Iranian Journal of Comparative Education, 2021, 4(4), 1520-1549

Research Article DOI: 10.22034/IJCE.2020.251473.1225 http://journal.cesir.ir

University-Industry Relationships in Iran and Sweden: A Critical Comparative Study

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ARTICLE INFO

Received: 05 October 2020
Revised: 21 November 2020
Accepted: 19 December 2020
Online: 27 November 2021

KEYWORDS

Comparison
Cooperation
Higher Education
Industry
University

ABSTRACT

This paper aims to compare ongoing mechanisms, processes, and policies for improving the relationship between university and industry in Iran and Sweden. As methodology, a qualitative-comparative study was applied. The data were collected via semi-structured interviews. Participants included 23 key Iranian and Swedish informants representing both universities and industries in the two countries that were selected purposefully using snowball sampling method. Semi-structured interview was applied for collecting data and analyzed based on coding method. Compared relevant policies and practices indicated that Iran and Sweden are applying two rather different models for bridging the gap between their universities and industries. Despite this, the variety of interactions between these systems in both countries can be considered as their similarities. The findings also indicate that despite the reported needs for close collaborations between the universities and industries in Iran, current policies and practices, including training, laboratory application, and financial support, needs to be revised critically. Additionally, in light of our findings on the Swedish policies and practices for connecting universities and industries, some practical strategies have been suggested towards improving the universities' relations with industries in Iran.

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1. Introduction

Nowadays, the university-industry association is considered as an important relationship for developing the universities, the industries, and also the countries (Arbuthnott, Hannibal, & Nybacka, 2011; Chakrabarti & Santoro, 2004). Based on empirical studies, the effective and efficient relationship between universities and industries can improve and provide extensive advantages and benefits for both sectors (Anatan, 2015; Bani Hashemi & Saghafi, 2015; Biedenbach, Marell & Vanyushyn, 2018; Frasquet, Calderón & Cervera, 2012; Klemes, 2013; Omar, Shanableh & Hamad, 2010; Safari, Ghazizadeh & Taheri, 2013; Shafiee & Yazdanian, 2008). Effective and efficient relationship between universities and industries can spread knowledge from the industries to the universities and vice versa, and then the knowledge will find its way from the universities to the society (Baraldi, Forsberg & Severinsson, 2013). There is a balance as well as a coordinating cycle between these two parts in many developed countries such as Germany, England, the Netherlands, Sweden, the U.S.A, Canada, and Australia (Bagheri, 2004; Mortazavi, 2004). However, the collaboration between the university and industry is somehow different in the developing countries, e.g., some Asian countries, including Iran (Behroozi, 2009).

The importance of improving the universities' connection with the workplace and providing students deeper insight about the reality of work and employment opportunities from one hand and some reports on ineffective collaborations and interactions between these two sectors in Iran (Ebrahimipour, Esmaeilzadeh, Dehnouyeh & Jafari Sirizi, 2007; Shiri, 2015) have urged us to review and compare relevant policies and practices in Iran and Sweden that is considered as one of the leading and successful countries in the world. Also known as one of the most advanced countries in Europe, Sweden is embracing the need to create a more connected and functional relationship between government, business and HEI in order to increase employment, productivity and social cohesion (European Commission, 2011). As an 'interaction' between HEIs and the businesses for mutual benefit, the university-business cooperation (UBC) can help society face a number of issues by fostering and extracting its value (Davey et al, 2013). It helps universities to tackle the problem of decreasing public funds (Carayol, 2003), helps businesses to gain and maintain their competitive advantage in today's dynamic international markets, contributes to the economic development on regional and national level (OECD, 2002) as well as meet the demands of the labor market to provide more relevant knowledge and skills and greater job prospects for students (Bozeman & Boardman, 2013). Additionally, there are substantial indirect outcomes of UBC including support in

the creation of a knowledge economy (Etzkowitz & Leydesdorff, 2000), support for local business (Davey et al. 2011), creation of jobs, stimulation of economic growth and increased living standards whilst reducing hindrances to good living. In this context, UBC creates mutual benefit for all parties involved, and wider, for the society. According to the statistical reports published by UNESCO, which was mentioned before, Sweden was the highest rated country in case of research and development costs among other countries based on the GDP and Iran was among the lowest rated countries (UNESCO, 2015, quoted from Ministry of Science, Research, and Technology, 2020: 20). Despite these achievements empirical data on Swedish UBC show that this model has been facing some concerning challenges and barriers towards intended goals.

Indeed in recent decades Iran has critically been suffering from an increasing unemployment rate among graduates resulting from a mismatch between higher education and the needs of labor market as well as unskilled graduated students (Hosseini, 2013; Salimi Kharashad & Salimi Kharashad, 2013; Taqipour Khalafloo & Hosseini, 2013). Therefore, it is quite important to know If the way Iranians approach towards connecting its higher education to industries is in the line with the most effective international traditions, policies and practices. One of the missions of higher education is to train well-educated people who are talented and skillful at work (Einarson & Lundblad, 2014). Although authorities and stakeholders understand the importance of the required cooperation their strategies are not useful enough (Shafiee & Yazdanian, 2009). On the one hand, they provide offices for the university-industry relationship as well as entrepreneurship at academies that manage all kinds of cooperation for the considered relationship, but these offices do not have efficient collaboration with industry.

The main aims of these offices are decision-making and creating appropriate platforms for the university-industry relations for all the students, researchers and scholars, and also funding researches as well as demand-driven and capable students and graduates (Ministry of science, research and technology, 2020). Human resources, including students and graduates, are considered the main indicators of every country's development (Ebrahiminejad, Hamedi & Hassanzadeh, 2013; Rustai Shalmani & Mila Elmi, 2013; Sadeghi, Ebrahimi Nejad & Habibpour, 2013; Salehi Imran & Mumtaz, 2013; Shokohi, Azizi & Zare, 2013; Zeineabadi & Shirzadi, 2013). Consequently, conceptualizing acts as a tie between universities and industries and improving the level of collaborations among them is one of the most strategic goals for which the Office of University-Industry Relationship has been established. On the other hand, the industrial sector

cannot have sufficient innovations in their products, despite having R&D departments in the production plants and factories. For instance, there are not diverse kinds of products in the industries in Iran, such as the automotive industry and the metal industry in comparison with the previous years. However, their efforts to improve their products can be facilitated by allowing universities to feed them with fresh ideas, innovative methods and carrying out scientific joint research projects on the new production lines.

