World Conference on Technology, Innovation and Entrepreneurship

Building Knowledge- Based Entrepreneurship Ecosystems: Case of Iran

Yagoub Entezari*

Institute Of Research and Planning In Higher Education, Tehran, Iran

Abstract

The main purpose of this article identifies KBEE and analyzing the linkage and interactions of its elements. They are extracted through exploratory study of literature; the paper utilizes the “interpretive structural modelling (ISM)” technique in order to model creating KBEE. A sufficient sample of entrepreneurial experts in Iran was interviewed for this purpose. According to exploratory study of literature and interviews with experts, seventeen elements of KBEE are identified. Elements are divided into two groups: six actors and eleven factors. The actors of KBEE are academic entrepreneurs, entrepreneurial universities, science and technology parks, knowledge-based industrial parks, financial institutions and government. The factors of KBEE are entrepreneurship opportunity, entrepreneurial capacity, technological learning, entrepreneurial culture, innovation capital, human capital, social capital, knowledge production, and infrastructure and info structure and university-company interactions. The analyses of elements relations in KBEE demonstrates that among the actors, scholars, researchers and scientists play entrepreneur role; entrepreneurial universities have incubator role; and government plays a supportive and key role in the KBEE. The key of building and lunching KBEE in Iran’s provinces is in the government hands.

Keywords: Knowledge-based Entrepreneurship; Knowledge-based Entrepreneurship Ecosystem; University-based Entrepreneurship Ecosystem

1. Introduction

The development gap between Iran’s economy and the developed ones increased in the last decade. In order to decline the development gap and improve its competitiveness position, Iran’s economy should be converted into a Knowledge-based Economy (KBE); the economies which are directly based on production, distribution and use of

* Corresponding author. Tel.: +989125140755; fax: +982122050324.
E-mail address: y.entezari1965@gmail.com
knowledge and information (OECD, 1996). Creating a KBE requires to build a knowledge-based entrepreneurship ecosystem (KBEE) (Al-Mubaraki et al, 2015). The identification of elements of KBEE and their linkage and interactions is the first step in order to build it. Despite of abundant financial and human capitals, Iran still lack adequate innovation and entrepreneurship to absorb, create, application and exploitation of knowledge and information. According to the results of GEM studies about entrepreneurship in Iran, during the past five years the entrepreneurial tendencies in Iran has been on an average level, compared to other countries under study. The Iranian Association Entrepreneurship Association (2013) has studied the ecosystem players and their roles in four large cities of Mashhad, Esfahan, Shiraz and Ahvaz, and furthermore has identified and prioritized five main challenges by comparing it with Tehran and the overall country. These challenges are: 1) Lack of a coherent communication network between players and entrepreneurs; 2) Absence of information about successful entrepreneurship stories; 3) Large number of policy making institutes; 4) Inefficient entrepreneurship education; and 5) Inability to identify the real entrepreneurs.

The purpose of this paper is to identify and analyses the elements relations of the knowledge-based entrepreneurship ecosystem. They are extracted through exploratory study of literature and interview with entrepreneurial experts in Iran; the paper utilizes the “interpretive structural modelling (ISM)” technique in order to model the building KBEE. A sufficient sample of entrepreneurial experts (15 people) in Iran was interviewed for this purpose.

