

[Field Research]

SWOT Analysis for Iran's National Innovation System based on Norwegian and Korean Experiences

Seyedreza Haghi*

Abstract

Purpose - The objectives of this study are to find the strengths, weaknesses, opportunities, and threats related to the national innovation system of Iran (using a SWOT analysis) and to extract some strategic recommendations to modify the innovation policies of Iran.

Research design, data, and methodology - This study used a literature review and field study. In the first phase, the author studied library resources and articles, and browsed through Internet information about the subject. The second phase was a field research investigation through designed questionnaires and interviews with more than 100 policymakers, officials, executives, and others related to the national innovation system in 2011.

Results - In this research study, strategic recommendations were extracted through a SWOT model for improvements to the innovation policies of Iran.

Conclusions - The findings of this study show the role of strengths, weaknesses, opportunities, and threats in the national innovation system of Iran and suggest strategic recommendations for its modification.

Keywords : Innovation, Strengths, Weaknesses, Opportunities, Threats.

JEL Classifications : M48, M16, R58.

1. Introduction and Literature Review

In this research study, on the results of a series of interviews with major stakeholders in Iran's innovation system, Strengths, Weaknesses, Opportunities and Threats analysis have been listed and then some of strategic recommendations have been extracted to modify the Innovation policies of Iran.

According to the innovation system theory, innovation and technology development are results of a complex set of relation-

ships among actors in the system, which includes enterprises, universities and government research institutes. In A national system of innovation has been defined as follows:

- "The network of institutions in the public and private sectors, whose activities and interactions initiate, import, modify and diffuse new technologies." (Freeman, C. ,1995)

- "The elements and relationships which interact in the production, diffusion and use of new, and economically useful, knowledge ... and are either located within or rooted inside the borders of a nation state." (Lundvall, B-A. ,1992)

- "A set of institutions whose interactions determine the innovative performance ... of national firms." (Nelson, R. ,1993)

- "The national institutions, their incentive structures and their competencies, that determine the rate and direction of technological learning (or the volume and composition of change generating activities) in a country." (Patel, P. and K. Pavitt ,1994)

- "That set of distinct institutions which jointly and individually contribute to the development and diffusion of new technologies and which provides the framework within which governments form and implement policies to influence the innovation process. As such it is a system of interconnected institutions to create, store and transfer the knowledge, skills and artifacts which define new technologies." (Metcalfe, S. ,1995)

In this article some selected OECD¹⁾ countries' innovation policy for example Norway and Korea, which have got a successful National Innovation system in Europe and Asia will be reviewed: 1- Norway, in a research study by OECD (1998) in Norway, 6 levels in the policy system organizational map of the NIS is distinguished that will be explained. 2-Korea, in a research study by OECD (2009) in Korea, Strengths, Weaknesses, Opportunities and Threats analysis have been listed. (OECD, 2009)And then the existed National Innovation System of Iran will be studied to distinguish the basic Institutional Mapping of National Innovation System of Iran, and then by using SWOT analyzing model some strategic recom-

1) The OECD countries are: Australia, Austria, Belgium, Canada, the Czech Republic, Denmark, Finland, France Germany, Greece , Hungry, Iceland Ireland, Italy Japan Korea, Luxemburg, Mexico, the Netherlands, New Zealand, Norway, Poland, Portugal, the Slovak Republic, Spain Sweden, Switzerland, Turkey, the United Kingdom and the United states, The commission of the European Communities takes part in the work of the OECD.

* Assistant Professor at Ferdows Higher Education Institute, Department of Management, Kolehdoz 30 St. Mashhad, Iran, Tel: +98-51-1729-1115. +98-91-5319-5443. E-mail: srhaghi@gmail.com.

mentation for improving the innovation policies of Iran will be suggested.

2. Methodology of Research

In this study, the library researches and field study have been used. At the first stage of initiation, the author has studied library resources, articles and Internet information network about the subject, based on OECD research class category to understand innovation and national innovation systems in other countries, which have been successful in NIS of selected countries such as Norway and Korea, and their experiences in this regard. The second stage of initiation is a field research investigation through designed questionnaires and interviews with more than 100 persons of policymakers, officials, executives and various related national innovation system. In this research study, the strategic recommendations will be extracted through SWOT model to suggest the strategic solution for improving the Innovation policies of Iran.

