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Identifying and Ranking the Components Affecting the Failure of Knowledge-based Companies in Iran and its Ranking by AHP Technique (The Case Study: Technology and Science Park of Kermanshah)

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ABSTRACT

In the history, the different methods of economic production have been introduced as the dominant method. All of them have a start time, peak time, and wane time and finally, left scene for another method. Today, we live in an era that the knowledge-based economy is introduced as a dominant method of economic production. It can be said that all countries try to improve in this field by introducing their strategies. In the new method, the different countries try to get away of method of industrial mass production and be successful in producing the developed technologies and offering services by following the innovation in the technology. These services and technologies can attract market because of their innovation. To this end, these advanced technologies will capture a major contribution of the GDP revenues. Since a decade ago, by launching technology-science parks, Iran has tried to support the knowledge-based companies to produce and provide goods and high technology services and therefore, get away from the single-product economy and raw materials sale. In this situation, There are challenges in this field. The present study tries to identify the components affecting the failure of knowledge-based companies and their ranking.

Introduction

After the success of the United States of America in passing the information era and entering the Knowledge-based economy era, many of world countries tried to enter the new economic

era fast and move along with science and technology. In the new era, the innovation in the science-based technologies is suggested as the important and valuable factors to continue sustainable development. This purpose is called as a Knowledge-based economy in Iran. Since a decade ago, by launching the technology and science parks, government has tried to support the start-up companies which tend to develop the new technologies based on the new science.

The process of establishing a technology and science parks in Iran started a decade ago; but, unfortunately, the appropriate result has not been obtained yet. In fact, the science parks had a main role in the knowledge-based economy, but after one decade, we are still far from the ideal of knowledge-based economy. The present study tries to find a solution for this problem. It seems that this matter has been challenged the activities of the science parks and start-up companies.

The Literature Review

Today, most of the developed countries have achieved the modern knowledge-based economy. Iran, based on its twenty-year outlook, tries to achieve a knowledge-based economy in the coming two decades. Given that technology-science parks are known as one of the innovation system components, the method of development of them has been attended significantly in the recent country development program.

Start-up company or knowledge-based institution is a public or private company or institution that is formed to the synergy of the science and wealth, develop knowledge-based economy, achieve the economic and scientific purposes (include develop and use the innovation), and commercialize the research results (include planning and produce the services and products) in the field of the high technology (high tech) and with much surplus value, especially in the related software production (Alahyari & Abbasi, 2011).

Nowadays, the role of the technology- science parks and technology growth centers as a part of the innovation foundations to actualize the plans such as technology transfer, entrepreneurship, and commercializing the research findings through consulting services, contribution attract, and reducing the start-up private company risk is clearly evident.

Based on the definition presented by International Organization for parks, basically, the technology and science parks should be able to make an appropriate relation between universities, research centers, and all centers related to the higher education. Also, these parks should be planned in way that being able to encourage and strengthen the science-based industries and institution that have high economic surplus value and have the physical presence in these parks.

Commercialization is a term that has different definitions. Some people believe that it is just an standardization of the production operation to present and transfer the technical knowledge to others. Some people define the commercialization as transferring the science and knowledge from one person or group to another person or group to use it in the production process.

In the simplest definition, the commercialization refers to the transfer of the technology. In other words, commercialization process is the process of transferring the knowledge and technology from research centers to the new industries or businesses. From the innovation

view, the commercialization means that the modern technology and knowledge should flow from the institutes presenting it to the demanding companies and industries.

The key concept of the knowledge-based economy is that the knowledge and education, which is known as the human capital, should be considered as the production criterion or production asset. Based on the Powell and Snellman theory (2004) in the knowledge economy paper, the knowledge-based economy is defined as an economic system that the products and services are based on the knowledge that accelerates the scientific and technical development and is accompanied with the rapid depreciation of the product and service. The key and the integral part of the knowledge-based economy is to emphasize on the mental abilities more than natural resources and physical input.