2. Literature Review

Literature of entrepreneurship development was divided to three group: the studies on influence of individual factors on entrepreneurial success; the studies on influence of environmental factors on entrepreneurial success and entrepreneurship performance; and the studies on influence of individual and environmental factors on entrepreneurship development. The literature of entrepreneurship ecosystem is belonging to the third group. Approach of entrepreneurship ecosystem have focused on various elements for entrepreneurship development in a region. Literature survey shows that the term “Entrepreneurial Ecosystem” was explicitly mentioned by Valdez (1988). Gnyawali & Fogel (1994) developed a theoretical framework for entrepreneurship ecosystem which categorizes the environmental factors in five dimensions (Government Policies and Procedures, Socioeconomic Conditions, Entrepreneurial and Business Skills, Financial Assistance and Non-Financial Assistance) and linked them to the five core elements of the start-up process (entrepreneurial opportunity, ability to enterprise, propensity to enterprise, likelihood to enterprise and new venture Creation). Neck et al. (2004) explored new venture creation within the context of an entrepreneurial system. Their findings indicate that incubator organizations, spin-offs, informal and formal networks, the physical infrastructure, and the culture of the region are related uniquely and interact to form a system conducive for dense high-technology entrepreneurial activity. Additionally, greater rates of new venture formation were found following critical moments in the life of incubator organizations. Isenberg (2010) identified 13 elements of an entrepreneurship ecosystem (leadership, government, culture, Success stories, Human capital, Financial capital, Entrepreneurship organization, education, infrastructure, Economic clusters, networks, Support services and Early customers ) that all must exist in order for an entrepreneurship ecosystem to be self-sustaining, and in order to achieve the Start-Up objectives. In a new version, Isenberg (2011) summarized these to 6 elements: policy, finance, culture, supports, human capital and markets. According to Isenberg (2010, 2011), the key to sustainable entrepreneurship lies in the specific combinations of the elements in an entrepreneurial ecosystem. World Economic Forum (2013) highlights 8 elements of an entrepreneurship ecosystem that includes: Accessible Markets, Human Capital/Workforce, Funding and Finance, Support System, Regulatory Framework and Infrastructure, Education and Training, Major Universities as Catalysts and Cultural Support. Vogel(2014) has defined entrepreneurship ecosystems as “dynamic and interactive communities within a geographic region, composed of varied and inter-dependent actors (e.g. entrepreneurs, institutions and organizations) and factors (e.g. markets, regulatory framework, support setting, entrepreneurial culture), which evolves over time and whose actors and factors coexist and interact to promote new venture creation.”

Present paper focus on literature of knowledge-based entrepreneurship ecosystem. These concepts appeared in the past decades, looking at development of the knowledge-based economy literature in the 1990s 2000s. Therefore, these terms are strongly linked to the discourse on the emerging knowledge based economy. It indicates change of
entrepreneurship essence in the global knowledge economy in the last three decades. In the knowledge based economy context, knowledge- based entrepreneurship (KBE) can be understood as a necessary mechanism mediating between the creation of knowledge and innovation and its transformation into economic activity and value, i.e., KBE represents a core interface between two interdependent systems: the knowledge generation and knowledge diffusion system on the one hand, and the productive system on the other (Caloghirou et al., 2014). According to Greene et al. (2010, p. 2), a university-based entrepreneurial ecosystem is defined as “multidimensional enterprises that support entrepreneurship development through a variety of initiatives related to teaching, research and outreach”. Fetters et al. (2010) offers a comprehensive picture of university-based entrepreneurial ecosystems which takes practical as well as theoretical aspects into account. They presented optimum strategies for universities seeking to develop their entrepreneurial capacities within knowledge-based entrepreneurship ecosystem. Raeesi et al. (2013) identified eleven general barriers to entrepreneurship and analyzed the interactions among them. In order to model these interactions, they utilized interpretive structural modeling (ISM). They divided barriers into two groups of inside and outside barriers and with the support of the ISM-based model, they show that inside barriers are dependent on outside barriers. Corrupted and unsupportive business environment then, shows to be the major driving barrier to entrepreneurship. Rice et al. (2010) analyzed the long histories of the six university-based entrepreneurship ecosystems (U-BEEs).Three overarching findings emerged from their analysis: 1-There are alternative pathways to the development of a comprehensive, highly evolved university-based entrepreneurship ecosystem; 2- Although the relative strengths of the elements of their U-BEES may vary, all cases share common elements; 3-The six case studies reveal success factors for the development of a comprehensive U-BEE that will be illuminating for universities that wish to pursue development of their own ecosystems.

3. Methodology

3.1. Research Goal

The main purpose of this article is to identify the knowledge-based entrepreneurship ecosystem and analysing the linkage and interactions of its elements. They are extracted through exploratory study of literature and interviews with experts; the paper utilizes the “interpretive structural modelling (ISM)” technique in order to model the building KBEE in the Iran’s provinces. A sufficient sample of entrepreneurial experts in Iran was interviewed for this purpose.

