
<td>-</td>
</tr>
<tr>
<td>Total alpha</td>
<td>0.932</td>
</tr>
</tbody>
</table>

Table 4: One-sample statistics

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
<th>SE mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose</td>
<td>90</td>
<td>4.283</td>
<td>0.451</td>
<td>0.07876</td>
</tr>
<tr>
<td>Perspective</td>
<td>90</td>
<td>4.353</td>
<td>0.404</td>
<td>0.07130</td>
</tr>
<tr>
<td>Process</td>
<td>90</td>
<td>4.972</td>
<td>0.361</td>
<td>0.06693</td>
</tr>
<tr>
<td>Human capital</td>
<td>90</td>
<td>4.028</td>
<td>0.398</td>
<td>0.07284</td>
</tr>
<tr>
<td>Product</td>
<td>90</td>
<td>4.006</td>
<td>0.515</td>
<td>0.09419</td>
</tr>
<tr>
<td>Value-added activity</td>
<td>90</td>
<td>4.033</td>
<td>1.299</td>
<td>0.23724</td>
</tr>
<tr>
<td>Being knowledge-based</td>
<td>90</td>
<td>4.175</td>
<td>0.364</td>
<td>0.06601</td>
</tr>
</tbody>
</table>

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 H0 is rejected and Hypothesis H1 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.
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
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

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

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

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

\[ r_{ij} = \frac{x_{ij}}{\sum_{j=1}^{n} x_{ij}} \quad i = 1, 2, ..., m \]

**Step 3:** Construct weighted normalized decision matrix:

\[ V_{ij} = W_i \cdot r_{ij} \quad \sum_{i=1}^{m} W_i = 1 \]

**Step 4:** Calculate the score of each alternative:

\[ S_i = \sum_{j=1}^{n} V_{ij} \quad i = 1, 2, ..., n \]

**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; Zaek, 2003, 2004; Vreja, 2011; Westerberg et al., 2012; Khytyun 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.

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REFERENCES


