International Journal of Academic Research (ISSN: 2075-4124)
September 2013, pp: 78-85

Explanation of Factors Affecting the Success of Technology Commercialization in Islamic Azad Universities in Region 3

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Abstract: Background: University Technology Commercialization, as the process of knowledge transfer from universities and research centers to industry, directly affects the innovations in existing businesses in the community.
Aim: the aim is to review and determine the factors affecting the success of university technology commercialization in Islamic Azad Universities in region 3 to serve existing industries in society.
Method: The sample populations are the Azad Universities in Region 3, that include 17 universities. From among these universities 10 experts were selected as subjects, then the data were collected using questionnaires and analysis of paired comparisons were performed using the FAHP test.
Results: It has been shown that each of seven variables: the parameter of university and industry's interest and motivation to transfer of technology to industry, strategic management's attention to the university and industry, acceptance of the university produced by the industry, the nature of technology, technology transfer centers in universities, universities and government 's support and coordination and costs and available funds, have an effect on the commercial success of the technology in universities.
Conclusions: Managers need to harmonize culture with a special effort to commercialization in university sector, provide human and financial resources in academic technology transfer organizations and reduce different views of the industry and investors towards the university sector.

Keywords: Commercialization, Technology, University, Islamic Azad University

1. Introduction

Commercialization is the process of transferring and changing the produced knowledge in research centers to different types of commercial activities (Hashemnia et al. 2009).

Technology is the final product of research or the scientific methods, technical knowledge and information that can change into a commercial or industrial product (Hill and Rothaermel, 2003). Universities are the producers of science and are the effective factor in interactions with industries for the production of new knowledge and these relations and cooperation between universities and industries should lead to the production and application of knowledge commercialization (Wand, Y and Lu, L, 2007).

The changes in the recent decades including globalization, increase of technological competition between countries, the increase of national and global costs and creating conditions that forces universities to become financially independent and playing new roles in societies, the increase of knowledge commercialization also shows the importance of research in the

domain of commercialization (Rasmussen, et al, 2006). Universities are increasingly facing more commercialization of their new research projects and reduction of traditional activities such as teaching and old methods of research. The development of university research commercialization has opened a new window to the privatization of common scientific grounds and scientific advances (Chang et al, 2009).

Based on the above, the aim of the present study is to explain the factors affecting the success of technology commercialization in the Islamic Azad Universities located in region 3 based on a conceptual model comprising of 7 variables: determining the role of strategic management of university and industry, determining the role of the offices of technology transfer, determining the role of interestedness and motivation, determining the role of industry acceptance, determining the role of public policy's supports and coordination, determining the role of the nature of technology, determining the role of costs and financial support. At the end through the use of results the effects of each of these variables on the success of technology commercialization in Islamic Azad Universities of region 3 will be mentioned.

2. Background and hypotheses

2.1. Technology commercialization

Commercialization is a process that turns the ideas, results of researches or the creations of the universities to products, services and usable processes to market. The nature of the commercialization process demands a cooperation between university and the industry to turn the results of the studies to innovations in market. During this process the results of the studies are shared between these two sections in different forms (Fakoor, 2009). Studies so far have shown that many factors play a role in the success of technology commercialization, among which seven factors are more emphasized: strategic management, technology transfer offices, interestedness and motivations, acceptance of the industry, supports and public policy coordination, the type and nature of technology, costs and the existing financial sources in Islamic Azad Universities of the third region.

2.2. Strategic management in the university and industry

Strategic management is a process of decisions and actions that lead to the creation of one or several effective strategies for the facilitation of reaching some goals (Jauch and Glueck, 1988).

Seagle et al point that commercialization activities cannot be easily adapted to the traditional structures and process of universities. Universities need a new perspective concerning organizational structures, working methods and the development of commercial skills (Fakoori and Hosseini, 2008). With the aim of studying the factors affecting the technology commercialization of universities, Tababaei (2010) reached this conclusion that the faculty members, the structure and management of university, profitability and financial sources, reputation and credibility and the existence of proper institutes are the most important factors affecting the technology commercialization. Sharifzadeh et al (2010) with the aim of investigating the moral ownership management for the development of university technology commercialization reached this conclusion that institutionalization and the management of the rights of the moral ownership acquires different and related actions. Bayanchi et al (2009) with the aim of investigating the view on dynamic capacities in technology commercialization reached this conclusion that managerial and organizational experience are needed to realize the prevalent capacities.

H 1: strategic management of university and industry is one of the factors affecting the success of technology commercialization among the Azad Universities of region 3.

2.3. Technology transfer offices

These offices are a new political framework for the distribution of technology and innovation and connecting university and industry and their progress (Sharif and Baark, 2005). Sharif and Baark (2008) have shown in their study that the role of university is based on its technology and knowledge transfer offices which are one of the institutes of higher education. They reached this conclusion that gaining more income for the industry dependent universities is possible through moral ownership and technology commercialization that results in a more completed role for technology transfer. Nazemi et al (2010) showed that technology transfer office based on the nature of research activity, level, cost and coordination between technological parts create the context for the entrance of the technology into the industry. Tello et al (2011) showed that in the commercialization of technology a logical approach is needed for the professional and standard actions of people for the common decision making for technology transfer in which the innovations of people play an important role and their suggestion is that managers should establish these technology transfer offices for better understanding and supervision of the performance of the decisions and reach a successful result (Tello et al, 2011).

