

UNIVERSITY-INDUSTRY RELATIONS: A STRATEGY FOR ECONOMIC DEVELOPMENT

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ABSTRACT

University is as a social institution dating back to about eight hundred years ago. It is only in the early stages of their life for a long time dedicated to educational activities. Later, with occurrence of two important scientific revolutions, after the mere attention devoted to education and research, it has undertaken technological innovation, which is called the third mission, that these universities are called entrepreneurial university. And the industry is meant all organizations (companies, factories, institutions, offices, agencies, departments, etc.) that can produce goods or provide services to the community are needed. In this paper we reviewed the literature and relied on the results of the investigation, dealt with similarities such as the role of university and industry to communicate, the role of technology commercialization at universities, etc., and differences such as the levels of development of countries, the role of time in making the relationship between universities and industry and so on, and comparison of theoretical-experimental community, similarities and differences and relationships between university and industry, and in the end, the discussions and conclusions are summarized.

Keywords: *Development, Strategy, University, Industry*

INTRODUCTION

Academic-industry collaboration is an example of contractual arrangements regarding to scientific and research activities and commercial enterprises. This collaboration is aimed to achieve the academics' knowledge power and industries' experience, and employ them (Anderson, 2000). In general, academic-industry relations would be a form of formal agreements between the two institutions which occur with the aim of achieving greater success (Shafei and Arrasteh, 2004). In this regard, university and industry are trying to do some of their scientific activities jointly and in concert. However, bilateral cooperation between the two institutions will include the activities that each is not able to do alone (Shafei and Arrasteh, 2004). The changes of the university in the situation based on knowledge market has led the university which is of the scientific-cultural institute become transformed scientific-economic one and it has been talked as a knowledge market in where the economic and scientific groups and knowledge enterprises. The knowledge enterprise means that a kind of dual rationality governs on: scientific rationality and economic rationality. This thinking has led to the development of entrepreneurial universities in developed countries. A large part of the industrial development of these countries, particularly in the field of new technologies such as information technology, nanotechnology and biotechnology have owed to a change in the attitude towards the university (Etzkowitz, 2001).

In this paper, having explained the relationship between the academies and industry, their interactions will be studied. Next, considering results of experimental researches, it will be examined the similarities including the role of academies and industry in communicating with each other and the role of technology commercialization in the universities etc. and differences including the role of development level of the countries, the role of temporal terms in making relationships between academy and industry, comparing experimental-theoretical community, similarities and differences and relation of the industry with academy, in the end, the discussions and conclusions will be summarized.

Academy and Industry

Effective communication between industry and academy become achieved when the universities would be about technology transfer by the applied research that this won't be possible unless institutionalizing research at the universities and also meeting the educational needs of professionals (Ehsani, 2004). The

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first realistic factor for academic-industry collaboration believes in the importance for the issues and consistently and firmly making communication for success of the organization from both. It should be stated that when no relationship has been defined and targeted the industry does not progress to the university. For example, one of the necessary conditions for making the relationship between academy and industry would be establishing research and development department of the industry (Jahangirian, 2004). Cooperation between these two institutions depends on creating the opportunity for industrial researches and greater participation in industry, the establishment of research units with faculty members and the creation of dynamic mechanism at the universities to solve the problems existing at the industry (Moetaghed, 2000). Other methods for effectively linking university with industry, it is listed as the creation of technology parks in the vicinity of universities (Karimian, 2003), the creation of incubators (Seljuk, 2003), increasing the quality and quantity of scientific visits of students and professors to industrial facilities (Rezai, 1998) and the effects of industrial contracts signed among the faculty members and the organizations on their promotion, priority to accepting master and doctoral students with work experience in the industry (Manafi, 1998). To how level the university is related to the industry of each country would be accounted for the indicators of determining development of the country, and it is so much clear that this relation per se is not configured unless establishing appropriate mechanisms and applying properly developed and strategic policies, if we believe the university to be as a place in where training specialized human capital and the industrial issues, problems to be solved by the scientific methods, and the industry with various executive functions are responsible for the most of the country's or the nation's programs, whether in viewpoint of manufacturing artifacts, or that of the provision of services and the training of the specialized human resources, the need for communicating industry with academy will be obvious to everyone. Before the first scientific revolution, the university's main mission was limited to educational and teaching activities. During the first, the research mission was added to the first mission. Academic or first scientific revolution occurred in German universities. The second scientific revolution based on innovation, relying on scientific knowledge, occurred in the late twentieth century, during which the university's mission, in addition to education and research, was undertaken a third mission and it was technological innovation. Nowadays, the universities with third mission are called as entrepreneurial universities (Aqajani *et al.*, 2010). The universities are seeking to exchange information with the industry must try long-term strategies to develop and achieve excellence in their particular field of research during their primary role is to educate to confirm their competence as mediators to stabilize their overall objectives. This requires a balance between population dynamics and resource allocation and capital.

