

[Field Research]

A Strategic Approach for Developing a Conceptual Model for Achieving Country Wide Academic Entrepreneurship in Iran

Omid Asgari*

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Abstract

Purpose - The pool of entrepreneurs with progressive qualities such as creativity and innovation was considered concurrently with such factors as work and capital that stimulate economic development and growth. This study aims to present a model to support the development of a strategic approach for achieving an overall academic entrepreneurship system in Iran.

Research design, data, and methodology - The research design of this study is based on applied research because of its objectives, using principles and techniques formulated for basic research to solve operational and real organizational issues. This design also drives the method used, describing and interpreting the findings. Secondary data (library research) was used for this study's data collection. Because of this research's essential characteristics, no hypothesis is launched, and no research setting, questionnaire design, population or population sampling, validity or reliability tests, or statistical analysis are needed.

Results and Conclusions - The model is created using a strategic approach acting in an octal setting comprising social, cultural, legal, economic, political, technological, competitive, and natural environments to present a conceptual framework for future studies.

Keywords: Academic Entrepreneurship, Strategic Approach, Economic Development Forerunners, Knowledge Based Entrepreneurship, Knowledge Generation.

JEL Classifications: M1, H52, H75, L26, L53.

1. Introduction

Developed countries have accepted the effect academic entrepreneurship has on economic development and competitive advantage. Universities in developed countries have gained experiences from past entrepreneurship trends. The outcome of these experiences has encouraged developing countries to apply this tool to facilitate economic progress. Academic entrepreneurship is a rather complicated phenomenon in developing countries. The complication stems from the fact that universities are in the forefront of introducing change in social and economic settings of these countries. Higher educational institutions have to introduce internal structural and social changes with a long term view in attempt to turn themselves into entrepreneurship centers. Changes in academic institutions are required in order for them to adapt themselves to emerging economic, social and environmental systems. These changes will, in turn, encourage a new culture for establishing a wide network for knowledge production and a national innovation system. Policy makers should prepare plans and allocate necessary resources to facilitate changes in educational institutions. Furthermore, policy makers should use all available resources to extend and internalize these changes across communities, cities, and all over country. Developed countries have focused their attention to the role of academic institutions on economic and social systems for three decades. Policy makers in these countries have turned to these institutions for creating entrepreneurship mentality. Policy makers have become interested in the direct role of universities in economic development based on the economic reports resulted from commercialization of sciences and technologies. The term "knowledge engine", used frequently these days, reflects the role economic scholars proposed for sciences and technologies many years ago (Brennan & Wall, 2005).

It is now a widely accepted belief that entrepreneurship has a profound effect on social and economic growth and development. Entrepreneurship can provide a base for formation of new industries, revitalization of existing industries, increased employment, wealth accumulation, and social advancement. Furthermore, from the view point of individuality, entrepreneur-

* Founder & CEO, Delta Consulting Group (DCG). Post Code: 1165616891.No 4, 2nd Nagharekhane, Charsogh Bozorg, Bazar, Tehran, Iran. Tell: +98-912-600-1972. E-mail:omid.asgari.dcg@gmail.com.

ship is useful as a means to overcome social problems and impediments such as racism, social strata and sex discriminations (Davidson, 1995).

Entrepreneurship is one way to satisfy individual's internal needs. Therefore, it is advantageous for economic development at macro level and personal self-satisfaction at micro level. Educational programs in the area of entrepreneurship have turned into major and extended activities among colleges and universities. Entrepreneurship courses are not only included in curriculum of higher education but are also considered for teaching in elementary and high schools as well (Rae, 2003).

Progressive universities in twenty first century are those who can combine expertise with management skills and are in forefront of entrepreneurship. Setting objectives for educational activities, creating balance among research activities, providing social education and services, diversification of financial resources are among characteristics attributed to progressive academic institutions (Anderson & Miller, 2002). Result-orientation and customer-orientation are the most widely heard keywords in entrepreneurship institutions. These institutions have a group of interrelated responsibilities that together produce valuable outcomes from the point of views of customers. Educational activities in these academic institutions are adapted to current and future needs of the world by using a systematic approach and utilizing management tools. Peter Drucker defined entrepreneur as a person who starts a small and new business with his own capital. Entrepreneur makes changes in values and transforms their quality. Entrepreneur takes calculated risks and makes right decisions. Entrepreneur requires capital for his business endeavor but he is not an investor. Entrepreneur is constantly seeking changes and identifies opportunities. From an entrepreneur's point of view, work means applying management concepts and techniques, product standardization, utilizing design tools and processes, and establishing work based on education and analysis. He views entrepreneurship as a behavior in some one's personality and not as a given industry (Anderson & Miller 2002). Researchers have been preoccupied with operational and managerial issues pertaining to companies and pseudo-companies associated with universities. Yet, there has been few definitions and models proposed for concept of academic entrepreneurship. Lack of research in this area has also contributed to the knowledge gap and confusion in methodologies creating doubts about the issue among some universities. Wide spread reception of academic entrepreneurship concept for increasing national competitive edge is dependent on the acceptance of knowledge oriented thinking as a way to induce economic growth. Experimental and economic studies indicate that knowledge oriented economy can provide the necessary stimuli for economic advancement in developing countries to close the existing gap with developed countries. Repeated mention of excellent and progressive names of places such as Silicon Valley and MIT and the effect that they have had on local, regional and national economies have encouraged the world to follow the same path. What makes applying the best experiences diffi-

cult is ignoring the basic questions which are being considered in the concept of creating academic entrepreneurship. Many of these problems stem from economic-social function of this phenomenon.

Some of the problems concerning the issue are the followings:

- What effect surrounding economic conditions have on entrepreneurial trends in a given university?
- What changes can social infrastructure (laws, social standing of universities, capital, scientific and economic underdevelopment, and technical capabilities) induce on the academic entrepreneurship approach?
- What relationship economic-social systems and strategic direction of country at macro level should have with academic entrepreneurship concept?

Considering the large volume of information collected on the subject of academic entrepreneurship, the attempt is made in this study to summarize the information and by way of simplification and modeling of functions present a conceptual model for achieving an overall system for academic entrepreneurship in Iran. Using a practical approach, this model should be able to clarify the role of academic entrepreneurship in economic prosperity of the developing countries.

2. Literature Review & Research Method(s)

2.1. Academic entrepreneurship Concepts

Schumpeter defines "new academic entrepreneurship" as an institution which is made of the following three elements:

- University as an institution adapts itself to entrepreneurial management style and is managed in this way.
- Faculty members (professors, students, and staffs) who work with entrepreneurial style.
- University in interaction with its surrounding social environment follows an entrepreneurial approach.

The study used existing analytical models to determine the scope of modeling. After review of existing entrepreneurial models, we determined that we cannot use them for a comparative evaluation of academic entrepreneurship in Iran. The reason for weakness of these models was that academic entrepreneurship having different levels of analysis (individual, group and society) and different operational modes (managerial, legal and social) is mostly depended on social-economic conditions prevalent in its environment.