Various investigation reports have been written about the university/industry cooperation with each other. Several management studies have emphasized on the importance of collaborative relationships for academic and industrial knowledge as well as the technology transfer (Dellano & Del Guides, 2015). Many empirical studies indicate that knowledge transfer activities between universities and industry have positive impacts on both of these sectors (Anatan, 2015; Omar, Shanbaleh & Hamad, 2010; Safari, Ghazi Zadeh & Taheri, 2013). Academic literature has also agreed on the importance of the strategic role played by the academic research and also by the interaction between universities and industry in facilitating the social and economic development of the nations (Delano & Delgaydis, 2015). Bani Hashemi and Saghafi (2015) also stated in their research that the strategy of relationship with industry and society in universities is the main way to grant the success of the universities, and they should establish a more effective relationship with industry to be more accomplished. In their research, Seyed Naghavi, Pourbehroozan & Seraji (2019) have identified the causes of the poor relationship between the universities and industry, providing solutions to improve them. The results of their research showed that the three main reasons for the weak relationship between the university and the one-dimensional faculty industry are the superficial industry and the government's negligence of infrastructures. Also, in a study conducted by Nazemian (2019) on creating a suitable platform for the relationship between chemistry education and industry at Farhangian University, the results showed that for the relationship between chemistry education and industry, it is better to provide a suitable platform for student teachers at Farhangian University to develop the relationship between industry and education.

Huggins, Prokop & Thompson (2020) in their article "University and Open Innovation: Factors Determining Network Centrality, the results" showed that the universities' effectiveness can be resulted from the structure of the universities and industrial networks and relationships, as well as the degree of their involvement in the production cycle and participation in research projects using foreign aids. In the research by Oliver, Montgomery & Berda (2020), which examined the multi-

level process of trust and learning in the innovation of university-industry cooperation, the results showed that there were two levels of individual and organizational trust and the interaction of trust at different levels and with overtime helps to explain the success or failure of a partnership. According to the development of university-industry relations in Iran, however, the relevant authorities, who have realized the importance of this relationship, have redoubled their efforts to establish a link between education and industry, such as holding several annual conferences, forming scientific and specialized associations, and establishing offices for industrial relations in the universities (Salami & Shafiei, 2014). Therefore, as a result, since graduates lack appropriate empirical, practical, and applied abilities about their field of study to enter the labor market, the number of unemployed educated people has sharply increased.

Unless there is a change in the circumstances, Iran will lose the most important resources, namely human resources. On the other hand, the funds used to train these forces are also wasted. According to the statistics, the high migration rate of Iranian highly educated people has ranked the country among top five developing countries in the whole world (Hori, Jalai & Hamzenezhad, 2015; Tavakol & Erfan Manesh, 2014). The International Monetary Fund reports that about 150,000 educated Iranians leave the country annually in the hope for a better life and finding better job opportunities. The departure of these 150,000 educated Iranians means that about $ 38 million of foreign exchange leaves the country annually (Hori, Jalai & Hamzenezhad, 2015; Monavariyan, Razavi Mehr, Amiri & Askari, 2019). This brain drain has negatively affected Iran's economic growth (Asgari & Badpa, 2017) and has caused losing the experts, who had cost a lot of money to be trained (Ahadi, Nademi & khochiyani, 2019). In addition, The unemployment rate for graduates in Iran has risen from 10.3% in 2000 to 21.5% in 2017 (Esazade & Hosaini, 2014; Iran Planning Management & Budget Organization, 2017; Ministry of Science, Research & Technology, 2019; Molai, Parvai Heredasht & Rahimi, 2017). Thus, the country witnessed a population of about 1200000 unemployed academics and about 5300000 of academia employment in 2016 (Safari, Arvin & Karimipour, 2019). Furthermore, despite studying at undergraduate, graduate, and doctoral levels, they do not acquire the necessary and sufficient capabilities for the experimental work, and only the time, energy, and capacity of the country are wasted. However, one of the main tasks in any university is vocational training and teaching the skills needed by the students to work in the industry and labor market (Baltock, 2008).

Deep root analysis on brain drain indicates variety and multiple causes among which miss-link between higher education institutions and society in general and labor markets in particular play an important role (Mousavirad & Ghodsian, 2015) and weakness in the relationship between the universities, industry, and government (Jozi & Noormohamadi, 2020; Seyad Naghavi, Poorbehrvazan & Seraji, 2019; Sobhani, Ebrahimi & Jokar, 2017). Naturally, if graduates could find a good job, they would not try to immigrate, and if they had a chance to work in a real workplace such as industrial sites, they would be skillful. According to these reasons, analyzing the policies and practices of the university-industry relations in Iran is essential to reduce the negative effects and for helping the country grow and develop.

In Sweden based on geographic locations, the relationships between the university, industry, government is created and improved (Szücs, & Zaring, 2013). This cooperation helps the universities and industry to complete each other (Klofsten, & Jones-Evans, 1996). Many universities, such as Chalmers and Gothenburg University, have close collaboration with the industry to make a maintainable future in both industry and the society (Berntsson, 2015). Since Sweden is a country with the proper background in the considered collaborations, based on the previous research (Arbuthnott, Hannibal, & Nybacka, 2011; Baraldi, Forsberg, & Severinsson, 2013; Biedenbach, Marell & Vanyushyn, 2018; Gustavsson, Nuur & Söderlind, 2016; Klofsten, & Jones-Evans, 1996; Szücs, & Zaring, 2013), it will be important to know how that country deals with this issue. Thus, in the first step, important factors and major limitations in cooperation between the universities and industry in Iran will be investigated in this study. In the second step, the important factors in Sweden will be considered to compare the issues critically. At the end, both results will be compared.

The final reason which can be used for justifying why Sweden was chosen for this study relates to long lasting academic ties between Iranian universities and Swedish ones from one hand and also, this country's desire and hospitality to host and collaborate with Iranian professors, researchers and postgraduate students carrying out joint research projects. This research is based on the interactions and models shown in the following Table. Different models of cooperation and interactions between the universities and industry are demonstrated in Table 1.

Table 1: Different models of cooperation between the universities and other institutions

Model\ Pattern	Designer	Involved Institutions in each model of university-industry relationship
Triple model	Otzkowitz & Leydesdorff	University-Industry-Government
Quadratic model	Carianians & Campbell	University-Industry-Government-society
Five-way model	Carianians & Campbell	University-Industry-Government-society- environment
Five-way native model	Samadi Miyarkalayi	University-Industry-Government-society- environment- culture-religion
N side model	Leydesdorff	University-Industry-Government, and several Involved Institutions

Source: Leydesdorff, 2018; Samadi Miyarkalayi & Samadi Miyarkalayi, 2013

However, this study aims to analyze and compare the policies and practices of cooperation between the universities and industry in Iran and Sweden which tries to answer the following main research questions:

1. How are the policies and practices of the relationships between the universities and industry in Iran?
2. How are the policies and practices of the relationships between the universities and industry in Sweden?
3. What are the similarities and differences between policies and practices in Iran and Sweden in order to associate with the universities and industries?