2.4. The motivations for technology transfer

Motivations are considered as obstacles that clearly affect different activities (Arvanitis et al , 2008). Soltanigard Faramarzi (2011) have shown in his study that there are some important factors affecting the technology commercialization and its success which are income and financial motivations, business skills, investments and assuring investment decisions. Chang et al (2009) have shown in their researches that for the promotion of university research commercialization, the university should deal with the motivational gap and the interests of the beneficiaries involved in this process. The second current is the institutional current in organizational and institutional sources. This current that appeared in the beginning of 21st century points that favorable institutional and organizational sources including business infrastructures, support, organizational motivation, gaining capital and risking investment play an important role in the promotion of the commercial-research performance of the universities (Chang et al, 2009).

H3: interestedness and the motivations of university and industry are one of the factors affecting the success of technology commercialization of Azad Universities in region 3.

2.5. Acceptance of the industry

To what extent the technology transfer is accepted by the society and to what extent are the universities organized with the proper structure? In other words, there is an interaction between the system of innovation and the technology transfer offices (Carlssonc and Fridh, 2002).

Cook and Morgan believe that cooperation and interaction between university and industry can include any economic activity. This case which is based on learning can by implemented by different users. In line with this study Wang and Lu have mentioned that the cooperation between industry and university will be so beneficial that organizations can feel this added value when they interact with universities (Wang and Lu, 2007).

Kayo et al have mentioned in their studies that key ideas and important achievements and successful technologies that have started from key ideas, are often the result of common interactions between research and progresses such as ideas and people involved in the territories between university and industry. Another factor involves the inability of many of

the national companies in guiding national R&D. The primitive nature of many of the academic creativities changes the cooperation of faculty members in more advanced ways into a basic factor for successful commercialization (Cao et al, 2009).

H4: the acceptance of university technology by industry is one of the factors affecting the success of technology commercialization of Azad Universities in region 3.

2.6. Support and coordination of public policies.

It is the innovation of government in brining a new policy of innovation such as establishing an innovation and technology fund for the strengthening of research capacities and also increasing the costs of research and development plans in the business section (Sharif and Baark, 2008).

The relation between university and government for the promotion of new technology commercialization is very important (Hoye and Pries, 2009). The innovation of the government in some societies with the entrance of a new policy such as establishing a fund for innovation and technology results in the reinforcement of research capacities and also increase of the costs of research and development in the commercial section (Sharif and Baark, 2008). The government plays two important roles in this respect: first, it provides a set of rules and regulations for the registration of the rights for the ideas and also facilitation of relations with industry, second, it provides a set of regulations and mechanisms for the establishment and support of technology transfer offices and public supports to these offices. Reinforcement of technology commercialization takes place through public supports, responding to the shortcomings of the technology transfer offices, using the net of managers interested in commercialization and helping the technology to find its way into the market.

H5: the supports and coordination of governmental policies as one of the factors affecting the success of technology commercialization in Islamic Azad Universities located in region 3.

2.7. The type and nature of technology

It is the investigation of the economic results of university inventions including private universities that has the highest incomes in different university domains (Bulut and Moschini, 2007).

H6: type and nature of technology as one of the factors affecting the success of technology commercialization in Azad Universities located in region 3.

2.8. Costs and financial support

It includes the financial supports of the technology creation plans that results in the facilitation of communications between university research groups and private industries (Sharif and Baark, 2008). Soltanigard Faramarzi (2011) with the aim of investigating the commercialization as a factor affecting the development of knowledge based institutes and the growth of national economy reached the conclusion that there are important factors that affect the technology commercialization and its success which are income and financial motivations, business skills, capital support and certain investment decisions. Tabarbaie (2010) with the aim of recognizing the factors affecting the technology commercialization in universities reached the conclusion that the faculty members, structure and management of the university, being profitable and financial sources, reputation and credibility and the existence of proper institutes are the most important factors affecting the technology commercialization. Financial support is the main factor related to the commercialization while the existing financial sources are remarkable and the capital market of these countries has a considerable amount of risk taking investments and a net of private and

unofficial investors are organized that can reach the universities.

H7: costs and the existing financial sources are one of the factors affecting the success of technology commercialization in Azad Universities located in region 3.

3. Methodology

3.1. Sample population

The sample population of the present study are the University units located in region 3 that include 17 universities. Finally 10 subjects were chosen as experts.

The sample population's gender was 70% men and 30% women, 50% of them were between 20 to 30 years old, 30% of them were between 30 and 40 and 20% of them between 40 to 50. Their degrees were 30% had a bachelor degree, 40% MA, and 30% had a PHD.