These models were used in practice under conditions existed in developed countries. In these countries free economy and capitalism were accepted as the obvious base for academic entrepreneurship because:

- Economic underdevelopment influences entrepreneurial activities in universities.
- The economic, cultural, social, technological, legal, political, competitive, and natural environments that exist in this

country influence entrepreneurial processes in different ways that are prevalent in other countries.

- Academic strategy of entrepreneurship in this country is different from the strategy of equivalent institutions in developed countries.
- The role of academic entrepreneurship in Iran is beyond the economic role played by similar institutions in developed countries. Furthermore, its cultural influence is higher.

Conceptual understanding of university role in economic development is still emerging. Two theories are mentioned more often for this role. The first one was proposed by Etzkowitz et al. in 1998. His viewpoint is well known as academic entrepreneurship. These researchers believe that university faculty and staff can operate in entrepreneurial fashion. Universities develop opportunities in government and private organizations to further their programs. Etzkowitz viewpoint was expanded in later years.

The other theory referenced in this respect is dubbed "Corporate Manipulation." The principal argument in this theory is that private companies intervene in usual processes of scientific research. They attempt to control those academic researches relevant to their commercial objectives (Etzkowitz et al., 2000). Brennan et al. (2005) proposed a model that clarifies concept of academic entrepreneurship. In another study, Brush et al. (2003) made an attempt to define attributes and philosophy of academic entrepreneurship within a conceptual framework in order to design a PhD program in entrepreneurship. (Brennan and Wall, 2005) (Brush et al., 2003). Another study was made by Mian (2007). This study titled "Can academic entrepreneurship model push Pakistan into a knowledge oriented economy?" attempts to create a model based on successful experiences. After reviewing past researches, this study proposes required elements for modeling based on best experiences (Mian, 2007). A move towards academic entrepreneurship requires an overall organizational restructuring, an integrated administration, and a comprehensive planning procedure involving all departments and offices in a given university. Therefore, all these have a long progression. Three key challenging issues were identified in the meeting of OECD Education Ministers in 2006 for members (including Iran) to study and deliberate. These challenging issues were:

- Investment: Who is to pay the cost of higher education?
- Quality: How to assure the quality and effect of higher education?
- Capability and suitability: To what extent higher education can meet economic and social needs of a globalized knowledge oriented economy?

Attending countries in this meeting were all from developing countries trying to overcome their underdevelopment in science, technology, and economy. One of concluding outcome of this meeting was the fact that time was an important issue for these countries. Consequently, it was advised for these countries to concentrate their national efforts equally on strategic (what is right to do?) and operational (how to do it correctly?) issues.

Successful academic institutions in the world are familiar with creating, managing and using knowledge. In today's economic conditions of the world, modern entrepreneurship universities apply knowledge (basic science, technology and innovation) by using different approaches. For Iran to be able to use this tool for overcoming its underdevelopment, it should expedite university changes towards this direction. However, Iran should not resort to mere imitation of existing experiences. For a university to reach maturity, a planning is necessary for all its interactions with social-economic environment. Apart from increased investment and quality improvement in higher education, forming a model which emphasizes the role of universities in creating national competitiveness using the outcomes of the best experiences is essential. The definition proposed by Etzkowitz is one of the basic viewpoints concerning academic entrepreneurship. They devised a model to complement their work. This model is referred to as trinary helical model. In this model, the relationships among government, industry and university are looked at from communication network point of view and the model has a practical form compared to the earlier versions. Interrelationships among government, industry and university in capitalistic economy are much different than other types of economic doctrines. The effect of this difference is not limited to allocation of resources to higher education; it also influences policy making at national level. On the other hand, internal market has structural differences with capitalistic economy. These differences can change the form of academic entrepreneurship processes (Etzkowitz & Leydesdorff, 2000). Entrepreneurship can be defined as a dynamic process which includes ideal, change, transformation and innovation. This process requires application and utilization of personal energy and motivation in creation and implementation of new ideas as well as finding applicable solutions. Main elements of this process are:

- Tendency to take calculated risk as a function of time;
- Net value or occupational opportunity;
- Ability to form a team for implementing a risky endeavor;
- Possessing innovative skills for organizing needed resources;
- Possessing basic skills for planning and design of a comprehensive and enduring occupational plan
- Having an eye for finding opportunities that others could not see in confusing and chaotic situations (Kuratko and Hodgetts, 2007).

2.2. The Advent of "Entrepreneurship Training"

Vocational experts and practitioners have created the myth that entrepreneurship knowledge is not learned but rather it is inborn. It is clear now that "entrepreneurship" and even its relevant details can be learned. The late Peter Drucker, who is one of influential thinkers in the field of management, believed that: "entrepreneurship is not a strange phenomenon. It is not even magic and or mysterious. It is a disciplined and comprehensive knowledge having nothing to do with hereditary and inborn

qualities. It is a knowledge that can be learned like all formal sciences."A decade long study on commercial and entrepreneurial enterprises as well as management education for small businesses supports this view. This study maintains that experimental research indicates that entrepreneurship can be taught and its qualities can be developed and expanded through teaching (Gorman et al., 1997).

In spite of the fact that entrepreneurial risk taking has gained wide acceptance as the key for effective innovation, production, and competition, yet, entrepreneurial training still remains as an unresolved issue. The following is a list of unresolved issues related to research into entrepreneurial domain and its education.

1. Entrepreneurship and management fields are not mutually exclusive, rather they cover specific domains. Entrepreneurship is influenced mostly by opportunities while management is mostly influenced by communication and resources (Ireland et al., 2003).

2. High risk taking, which also include providing high risk capital, like other innovative ways of covering expenses started during 90s and were unprecedented at the time.

3. This trend extended the influence of entrepreneurship into the next decade. (Shepherd & Zacharakis, 2001, 2002; Dimov & Shepherd, 2005)

4. Entrepreneurial companies and the need for having companies that support creation of these types of companies have gained importance. (Miles et al., 2001)

5. In studying entrepreneurial applications, it is found that they have common areas with important cases and issues. They also had interactions with entrepreneurship and applications. (Ireland et al., 2001)

6. Differences among entrepreneurs and the diversity of their approaches to gain success have created ground for research into their psychological aspects that may help predict their future success (Kickul & Gundry, 2002).

7. Risk takings and give and take attributed to entrepreneurship as well as its nature of creating internal pressure and requirements of such occupation have been subject of research by interested groups. These researches cover active and future entrepreneurs (McGrath et al., 1992).

8. The number of entrepreneurs among minorities and women has increased tremendously. It seems that this group of entrepreneurs face different problems compared to others (Chaganti & Greene, 2002; Greene et al., 2003; Gundry & Welsch, 2001; McDougall & Oviatt, 2003).

9. "Spirit of entrepreneurship" has become a global subject. It has been subject of increasing attention and interest all over the world during recent years (McDougall & Oviatt, 2003).

10. Experts have proved that entrepreneurs, new companies and family businesses have high social and economic contributions in increasing employment. This is also true for innovation and economic revitalization, while large corporation have comparatively much less contribution in this respect (Chrisman et al., 2003).

11. Because of recent corporate scandals, entrepreneurship

and business ethics have become subjects of many ongoing researches.