2. Conceptual Framework

Based on the available theoretical insight which indicated universities, industry and government are interdependent and co-evolving parties, this study uses the 'triple helix' model (Figure 1) of university–industry–government relations as the research conceptual framework based on which main university-industry cooperation indicators (Figure 2) in Iran and Sweden will be compared (Etzkowitz, 2008). Indeed, the significance to the functioning of the 'triple helix' is the creation of the 'knowledge space' to intensify research and generate new knowledge through collaboration, the 'consensus space' to build relationships, agree on objectives and develop joint actions, and the 'innovation space' to implement joint actions by bringing together knowledge, business expertise and venture capital. For this under the assumptions of 'triple helix' model, maximizing interactions, creating 'spaces' and new organizations that cut across the university–industry–government boundaries are proposed to increase the potential for innovation and wealth creation through free movement of people, knowledge and venture capital between universities, industry and government.

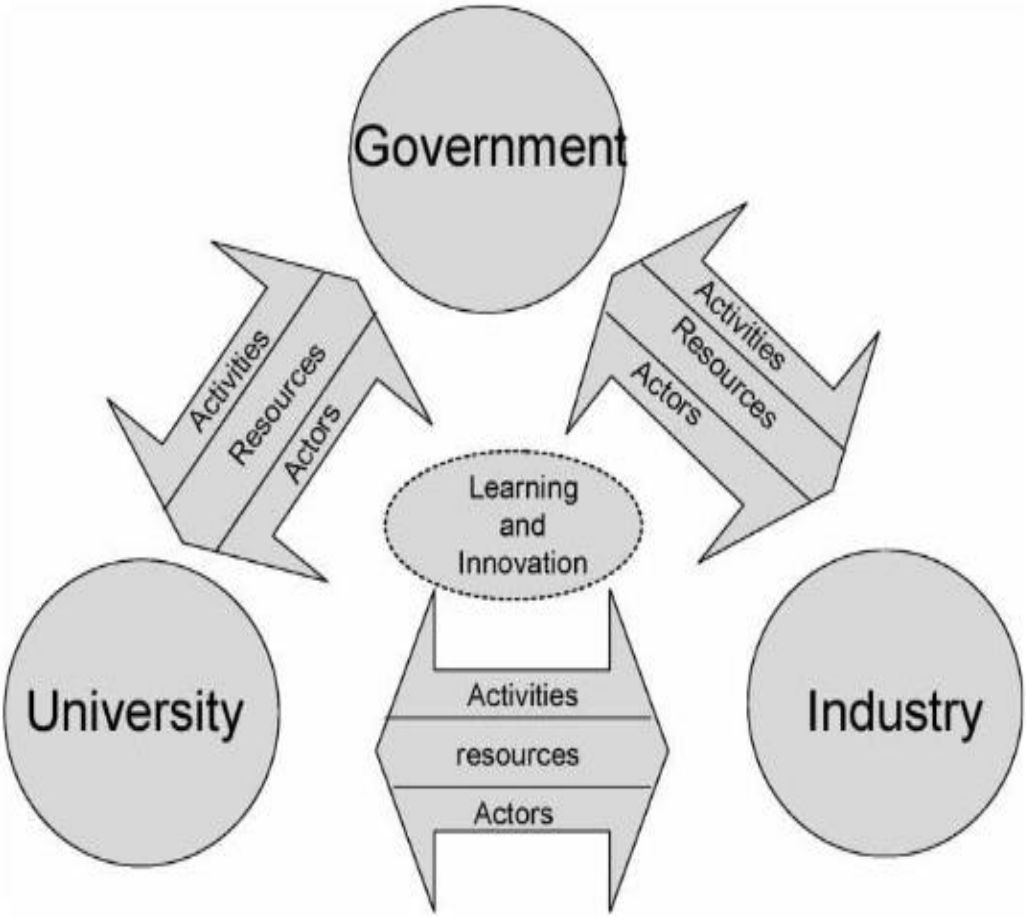

Figure 1: Triple Helix Model for effective links and integration between the three spheres (Saad & Zawdie, 2005).