Based on the studies of the Asia-Pacific Economic Cooperation forums and according to the experimental evidences, the most successful countries are those that their economy has the least distance to the characteristics of the knowledge-based economy. Moreover, from this committee view, a knowledge that is the foundation of the knowledge-based economy is far beyond the technical knowledge and includes the cultural and social and management knowledge, too.

Economy Evolution to the Knowledge-Based Economy

One of the most beneficial works of the Pink is to divide the different economy periods to four classified periods. In each of these periods, an especial workforce drives the economic activities and evolution. This book, which published in 2005, says that the business world future will belong to right-brained people.

Pink (2005) classifies the economic eras into four ages, namely agricultural age, industrial age, information age, and conceptual age. In the fourth age, in which we live, pink focuses on the business success. From the Pink's view, the factor forming the conceptual age is due to the occurrence of the three major evolutions: First factor is the abundance which refers to many choices of consumers and the lack of service and product shortage. The second factor is Asia that means the outsourcing of the many economic activities to Asian inexpensive country. The third factor is the automation that means the computerization and using the robots and technologies.

From the Pink's (2005) view, these processes introduce three critical questions that are important for any business. The questions are:

- Is this business done faster by the computer?
- Is my offer the market demand in the abundance age?
- Is there someone else in overseas who runs this business or produce the same product or service with lower price?

Finally, Pink (2005) finds the importance of the creativity and its features.

Definition of the Technology and Science Park

In future, the nations success will be dependent on their grow level and its effect on the scientific and research relations and strategic products. The countries have been able to enhance the standard level by continuous improvement in science, technology, and culture, as far as they have dominated, scientifically and technologically, in the World Wide Business in national and international fields. Applicable science and top technologies are the main

indicators of development. The results of World Watch Entrepreneurship research in developed countries and developing countries show that we cannot have a stable situation in comparison and active participation in international scientific and commercial arena without enough attention to knowledge-based entrepreneurship (Koh, & Tschang, 2005).

The final mission of the technology parks is to coordinate the results obtained from the university research and industry needs and fill the gap between university and industry. This leads to commercializing the science. The commercialization is a process to transform the theoretical science of university to different economic activities. In the new view of university that offered in the Third Millennium, the university task is not only science and knowledge production, but also their important task is to transfer the technology activities. After education, the academic entrepreneurship is the new task of the universities (Talebi, Sanaei Pour, & Heidari, 2011).

The success of companies that are in the technology parks of Stanford and M. I. T universities is inspiring the parks developers and economy Policy makers to establish the technology parks at the college level.

The purpose of Technology Park is to commercialize the ideas and scientific research, encourage and support the technical start-up companies, sustainable occupation, and action performance as the intermediate loop between universities and industries. In fact, the ultimate goal of the technology park is to create value and national and regional development (Talebi et al., 2011). Any start-up company which established in the technology- science parks typically goes through the following steps:

Pre-Growth Stage

The main goal of this stage is to support the idea of owners. In different countries, regarding the activity nature of the idea, the technology growth centers access the financial resources and other facilities and support the ideas by these resources. The support will be limited in this stage. This action establishes the basic relationship between universities and industry. The goal of this stage is to support the innovation that is accompanied with different risks.

Growth Stage

In this stage, the execution plan of the idea is clear and the operation of transforming ideas into product has been started. The technology growth centers correct and modify the plan and provide the financial resources and other additional facilities to implement the plan. In this stage, the company has not been achieved the profitability stage yet. The technology growth centers are not able to provide the required services and other facilities or need to more especial facilities compared with the previous stage.

Post-Growth Stage

In this stage, the company reaches the stage of profitability and requires the especial facilities. In fact, except this matter, the company does not need the technology growth center. It seems that many of these centers continue the start-up company support and help them to develop a lot of programs.