3. Norwegian Experience

In this part the main organizations of the Norwegian innovation system and their relationships are characterized, and defer the discussion of institutions. In a research study by OECD (1998) in Norway, 6 levels in the policy system organizational map of the NIS are distinguished:

- Institutions laying down the general policy framework
- Technology and innovation policy formulating institutions (including financing, co-ordination, supervision and assessment)
- Research and innovation facilitating and modulating institutions
- R&D performing institutions
- Institutions promoting technology diffusion
- Goods and service producers

Thus, OECD lays out the map of the institutions of the innovation systems between two poles: Private and public production of goods and services, and public policy making. In this organizational universe, the general policy making institutions make up the apex of a pyramid. There are layers in this pyramid corresponding to the relative authority and autonomy they have in the overall system.

3.1. Institutions defining the general policy framework

3.1.1. The system of government

The apex of organizational pyramid is the Norwegian government system. In the Storting (parliament), the day to day business is handled by party groups and in the committee system.

The Parliamentary committees dealing most directly with innovation policy issues are

1. The Committee on Education, Research and Church Affairs
2. The Committee on Business and Industry
3. The Committee on Energy and the Environment
4. The Committee on Finance and Economic Affairs

As a result of the sector oriented division of committees, research and innovation policy issues are dealt with in several committees. The Committee on Finance and Economic Affairs has an overall responsibility for economic policy, but only indirectly impact on the innovation system as it deals with businesses related to general economic policy, public finances and credit policy, taxes etc. The Committee on Education, Research and Church Affairs has a particularly important role as it handles the budget for education and research including research related to agriculture, fisheries and industry. The Committee on Energy and the Environment handles oil and energy businesses; the Committee on business and Industry handles businesses related to industry and business, but also fisheries, agriculture, subsidies of shipbuilding and tourism is the concern of this committee. Both of these committees handle matters of importance for innovative performance, like funding of the Norwegian Industrial and Regional Development fund (Business and Industry).

I. High level research policy committees

At Governmental level however, there are two high level committees focusing on science and technology policy related issues: The inter-ministerial Research Forum (DFU) and the Governmental Research Commission (RFU). The DFU is an inter-ministerial committee with regular meetings at administrative level. Its primary function is to support the ministry of Church Affairs, Education and Research policies. The RFU is a commission of government ministers, appointed by the Government and headed by the minister of Church Affairs, Education and Research. Its term of reference is to advice the government on R&D policies and decisions, but in practice its main function has been in the setting of annual R&D budgets.

3.1.3. The ministries

In a general sense, all the ministries have a direct or indirect impact on the Norwegian system of innovation. However, measured in terms of funding of industrially related R&D and innovation, the ministry of Education, Research and Church Affairs (KUF), the Ministry for Trade and Industry (NHD) and the Ministry of Regional Affairs and Labour Relations (KAD) are the largest ones.

The Ministry of Education, Research and Church Affairs (KUF) and its affiliated institutions make up a major component in the R&D related innovation policy system. The main axes of this component are the Norwegian Research Council, founding both basic and applied research, and the higher education institutions (HEI). In addition to R&D funding KUF has responsibility for the overall organization of the research system, a

<Table 1> Categories of Strengths, Weaknesses, Opportunities and Threats in Iran's national innovation system