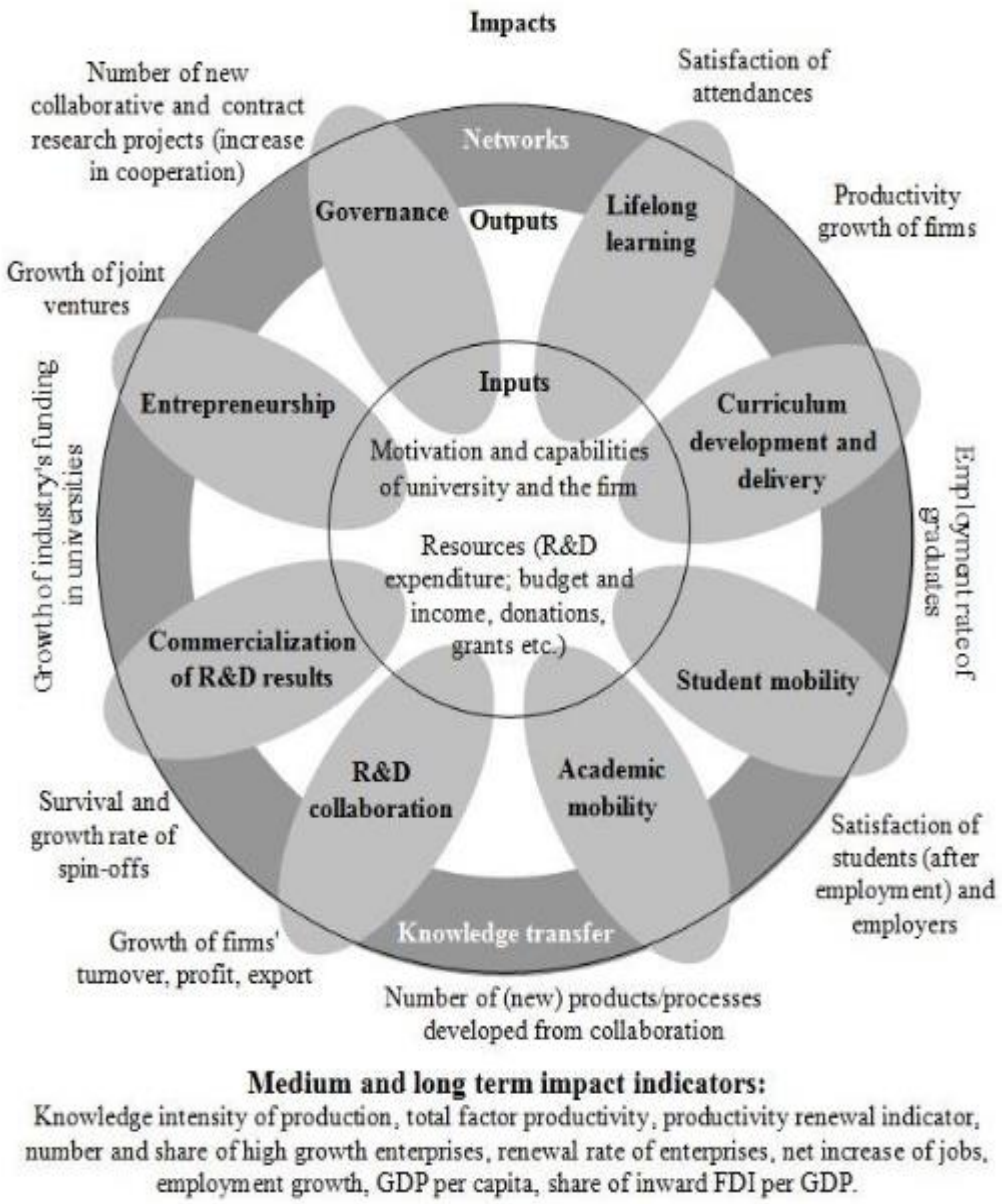

Figure 2.The framework of university-industry cooperation indicators.

3. Research Method

In order to compare the university and industry relations (University-Business Cooperation - UBC in European context) policies and practices, the qualitative-comparative method was applied. Based on "different systems and different results" strategy, Iran and Sweden were chosen to be studied (Madandar Arani & Kakia, 2019: 53-60). For this, one company and two universities in the central region of Iran and one company in the west and two universities in the west and south of Sweden were chosen for the comparisons. The participants were selected purposefully via the

snowball sampling method based on their field work experiences and expertise. The participants included 23 university professors, researchers, graduates, and students who had interactions with the industry as well as HR and R&D departments representing the industry. Participants of each country were representing one company and two universities, which had long lasting interactions and field collaborations. The data were collected via semi-structured depth interviews either in person or via phone. In order to confirm the validity of the data, the interviews were transcribed and sent back to interviewees to review, modify, and confirm their opinions.

The coding or categorization method was applied for analyzing the data obtained from the interviews. The data were transcribed and coded using open coding, axial coding and selective coding methods. In the first phase of data analysis, 350 initial codes were extracted from the text of the interviews with the participants (200 initial codes in Iran and 150 in Sweden). Then, by deleting, merging, and modifying the original codes, 210 codes were considered as open codes for the next step. Based on the similarities and in order to answer the research questions, the central codes were identified, categorized, and 80 codes were considered as the axial codes. After that, one to 10 sub-categories in each category were identified as selective codes leading to highlight the main category for each field. The reliability of the obtained codes was confirmed by 4 people, including supervisors and advisors. The process of doing this study is demonstrated in the following chart:

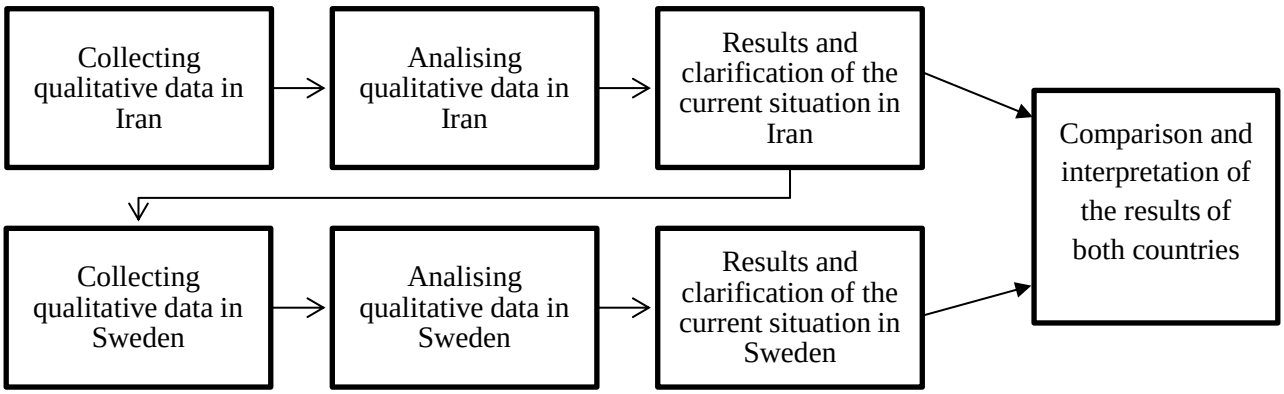

Figure 3: Research Process

Demographic characteristics of interviewee in Iran and Sweden are indicated in Table 2.

Table 2: Demographic characteristics of interviewees in Iran and Sweden based on gender and position

	Interviewees	Gender	Position	Field	Experience
Iran	1	M	MA	Humanities	Responsible for industry education
	2	M	Professor	Engineer	Head of Entrepreneurship and industry relations office
	3	M	Professor	Engineer	Head of university relations and research and development in industry
	4	M	Master's degree in R&D engineering	Engineer	Managers of university relations and research and development in industry
	5	M	PhD student	Engineer	Doctoral Student
	6	M	Master's degree in R&D engineering	Engineer	Managers of university relations and research and development in industry
	7	M	MA student	Engineer	Master's degree Student
	8	M	Expert	Engineer	Specialist in R&D and university relations in industry
	9	M	PhD Student	Engineer	Doctoral student
	10	M	Researchers	Engineer	Post-doctoral
	11	F	PhD Student	Humanities	Doctoral student
Sweden	1	M	MA	Humanities	Senior Lecturer who have had many collaboration with industry
	2	F	Researchers	Science	Post doc
	3	M	Head of HR and R&D	Management	HR manager
	4	F	Master's degree in R&D engineering	Engineer	Expert of training department at industry
	5	F	MA student	Engineer	MA Student with summer job at industry
	6	M	PhD student	Engineer	PhD Student working in industry
	7	M	MA student	Engineer	Student with summer job at industry
	8	M	Professor	Management	Pro-vice-chancellor with many collaborations with industry and head of cooperation team with industry
	9	M	Professor	Engineer	Professor with many collaborations with industry and responsible for cooperation team with industry
	10	F	Professor	Engineer	Professor responsible for cooperation with industry
	11	M	researcher	Engineer	Post-doc
	12	M	Professor	Humanities	Professor having a number of projects with industry

4. Findings

The results of this study revealed from interviews are hereby given to answer the research questions.