3.2. Sample and Data Collection

In order to identify elements and analyses the nature of structural and contextual relationships among the elements (actors and factors) of knowledge-based entrepreneurship ecosystem, we initially got help from a group of 10 experts. Another group of five experts was also used in the final step of ISM approach to validate the model. All these experts had both considerable academic background and comprehensive practical personal experience with knowledge-based entrepreneurship. Two general discussion meetings were held, with a one-week interval to make sure about the consistency of their views. In each session, they were asked to perform a structural and contextual connection of “leads to” type between any two elements (actors or factors).

3.3. Modelling the Interactions among the actors and factors of KBEE

To order modelling the Interactions among the actors and factors of KBEE, w use method of Interpretive Structural Modelling (ISM). It is noteworthy that ISM was introduced by Warfield (1974) as a suitable modelling technique for analysing the impact of one element on other elements and for getting better insights into the problem. This method provides an ordered and directional framework for complex problems, and gives decision makers a realistic and clear picture of the system and its involved variables (Raeesi R. et al 2013). ISM is interpretive since the group’s judgment decides whether and how items are related; it is structural because it extracts an overall structure from the complex set of items, based on the identified relationships; and it is modelling in the case that it provides a digraph model of the specific relationships and the overall structure (Raeesi R. et al 2013). The steps of ISM which lead to model construction for the interactions among the actors and factors of KBEE are applied in the following subsections. According to the goals of paper, above literature and interviews, we identify and list all the
related actors, factors and context of the KBE ecosystem in the following table:

**Table 1: The related actors, factors and context of the KBE ecosystem**

<table>
<thead>
<tr>
<th>Actors</th>
<th>Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Creating Entrepreneurial University</td>
<td>A university, as an incubator, supports the entrepreneurial ecosystems in many ways: developing and motivating knowledge-based entrepreneurs; developing innovation, human and social capital; knowledge production; and …</td>
</tr>
<tr>
<td>2 Building Knowledge-based industrial park</td>
<td>Place for professional and supporting services. The industrial park will cater to the specific needs of information technology, media, research and development, gems and jewellery and business services.</td>
</tr>
<tr>
<td>3 Building Science and Technology Park</td>
<td>Place for facilitate the creation and development of new technology-based companies and knowledge transfer from universities to companies</td>
</tr>
<tr>
<td>4 Creating good governance</td>
<td>Governance Partly is about how governments and other social organizations interact, how they relate to citizens, and how decisions are taken in a complex world.</td>
</tr>
<tr>
<td>5 Developing universities - companies interactions</td>
<td>Interactions between Entrepreneurial University, Academic Entrepreneurs, Science and Technology Park, Knowledge-based industrial park, Knowledge-based Firms, Government and Financial Institutions</td>
</tr>
<tr>
<td>6 Developing Infrastructure and info structures</td>
<td>It is defined through tangible elements of the regional infrastructure, for example through ways and possibilities of transport or the range of available office space, flats and other realty and information and communication technology</td>
</tr>
<tr>
<td>7 Developing Market openness and competitiveness</td>
<td>the extent to which commercial arrangements undergo constant change and redeployment as new and growing firms compete and replace existing suppliers, subcontractors and consultants, consisting of networks and early customers</td>
</tr>
<tr>
<td>8 Developing Human capital</td>
<td>Appropriate Technical and Practical Skills and knowledge embodied in labor Technical and vocational education, Business education, Entrepreneurial training programs, Availability of information, Education provides knowledge and …</td>
</tr>
<tr>
<td>9 Developing Social Capital</td>
<td>trust-based professional networking with companies, governmental bodies and venture capital funds increases the likelihood that a researcher will choose an entrepreneurial career path</td>
</tr>
<tr>
<td>10 Developing innovation capital</td>
<td>Innovation capital includes intellectual property such as patents, trademarks and copyrights, and intangible assets. Intellectual properties are protected commercial rights such as patents, trade secrets, copyrights and trademarks.</td>
</tr>
<tr>
<td>11 Creating Entrepreneurial Culture</td>
<td>An entrepreneurial culture is an cultural environment where someone is motivated to innovate, create and take risks, including entrepreneurial success stories, Respect to capitalist and social norms</td>
</tr>
<tr>
<td>12 Financial Supports</td>
<td>Venture capital, Alternative sources of financing, Low-cost loans, Willingness of financial institutions to finance small entrepreneurs Own financing sources, Public subsidies, Private investors, Equity offerings,</td>
</tr>
<tr>
<td>13 Developing Entrepreneurial Tendency of Academician</td>
<td>scientists becoming entrepreneurs by developing new products and starting their own companies to market</td>
</tr>
<tr>
<td>14 Technological learning</td>
<td>Observing the example of successful entrepreneurs motivates other researchers to consider the possibility of developing their own ventures.</td>
</tr>
<tr>
<td>15 Knowledge production</td>
<td>developing and providing new knowledge; research and development</td>
</tr>
<tr>
<td>16 Knowledge-based Entrepreneurship Capability</td>
<td>Entrepreneurial capacity consists of motivation and entrepreneurial attribute</td>
</tr>
<tr>
<td>17 Knowledge-based Entrepreneurship Opportunity</td>
<td>Entrepreneurship opportunity refers to both the existence and perception of market opportunities available for exploitation</td>
</tr>
</tbody>
</table>
According to ISM technique, the results of partitioning elements levels of knowledge–based entrepreneurship ecosystem, is presented through Table 2.