The technology growth centers have been formed with regard to the developmental level of the technology in the industrial countries and developing countries. The main goal and priority in these centers was to support the technical start-up companies that their managers wanted to transform their ideas, which were based on the innovation in technology, to the new services and products and sell it in the market (Mark, 2009). Figure 1 presents the startup cycle of business.

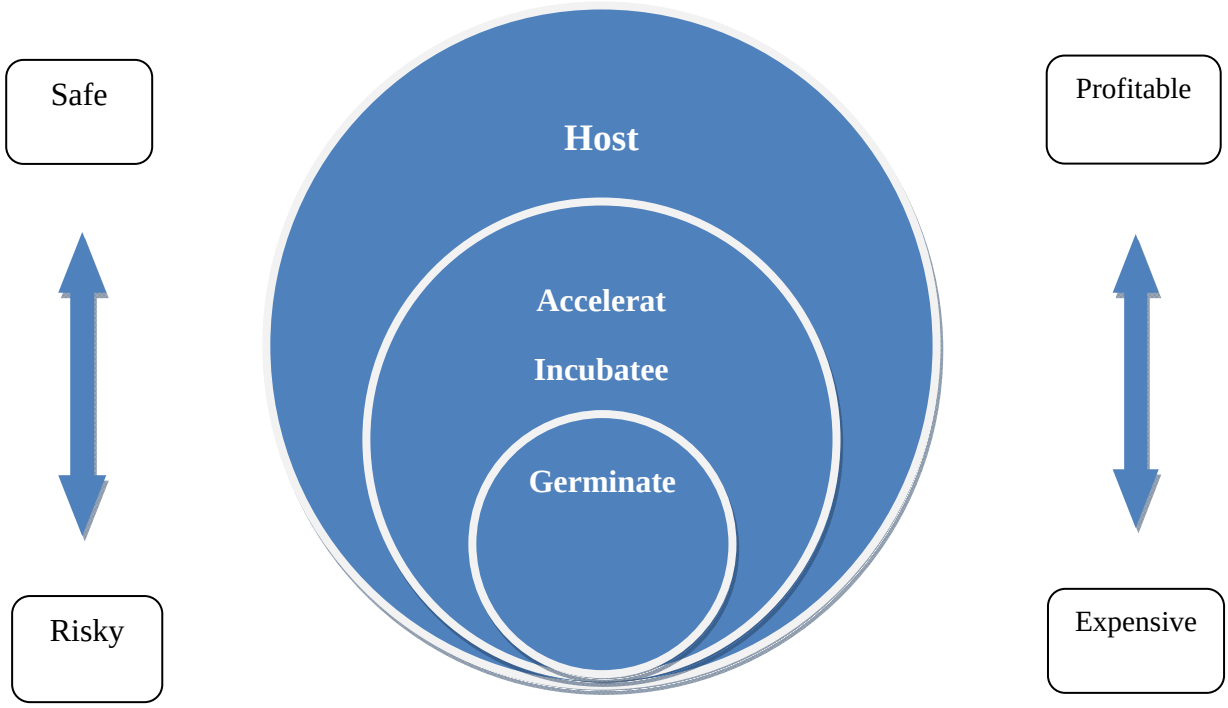

Figure 1. The startup cycle of business (Mark, 2009)

History of the Technology and Science Parks in Iran

The first research and scientific town in Iran was established in 1993. The suggestion of the preliminary reports was presented by the Steel Company. The general follow-up work was entrusted to the Research Department of Isfahan University of Technology. In the same year, it was approved by the Scientific Research Council. By forming the Board of Trustees, the executive operations of the town were started at 1994; its statute was approved at the SCCR in 1997; and the executive operations of the town were completed in 1999. Finally, the Ghadir technology growth center was launched with 17 research and technical units in 2000. The Pardis technology park performed the preliminary research of locating in 2000 and it was established in the Pardis city in 2001. In terms of functionality, this park, which is affiliated with presidential institution, is different from other Iranian parks. In 2002, The Scientific and Industrial Research Organization of west Azerbaijan, Semnan, Khorasan, Fars, Guilan, Markazi, and Yazd closed and changed into the technology and science parks. Based on this, the process of establishment and development of the parks should be continued according to the duties of the Fifth Development Plan. This process has been observed in the annual budget

law and its development is continued by this deputy as the charge of the budget on one hand and the Ministry of Science, Research and Technology, on the other hand.