Description

Iran

The current model of relationship between the universities and industry in Iran is the triple model. Three institutes are involved in this model. According to the basis of the triple model, it significantly indicates the policies of the required cooperation that is only based on the collaboration of 3 institutes, including the university, industry, and government. The themes identified in these interviews are set out for the government role to be budgeting for some projects, incentives, and facilitators. However, the government is not fully involved in this relationship. Universities and industry have deferent kind of interactions, including having joint projects, contracts, memorandum of understanding and research cores, different types of training (e.g., utilization of academic professors to conduct courses at the industry, and sending industry experts to conduct practical courses at the universities), letting academic experts come to the industry and use the required facilities, equipment, laboratories, and workshops, having research services in joint universities and industries, holding joint events, sending students to the industries for training, and having joint publications. Most of these interactions are mutual, but unfortunately, some of them are not useful enough. For example, there are many research projects which are not applicable and only remain in the form of a report at the library of the industries.

Measures and activities are carried out in order to implement the plan for the transformation of the cooperation of universities and educational institutions, such as management and coordination of research projects related to the industry and their continuous monitoring, pathology of problems and legal issues of universities and industrial relations and development of appropriate methods to facilitate collaborations, Strengthen the structure of industry liaison offices of universities and research institutes and anticipate appropriate incentives to expand cooperation and increase the quality of project implementation, development, organization, and continuous monitoring of the developing skill courses for students and graduates based on the needs of the labor market at the national, regional and provincial levels, in cooperation with ministries and executive bodies, organizing, increasing the quality and productivity of the students training

programs, development of technology, and promotion of productivity in the industry through the implementation of postdoctoral courses and attracting researchers in the industry, conducted by Deputy of Research and Technology Office of Community and Industry Relations, cannot be ignored (Deputy of Research and Technology , Office of Community and Industry Relations, 2019; Deputy of Research and Technology, Office of Community and Industry Relations, 2019). However, the results obtained from the interviews indicate that there are no proper regulations for the university-industry interactions. Analyzing the interviews identified that the relationship between the universities and industry is on intermediate to weak level. According to the published statistics related to the Global Innovation Index (2010-2018), Iran's score in the field of university research cooperation with industry is among the lowest ranked countries. Also, the report of the mentioned institution has shown the declining statistics of the university's research cooperation with industry in Iran compared to other countries (Ministry of Science, Research & Technology, 2020).

According to the statistics published in connection with the global innovation index, Iran's rank in the field of university research cooperation with the industry is among the lowest countries. Also, the report of the mentioned institution has shown the declining statistics of university research cooperation with industry in Iran compared to other countries. These results indicate the functional weakness of the university supply and the demand for technology and innovation in Iran. It seems that the universities and industries need to take big steps in using each other's capabilities to build a cohesive relationship (Ministry of Science, Research, and Technology, 2020).

Sweden

The current model of the relationship between the universities and industry in Sweden is a five-way model. In this model, 5 institutes are involved. Based on the application of the five-way model, it significantly shows that the cooperation policies are based on the collaboration of 5 institutes, including the universities, industry, government, society, and the environment. From the themes identified in the interviews, it can be shown that government role is fully involved in this cooperation. Not only does government provide fund and budget in different ways (Based on interviews; Lundberg & Andresen, 2012) for different type of collaboration between the universities and industry, but also it has the role of monitoring, evaluating, policy making, promoting, providing incentives and facilitating.

Sweden possesses different types of interaction, all of which show the two-way model. These interactions include joint research projects, contracts, memorandum of understanding and research cores, different types of training such as utilizing academic professors to conduct courses about the industry and sending industry expert to conduct practical courses at the university, allowing usage of facilities, equipment, laboratories, and workshops in both the industry and universities, having research services in the joint universities and industry, holding joint events, sending students to different industries for training with low salary, joint publications, and summer jobs for students and graduates. PhD student from both institutes include doctoral students from the industry and PhD schools play important strategic roles for having long-term participations (Hellström, 2007), postdoc projects, and training schools for industry.

Based on the interviews in Sweden, interactions and participations between the universities and industry are coherent and in good and satisfactory level (interviews; Broström and Lööf, 2008) European Union has a strategy for helping each different region in Europe for their improvements. It is to say that with developing a small region, all Europe will be developed. Among the EU countries, Sweden is a country that has a strong supporting role of the private sector towards the university-industry collaboration and excellent potential to support the university-industry cooperation (Lilles, Rõigas & Varblane, 2020). This country is one of the countries in Europe which is listed as a country with the highest cooperation between the universities and industry (Seppo, Rõigas & Varblane, 2014).

The results of the interviews to answer the first and the second research questions can be seen in the following tables. The sample of the data coding process collected in the interviews is shown in Table 3.

Table 3: Sample of coding data of Iran and Sweden

	Conceptual title (Open coding)	Categories (Axial coding)	main category (Optional coding)
Iran	– Helping high-risk projects – Undertaking a part of the financial support of projects – Not having a budget problem in the industry	Budgeting	Position and role of government in relationship between universities and industry
	– Lack of effectiveness of government budget and resources – Successful role of government facilitation – Success of the government's incentive role – Tax purification as a facilitator or incentive role – Facilitation using the Tax Clearance Act – Longer length of the tax process – Non-complete implementation of tax clearance due to the separation of its implementing department (Ministry of Science) from industry – Having a catalyst role – Tax incentives to improve cooperation – Encouragement – Status of tax purification law – Increasing the relationship between universities and industry with the enactment of tax laws – Encouraging role – Lower taxes – Discussion of incentives and facilitators	Role of incentive facilitation	
	– Establishing laws to make the relationship between university and industry mandatory	Establishing rules	
Sweden	– European Union provide sufficient fund for university-industry cooperation – Each municipality provide extensive fund for university-industry cooperation – There is different money places all over – In most cases, 50 % of the fund will be provided by government – Government pay for different part of projects	Budgeting	
	– Government monitors the funded projects – Government evaluates results and output of the joint projects – Providing Policies for collaboration, – Preparing many fields and subjects for joint research – Having discussion with industry – Having discussion with universities – Having responsibility for cooperation between the universities and industry – Government asks for report after finishing the joint projects – Providing Equipment – Promoting cooperation – Government controls the university-industry collaboration	Fully involved role as a part of collaboration	

Table 4: Recent model of the university-industry relationship, their interactions, weaknesses, and strengths in Iran and Sweden based on analyzing the interviews