Government policymakers and public institutions can help strengthen these incentives and ensure that the research key universities not only can help the development of human resources, but can also help industrial modernization. How this balance can be made is still not known but the research put in practice to discover effective policies for universities and industries (Yusuf, 2008). When talking about the relationship between university and industry in the community, the more attention is given to the universities of industry and the School of Science, while this definitely is not the correct interpretation and the industries would be related to a wide range of different fields. The studies show that in developed countries, the relationship and cooperation between industry and university is a strong backing. Most industrial evolution of these countries got started from the universities and industrial centers and the universities are precursors of industrial development, while this relation in developing countries is poor and pale.

The relationship the weaker, the technology development the slower done, and ultimately it gave rise to shortcomings in the industry, industrial associations, improper exploitation of natural resources, waste of social capital, and so on. Such a situation may lead to many social and economic challenges, including unemployment (Hamzeie *et al.*, 2007).

The Results of Empirical Research

In this section, different ideas and theories of foreign and domestic theorists will be examined in the field of the relationship between university and industry:

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❖ Yusuf (2008) in an article entitled "The exchange of information between universities and business sectors," when examining the influential factors came to the conclusion that the most important factor at the start of communication between universities and industry would be that the intermediary institutions exist that eliminating barriers to communication, facilitate a way to communication. He noted that these institutions should be formed within universities and industrial centers and the governments facilitate this process by creating these centers and helping them.

He also pointed out factors such as reputation of the university and in the end he concluded that the formation of the communications between industry and university, when increasing productivity, can lead to progress of the community.

❖ Kroll & Liefner (2008), in their study by examining the relationship between university and industry of developed countries and studying data from 82 interviews with generative companies in China, debated on the formation of generative companies that are sitting in a developed economy, at the end concluded that the prevalence of generative companies and governments' support and the level of development of the countries are factors affecting the success of university-industry relations.

❖ Elmuti *et al.*, (2005) in a study entitled "An overview of the relationship between universities and companies," by referring to an increase in the relationship between universities and industry have said that it was considered as a strategic planning for both parties and have concluded that strategic relations between higher education institutions and companies has numerous advantages. They referred to the obstacles to be as an inherently different of the cultures and the parties' goals, they knew that it was effective that by making close both parties' expectations of commercialization process outcome, it should be tried to make close them together.

❖ Aqajani *et al.*, (2009), expressing the importance of commercialization of research findings and the reasons for the failure of university-industry relations, enumerated some factors such as missing links in the chain of production research, being the university estranged from the industry and the dependence of foreign countries and in following, four commercialization models of research findings to bridge the gap between university and industry have been pointed out.

❖ Bournaei and Gorbanali (2008) in an article entitled "Commercialization of science, research and industry missing link of the country ", by discussing although Iran has been grown very good in science production and stands in a good position in the world, the growth of technology in Iran is not in proportion to the growth of science, investigates the reasons for this that knows the main factor to be the serious effort of the scientific centers in the production of patents and government agencies' support to supply the costs. They express the tools and platforms required for the development of technology and at last the concepts of technology and intellectual property.

❖ Hoye and Pries (2009), in his research, while it is important making the research focused on the institutional factors and the external environment, believed that it should focus more on individual factors and those within universities. Studying the extent of innovations and creativities at a university in Canada, they found that the most important affecting factor would be the amount of experience and former background of relationships between industry and academic researchers, this leads they to better identify new opportunities and with respect to better communication power with the industry, pave the way for the commercialization of new ideas create (Hoye & Pries, 2009).