2.3. The scope of academic entrepreneurship

Entrepreneurship, as an independent concept, has an extended history and covers an expanded area of research at different levels. Candida Brush et al (2003) studied entrepreneurial qualities and thinking to develop a conceptual framework with the objective to determine the application of entrepreneurship in an academic domain. This model is very important for entrepreneurship education (Brush et al., 2003).

<Figure 1> represents the entrepreneurial domain in the study conducted by Brush et al. (2003). The study scope is shown by overlapping circles. These overlapping circles were devised to draw border lines for overall levels of study on the subject of entrepreneurship. The overlapping area represents official identification, search, and operation processes of opportunities. The overlapping circles represent general conceptual meaning which from the stand point of operation include administrative and strategic processes and the like. Operational processes are for achieving objectives and can include monitoring and measurement, official approval, uncovering entrepreneurial opportunities, expecting and anticipating opportunities, and understanding of company capabilities for using opportunities. Processes are placed within their surrounding space or context. Space or context in <Figure 1> means:

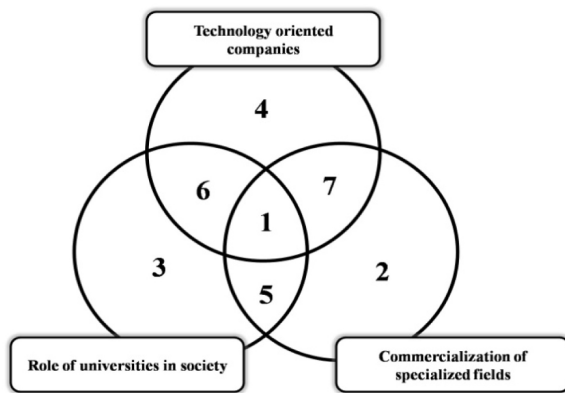
- Process level (individual, group, corporate, social, etc.);
- Type of operation (family, corporate, franchise);
- Geographical area.

Outer circle represents the activities that lead to creation of new forms of products and services, new production methods, new investment, new industries, new markets in existing sectors, and new markets with new concepts and new values. Examples of innovative activities include investment and creation of new economic activities, social networking, investment on resources, strategic planning, developmental programs, programs to establish working groups, team formation, and individual behavior during initiation stage. The processes and activities used in this model can be defined based on scientific and practical viewpoints of different disciplines or based on different theoretical viewpoints. The outcome of these activities can affect the surrounding macro environment and, therefore, they come under influence of each other. The surrounding macro environment can include local, regional, and even international social-economic systems. Brush et al. (2003) believed that they have covered all aspects of entrepreneurial field of study that can be related to academic setting. This figure clearly shows various factors and different levels of analysis. It also emphasizes innovation and opportunities associated with that. Other researchers have observed three different types of entrepreneurship in academic environment. According to their observations, a transformation occurs from "pure academic" to "usable science" in these three different types of entrepreneurship. The three types of en-

trepreneurship are:

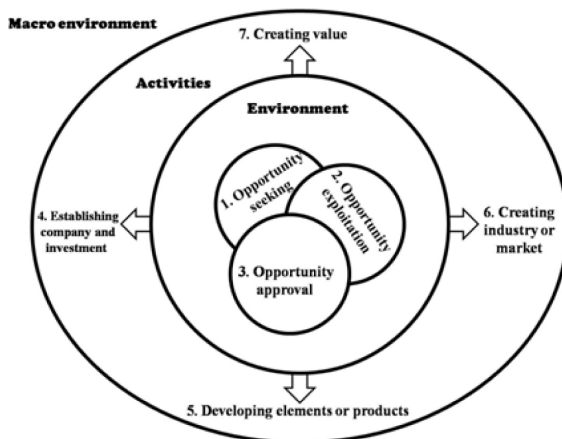
- Academic entrepreneurship: denotes a person who is involved in entrepreneurial efforts, which in his belief, they are related to his academic activities.
- Specialist in entrepreneurship sciences: a specialist or scientist in science and technology who works full time in a commercial or economic position. The important point here is that the motivation for this person is his scientific interests rather than his commercial activities.

Scientific entrepreneurs with scientific and commercial activities who have responsibility in commercial activities and believe that science and business are equal.



<Figure 1> Representation of the scope of academic entrepreneurship in the study conducted by Candida G. Brush et al. (2003)

Brennan et al. (2005) proposed a different model for academic entrepreneurship. There are similarities between this model and the previous model. This model also maintains that academic entrepreneurship is affected by inherent characteristics of entrepreneurship and is presented in several levels with various elements. Academic entrepreneurship in this model is made of seven overlapping elements. Each element has different analytical level <Figure 2>.



<Figure 2> Representation of the scope of academic entrepreneurship in the study conducted by Michael Brennan et al. (2003).

The overlapping area represents seven subjects related to commercialization as follows:

1. An academic entrepreneur is a person who strikes a balance between the knowledge he acquired in his discipline with opportunities stemming from commercialization of the same. What is intended is the coordination between the strategy to transfer technology from an academic institution and the opportunity to utilize the mental capital available in the market. The opportunity for such activities is available in companies that are in forefront of technology.

2. Persons who are within the realm of their discipline but their standing in an academic institution are based on their innovation and creativity. The members of this group are active in their line of expertise and do not involve themselves with cross discipline entrepreneurship.

3. In this area, human assets and organizational know-how in an academic setting are identified and developed. The emphasis here is on the traditional role of academic institutions and indirect intervention in economy.

4. Technology oriented companies with competences stemming from their expert knowledge by which academic institutions directly enter economic activities.

5. Academic institution intervenes or mediates for commercialization of organizational know-how. Universities cooperate with government and industries for exploitation of new acquired knowledge.

6. Academic institution intervenes or mediates formation of technology oriented companies. The institution provides assistance in support of intellectual and technical property as well as other matters related to the technology oriented company.

7. Faculty members who work for technology oriented companies and utilize their expert knowledge independent of their academic institutions.

All activities take place in a macro entrepreneurial environment where academic institution resides. Involvement of academic institution in such activities put it in interaction and transaction with policy makers and market. The difference between the first and second models is that the second one looks at the academic entrepreneurship form the viewpoint of an enterprise or company (rather than personal).

Brennan et al maintain that, "the intersection between the three areas of study (technology oriented companies, commercialization of expert knowhow, and role of academic institution in society) with a viewpoint of an enterprise or company is agreeable to academic entrepreneurship". This area of study shows that an entrepreneurial academic institution is more complicated than a traditional one. From the first definition, it can be devise that the main responsibility of an entrepreneurial academic institution is creating a balance between the roles bestowed upon it and the role expected from it in a modern world and a new economy.

2.4. Seven features of academic entrepreneurship

Peter Drucker believes that an entrepreneur is a person who starts a new small business with his own capital. An entrepreneur makes changes in values and transforms their quality. An entrepreneur takes calculated risks and makes right decisions. An entrepreneur requires capital for his business endeavor but he is never an investor. An entrepreneur is constantly seeking changes and identifies opportunities. From an entrepreneur's point of view, work means applying management concepts and techniques, product standardization, utilizing design tools and processes, and establishing work based on education and analysis. He views entrepreneurship as a behavior in some one's personality and not as a given industry (Anderson, Miller 2002).