3.2. Data and measurement criteria

The most important data collection tool was a pair comparison questionnaire. In the first step all of the factors were compared in pairs by the experts to realize their priority against each other. Then the verbal expression of their ideas (experts) about the affective indexes on the technology commercialization of Azad Universities located in the third region were collected based on a nine item hourly range.

4. Findings

The results of the descriptive tests related to respondents showed that 80% of the respondents were males. Most of the respondents were between 20 to 30 years old. 40% of the respondents had an MA. In confirmation of the factors the experts were asked to grade the importance of the indexes from 1 (not so important) to 10 (vitally important). In case their importance grade was more than 7 then those factors could be chosen. This confirmation process showed that all of the variables except the index related to the gradual and radical technological innovation had a mean more than 7.

The results related to the prioritizing of the main criteria of the indexes affecting the technology commercialization in Azad Universities located in region three using FAHP are shown in the following table:

Table 1. Prioritizing of the main criteria of the indexes affecting the technology commercialization in Azad Universities located in region three using FAHP

factors	Attention of strategic management in university and industry	Technology transfer offices in universities	Interestedness and motivation of university and industry to technology transfer	Acceptance of university technology by industry	Public support and coordination	Technology types and nature	Cost and existing financial sources	sum
Minimum degree of feasibility	0.80	0.33	1	0.58	0.13	0.33	0.04	3.22

Final load	0.24	0.10	0.30	0.18	0.04	0.10	0.01	
grade	**2**	**5**	**1**	**3**	**6**	**4**	**7**	

The results of adaptation matrixes related to the paired comparisons of phase Am and Ag has shown that:

1- Matrix Am λ_{max}=7.39

Compatibility index:

$$CI^m = \frac{(\lambda^m_{max} - n)}{(n-1)}$$

CI=0.06

Compatibility Ratio (CR):

$CR = CI/RI$ = 0.06 / 1.2874 = 0.05

Since the value is less than 0.10 it has an acceptable compatibility.

2- Ag matrix

λ_{max}= 7.14

Compatibility Index:

$$CI^g = \frac{(\lambda^g_{max} - n)}{(n-1)}$$ CI=0.02

Random index:

In order to determine the random index the table given by Gagos and Bucher has been used that is 0.40 for the present problem.

Compatibility index (CI):

$CR = CI/RI$ = 0.02 /0.409 = 0.05

Since the acquired value is less than 0.10 it has an acceptable compatibility.

5. Discussion and conclusion

Nowadays universities have expanded the territories of science through applied and fundamental studies in all of the domains and have provided unified solutions for the challenges that every nation is facing. Without any doubt it can be said the future innovations cannot happen without providing the basic structures and rules for the research in universities and other research organizations. The analyses in the present study have shown that all 7 variables affect the success of technology commercialization in universities. There has been other studies similar to this one. The results of them are compared with the present study in this part.

The present study dealt with the factors affecting the success of technology commercialization in Islamic Azad Universities located in region 3. Studies so far have divided the factors affecting the success of technology commercialization in different forms. In the present study the result of the prioritization of the main criteria affecting the technology commercialization in Islamic Azad Universities located in region 3 was carried out using FAHP for analysis.

Based on the primary aim of the study, it can be concluded that the variables interestedness and the motivation of university and industry for the transfer of technology have the first place among the other variables based on the ideas of the experts. A successful transfer of technology needs a recognition of the aims of the industry, technological sources, the innovation and transfer method, transfer methods, affective factors, and attraction and development. So, the managers of university and industry are expected to pay attention to their development and progress. Also, nowadays industrialization deeply depends on technology transfer and this requires more attention on the side of managers and authorities.

The next index that has grabbed the attention of experts was the attention of strategic management in university and industry, four main elements of strategic planning in

universities include: a) evaluation of the environment for the realization of processes or probable changes in the environment and its effects on the university, b)evaluating the university for the realization of the strong and weak points, its problems and capabilities, c) evaluation of values (examining the values and ideas of beneficiary groups and the responsibilities of university toward these groups and society), and d) formulating a comprehensive plan for the formation of a model and design for the university based on the findings of the first three elements which should be considered by university managers. Industry should also provide a framework so that it can achieve its goals and plans and establish a better relation with university.

The next variable that was more important than the other variables was the acceptance of the technology of university by the industry. Since technology is a basic factor for the creation of wealth, ability and knowledge of the countries and a powerful tool in national development, the industry managers should establish a proper interaction with universities to facilitate the transfer of technology from universities to industry.

The variables the type and nature of technology, the technology transfer offices in universities, public support and coordination, costs and existing financial sources were respectively the next important variables. Since most of the researchers have considered the emergence of new companies from within universities, public support, relations with industry and many other factors are the most important factors affecting the success of technology commercialization, and universities are expected to play a more important and sensitive role in economic innovation and development. So, for the creation of a culture in accordance with commercialization of the university sector, managers should be more concerned. The difference between the views of industry and investors with the university should be minimized. Mutual trust between university, industry and investors should be created and effects of university research commercialization should be taken seriously by government, industry and investors.

6. Future study

- Prioritizing factors affecting technology transfer and the commercialization process.
- Prioritizing factors affecting technology commercialization

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