	Iran	Sweden
Model	– Triple model: University, Industry, and Government – Environment has a small distinct interaction with industry as well as university	– Five-way model: University, Industry, Government, Society, and Environment – Interactions of environment and society, government and university are more than that of industry
Government roles	– The roles of the government are only as a facilitator, encourager, financial supporter and, provider of regulations	– Government is fully involved in all part of this collaboration and has many roles such as being a facilitator, financial supporter, monitoring, evaluator and planner
variety of relations	– Projects, contracts, memorandum of understanding and research cores – Different types of training – Facilities, equipment, laboratories and workshops – Research services – Holding joint events – Training – Joint publications	– Projects, contracts, memorandum of understanding and research cores – Different types of training – Facilities, equipment, laboratories and workshops – Research services – Holding joint events – Training as a job (having low salary) – Joint publications – Summer job – PhD student from both institutes – Postdoc projects – Having an industrial institute
Strengths	– There is a strong evaluation cycle at the industry – Having variety of interactions – Having two-way interaction	– Relationship between the university-industry is strong – There is a strong planning, monitoring and evaluation cycle by the government – There is a strong planning cycle by the university and industry – Having coherence interaction – Having a futuristic vision
Weaknesses	– Relationship between universities and industry is weak to moderate – Lack of planning, monitoring and evaluation cycle by the government – Difference between industry and universities – The difference between the missions, goals and structure of the two institutions of universities and industry – Lack of trust and confidence between industry and universities – Taking of low risk by industry managers and fear of changes – Low awareness of universities and industry about each other's needs – Lack of priority in connection with industry in the programs of the Ministry of Science and Research – Lack of proper cooperation and interactions between	– Lack of strong evaluation cycle by the universities and industry – Distrusting the cooperation can cause no more collaboration – Bureaucracy – Time-consuming rules – Having different objectives

	the universities and industry – Lack of equal participations of all the universities, professors and students in the industry – Industry budget constraints – Lack of foresight in the industry and universities	
Efficiency and effectiveness of relations	– Doesn't have enough efficiency and effectiveness	– Good and satisfactory level

Comparison

First important distinct aspect for the model of cooperation in Sweden and Iran indicates several differences in their relationships. Only 3 institutes are involved in this type of participation in Iran, as demonstrated in Table 3, shows no coherence and has many weaknesses. In Sweden 5 institutes are involved coherently, which can improve and provide stronger collaborations. In addition, based on the goals and mission of each interaction, there are many types of them that need various institutes to be involved with their roles in specific relationships. Sweden pays attention to this issue and uses it in practice. However, Iranian authorities do not care about this significant matter. The findings indicate that there is a coherent interaction for linking both the universities and industry in the Swedish policies and practices, such as training, doing research projects, supervisors, laboratories, as well as financial support, and the government is involved where necessary. However, there is a weakness in the evaluation part. Different kinds of interaction come from both sides between these two institutes in Sweden. It is more like a two-way interaction. It means that what comes from the universities comes from the industry as well in different forms, but it depends on their needs. For instance, universities send their PhD students to complete their theses in the industrial sectors, while the industrial sectors send their employees to get PhDs at the universities in order to solve their problems. In Sweden, the industrial sectors establish high schools and universities, as well as institutes, where the student can learn about workplaces easily, and they have this chance to experience in real life in the small plants and workshops.

Budget comes from many resources such as the government, the European Union, some federations, locally, and from industries but not from the universities. It shows that not only Sweden but also all the European countries pay attention to the university/industry relationships. In addition, they know the importance of academic competencies, and because of that, these institutes provide financial aids all through the year to the universities that want to have cooperation with the industry or may themselves have projects in the required areas. This point cannot be observed in Iran. The budget mostly comes from the industry, or the government sometimes provides part of the budget. Other institutes are not involved in this regard. In this

evaluation, some of the components that have led to the ineffectiveness of the relationship between the universities and industry are presented, considering the points of views of the participants in Iran and Sweden, taken to account the results of the Table above. Some interviews in Iran are primarily stated as follows:

Differences in the important issues and issues dealt with the universities and industry

" I think this relationship is not as good as it used to be. Industry has a view of issues and universities have a different view of them. The university is more concerned with the development of science and movement at the edges of science, and industry is mainly involved in the field of technology. The relationship between these two is not very fruitful until they get closer to each other, unless they come and bring their views closer to each other. "(Interviewee No. 1, Iran)

Difference between the missions, goals and structure of the universities and industry

"What exists is a bit different from what should be, and of course I have examined it myself, and it seems that the connection between university and industry is almost impossible at first glance. Because the university has its own vision, missions and strategies, and the industry has its own, and in fact, they are moving in two different directions. Simply, there is no task alignment at first glance between the two structures" (Interviewee No. 3, Iran)

Lack of trust and confidence between the industry and universities

"I think there are two completely different trends: one is that universities do not accept many industries and their systems, preferring to do a routine job that has been done for 20-30 years, and they are afraid of changes and prefer normal work. And the industries also think that universities are very theoretical and usually "They do not accept the output of universities." (Interviewee No. 6, Iran)

Taking low risk of industrial managers and fear of change

"Universities see industry as an industry that does not care about new sciences at all and likes to work with the same knowledge and technologies of the past, having no interest in industrial changes. Many of the research projects are presented by the universities and become a booklet in research and development. Some of them are not operational because industry admits no risk. In fact, risk taking operations are performed neither in the upper positions, nor in the lower ranks. "Because they have other conflicts in their operations and they do not want to add a conflict to their own conflicts." (Interviewee No. 4, Iran)

Low awareness of the universities and industry about each other's needs

"There is a connection between academia and industry, but it is not strong. If it was strong, there would not be so many unemployed students in the country. Neither the university nor the industry is aware of each other's needs. At the university, they think that they do not need to do practical work at all. If they want to enter the industry, they do not know what the problems and needs of the industry are. Industries do not know exactly what the university's needs are." (Interviewee No. 11, Iran)

Lack of priority in connection with the industry in the programs of the Ministry of Science and Research

"The connection you have in mind, I think is not very good. That is, university professors, with the system set up by the Ministry of Science, are more inclined to submit ISI papers and articles with the methods that they have set up, and something that helps them to improve them can get its academic rank. There is a lot of interest in this field in the country in terms of expressing in the industry and doing something in the industry which is not very well arranged. That is, they give a lot of value to those professors who work mostly in these fields, while giving an article does not necessarily have scientific efficiency. "As the saying goes, science has to be kind of practical." (Interviewee No. 7, Iran)

"The connection between our universities and industry is very weak. There is something that is obvious, and most people know from its signs. It can be said that most graduates after graduation do not know the issues very professionally. Engineers have passed a series of theoretical courses, high general information, high science, even though they have good articles, but there is separate discussions and weaknesses that we see in the industry." (Interviewee No. 8, Iran).