1. An academic entrepreneur is a person, who strikes a balance between interdisciplinary considerations, strategy for transfer of technology, opportunity created out of intellectual assets of an academic institution in a technology oriented company setting.
2. It is a discipline that makes an academic institution well-known for offering special courses.
3. It is an academic discipline that progressively identifies assets based on organizational know-how in the same way personal assets are identified.
4. Founders of technology oriented companies with competences based on special know-how.
5. Intervention of academic institution in commercialization of organizational know-how.
6. Participation of an academic institution in creation, support and implementation of science in a technology oriented company.
7. Entrepreneurial faculty members who work for technology oriented companies independent of their academic institutions.

2.5. An academic entrepreneurship example

United States of America is the birthplace of academic entrepreneurship. The first group of companies born out of academics is the ones started by MIT and Stanford Graduates. Silicon Valley is one well known location for these companies. The number of universities offering graduate level courses has increased by eight fold to 200 and the number of patents has increased by four fold during the last twenty years (Mowery & Shane, 2002). During the 90s, about 150 companies were formed yearly out of MIT making the total of these companies about 4000 by the year 1999. These companies collectively had one million employees and total sales volume of \$ 232 billion around the world.

The rate of knowledge-oriented company formation out of MIT is an exception. Other academic institutions active in the field in the United States are Stanford University in North California, University of Texas in Austin, and Cambridge University

(Steffensen et al., 2001).

2.6. Human assets of entrepreneurship (Economic Development Forerunners)

The role of knowledge, specially learning, and the search for acquiring new knowledge, are the main elements in creating entrepreneurial business. The key objective in successful business is creating new knowledge for gaining and maintaining a competitive advantage (Begner, 2006).

Creation of new businesses requires unique skills and knowledge. Human assets play an important role in this endeavor. Based on common standards, education and job experience are important. But, are these the most important aspects that entrepreneurs should pay attention to? Do organizations require a different set of skills for their entrepreneurial business development?

Iyigun and Owen (1998) defined two types of human assets: 1) professional human asset and 2) entrepreneurial human asset. They explained the role of these two types in economic development. Professional human asset is referred to learning based on traditional system of education or management experiences, while entrepreneurial human asset is exclusively referred to entrepreneurial experiences. Their model shows that both types of human assets are essential for economic development (Coff, 2006).

Entrepreneurial human asset is related to an extended concept of human assets. Entrepreneurial human asset is a set of knowledge and skills that individuals bring along in creating and exploiting market opportunities.

Considering that the focal point of research into human assets is return on investment, the key question under discussion for entrepreneurial human assets is the valuation of these assets; that is, to what extent increase in entrepreneurial human assets can bring about success for new businesses from organizational and entrepreneurial point of views.

One key question is how this concept can be separated from others (especially human assets and social assets). Since human assets by definition are valuable for increasing individual and corporate productive capabilities, then, they are important for business success. Therefore, it is necessary to find out how human assets required in an entrepreneurial setting are different from others.

There are three important questions that should be considered in identifying entrepreneurial human assets as a separate concept. They are:

- What sort of knowledge and skills are required to achieve success in new business?
- How people can invest in entrepreneurial human assets?
- In what ways entrepreneurial human assets are different compared to social assets? (Coff, 2006)

Tim Gimo and his team (1997) conducted an experiment on the subject. They surveyed more than 1500 entrepreneurs and found out that human assets have an effect on economic per-

formance of an enterprise. The most important measures of human assets are education, management experience, supervisory experience, past experiences in similar businesses and experiences gained in previous jobs. These all make up different forms of professional human assets. These aspects increase productivity in most business environments and are not specific to an entrepreneurial environment. This conclusion corresponds to the statement made by Lerner and Haber (2001) that managerial skills have a significant correlation with performance of a new business (Coff, 2006). The best practical definition for entrepreneurial human assets is: a set or sets of methods in human resources that increase the potential for turning new knowledge into new products or services (Collins et al., 2006).

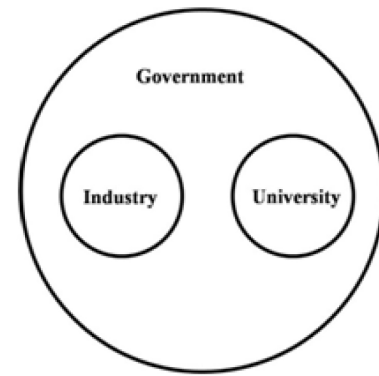
2.7. Academic entrepreneurship model

The model proposed by Etzkowitz is called trinary helical model. This theory shows how academic institutions can play more active role in the move towards innovation. Innovation is the base for knowledge oriented societies. From the analytical viewpoint, this model is different than the national innovation system in spite of some similarities. In national innovation system, an enterprise has a leading role in innovation.

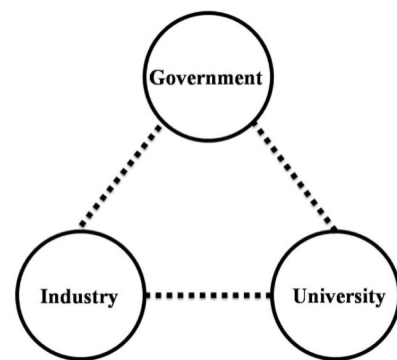
Etzkowitz model is centered on communication network. It is expected that communication between academic institution, industry and government representatives take a new form when this model is implemented. The volume and quality of communication can lead to higher levels of economic innovation.

Direct participation of academic institutions in industry and economy is called "third mission". By reviewing historical experiences of academic institutions in the United States and other developed countries, Etzkowitz devised a model in order to find answers to the open questions. These questions were: was it possible to put third mission for economic development in line with education and research? And how different responsibilities could be combined? Etzkowitz maintains that progressive universities added research responsibilities to their mission at the end of nineteenth century, while many universities in the world do not yet completely take on this responsibility. Etzkowitz studied the relationships between government, industry and academic institutions all over the world. The historical form of these relationships is depicted in <Figure 3>.

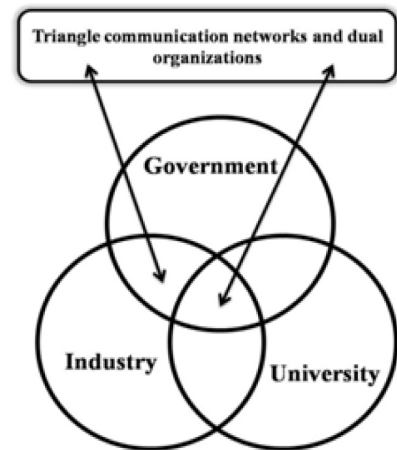
In this form, government has control over industry and universities and manages their relationships. The most powerful implementation of this model could be found in former Russia and Eastern Europe under communism. A weaker form of this model could be found in Latin Americas and in some European countries like Norway.



<Figure 3> Relationship model between government, industry and academic institutions with government as dominant.