Strengths	<p>S1. In the law of supporting the Knowledge –Based companies and commercializing innovations and inventions has been identified and approved the role of innovative companies, the High Council of Science and Technology, Ministry of Science, Research and Technology, innovation and development banks and funds.</p> <p>S2. According to patent and innovation law, recording of new products or production processes in the law (Parliament of IRI, 2007) can be registered and recorded.</p> <p>S3. High Council of Science and Technology has the responsibility to follow-up the law of supporting the Knowledge –Based companies and commercializing innovations and inventions</p> <p>S4. Responsibility for innovation policy and planning based on legislation is the job of High Council of Science and Technology</p> <p>S5. After 2013, 0.5 % of GDP will be assigned to innovation and development fund.</p> <p>S6. Industrial Property Office registers and records the innovative new products and new process.</p> <p>S7. Academic research projects in the universities have a good ability for innovative solutions if the industry sector offers its problems.</p>
Weaknesses	<p>W1. In the law of supporting the Knowledge –Based companies and commercializing innovations and inventions has not been covered the innovations in all of private and public enterprises.</p> <p>W2. High Council of Science and Technology doesn't cover the policy, planning and follow-up two identified functions of innovation (organizational innovation and marketing innovation).</p> <p>W3. There is not any organizational interface between state, university and industry with the mission of coordinating of the main pillars of innovation.</p> <p>W4. Patent Law doesn't cover two innovation functions (organizational innovation and marketing innovation).</p> <p>W5. Official and legal institutions for registration and marketing of research ideas and achievements do not exist.</p> <p>W6. Offering the graduate studies scholarship by industries is evaluated weak.</p> <p>W7. Centers for technology transfer and technology forecasting by university and industry collaboration are evaluated very poorly.</p> <p>W8. High-speed and secure networks infrastructure and IT applications are evaluated poorly.</p> <p>W9. The centers for technology development and localization in small and medium industries such as RTO (Research Technology Organization) are evaluated very poorly.</p> <p>W10. Data based information network to facilitate access between researchers and applicants is evaluated poorly.</p>
Opportunities	<p>O1. The potential for Iranian companies to enter the production and trade on a global scale is a fairly good evaluation.</p> <p>O2. Approach of women to enter to the colleges and graduate studies have been increased the potential of laboratories and research centers.</p> <p>O3. Young age average for next ten years is a dynamic opportunity for innovation functions.</p> <p>O4. Potential of universities to support research and innovation is an opportunity.</p> <p>O5. Culture of teamwork between different scientific and industrial research groups, is evaluated strong.</p>
Threats	<p>T1. Rapid transfer of new technology into the country is suffering from challenges.</p> <p>T2. Globalization as an opportunity to develop innovative technology is suffering from challenges.</p> <p>T3. Purchasing the modern and technical equipments cause of sanctions are suffering from challenges.</p>

prime dimension of which is the general funding principles and policies towards the large sector of autonomous contract research institutions. From the innovation policy perspective this concerns mostly the industrial and technological research institutes.

The Ministry of Trade and industry has a wide impact on the Norwegian system of innovation. Its areas of responsibility covers:

- Legal issues related to industry, trade, foreign ownership and immaterial property rights.
- Industry and trade policy issues related to the structure of industries, to public financing and venture capital for industry, small and medium sized businesses, export credits and guarantees, and to the handling of government ownership in joint-stock firms.
- Loans, warrants and funds for financing industrial development at firm and industry level.
- Co-ordination of industrial policies with policy making in EU, EEA, WTO and OECD, and bilateral technology and industrial co-operation with other countries.

- R&D policy, including founding of NFR, space research, ship research, public procurement and public R&D contracts.

- The public advisory services.

- Administrative responsibility for standards setting agencies, ship control, shipping registers, the Norwegian patent office and for mining related exploratory and regulatory bodies.

The Ministry of Petroleum and Energy has had great influence on offshore related technical research in Norway, and on innovation capabilities of the related industries, through criteria used for giving concessions for oil exploration to foreign and national firms. The efforts have led to very significant investments being made by private firms in offshore related R&D in Norway.

The Ministry of Regional affairs and Labour Relations (KAD) has played a role in formulating regionally oriented industrial and innovation policies, and is playing an active role promoting regional innovation capacities. Its main role as a provider for funds for innovation related activities is as a sponsor of the Norwegian Industrial and Regional Development fund (SND). The ministry also supports the establishment of science parks. These budget allocations are all positioned within the framework

of Norwegian policies for regional development. (Statskalenderen, 2009)

<Table 2> SWOT matrix analysis

Strengths/ Weaknesses Opportunities /Threats	S1,S2,S3,S4, S5, S6,S7	W1,W2,W3,W4,W5, W6,W7,W8,W9,W10
O1 O2 O3 O4	SO1 SO2 SO3 SO4 SO5 SO6 SO7 SO8 SO9	WO1, WO2 WO3, WO4 WO5, WO6 WO7, WO8 WO9, WO10 WO11, WO12 WO13, WO14 WO15, WO16
T1 T2 T3 T4	ST1 ST2 ST3	WT1 WT2

3.2. Institutions which formulate technology and innovation policies, and implement policy by financing, coordinating, supervising and assessing innovation efforts

The Research Council of Norway (NFR), identifies important fields of research, allocates funds and evaluates R&D. It is also called upon to offer strategic advice to the government on science and technology issues. NFR takes responsibility for resource allocations in six sub-areas: Natural science & Technology, Medicine and Health, Industry & Energy, Culture and Society, Bio-processing and Environment & Development.