Lack of proper cooperation and interactions between the university and industry

"There are no interactions and the industry has not received a response from the university. Professors do not cooperate and are mostly looking for financial benefits, and the problem is communication. "Industry and academic people not trust each other." (Interviewee No. 10, Iran).

Lack of possibility of equal partnership of all universities, professors and students in the industry

"This relationship is not as it should be and the relevant officials do not have a good opinion of the relationship between the universities and industry. But this does not mean that nothing has been done. "There is a limitation. For example, we are content with a number of university professors based on distance and academic excellence, and we will move forward with these. If these calls and interactions and even trans-regional connections with other universities are applied, it will have a good result." (Interviewee No. 9, Iran)

Industry budget constraints

"Most industries, especially small industries, have budget problems because of this connection with the university; they prefer to spend their budget on the production line, which has a quick efficiency and output, rather than spending on long-term projects." (Interviewee No.2, Iran)

Lack of foresight in the industry and universities

"We have a functional structure in our industry, which means that everyone in their job and position has a job description that they have to do. I think we need to have a matrix structure in order to be able to use the academic potential much better in the industry. This means that, each person should also have a research task in this field. This means that all people in the industry can be experts in research and development in their own way, if this matrix structure is defined for them." (Interviewee No. 5, Iran)

Some of the barriers of interaction between the universities and industry in accordance with the views of the participants in Sweden are as follows:

Distrusting the cooperation can cause no more collaboration

"I would say that is somehow sustainable contact with the researchers especially fundamental research. You think sustainability is good but also trust is important and no broken promise. It's difficult to say what's most important for me but maybe trust". (Interviewee No. 5, Sweden)

"I think there may not be many of them who are used to have contact with the academic people, so that it feels a little bit uncomfortable for them. They don't feel safe with talking with us" (Interviewee No. 7, Sweden)

Lack of strong evaluation cycle by the universities and industry

"We of course get reports. If it is a study done including our company, we are getting the reports from the University. Sometimes it's very usable for us and sometimes it's not as much. Yes! We are doing that kind of evaluation. But it's more depending upon what it is". (Interviewee No. 3, Sweden)

"That is something that we lack today. We don't have any kind of evolution or schedule or something like that but we have seen that we need that because that's one of the weaknesses that we have today because everything is bounded to personal level and to people you have your connections and I have mine and so on, but we're living and we work in an environment where it shouldn't be your relation and it should be our relation and that's the first thing that we have to deal with , and from that follows that we also need to have a better way to understand and evaluate our relationships but we don't have that". (Interviewee No. 11, Sweden)

Time-consuming rules

"A huge barrier has been the IT side of integrating a student into the working life. At industry, everything is so secure, that a simple request for an email may take 1-2 weeks, and access into share point and other important tools can take multiple weeks. Every step needs to be approved by higher people, and it simply takes too much time. You end up losing a lot of time that you could have done more work with". (Interviewee No. 6, Sweden)

Having different object

"Of course, one of the biggest barriers is the difference in objectives between the university and industry. While universities want to educate students and publish articles, the industry has different objectives. Industry also wants to educate students for the purpose to have a pool of future employee candidates, but in contrast to the university, the industry would like to deepen knowledge about a topic and bury it in patents and/or company secrets. However, this difference usually can be dealt with by a clever

distribution of company research and university research, as well as well formulated contracts between the parties" (Interviewee No. 8, Sweden)

Bureaucracy

"we have our processors here at the university that sometimes make things harder because we need to process things in a certain way within certain times and so on, and it's the same at the companies. That's the main barrier because sometimes the companies consider the universities, I'm interested in this very interesting theoretical problem and you try to find other partners who are interested in the same problem and then we search for funds and where to get money to do the research and then we do apply for the research funds and then we sent it in and then there might be six months or something like that to evaluate the applications and then we get the money so this might take time for 18 months or something like that"(Interviewee No. 10, Sweden).

Tables 5 & 6 illustrate the answers to the third question of this study to compare the similarities and differences between the university-industry relationships in Iran and Sweden.

Table 5: Similarities and differences of the model of the university-industry relationship between Iran and Sweden based on the interviews

		Iran	Sweden
Involved institutes	University	❋	❋
	Industry	❋	❋
	Government	❋	❋
	Society		❋
	Environment		❋
Government roles	Facilitator	❋	❋
	Encourager	❋	❋
	Monitoring		❋
	rules maker	❋	❋
	financial supporter	❋	❋
	Evaluator		❋
	Planner		❋
variety of relations	Projects, contracts, memorandum of understanding and research cores	❋	❋
	Different types of training	❋	❋
	Facilities, equipment, laboratories and workshops	❋	❋
	Research services	❋	❋
	Holding joint events	❋	❋
	Training	❋	❋
	Training as a job (having low salary)		❋
	Joint publications	❋	❋
	Summer job		❋
	PhD student from both institutes		❋
	Postdoc projects		❋
	Establishing an institute for industry		❋

Table 6: Similarities and differences of the strengths and weaknesses of university-industry relationship between Iran and Sweden based on the interviews

		Iran	Sweden
Strengths	Relationship between university – industry is Strong		❋
	There is a strong planning, monitoring and evaluation cycle by the government		❋
	There is a strong planning cycle by the university and industry		❋
	Having variety of interactions	❋	❋
	Having coherence interaction		❋
	Having two-way interaction	❋	❋
	Having a futuristic vision		❋
	There is a hug fund and budget from both the government and industry		❋
	There is enough budget from industry	❋	❋
	There is a strong evaluation cycle at the industry	❋	
Weaknesses	The relationship between university and industry is Weak to moderate	❋	
	Lack of planning, monitoring and evaluation cycle by the government	❋	
	The difference between industry and university	❋	❋
	The difference between the missions, goals and structure of the two institutions of the universities and industry	❋	❋
	Lack of trust and confidence between the industry and universities	❋	❋
	Taking low risk of industrial managers and fear of changing	❋	
	Low awareness of the universities and industry about each other's needs	❋	
	Lack of priority in connection with industry in the programs of the Ministry of Science and Research	❋	
	Lack of proper cooperation and interactions between the universities and industry	❋	
	Lack of equal participations of all the universities, professors and students in the industry	❋	
	Industry budget constraints	❋	
	Lack of foresight in the industry and universities	❋	
	Lack of strong evaluation cycle by the universities and industry		❋
	Distrusting the cooperation can cause no more collaboration		❋
	Bureaucracy	❋	❋
	Time-consuming rules	❋	❋
	Having different objectives	❋	❋