<Figure 4> Relationship between government, industry and universities in free economy model.



<Figure 5> Relationship between government, industry and universities in trinary helical model.

The official areas in the second implementation model <Figure 4> are completely separated and bordered, while communication has a certain scope. A good example of this model is Sweden. Communication coordination is arranged in meetings in this country and separate reports are combined. In the final model <Figure 5> knowledge infrastructure is formed in overlapping areas. Each one of these elements sometimes takes the

role of the other and therefore organizations with dual functions are formed in the overlapping areas. Etzkowitz compared these three models in his subsequent articles and evaluated them based on actual experimental results. The first model <Figure 3> is known as a failed method. A limited space for lower-up initiative on innovation is disappointing. Therefore, creativity is suppressed by government directives and procedures. The second model <Figure 4> requires no government intervention in economic activities. In this model, some government interventions practically push this model towards the first one during implementation. Trinary helical model <Figure 5> includes academic associated companies, triangle partnerships which promote knowledge oriented economic development, strategic partnerships at corporate level, affiliation with governmental research centers, and academic research groups. This combination receives government support but it is not controlled by it (Etzkowitz & Leydesdorff, 2000).

2.8. Academic entrepreneurship model

Academic entrepreneurship means solving scientific problems of society, government and enterprises, creating a ground for innovation to flourish among academic members, presenting the results of academic research to the market, as well as developing and presenting new technologies and innovation in an attempt to extend limits of human knowledge. Academic entrepreneurship has four functions. Academic entrepreneurship can be materialized within government-industry-university golden triangle with the help of these four functions. These four functions are as follows:

1. Generating knowledge: this function complies with research responsibilities in universities. Producing knowledge in universities of developed countries is a part of traditional role expected from universities. In developing countries, implementation of academic entrepreneurship concept follows a different process.

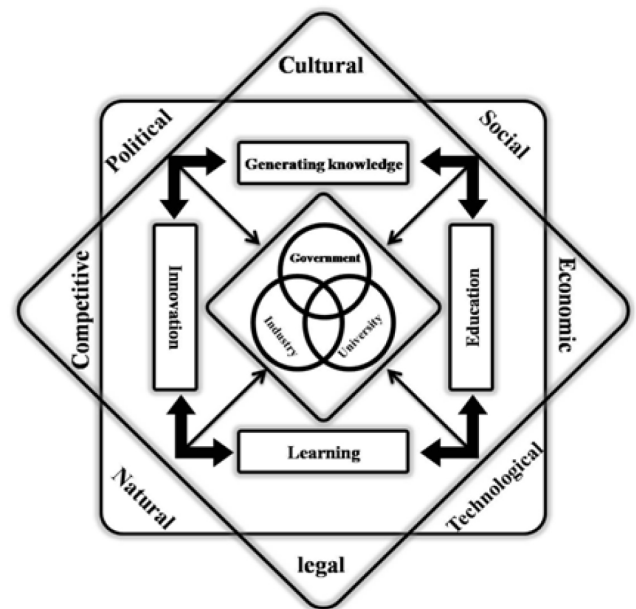
2. Education: this function represents the philosophy of existence for a traditional university. Education in support of social changes and for expanded utilization of international knowledge resources can create a new form for this function, which requires changes in methodology.

3. Innovation: this concept is the gate for entering in the academic entrepreneurship domain. It is associated with economic utilization of knowledge. Economic utilization of knowledge involves all efforts made to increase performance and is associated with a certain combination of cultural, political, and social phenomena.

4. Learning: this concept ensures progressive role of university in government-industry-university triangle. It relies on all studied economic assumptions while emphasizing on managerial and operational aspects.

In a model that is made of the these functions, reciprocal cause and effect assumptions of all forces governed by under-developed economy and also the cost and time of social

changes to go into effect, as well as utilization of international knowledge are considered. These four functions playing the roles of the three un-substitutable parts, namely, government, industry, and university, will be formed in an environment with practical approach. This study intends to modify these four functions in its final model to conform internal characteristics prevalent in Iran in order to devise an overall academic entrepreneurship system. In an attempt to build a model that conforms to internal characteristics, the internal environment including government and industry and also external environment including cultural, political, social, competitive, economic, technological, legal and natural environments shall be considered. External environment and internal environment will have significant influence on the process of this model. For example, each one of cultural, competitive, political, and economic factors shall produce its effect on the processing of this model. However, the effects are rather different in Iran because of the limitations confronting political, competitive, economic, and other pertaining factors. Therefore, an applied approach is used in this study to devise a conceptual model for overall academic entrepreneurship system <Figure 6>.



<Figure 6> Functions of Academic Entrepreneurship.

2.9. Academic entrepreneurship and knowledge formation

Time is an important factor for developing countries when they consider pushing for economic growth. The longer it takes to enter in international knowledge production, the farther behind they get relative to developed countries.

The outcome of getting behind in knowledge growth shows up in per capita income and more importantly in utilization of new economic resources. Therefore, developing countries are well advised to employ the latest sciences and technologies when entering in production by using sciences and technologies.

The developing countries should attempt to create opportunities for themselves and consider the followings in all stages of planning and implementation.

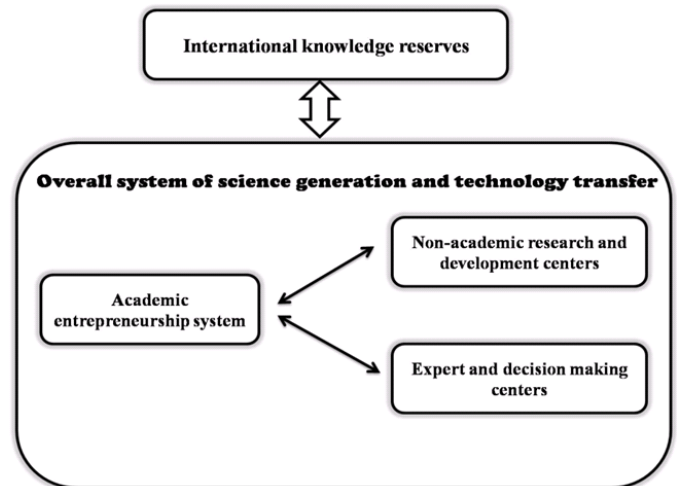
- A continual economic growth is followed by bilateral changes or reciprocal effects between social and technological changes.
- Modeling after a progressive society should include all aspects of relevant economic activities.
- Drawing out and using from international knowledge reserves solely depend on prevailing strategic environmental factors (that is, cultural, social, economic, technology, legal, natural, competitive, political).