<table>
<thead>
<tr>
<th>Level 1</th>
<th>Level 2</th>
<th>Level 3</th>
<th>Level 4</th>
<th>Level 5</th>
<th>Level 6</th>
<th>Level 7</th>
<th>Level 8</th>
</tr>
</thead>
<tbody>
<tr>
<td>2, 3, 16, 17</td>
<td>14</td>
<td>13</td>
<td>10, 11, 12</td>
<td>9, 15</td>
<td>8</td>
<td>1</td>
<td>4, 5, 6, 7</td>
</tr>
</tbody>
</table>

Determining the levels of elements in the digraph through step 4 of ISM, and having the initial reachability matrix (IRM), the initial ISM digraph could be established. To do so, after positioning the factors into their designated levels, the IRM is utilized to determine whether an arrow goes from the $i$th element to the $j$th element, or not. And ultimately, after removing the transitivity the final ISM digraph is obtained as in Figure 1. As it is showed in Figure 1, element 17 goes to the top of the hierarchy as also Table 1 assigns the first level to this factor. Factor 16 is on the next level and so on.

Fig. 1. A model for interactions among the elements building a knowledge–based entrepreneurship ecosystem

Starting from the bottom of the hierarchical structure in Figure 1, it could be seen that according to the SSIM
there are links from 4 to 5, 6, and 7 and vice versa and form 5 to 1. In the next level of bottom, there are links from 1 to 2, 3 and vice versa, and from 1 to 8, 9, and 15. There are also links from 8 to 1 and vice versa, and from 7 to 1 and vice versa, but as suggested by SSIM there is no link from 1 to 11. The rest of the digraph could be explained likewise. In order to construct the final structural model of interactions among factors of entrepreneurship ecosystem, these elements should be replaced by related statements. Final structural model is showed in Figure 3. Using matrix 2, with regard to elements’ dependence and driving powers, elements could be classified into four distinct groups, i.e. autonomous elements, dependent elements, linkage elements, and independent elements.

The first group (I) consists of autonomous factors that have weak driving power and weak dependence, and are relatively disconnected from the system. As they get more distant from the corner they are more interactive with the system. The second group (II) contains dependent factors that have weak driving power but strong dependence. They are more affected by other factors rather than affecting them. The third group (III) contains linkage factors which own strong driving powers along with strong dependence. These factors are central to ecosystem and any action of these factors will have an effect on others and also have a feedback on themselves. The factors of the fourth group (IV) are independent factors which have strong driving power but weak dependence. They are the basis on which many other factors are reinforced, and call for special attention.