Kermanshah Technology and Science Park

The technology growth center of the Jihad university of Kermanshah province officially began its activities by the support of national and provincial executives and benefit from resources and facilities of Jihad University in the summer of 2005. Then, to support and contribute to the development of knowledge-based companies, by having new ideas, emphasis on the commercialization the research results, obtaining provincial approval of the committee of ministers, and with the benefit of protection laws including the benefits of economic activities in free zones, the Kermanshah technology and science park was established in 2006. Until half of 2014, more than 225 technical units have been activated in the technology and science parks and technology growth centers and have gained valuable achievements.

Bresciani and Eppler (2010), in their paper, expressed the importance of branding approach for start-up companies and it is stated that branding has become a vital activity for start-up companies. Indeed, their survival depends on the importance of this subject. To provide this paper, 15 successful starts-up companies in Swiss are analyzed. Finally, this paper, with emphasizing that these start-ups should not compare themselves with big companies, offer a clear framework to make brand in start-ups. This paper concludes that need of start-ups to customer conducts the brand subject. Moreover, Khodadad Hoseini and Sohrabi (2006) believe that in Iran there is not a coherent and targeted structure of technology trades. This problem causes many difficulties for both supplier and suppliant.

In the triple helix model, the role of University, Industry, and Government overlap. University, beside the education and research, creates Entrepreneurship, too. Industry, beside the good produce, disseminates knowledge. Government invests in fields such as knowledge creation, innovation, technology, and production goods and service. A comprehensive management of relation between University, Industry, and Government needs intelligent structures, suitable space for innovation, efficient organized mechanisms, connective mechanisms, and common organizations.

The Study

In this study, we investigate the most important reasons of the failure of the knowledge- based companies by referring to the information collected from units sponsored by Kermanshah technology and Science Park. Given that the situations of all the Iran technology and science parks are similar, the Kermanshah technology and science park was selected as a sample. According to the research subject, the most important challenges that the technical units are facing are to produce the knowledge-based services and products and develop the knowledge-based economy. These challenges should be identified and their importance should be studied. Figure 2 shows the conceptual model of the research.