Academic entrepreneurs use two knowledge production processes. The first process centers on the field academic entrepreneurs for which they have tools and techniques in their possession. This process is indicative of the general circumstances and exists in almost all universities that have internalized research as one of their main responsibilities. The second one includes interdisciplinary interactions and cooperation with other universities with different fields of study or individuals and nonacademic organizations as part of entrepreneurial macro system. The first method of science production is process oriented and general. Members of faculty accept responsibility in their related fields. The second method represents the knowledge produced in cooperation with other members of faculty and the individuals who have practical experiences in other disciplines. Both methods function in a broader environment namely, academic entrepreneurship system. Specific and outstanding characteristic of academic entrepreneur appears in a continuous flight between two different knowledge production processes. Selection of flight process is dependent on the nature of academic entrepreneur. A scientific entrepreneur is looking for a wider application of academic knowledge in new issues (emphasizing on technology application). However, a technical academic entrepreneur is seeking for an extended application of academic knowledge in new opportunities (emphasizing on market applications). Policies of developing countries that encourage faculty members for production of interdisciplinary science and academic entrepreneurship are as follows:

- The relationship between academic institutions, research centers and governmental and industrial research and development centers which have more contacts with the experimental issues in their own fields;
- Creation of a comprehensive overall academic entrepreneurship system for establishing communication between specialists in different fields;
- Forming groups and social networks from problem solving, research and development groups;
- Establishment of a structure that associate employees' professional and income development to interdisciplinary activities;
- Establishment of a powerful communication system based on web, to facilitate flow of information within university and provide connection with external research partners;

- Development of interdisciplinary communication at international level;
- Providing facilities for membership in specialized or interdisciplinary knowledge production groups at international level.

Based on this introduction, the study present a conceptual framework for academic entrepreneurship and knowledge generation <Figure 7>.



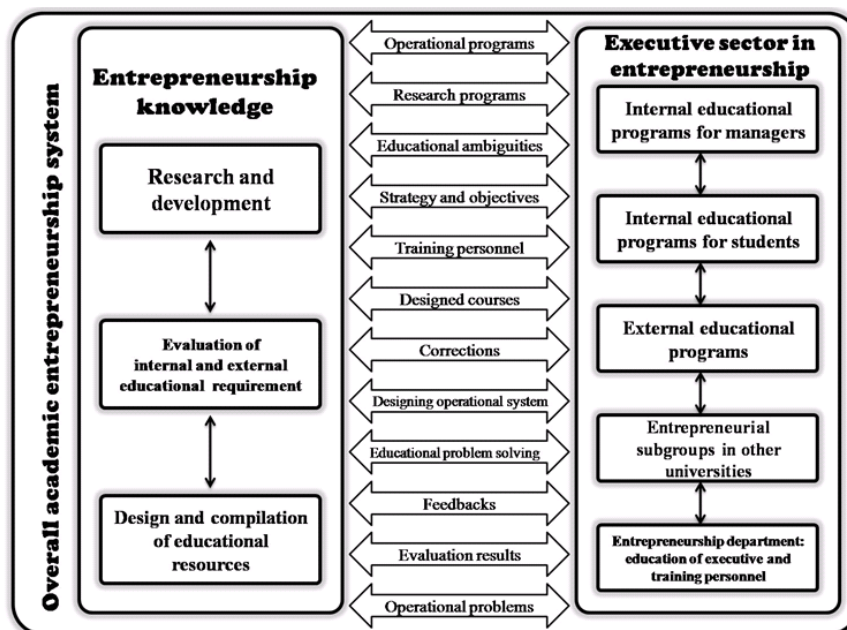
<Figure 7> Academic Entrepreneurship and knowledge production framework.

2.10. Academic entrepreneurship and knowledge formation

The ultimate objective is to provide opportunity for teaching entrepreneurship at university level to anyone entering any field of study. It is natural that not everyone to be interested in becoming an entrepreneur but everyone should have minimum information about the role of entrepreneurship in economy and be familiar with its aspects as a choice for earning an income. The study should not overlook the possibility of confusing entrepreneurship education with management education because of similarities between them. What distinguishes entrepreneurship education from management education is that the former concentrates on understanding opportunities, while the latter is centered on the best methods for implementation of existing hierarchy. It is logical that a part of academic activities in entrepreneurship education to be focused on training of the present managers. Short and long training seminars, workshops, and conferences can introduce entrepreneurship concepts to managers in government and industry. Such gatherings could be a suitable place for transfer of experiences from long-time managers to academic entrepreneur groups. An important function of educational relationship with outside is formation of a common language, which facilitate dynamic extension of academic communication. There will be opportunities resulting from these meetings for academic entrepreneurs to utilize <Figure 8>. Since knowledge is the main source of academic entrepreneurship, we should not overlook knowledge production for entrepreneurship

itself, because, it is the only way for entrepreneurship education. Entrepreneurship knowledge production in developing countries can contribute to international knowledge reserves because of different economic models they use. As a result of using different approaches, research and development centers have been separated from department for evaluation of educational requirement. A research and development center is occupied with operational issues, while department for evaluation of educational requirement has executive roles. The latter one acts as the intermediary between research and development, and departments responsible for compilation of educational resources, playing as communication channel with those responsible with implementation. Executive sector is designed within educational framework of academic entrepreneurship in such a way to bring the role of entrepreneurship and academic entrepreneurs out of shadow and involve it with all academic education activities. All these activities take place within an overall academic entrepreneurship system. An overall system is essential because it prevents potential impediments.

It is important to note that knowledge cannot be transformed into data. Therefore, it is not possible to introduce change solely based on information and data. Instead, learning is possible with change. When change and problem produce competence and capability for solving a given problem, learning has occurred. Learning is a concept resulting from three factors: knowledge production, education and innovation. Learning affects all of them. Learning gains importance when it becomes evident that academic entrepreneurship does not follow a natural and an established course in developing societies. Therefore, an academic entrepreneurship culture should be created. Knowledge production, entrepreneurship education and innovation induce learning. A learning attitude towards these three factors makes their nature different from common form. This model emphasizes on all existing aspects discussed in learning literature. Function of academic entrepreneurship in this model has a managerial role and justifies time and effort necessary for introducing changes. Learning is included in this model so that it can initiate changes in social-economic structure surrounding an academic entrepreneurship with the support of management



<Figure 8> Educational framework of academic entrepreneurship.

2.11. Academic entrepreneurship and knowledge formation

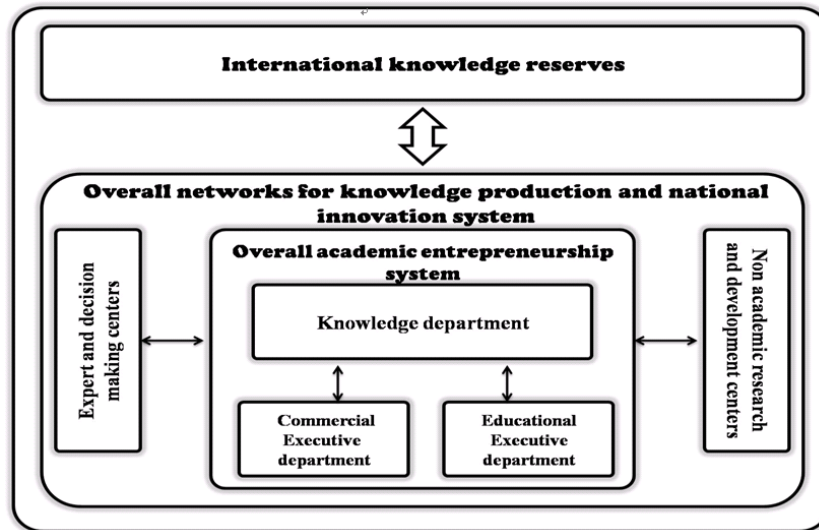
The best experiences that express effect of entrepreneurship on its surrounding social-economic system usually ignore the making of its surrounding population. According to reports on per capita income in regions around universities, the concentration of educated people in those regions is high and most businesses that introduce changes are formed by these people. It is possible to claim that academic entrepreneurship policies have contributed to formation of a learning community in these areas.

literature.<Figure 9> represents an overall learning within a national social and economic system with academic entrepreneurship playing a central role. Such university by creation of a learning environment - where complying with changes and utilization of innovation opportunities are essential - initiates a move that ultimately changes national innovation system and increases overall knowledge volume.