❖ In the study by Jacob *et al.*, (2003) conducted with a case study on the Chalmers University in Sweden stressed the crucial role of universities. Referring to the concept of entrepreneurial university and its relevance concepts and evaluating its related factors in their study, they concluded that due to the universities being tendentious to the restructuring from the rigid and formal structure to structural which is flexibility and encourages innovation and change, the easier path for communication between academic researchers and new industry would be established.

❖ Styles and Genoa (2008) a survey of companies that were formed within universities concluded that establishing these companies and helping them to be internationalized, it helps the researchers to apply the opportunities. The study also suggests that risk-taking, technological innovation, and independence in certain parts of the university help communities' industry.

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❖ Chao and Chen (2009) in his article explained the significant role of organizational underpinnings to the commercial relations. They also identify the policies and academic institutions that shape the nature and effectiveness of publishing innovation in China and found that the type of changes made by universities are going to improve and expand research capabilities in relation to the management of discursing innovation and creativity and scoring exclusively, policies to start new businesses by the faculty and graduates and funding quickly, providing educational facilities, especially the relationship between technology transfer offices and office of Academic Affairs and also Faculty, how to reconstruct the incentive construction to encourage and facilitate participation in industry, how to distribute gross royalties or net royalty income between university and the faculty.

❖ Hashemnia *et al.*, (2009) have argued in recent years, the relationship between universities and industry could be treated as one of the primary functions of universities in developing countries, the main consequence is establishing better opportunities in financing the needed funds, especially from non-governmental channels. Data analysis showed that variables such as the number of articles published in international journals and conferences, joint agreements with industry and also graduate students' theses are significantly related to earmarked revenue so the results are in line with international studies. Therefore, it is necessary for universities to develop joint contracts in the short term more seriously and on macro-horizon to create lasting relationships with the commercial network, and to position the status and income proportion of the faculty.

❖ Siegel *et al.*, (1995) in a study entitled "Making speed the business technology," by survey of the main problems on the relationship between universities and industry, have pointed to new trends in competitive market and according to customers' tastes changing referring to the organization and competition spread, he pointed out these communities to be important and believed the factors such as organizational structure and leadership strategies to be effective and provided strategies to their appropriate functioning and good impact.

❖ In case study of 3M Company, Conceicao *et al.*, (2002) have acknowledged that through research and development of the companies they are able to organize the efforts to advance knowledge for innovation that can lead to new products and processes. They also pointed to the importance of organizational change and the appropriate structures which are necessary.

❖ Mosaei (2008) by presenting a plan to determine and commercialize the opportunities at the university R&D centers, referred to the importance of research and development, and states that today, it is felt the need to address the issue of research and development in universities of our country more and beyond the developed countries than past. If more purposeful of the research presented, it can be useful. R&D is considered only competitive advantage of modern industry and the companies just have been stabled within that relationship with the university has been institutionalized (Mosaei, 2008).

❖ Shane (2002) examined the entrepreneurial firms created from within the universities. This paper discusses four dimensions of cooperation between university-entrepreneurial firm that: (1) research contracts with industry support, 2-consulting, 3- granting the patent of technology and 4- development and commercialization of technology, and it enumerates differences existing in their relationship and the interactions between universities and entrepreneurial firms. He expressed the importance of these companies to communicate with industry has concluded that technology transfer and academic research would be highly important for entrepreneurial companies. In some areas, such as biotechnology, academic research they have led to the creation of entirely new industries. In other areas, the universities have been tied to the needs of the domestic industry.

❖ In a study in China by Wang and Lu (2007) aimed to achieve a strategic framework for the transfer of successful identifications (knowledge) of interactions between the university and industry, in between knowledge transfer four states (knowledge) have been characterized that each of which can help us in different stages of the relationship. The four are: interactions with respect to the priorities for the university affiliated to the industry, interactions with the priorities for industry affiliated to the university, the interactions by taking into account the bilateral heavy ties and the interactions with regard to bilateral weak ties.

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❖ Doustdar *et al.*, (2007) in a study to investigate the obstacles to effective communication between university and industry and provide solutions to overcome these obstacles found that the most important channel to maximize speed of development and progress of the university is that both parties understand that this relationship will be beneficial for both parties. The most important solutions are presented at the end of this study can be mentioned to improve the scientific level of teachers based on their cooperation with the industry, increasing the number of applied-scientific universities, government-sponsored contracts of industry-university.