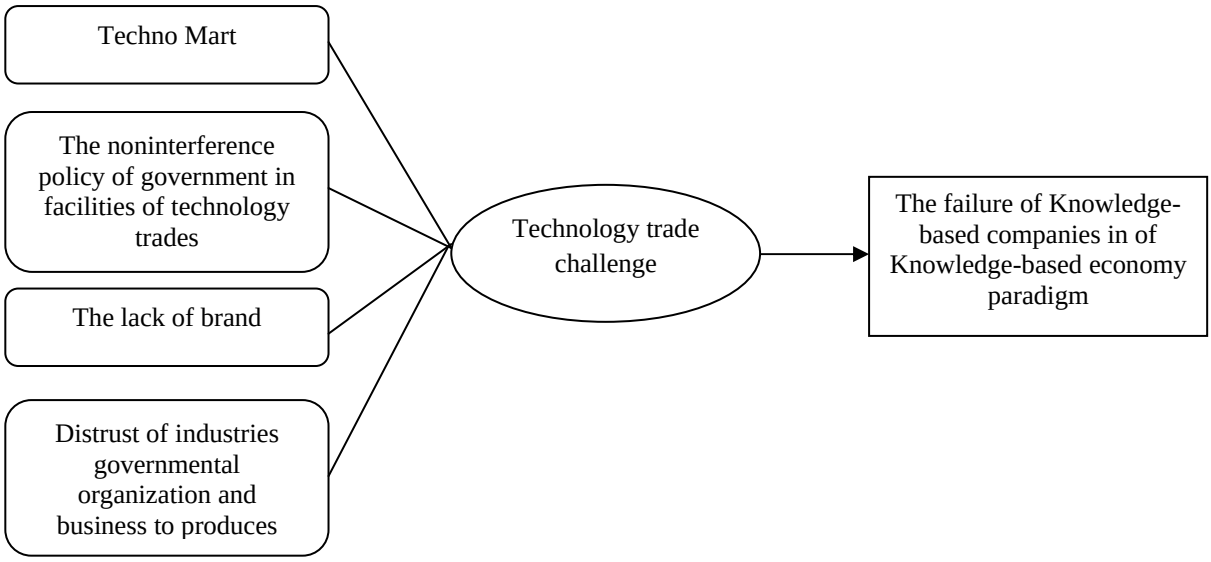

Figure 2. The conceptual model of the research

The main goal of the present study is to find the variables that prevent developing the knowledge-based economy. We try to identify the point in which the knowledge-based economy faces a strategic challenge (matter of selling the knowledge-based services and products). This is the same challenge that is the main obstacle in completing the cycle of knowledge-based economy and thus, producing the new technologies, developing the new sciences, reducing the unemployment rate, producing wealth, and many sustainable development indicators.

With regard to the nature of the present study, the method used in this study is the survey-descriptive because this method describes and focuses on the situations, relations, common beliefs, current processes, evident effects, and expanding processes. Also, since this study investigates the distribution of the statistical population characteristics, it is called survey study and since the data about one or more traits was collected in a section of time, it is called sectional study. In terms of the goal, this study is considered as the practical one.

The statistical population of the study includes the managers, senior experts of the knowledge–based organizations, industry experts, and University Professors in the technology and science park of the Kermanshah.

Although, the number of managers and senior experts of the knowledge–based organizations in the technology and science park of the Kermanshah are identified, but because of the lack of the full information of the number of the industry experts and university professors in the technology and science park, the statistical population was considered to be unlimited. Then, based on the non-random sampling method, the 70 questionnaires was distributed and collected.

Research Questions

Considering the goal of the study, the main study questions are:

- What are the components affecting the failure of the knowledge-based companies in Iran?

- How does the prioritization of the components affect the failure of the knowledge-based companies in the field of exchanging, commercializing, and selling the technology in Iran?

Results

To answer the firs research question, by reviewing the related literature and books, the dependent and independent variables were defined. The dependent variable in this study, which has the strategic and important role in the country development, is the failure of the knowledge-based companies in the knowledge-based economy paradigm in Iran. Since the failure level can be different (low, medium, and high), then it is a variable. Some factors influence the Progress or regress the failure of the knowledge-based companies.

In the present study, several factors and parameters are defined as the independent variables that determine the fluctuations of the dependent variable. In fact, the failure of the knowledge-based companies, implicit in the knowledge-based economy, is considered as the dependent variable that depends on the following independent variables including Techno Mart; noninterference of government in the facilitation process in technology trades; the lack of brand; and distrust of industries, governmental organizations, and business to knowledge-based product. Table 1 presents the operational definition of the variables.