Learning and its communication channels contribute to economic development in many different ways <Figure 9>. An important point in this model is that knowledge is presented in a concentrated form. This section is placed in an academic entrepreneurship department if university has one.

By using this model, it is possible to define more comprehensive mission and vision for active entrepreneurial groups within university and design a suitable structure for academic entrepreneurship department.

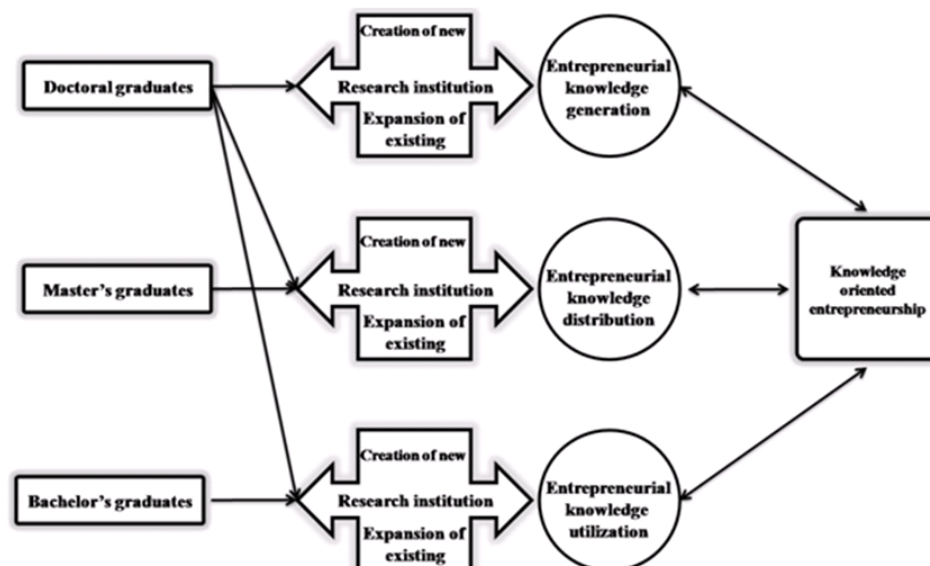
ic growth and development as well as social transformation, many governments in developed and developing countries attempt, by way of maximum utilization of available resources and research outcomes, to encourage and lead those individuals with entrepreneurship qualities to participate in educational pro-



<Figure 9> The conceptual model for academic entrepreneurship based on learning.

Some economists and management scholars believe that entrepreneurs are engines of economic development in a society. They energize and develop a society in a competitive and unbalanced condition (and not static balance). And entrepreneur with a proper understanding of opportunities and utilization of free capitals creates facilities and with suitable organization and management of resources to implement his ideas and consequently plays an important role in creation of productive employment. Because of the role entrepreneurs play in econom-

grams designed for entrepreneurs and entrepreneurial activities. Entrepreneurs with their skills in identifying opportunities and situations, and their abilities to create a move toward development of these opportunities are the real forerunners in economic and social changes and transformations. In age known as knowledge era, universities are considered a suitable place for knowledge based innovation and entrepreneurship because of having the basic requirements such as production and distribution of knowledge as well as a pool of potential inventors such as students and faculty members. University graduates are in three levels of



<Figure 10> Relationship between different knowledge oriented entrepreneurship and graduated of different levels of higher education.

bachelors, masters, and doctorate. There are different entrepreneurial expectations from these groups of graduates. Graduates at doctorate level are expected to contribute to entrepreneurship in knowledge production, while graduates at master's level are expected to be entrepreneurial in utilization of knowledge. Consequently, universities should design their academic programs according to different levels of education that they offer. <Figure 10> shows the relationship between different knowledge oriented entrepreneurship and graduated of different levels of higher education.

2.12. Academic entrepreneurship and knowledge formation

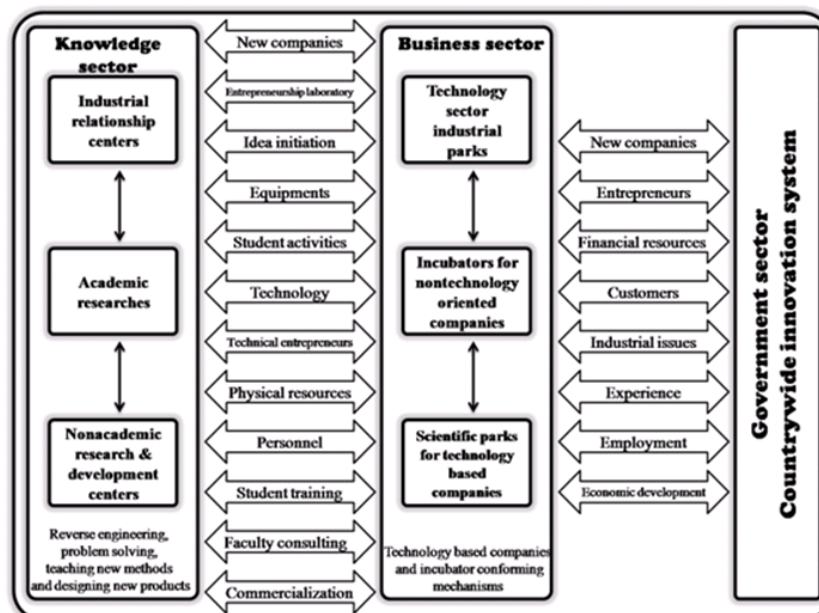
Three sectors of knowledge, commercialization and government are considered in this framework, the third one being the public sector. However, looking at it with a commercialization viewpoint, government can substitute public sector. This substitution can include industries owned by the government.

Knowledge sector in this framework provides guidance and support to other sectors. Technical entrepreneurs can play an effective role in the teams formed in this sector. Faculty members who do not desire to participate directly in commercialization may act as consultants, advisers or executive managers to scientific groups active in this sector. Communication departments in this sector may not have commercial relationships. They can merely bring up issues and attempt to solve them with the cooperation of others. The commercial sector represents the external and visible qualities of entrepreneurship all over the world. The majority of research activities are concentrated in this area. This section can be the best example for scientific, industrial and governmental policy making in Iran and the best one to carry them out <Figure 11>.