❖ Ibrahimpour (2011) in research entitled “The study of relationships between university and industry in Iran” compared the relationship of these two influential institutions in Iran and other countries in the world. In this study, the most important obstacles to that he referred can be the structural barriers, education system unrelated to the industrial system of country, lack of trust of university to the university. In this study he concludes that the most important and most effective way to increase communication between industry and university would be to make student projects applied in the industry (Ibrahimpour, 2011).

The Theoretical Comparison of the Empirical Research Results

Similarities

In this section, based on the results of the investigation presented above, it will provide some similarities in various areas that include:

The role of university in communication between university and industry

Ever changing business developments and the emergence of new technologies, governmental laws and regulations, changing consumption patterns, educational requirements and making high standards, the need to pay serious attention to the universities and scientific institutions to be fulfill their needs will be inevitable. The university as an academic collection in which the continuous scientific and research process takes place can be strengthening the industry and thus the industry and the economy in a society can be developed and improved together. In the process of transfer of technology, the universities can be active to both identify appropriate technology and learn foreign technology and product the technology and not produce the article just. Industry requests its own needs from the universities and university would be flexible that finally a suitable model gets developed. Production of scientific journals and publication of useful and applicable papers in scientific journals which is taken into account for scientific activities of academic centers could have an important role in industrial development and quality of life in communities. The universities need for follow at first four major activities of education, research, promotion and counseling of entrepreneurship and the creation of productive employment tailored to all academic disciplines, then lead the talented students of all disciplines to advance-development centers, incubators, science and technology parks pertaining the university. It is necessary all academic disciplines, in addition to specialized courses, pass courses on entrepreneurship and the creation of productive employment, the commercialization of research and converting them to a fortune. Another significant role of universities in establishing effective communication with industries can produce new and effective programs of research, prepare experts and adapt university courses with the real needs of industry compliance topics mentioned in any society.

The role of industry in making communication between universities and industry

Commercialization of science can be used as a way of unilateral knowledge transfer from scientists from the university to administrators and researchers in industries. Identifying target markets to meet the needs of consumers and compete in the world to transfer develop the technology, in order to transfer and develop the technology and commercialize the research results and innovations would be included as activities are required to do so. Interaction between university and industry in the national system of innovation theory, existing scientific and technology parks, incubators and generative companies of the universities can be considered as factors of commercialization of knowledge and provocation of innovation. The industry as one of the key players in Science and Technology Park and incubators and as a major consumer of scientific research and with regard to financial funds at their disposal, it must allow to implementing the commercialization of research and development and applied searches. For this

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purpose, one of the students' expectations is that their royalties and license are being bought and sold. The knowledge and innovation are increasingly well known as a source of global competition and the health economy. Research on innovation systems show that the country's capacity to produce new and innovative products and services and innovation participating in creation of wealth for the country has been linked to the research activities, the proportion of scientists and students, programs, and policies related to the research and their commercialization. The ability to expand geographically concentrated clusters of businesses is linked to the institutions and companies working in the public field of quality connection between scientific centers and companies. The most important scientific institutions would be universities can be as a bridge the technology and the companies, which is strong. The activities of supportive funds have been proven in the form of scholarships, salaries, insurance and even warranty, with the industry's commitment to support the students for sending them to educational programs and in bringing the best talent in the industry. In countries where the industry would back effectively the mechanisms matched together, the companies (companies that have the royalty to hire new graduates) are committed to the students' graduation. For example, public telecommunications companies in the Philippines, which pay costs of graduates and undergraduates, under regular training, of universities and scientific centers through a good interaction between university and industry, labor markets, housing activities and programs of a simple guide for the career development can put in practice to attract appropriate and systematic employees to jobs needed.

Role of technology commercialization at universities

Today, the university, through applied and fundamental research, extended boundaries of knowledge in all areas and provided comprehensive solution for challenges that are national human backfire. Certainly, it is possible the next innovations just thanks to ordering and establishing structure of research at universities and other research organizations and commitment to. In recent years, in economic viewpoint of the knowledge in aspect of the world, the traditional role of universities as producer and promoter of knowledge has been revised and the view becomes reinforced that the universities to turn their knowledge into the factors promoting economic growth are more responsible. On the other hand with a reduction in subsidy of research, gradually the researchers have tended to support the industry sector and commercialize their ideas and this is done in different ways, such as contract research, intellectual property selling and developing reproductive organizations. Lack of adequate government support, gradually the nature of academic research has been driven from independent state and based on theoretical concepts towards being in line with efforts of commercialization. The rapid knowledge-based growth of economy emphasizes greatly on the importance of promoting academic research and ensuring the transfer of knowledge from universities to society and the business sector.