Table 1
Operational Definition of the Variables

Variables	Operational Definition
Failure of the Techno-Market	Techno mart is sorted as a different type based on different indexes: Techno mart are divided into three categories, namely Techno mart of information technology, Techno mart of transfer and trade of technology, and the combination of Two previous. Techno mart of information technology are a comprehensive system that collects and produces information about technology transfer trades and publishes them for users. Applicant can search the suitable technology considering easy and fast access to information that is transferred by information broadcast network. An example is Europe techno mart. Techno mart of transfer is a known business system that works by direct introduction between buyer and seller, regular and irregular holding of exhibitions of samples of technological products. The activities of technology trades can be comprehensive or be different based on field and goal of product. Technology offer and transfer seminars are held with technology trades. These businesses can be created in an area, division, district, or a combination of each. An example is information center of technology trade of mediate and small companies in Jupon and Techno Mart of Korean. Combination example of both cases is a techno mart that present advice, intermediaries and technology trades (trade duty) and supply information associated with technology trade and support the commercial investments (support duty). An example of this combined type is Asian and Pacific Centre for Transfer of Technology (APCTT) and techno mart of Hong Kong Productivity Council. Techno mart has to possess three parts to cover the foundational problems of traditional trade: First part is a physical trade in which technology resource owners with skillful staff trade in form of technological and commercial exhibitions. The second part is virtual trade by which the technological cooperation is formed through coherent information network on the internet. The third part is support system. This system presents the main services to facilitate trades in two other parts that includes assessment of technology, the copyright, and financial services (Oh & Kang, 1999).
Lack of Government Intervention in Facilitating the Technology Exchange	Ferguson's research (1999) about companies growth showed that the companies located in technology parks have more profitability than those that are out of parks. Also, the image of these companies has a special value because of their presence in park. Lofsten and Lindelof (2001) have studied the growth of companies in technology parks in Sweden. The assessment scale of companies is the average of companies' growth in three topics, sale, profitability, and occupation in three years during their activities. The results of this research show that technology and science parks have a positive effect on the growth of employee numbers, sale, and profitability of companies. Gorman & McCarthy (2006) have studied the development of start-up companies or high-technology producer companies. These researchers have given some suggestion to support the companies in beginning stage of their growth. These suggestions are financial support, counseling to managers, and making relation between companies.
The Lack of Brand	For the first time, the term of "special value" of brand has been used widely in 1980 and has been known as a surplus value that the brand give to product. Feldwick (1996) argues that because of lack of a measurement and usage criterion in business environment, the surplus value of a brand is a vague concept. He concludes that the surplus value of a brand is used as a general criterion about all things vaguely that the company has to do for improving the future performance (Smith, Gradojevic, & Irwin, 2007).

Industries, State Organizations, and Market Distrust about Products of the Knowledge- Based Companies	One of the most important challenge that today knowledge-based companies faced with is that industries and governmental organizations do not accept and support these companies' products. Although, many of these products are able to compete with other commercial products, but even a product is produced with perfect competitive advantage, industrial business and governmental organizations show a strange resistance to buy it. This causes the strategic problems for the knowledge-based companies. When we speak about favorite conditions in relation of two social institutions, we should consider the conditions in which there is a mutual communications between different institutions in society. We should consider the conditions in which there are mutual business and communication between different institutions. In these conditions, mutual communications lead to growth and development of social system. For this purpose, the mutual communication between industry and university either develops both of them and either leads to the improvement of the social system as a whole.

To answer the second question of the study, a questionnaire came into use. Each of these components are divided into sub-components. Following this, 9 questions are about evaluating the failure of the tech-market; nine questions relate to evaluating the lack of the government intervention in facilitating the technology exchange; twelve questions are about evaluating the lack of the brand; and ten questions consider evaluating of the industries, state organization, and market distrust about knowledge-based companies. In total, 40 questions used to evaluate all of the variables of the research.

Friedman Test: Dimensions Rank

To rank each of these dimensions and with regard to the four determined dimensions, we used the Friedman test in this study which is appropriate for intergroup plans (dependent samples).

Wilcoxon signed-rank test is a Generalized Friedman test; it is the non-parametric equivalent of the repeated measures test. In this test, there is a group of persons that were evaluated in two situation or two different time periods. The goal is to compare the change of the average scores in two or more situations or time periods. In this test, the evaluation level of the variable should be ordinal.

The results of the Friedman test are reported in the Table 2. This test shows which of the dimensions of each variables are more common in the companies and determines the priority of the dimensions. According to the Chi-square value that is 193.06 (df-3) which is meaningful in the error level less than 0.01, we can say that the ranks of these 4 dimensions are different from each other.