2.13. Research Method

Achieving scientific objectives or discovery and analysis of scientific issues is only possible through the right methodology. Methodologies as a guide for achieving research objectives are categorized based on collection objectives, methods and approaches. Applied research (also called practical or management research) is research that engenders data, insights, methods, concepts and views –often derived from the knowledge gathered during the course of fundamental research –which is applicable for a specific organizational or managerial problem. Applied research strives (a) to obtain knowledge about a particular issue, etc. in the organization and (b) to contribute to the improvement of that issue, etc. leading to problem solving. In general a conceptual model is nothing more than an abstraction way to perceive a specific part, function, property or aspect of reality (Jonker & Pennink, 2010) (Holtom & Fisher, 1999). Due to mentioned theoretical background, research design of this study is based on applied research because of its objectives, using of principals and techniques formulated for basic research to solve operational and real issues in an organization. This research also is descriptive for the method it uses - it describes and interprets whatever that exists. It takes into account the existing conditions and relationships, prevalent thoughts, current processes, observable effects or progressive trends. Its outmost focus is on present, although, it often reviews past events and effects related to the existing conditions. On the base of studies (Sekaran, 2003), secondary data (library research) was the base of data collection for this study.

Therefore, by the essence of this research any hypothesis is not launched and consequently for research setting; designing questionnaire, population and sampling, validity and reliability tests and statistical analysis are not to be needed.



<Figure 11> A Conceptual framework for academic innovation and entrepreneurship.

Identification of study limitations helps researchers in defense of their results. This research was limited in financial resources and time. Because there is an extensive body of research in academic entrepreneurship at international level, it was difficult to include different research viewpoints about basic and practical concepts. The proposed model is at a study level at this point of research, because field studies, pilot studies (experimental), and extended studies have not been carried out.

3. Findings

Historical trends and economic-industrial development in developed countries indicate that educational system dynamism and deep connection between science and technology with employment market is one of important factors in their economic and cultural growth and development.

Development as an important and basic objective depends on optimum utilization of all resources that are available in a country, especially its human resources as an important and key asset. Considering that Iran is one of the countries with large populations of young generation making a huge number of people with potential qualities especially among educated ones available for employment, therefore, the importance of entrepreneurship training is more evident. Taking a practical approach at all levels gains importance because management of achieving academic entrepreneurship requires applied thinking in all elements that make up this model.

The government-industry-academic golden triangle and an analysis of their relationships as the main elements of internal environment, which we discussed their different combinations, taking a practical approach and its implementation in other elements of internal environment including knowledge production, education, learning, and innovation are essential and inevitable. Because an overall entrepreneurship system is dynamic and a dynamic system has a close relationship with its surrounding and external environment, an analysis of its external environment including economic, political, social, competitive, technological, natural, legal, and cultural environments is required. What describes this model is the term "a practical approach to academic entrepreneurship" which is evident in steps taken in making this model.

3.1. Steps taken in creation of this model

On the first step, government and industry with all their subdivisions acting as the main providers of the proper ground to facilitate achieving academic entrepreneurship establish a multi-dimensional interaction with universities.

On the second step, universities - as the main player in academic entrepreneurship in knowledge oriented economy - create a proper environment with the support of government and industry for maximizing productivity in four key functions of aca-

demic entrepreneurship.

On the third step, university concentrates on its most important mission i.e. knowledge production. Relationship with international knowledge reserve at macro level is not exclusive to universities. Perhaps, that part of industry which is involved with transfer of technology is more successful in getting acquainted with practical flow of science and technology. Lack of proper relationship between industry and academia bring about their widening separation. Therefore, universities in developing countries, including Iran, are more inclined to focus on basic research and increasingly become oriented to specialization. Industrial centers and other decision making and operational centers without having a relevant base of specialization, lose resources and opportunities for making the right choices in respect to international knowledge reserves. When this trend continues, the problem with time becomes more problematic and the cost of entering into modern economic growth increases.

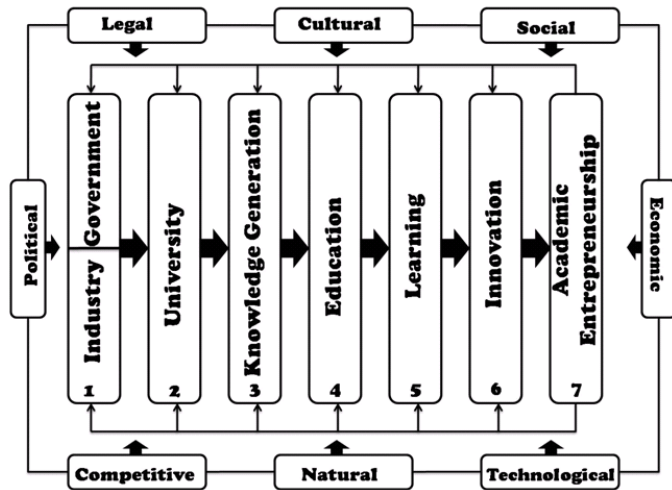
The study suggest that an overall knowledge production system made of interdisciplinary teams from relevant science and technology centers take over control, and support relationships depicted in <Figure 7>. Establishment and monitoring such relationships are only possible by academic entrepreneurship. Therefore, the other visa-a-vie the university is its overall entrepreneurship system.

On the fourth step, the knowledge produced by knowledge should be taught to students. Learning can take place only if it is accompanied by change in behavior. Students are expected to show more entrepreneurial behaviors. In this step of overall academic entrepreneurship system, there are two main sectors and their relationships are conclusive. The first sector is entrepreneurship knowledge which includes research and development, requirement evaluation of internal and external education, and design and provision of educational resources. The second sector is the application of entrepreneurship which includes internal educational programs for managers, internal educational programs for students, external educational programs, entrepreneurial sub-groups in other universities, departments of entrepreneurship, and interaction between these two groups as depicted in <Figure 8>.

On the fifth step, after knowledge production and educational processes that together make the ground for learning, two sectors, namely international knowledge reserves and overall network for knowledge production with national innovation system are important. The later one has three sectors including, overall academic entrepreneurship system, nonacademic research and development center, and expert and decision making center. Overall academic entrepreneurship system is made from the interaction between knowledge department, educational executive department, and commercial executive department <Figure 9>.

On the sixth step, innovation -as an important skill of an entrepreneur - should be trained by entrepreneurial academic institutions. This is made of three sections, namely knowledge, business and government. Nonacademic research and development centers, academic research, and communication center

with industry are the main elements of knowledge section. Technology sector of industrial parks, Incubators for non-technology oriented companies, and scientific parks for technology based company are important for business sector. Overall innovation system is the important part of government sector. Interactions between these subsystems are shown in <Figure 11>.



<Figure 12> A Conceptual model for achieving an overall academic entrepreneurship system in Iran with Strategic approach.

At the end of this process, there will be academic entrepreneurship with previous six steps. Any non-dynamic system is due for failure. Because of dynamic nature of the model, the feedback from this step is provided to other steps. All interactions in this model are formed with practical approach acting in an octal environments consisting of social, cultural, legal, economic, political, technological, competitive, and natural. This model is self-adopting to factors affecting these environments.

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