Differences

In the section, with regard to obtaining different results from the research that has been conducted on the relationship between university and industry, some of their differences in the various areas will be addressed that includes:

The role of development level of countries in communication between university and industry

Establishing relationship between university and industry can be affected by the development level of the countries. The various studies show that the type of effective factor in communication between industry and university will vary according to their level of development. For example, Mosaei in his research of developing countries believed R&D to be as a vital need and the only competitive advantage for effective communication between university and industry of this country (Mosaei, 2008), while Carroll and Linfer in a study conducted in developed countries of the world introduced the formation of generative companies as a contributing factor to the success of university-industry relationships (Kroll & Liefner, 2008).

As seen, therefore, to establish effective communication between the university and industry in each country, it must consider the level of development as a critical factor and due to this factor, improve communication between the university and industry, because for each country according to its degree of development, a special variable is prescribed for communication between industry and university.

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The role of different time conditions in communication between universities and industry

The results of studies on the relationship between university and industry show that this relationship is largely influenced by the time period. For example, in a study conducted in Iran by Bornaei and Ghorbanali (2008), due to the fact that the country at this time (2008) was positioned in the science production on a good place in the world, but the growth of technology not in proportion to the growth of science, they said commercialization of knowledge as the missing link in the relationship between research and industry research, while in a research by Ibrahimpour (2011) in Iran, given the usual conditions for the production of science and technology development in Iran, he knew making students' projects practical in the industrial sector as the most important and effective way to enhance the relationship between universities and industry. To create a link between university and industry in each country in which it is due to certain circumstances, specific operating conditions must be strengthened.

More effective role of university or industry in communication between university and industry

According to Yusuf's (2008) opinion, shaping and development of relations between universities and businesses is witnessed as one of the most important means to develop knowledge that it can change the business. There are grounds to this belief that the role of universities in the knowledge economy will be more significant. With the increasing complexity and cost of the new technology, even the largest companies are forced to make its internal research specialty. It only emerged in the last decade is likely to increase the willingness of the companies to adopt new strategies and research cooperation with universities. By contrary, Siegel *et al.*, (1995) in their research suggests that in the late 1980s and early 1990s it has become abundantly clear that new methods and resources needed to industries that help them in commercialization of their methods faster (effective role of the industry to the university). The process of innovation must become the commercialization process while still innovative new ideas appear in that section.

RESULTS AND DISCUSSION

Results and Conclusion

As mentioned in previous discussions, the results of studies and research conducted on the relationship between university and industry have had many differences and similarities; in this paper, just mentioning three of the similarities and the same number of differences. Table 1 shows the mentioned similarities and differences.

As mentioned in theoretical discussion on the theme of the article, this aims at evaluation of efficient and effective factors, especially the role of universities and industry in establishing effective communication between university and industry, which academics and industrialists due to assessment and analysis of them can attempt to establish relation between them more effectively. Establishing reasonable links between university and industry causes that the knowledge generated in universities and research organizations become transferred to marketable products or industrial processes. This process involves in serious cooperation and interaction between higher education institutions and research organizations affiliated with the government, industry associations, financial and investment institutions, entrepreneurs and the scientific individuals. The importance of knowledge as a driver of economic growth and as a factor of increased productivity is getting emphasized by the most governments and academic and industrial sectors around the world. In today's economy area, the knowledge production along with successful release and effective application of knowledge in the field of production has been a global goal to the production. The universities and research centers can play a role not only through the advancement of knowledge and the training of specialized labor, most importantly, but also through technological advance of the countries. On the other hand, considering the strong link and cooperation between university and industry resulted in the transfer of technology from the research organizations and universities to the commercial markets. The industry with lack of knowledge is doomed to decline; and the knowledge without application is considered worthless in the industry and this means university-industry links. In many of the articles that were studied in conjunction with universities and industry, it was observed that their authors merely took some step into explain the pattern of university-industry

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relations or ways of improving their communication and addressing obstacles between university and industry, however, this paper as well as definitions and objectives and missions and tasks of influencer actors in the development of each country, it has studied and discussed clearly the most important factors affecting effective communication between universities and industry. Necessarily, as long as all we don't evaluated simultaneously the important and effective variables mentioned in this article happen, we will not be able to establish a correct and rational relationship between these two important organizations. As long as we don't know what they want from each other, we will not able to work to remove barriers and improve communication.