With respect to second matrix of ISM, elements of entrepreneurship ecosystem are placed in their corresponding positions in the clustering diagram (Figure 2). For example elements 1, has driving power of 13 and dependence of 7, hence it is located in the related position as an independent factor. Factors of entrepreneurship ecosystem are divided into three groups according to the clustering diagram, i.e. dependent, independent and autonomous elements; there are no linkage elements in the KBEE. Elements 1, 4, 5, 6, 7 and 8, are independent elements and elements 2, 3, 10, 11, 13, 14, 15, 16 and 17 are dependent factors. Elements 9 and 12 are autonomous elements.

4. Analysis of the ISM-Based Model

Replacing the factors labels with corresponding statements in Figure 1, the final ISM-based model for factors of entrepreneurship ecosystem could be achieved as in Figure 3. Indeed, this structural model provides many fruitful and informative connotations, which can greatly aid decision makers and entrepreneurs. This model was presented at a committee of five experts who were independent from the first group of 10 experts who were engaged in ISM construction steps. All the members agreed on the consistency of the model with real world variables, their own professional and academic experience, and the axiomatic rationale of the interactions among elements (factors and actors) of entrepreneurship ecosystem. Figure 3 shows elements (factors and actors) and their relations that creating
or developing them that lead to build a knowledge-based entrepreneurship ecosystems (KBEE). These elements and their relations are considered partially in some literature. In following, the relationship between elements of KBEE are analysed and attached literature is considered. Academic entrepreneurship is designed and organized by the scholars, researchers and scientists who are called “knowledge- intensive entrepreneur”. Scientists become entrepreneurs by developing new products and starting their own companies to market their research knowledge and inventions (Goethner et al. 2012, p. 629). Engaging scholars, researchers and scientists in entrepreneurial activities is seen to be important for the setting-up of high-growth and high-tech organizations (Oliveira et al. 2013). The knowledge- intensive entrepreneurs are developed and motivated by entrepreneurial university. He or she is the main actor of knowledge-based entrepreneurship ecosystem. Thus, the entrepreneurial university as the second actor is the nucleus of each knowledge-based entrepreneurship ecosystem. In fact, these type of ecosystems were formed based on entrepreneurial universities. The entrepreneurial university is incubator of new knowledge –based ventures. In one side, it creates KBE process and mechanisms through developing and motivating scholars, researchers and scientists to become entrepreneurs and other side, develops new knowledge, new idea, human capital, innovation capital, social capital and entrepreneurial culture that are necessary for building entrepreneurship ecosystem. Main Strategy of entrepreneurial university is to increase patenting and spin-off activities Thus, creating and patenting innovative ideas is an important activity in the KBEE that positively correlated with human capital (Unger et al. 2011), innovation capital and social capital (Kim & Aldrich, 2005) and a similar relationship can be observed between the scientific novelty of research outcomes and the successful registration of new patents (Owen Smith & Powell 2003). Entrepreneurial university and knowledge- intensive entrepreneur attempt to develop their entrepreneurial capacity and to create or discover knowledge-based entrepreneurial opportunities.

Fig. 3. ISM-based model for building a knowledge-based entrepreneurship ecosystem

These are the major elements in formation of entrepreneurship ecosystems in a region (Gnyawali & Fogel 1994;
Andersson et al, 2010). Entrepreneurial capacity is an inside factors and related to personal nature of entrepreneurs. However, the findings of our model suggest that capacity, originally emanates from structural and institutional factors of entrepreneurship ecosystem. Scholars, researchers and scientists develop their entrepreneurial capacity by entrepreneurial learning and technological learning (through appropriate technical and engineering education, learning by doing and market experience, using device, interaction with knowledge-based firms). Some actors such as Science and Technology Park and Knowledge-based Industrial Park directly but some other factors such as university, financial institutions and government indirectly assist to create Knowledge-based entrepreneurial opportunities and to develop knowledge-based entrepreneurial capacity (Gnyawali & Fogel 1994; Carayannis et al, 2006). Informal access to facilities such as Science and Technology Park and Knowledge-based Industrial Park tends to increase the number of spin-offs generated by a university (Moutinho et al, 2014). Existence of Science and Technology Park and Knowledge-based Industrial Park can also assist to technological learning.