5. Conclusion

Universities' efforts to manage external stakeholder influences in a highly competitive globalizing world of higher education are reflected in various changes to their business models in recent decades. In the light of these developments university-industry relations and its emerging models evolved through a series of transitions to the content, structure and governance of universities' activities. Choice of a particular model therefore, is mainly influenced by a university's strategic mission, vision, goals and actions, as well as areas of transformation. However, it should be also said that the future of universities relies on how successfully they interact with their numerous and diverse external stakeholders. In the "clients" category of external stakeholders, industry partners hold the second place by significance, just after students. University-Industry links from the perspective of intensity of their interaction in building relationship and doing work are usually based on 'triple helix' with particular reference to the C3 (Cooperation-Coordination-Collaboration) framework in which the interaction between university and industry initially starts via cooperation, followed by coordination, and finalized by collaboration as a purposeful deep and well-established dual engagement (Seres et al, 2019; Azizi, 2017). Despite this, the forms, motivations and also outcomes of the collaboration between universities and industries in different countries can be very different. What is evident is that these sorts of interaction between these two in most developing countries have not resulted in a satisfactory outcome which is subjected to Iran too. For this we decided to compare the country's policies and practices in this regard with Sweden as a leading European country by which we could suggest some practical customized directions for reforming the country' higher education link to industry.

However, based on conceptual framework (input-outcome process) as well as participants' views, the effectiveness of the relationship between the universities and the industry in Iran was lower than expected. This was noted by the previous studies as well (Jozi & Behroozi, 2009; Ministry of Science, Research, and Technology, 2020; Noormohamadi, 2020; Seyad Naghavi, Poorbehrvazan & Seraji, 2019; Sobhani, Ebrahimi & Jokar, 2017). In comparison, Sweden has a relatively good and satisfactory level, which was reported by previous studies (Broström & Lööf, 2008: Lilles, Rõigas & Varblane, 2020; Seppo, Rõigas & Varblane, 2014). However, analyzing the university-business cooperation in Sweden shows there is a focus on more commercial forms of cooperation in Sweden. In fact, UBC activities, the most short-term and economical aspects of the

supporting mechanisms, are the most developed supporting mechanisms in Sweden. Overall, whilst Sweden still has a prosperous level of UBC development, some longer term commitments and the development of 'implementation strategies' could indeed lift Sweden to higher level of cooperation. Sweden has the most developed commercially-oriented types on university-business collaboration in which it has been most successful and leading country in collaboration in research and development (R&D), commercialization of R&D results, and entrepreneurship (Davey et al, 2013). Indeed in comparison with other European nations however, its weak record in staff and student mobility can be considered as an exception for which is to be one of the least developed in Europe. The high development of 'collaboration in R&D' can be partly explained by the fact the Sweden is allocates one of the most resources per capita for R&D in the world (Frykfors and Klofsten, 2011) indicating a high respect to R&D in company success. Indeed UBC achievements in Sweden can be justified in the light relationship drivers' such 'existence of mutual trust', and 'existence of mutual commitment' which were nominated as the biggest drivers of UBC. This suggests that greater effort to bring academics together with business could be a focus for further improvement of cooperation. Although Sweden shows a medium degree of development on the different types of UBC but empirical studies have shown numerous barriers to UBC in Sweden in which the followings are among the most critical ones:

- Need for business to have confidentiality of research results
- Differing mode of communication and language between university and business
- Differing time horizons between university and business
- Differing motivation / values between university and business
- Limited absorption capacity of SMEs to take on internships or projects (Davey et al, 2013)

According to the findings indicated in Tables 3 and 4, the current model of the relationship between the universities and industry in Iran is a Triple model with university, industry, and the government. Of course, it should be noted that the role of the government is only to facilitate, which is a minor role in this regard. On the other words, the role of government in the relationship between the universities and industry is currently more facilitative and incentive in Iran. However, the present model of the relationship between the universities and industry in Sweden is a Five-way model with the university, industry, government, society, and environment. However, based on different types of collaboration, they sometimes use other models. The government is fully involved in all parts of this collaboration and has many roles, including facilitation, financial

supporting, monitoring, evaluation, and planning. Both the academic staff and industrial specialists in Sweden are interested in having collaborations with each other, and they welcome this type of cooperation, although this interaction may take some time due to extensive rules and security measures in the industry. Comparing to Iran, most of the requests are from the industries. Academic staff mainly prefers to teach, do research, and write articles. It can be seen in Sweden as well, but because of the good financial support, they mostly prefer to collaborate with industry. Regarding the Iranian policies and practices, it should be mentioned that there are many interactions from each side, such as training, doing research projects, supervisors, laboratories, and financial supports. However, although the evaluation part is strong, there is not enough coherence in the required cooperation, and the role of government is mainly facilitation. There are many interactions existing between the universities and industry in Iran, but not from both sides. Some interactions are one-sided. The issue has recently been a matter to be solved by the university experts and industrial specialists in order to provide interactions between both sides.

The authorities and Ministry of Science, Research and Technology have primarily reconstructed the policies of this collaboration to provide a better relationship between universities and industry in Iran. As a result, they have tried to develop strategic plans and redesign the universities' ongoing practices because its usefulness has been critically questioned and has failed to establish dynamic and effective business collaboration with industries. Therefore, an emerging alternative method needs to be considered in order to emphasis on some complimentary aspects which were ignored in prior attempts to connect the country' higher education to the industry. This new plan should figure the roles of society and environment. Secondly, the government should change its role and accept more responsibility and participation including providing budgets and monitoring. Thirdly, by creating some intermediate and knowledge-based companies, an appropriate platform can be provided for extending the university-industry relationships. Finally, it is essential to emphasize that although Sweden is one of the developed countries and the intention of this study is not copying or imitating their policies and practices in this field, their method and function could be inspiring in order to make our own suitable policies and practices for the conditions and geographic situation in Iran. Researchers of this study believe that in case a country intends to have developments based on the other countries, the developed countries should be considered as a pattern, not the similar developing ones. Since this research has been done by the qualitative-comparative study with interviewing as a research tool, it is suggested that researchers should also use questionnaires to assess the possibility of generalizing the research. Moreover, since this study focuses on one type of industry and two universities due to its qualitative study, it is also

recommended to assess other industries and universities in the country. A limitation of this study indicated language barriers in Sweden for both the researchers and participants since they had to discuss the matter in English, which was not their mother tongue.

Acknowledgment

Researchers truly appreciate the universities and companies both in Iran and Sweden for their proper participation in the completion of this study.

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