Table 1: Similarities and Differences of the Researches Conducted

Criteria	Description	
Similarities	The role of university in communication between university and industry	The most important roles are: producing research effective and new programs, preparing specialized labor force and matching the university's course topics with real needs of the industry, producing scientific publications and commercialization of research
	The role of industry in communication between university and industry	The industry as a major actor of science and technology park and incubators and as a main consumer of scientific researches plays an impressive role in communication with the universities
	The role of technology commercialization at the universities	Traditional role as a producer and promoter of knowledge gets revised and this viewpoint is enhanced that the universities are more responsible for to translate their knowledge to factors are promoter of economic growth
Differences	The role of countries' development level in communication between university and industry	So to establish relationship between industry and university of every country, it should be considered the level of development as a crucial factor and given that, it is extended relationship between university and industry.
	The role of temporal circumstances in communication between university and industry	So to establish relationship between industry and university in every country, given a special time interval in which it is put, the respective factor to that condition must be enhanced
	The role of effective organs in communication between university and industry	Some research believes the role of university to be more effective than industry in communication between them and some shows that of industry to be more useful and significant.

According to proving the hypothesis that the universities are an important factors affecting the communication between university and industry, it is expected that given the importance of this issue as soon as possible mean while promoting awareness of this area in universities and research centers through publications, workshops and seminars, it should be provided the necessary infrastructure such as laws and regulations required in the ownership field and management of intellectual property originated from the universities and research centers and as well as commercial activities including licensing and forming the academic companies. Given the most universities and research centers to be public, it is expected to the

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government plays their supportive role for the establishment of technology transfer offices in universities and research centers and the activities of these offices that the flow of technology transfer from the scientific bases that are more systematic ordered, using new methods and mechanisms, becomes more intensive. In academic sector, taking advantage of the research results and commercialization of them are significantly prioritized because the national interest requires that it is maximum exploited the important and significant resources in form of expertise, funding and opportunities for implementing the research in this sector which is conducted, and the community will benefit of the results of this research in various sectors of the industry.

In this context, it is necessary, meanwhile more precisely understanding the underlying conditions and the factors to reaching the successful relationship between universities and industry, formulate policies and design programs for their effective implementation. Thus, the success of the university sector in commercialization of the university research results requires to preparing several important and various conditions and prerequisites in the university sector, the industrial sector and socio-economic environment prevailing in both sectors. If macroeconomic characteristics in the country is not so favorable for development of entrepreneurial, production and industrial activity and economic, industrial and legal different infrastructures are not provided to do so, it will not be formed the fields of demand and absorption of technology in the industrial sector and on the other hand, as long as the research and development policies would not be put in line with the basic needs of the national innovation system; the research conducted in the university sector will not be qualified to be attracted and received by the industry. After evaluation of the results of the research, it suggested proposals for better research to improve the relationship between universities and industry which are:

- ❖ Theoretical-experimental comparison of factors affecting the relationship between university and industry by employing factors other than what is mentioned in this article.
- ❖ Theoretical-empirical comparison of unique role of governments in establishing effective communication between the university and industry.