Government as the third actor of KBEE, contributes to creating entrepreneurial universities through developing framework condition, developing infrastructures and info structures, opening the society and markets, financial support and developing universities - companies interactions (Fuerlinger et al, 2015). The interaction between universities and companies is established through several channels, more precisely, (1) cooperation through outsourced R&D projects or applied research consortiums and research joint-ventures; (2) the development of spin-off companies and (3) the transfer of Intellectual Property Rights (IPR), including patenting and licensing (Bercovitz & Feldman 2006). There is a long tradition of studying human capital (Unger et al. 2011) and social capital (Kim & Aldrich 2005) as antecedents of entrepreneurship, in other words, as determinants of the individual decision to become an entrepreneur. Personal experiences provided by social relationships, such as the exposure to different ideas, mindsets, beliefs and ways of life, shape a reference framework that supports the identification of business opportunities and their development (Davidsson & Honig 2003). Human capital, social capital and entrepreneurial culture are outcomes of educational system (Qunlian, 2011; Yaghoubi, 2010). Today, entrepreneurship education is one of the entrepreneurial university mission (Qunlian, 2011). The literature on academic entrepreneurship emphasizes that professional networking with companies, governmental bodies and venture capital funds increases the likelihood that a researcher will choose an entrepreneurial career path (Landry et al. 2006; Shane & Stuart 2002). The personal interactions or social bonds resulting from collaborating with corporate partners through research joint-ventures or applied research consortiums not only generates a spill-over effect that benefits the industry, but also provides the researcher with the business related knowledge necessary to commercialize research outcomes through entrepreneurship (Bercovitz & Feldman 2006, 2008).

5. Conclusion

Knowledge based Entrepreneurship(KBE) is the key to new job formation, and well solution for the crisis of unemployment of higher education graduates and powerful engine for knowledge based development and building the knowledge based economy in Iran. Of course, this is a complex and multidimensional process that various actors and factors cooperate in that. Developing KBE requires building a Knowledge-Based Entrepreneurship ecosystem (KBEE) that include all actors and factors which contribute developing KBE. Each KBEE at least include 17 interconnected elements with active interactions (actors and factors). Universities have central role in this ecosystem. Unfortunately, often provinces of Iran have not most of KBEE elements. All of Iran’s provinces have not knowledge based industrial park; some of them have not Science and Technology Park, appropriate infrastructure and info structure, enough funds and resources, openness markets and supportive business environment; Most importance of all, entrepreneurial universities have not yet been created in Iran’s provinces. As a result, they have not adequate human capital, beneficial innovation capital, and intransitive social capital. Thus, knowledge-based entrepreneurs, knowledge-based entrepreneurial capacity and knowledge-based entrepreneurship opportunities don’t develop in Iran’s provinces.

A government has supporter role in the KBEE. The key to develop KBEE is still in the hands of top governmental management. Regrettfully, the government in Iran doesn’t care for KBEE and doesn’t already feature an entrepreneurship ecosystem and has not a distinct political agenda to promote entrepreneurship. In order building a KBEE in Iran, government of this country must follow the following political agenda: 1-reform of regulatory environment and pass more supporting rules and regulations; 2-reform business environment and opening markets
as well as to reduce redundant and bothering bureaucratic procedures to minimum; 3-developing financial supports, reform publicly funded programs that support the early stages of new ventures and facilitating obtaining loans; 4-developing entrepreneurship and technological learning in level of individual and organization, especially tertiary education; 5-developing the incentive schemes for scientific staff to encourage more technology transfer activities, through the involvement of private investments, in order to exploit the full growth potential of new ventures; 6-developing entrepreneurial culture and policies that affect social values and attitudes towards entrepreneurship in order to reduce the stigma of failure and enhance the appreciation of entrepreneurial activity in the society.

References
Fetters et al. (2010). The Development of University-Based Entrepreneurship Ecosystems: Global Practices. Edward Elgar Cheltenham, UK