Table 2
Results of the Friedman Test to Study the Difference of Components' Rank

Statistical Indicators	Statistic Value
Sample Size	70
Chi- Square Value	193.06
Freedom Degree	3
Meaningfulness Level	<0.001

The results of ranking the dimensions are shown in Table 3. Comparing the ranks' average it can be stated that the industries distrust about the knowledge-based companies' products is in the first place; the lack of the brand is in the second place; the lack of government intervention is in the third place; and the failure of the techno-market is in the last place.

Table 3
Results of Ranking the Dimensions: Rank Average of the Components

Rank	Factors	Rank average
1	Industries Distrust about the Knowledge-Based Companies' Products	3.68
2	The Lack of the Brand	3.32
3	The Lack of the Government Intervention	2.09
4	Failure of the Techno-Market	1.19

To prioritize the components of the knowledge-based companies' failure, paired comparison method and AHP model were applied. In this method, we compared the components of the knowledge-based companies' failure with each other and ranked them by expert choice software. To obtain the matrix of the paired comparison, we used the AHP questionnaires which were distributed among the associated managers and experts. Collected data were analyzed by the Expert choice software and the components of the knowledge-based companies' failure were ranked as presented in Figure 3 which shows the ranking of the components of the knowledge-based companies' failure by using the AHP technique.

Figure 3. Ranking the Components of the Knowledge-Based Companies' Failure by Using the AHP Technique

Among the four factors introduced for components of the knowledge-based companies' failure, the industries, state organizations, and market distrust about the knowledge-based companies' products obtains the most score. Also, the obtained inconsistency rate was less than 0.1. This shows the accuracy of the information of the completed questionnaires. The share of each factor in the failure of the knowledge-based companies is shown in Table 4.

Table 4
Results of the Prioritizing of the Factors

Factor name	Factor Weight	Ranking
Industries, State Organizations, and Market Distrust about the Knowledge- Based Companies' Products	0.58	1
The Lack of the Brand	0.20	2
The Lack of the Government Intervention in Facilitating the Technology Exchange	0.13	3
Failure of the Techno- Market	0.07	4

Discussion and Conclusion

About the effect of the lack of the technology exchange and commercialization on the failure of the knowledge-based companies of Iran, the results obtained from analyzing the research variables showed that the role of the lack of the technology exchange in the failure of the

knowledge-based companies, is significant in the process of the product and services sale in the market.

The lack of the technology exchange and commercialization cause the process of entering the companies to market face challenges. Then, the process of converting the science and technology to the money become inefficient. This serious damage can convert total activities of the knowledge-based companies and parks to an inefficient process. Then, whole of used energy and financial resources is wasted.

Prioritizing the components affecting the failure of the knowledge-based companies in field of exchanging technology, commercializing, and selling in Iran shows that the industries, state organizations, and market distrust about knowledge-based products and the lack of the brand are two more important factors which have the highest rank in the table of the failure of the knowledge-based companies. The average ranks of these two factors are 3.68 and 3.32, respectively. These results show that from the respondents' view, the industries, state organizations, and market distrust about knowledge-based products and the lack of the brand are more important than other dimensions. Then, these two dimensions have the most impact on the failure of the knowledge-based companies. The lack of the government intervention is in the third place with the average rank of 2.09. The lowest average rank is related to the failure of the techno-market.

Based on the results obtained from the ranking by AHP technique, the factor of the industries, state organizations, and market distrust about knowledge-based companies' products is in the first place; the lack of the brand is in the second place; the lack of the government intervention in facilitating the technology exchange is in the third place; and the failure of the techno-market is in the last place. It was not unexpected that the industries, state organizations, and market distrust about the knowledge-based companies' products placed in the first place because from the experts' view, this factor is a structural factor and have more depth and breadth more than other factors. Also, the factor of the failure of the techno-market is in the lowest place because this factor is a result of the industries, state organizations, and market distrust about knowledge-based companies' product. If the problem of industries distrust was solved, the inefficiency of the techno-market would be solved, too.

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