REFERENCES

- Anderson M (2000).** University- Industry partnerships. In *Higher Education in the Unites States: An Encyclopedia*, edited by James Forest and Kevin Kinser, (ABC- CLIO: Santa Barbara California).
- Aqajani HA, Hassanzadeh A and Mirzaee A (2009).** The models of research results commercialization of universities, *Proceedings of the Conference on Entrepreneurship*, Islamic Azad University of Bandar Anzali.
- Bornaie A and Gorbanali A (2008).** The commercialization of knowledge; the missing link of research and industry in the country, *Proceedings of the Conference on Technology Management*.
- Chen CJ (2009).** Technology commercialization, incubator and venture capital and new venture performance. *Journal of Business Research* **62** 93–103.
- Conceicao P, Hamill D and Pinheiro P (2002).** Innovative science and technology commercialization strategies at 3M: a case study. *Journal of Engineering and Technology Management* **19** 25–38.
- Courtney L and Anderson N (2009).** Knowledge transfer between Australia and China. *Journal of Knowledge-based Innovation in China* **1** 206-225.
- Ehsani MR (2004).** Director of the Office of university-industry relations in Isfahan University of Technology by interview with HR. Arrasteh.
- Elmuti D, Abebe M and Nicolosi M (2005).** An overview of strategic alliances between universities and corporations. *The Journal of Workplace Learning* **17** 115-129.
- Hope K and Pries F (2009).** Repeat commercializers, the ‘habitual entrepreneurs’ of university–industry technology transfer. *Technovation* **29** 682–689.
- Jacob M, Lundqvist M and Hellsmark H (2003).** Entrepreneurial transformations in the Swedish University system: the case of Chalmers University of Technology, *Research Policy* **32** 1555–1568.

Research Article

Karimian Iqbal M (2003). The creation of technology parks in the vicinity of universities, challenges and opportunities, *Proceedings of the Seventh National Congress of Cooperation between Government, University and Industry for National Development*, Isfahan.

Kroll H and Liefner I (2008). Spin-off enterprises as a means technology commercialization in a transforming economy – Evidence from three universities in china, *Technovation* **28** 298-313.

Kroll H and Liefner I (2008). Spin-off enterprises as a means technology commercialization in a transforming economy – Evidence from three universities in china, *Technovation* **28** 298-313.

Manafi A (1998). The experience of the TAVANIR company in relation to cooperation between industry and university, *The Fourth National Congress of Cooperation between Government, University and Industry for National Development*, Tehran.

Moetaqed A (2000). Development of exports of manufactured goods, driver of the country's development and a new proposal, *The Second International Congress and the Fifth National Congress of the Tripartite Cooperation between Government, University and Industry*, Tehran.

Mosaei A (2008). Designing a model to determine the opportunities and the commercialization of them in research and development centers. *Quarterly of Technology* **18** 13-20.

Noorani SMR (2002). *Relationship between Industry and University, Barriers, Strategies and Experiences*, (Tehran: General Office of Research and Relation with the University, Iran Khodro).

Rezaei A (1998). Our experience in the field of cooperation between industry and universities: assessing problems and bottlenecks, *The Fourth National Congress of Cooperation between Government, University and Industry for National Development*, Tehran.

Seljuk Kh (2003). Science and technology development centers, the government's private book of interaction between university and industry: the role and existing position of government, university and industry, and drawing favorable conditions for national development, *Proceedings of the Seventh National Congress of Cooperation Government, University and Industry for National Development*, Isfahan.

Seljuk Kh (2008). Knowledge-based economy, *The Third International Congress and the Tenth National Congress of Cooperation between Government, University and Industry*, Tehran

Shafie M (2003). *Relationship between Industry and Universities, Bright Future, Dark Background* (Publication of Amir Kabir, Tehran).

Shafie M and Arrasteh H (2004). University-industry cooperation, *The Encyclopedia of Higher Education*, under the supervision of a Dr. N.Quorchian, H.Arrasteh. P.Jafari, (Tehran: Great Persian Encyclopedia Foundation).

Shane S (2002). Executive Forum: University technology transfer to entrepreneurial companies. *Journal of Business Venturing* **17** 537–552.

Shane S (2004). Encouraging university entrepreneurship? The effect of the Bayh-Dole Act on university patenting in the United States. *Journal of Business Venturing* **19** 127-151.

Siegel DS, Waldman DA, Atwater LE, and Link AN (2004). Toward a model of the effective transfer of scientific knowledge from academicians to practitioners: qualitative evidence from the commercialization of university technologies. *Journal of Engineering and Technology Management* **21** 115–142.

Styles C and Genua T (2008). The rapid internationalization of high technology firms created through the commercialization of academic research. *Journal of World Business* **43** 146–157.

Wang Y and Lu L (2007). Knowledge transfer through effective university-industry interactions Empirical experiences from China. *Journal of Technology Management in China* **2** 119-133.

Yusuf S (2008). Intermediating Knowledge exchange between universities and businesses. *Research Policy* **37** 1167-1174.