The Norwegian Industrial and Regional Development Fund (SND), also established in 1993 as a reorganization of previously existing institution, is now the central institution for public funding of industrial and regional development in Norway. Its main supporters, the Ministry of Trade and Industry and the Ministry of Regional Affairs and Labour Relations, provide the general financing of SND's main instruments. These include grants for innovation related activities, loans for such activities and for other 'change-generating' activities like development and acquisitions of new capital goods, warranties that enable firms to get loans from private financial institutions, and a general venture fund. And there are other public funds, Banks etc. (Hauknes, Johan 1995)

4. Korean Experience

In a research study by OECD (2009) in Korea, on the results

of a series of interviews with major stakeholders in Korean's innovation system have been listed Strengths, Weaknesses, Opportunities and Threats analysis and then have been extracted some of strategic recommendations to modify the National Innovation System of Korea. The most important of Strengths, weaknesses, opportunities and threats as followed:

4.1. Strengths

- Strong, mobilizing national vision
- High growth rates in GDP
- Strong government support for innovation and R&D
- Good improving framework conditions for innovation
- High ratio gross domestic expenditure on R&D (GERD) to business enterprise expenditure on R&D (BERD)
- Highly educated workforce
- Good supply of human resources for science and technology (HRST)
- Read only adopters of new technologies
- Strong ICT infrastructure
- Exceptionally fast followers
- Strong and internationally competitive firms
- Learning society with a capacity to learn from failures and international good practices
- Capability to produce world-class talents (OECD ,2009)

4.2. Weaknesses

- Underdeveloped fundamental research capabilities and weak research capacities in universities
- Weak linkages between GRIs and institutions of higher education
- In education, rote learning, over emphasis upon university entrance exam, and crippling cost of private education
- Underutilization of female labour
- Low productivity in service sector
- Relatively weak SME sector
- Legacy of dirigisme which hampers the development of a diffusion-oriented innovation policy
- Unbalanced international linkages
- Uneven development across regions and sectors
- Small domestic market (compared to China, Japan, USA)
- Policy co-ordination problems between ministries (OECD ,2009)

4.3. Opportunities

- Geographical positioning in one of the most dynamic regions of the world
- Free trade agreements
- Globalization, including R&D
- Growing Korean S&T Diaspora
- Developments in S&T (technological change), particularly information technology, nanotechnology, biotechnology and

environmental technology and their possible fusion

- o Growth of china and other newly industrializing economics, both in the region and worldwide, offering new markets for Korean exports (OECD, 2009)

4.4. Threats

- o Low fertility rates and an aging society
- o Arrival of strong new competitors in fields in which Korea excels, e.g. ICTs, particularly from China
- o Geopolitical developments in the region
- o Disruption in the supply of imported natural resources and energy upon which the Korean economy is highly dependent
- o Global economic outlook and its consequences for export-oriented economies (OECD ,2009)

4.5. Strategic tasks and guiding principles in Korea

The main strategic task of Korean's innovation policy is to achieve convergence with more advanced OECD economies. It needs to achieve this in the context of declining fertility rates and increased competition from newly industrializing countries, particularly china. Korean innovation policy therefore needs to accelerate the shift of the innovation system away from a catch-up to a more creative model, by supporting more fundamental research in diverse domains, raising the innovative and absorptive capacities of SMEs, and better linking up to international sources of knowledge. In accomplishing these tasks, policy should follow certain guiding principles:

- o International openness
- o Diversification
- o Shift from economic development programs toward more public and generic research
- o Incorporating a long-term perspective when assessing the costs and benefits of public R&D funding
- o Balancing competition with the development of co-operation and trust
- o Systematic and evolutionary approach to the promotion of innovation
- o Comprehensive approach to fostering innovation beyond support for R&D and Hi-tech
- o Gender main streaming (increase female participation rates in science & Technology in order to maintain economic growth.)
- o Participatory governance of S&T

5. National Innovation System of Iran's conditions

A comparative study about science and technology policy in 50 countries across five continents in the world in 2001 shows that all these countries, creating the foundation of the knowl-

edge society as one of the most important goals of its vision to around 2020 and have chosen (Strategic document of Iran for 2025 perspective that was approved in 2004 AD, the same base is selected as the key objective). (Haj Hosseini, 2005)

The first characteristic of the attitude to science foundation (endogenous production of knowledge), refer to the country's indicators of science and technology can be said that knowledge production capabilities in recent years has been to significantly improve. The index of scientific papers during 1995 and 2005 shows a growth of 123% that is very impressive, but unfortunately, the production index of technological knowledge (patent registered) seems weak. in the national innovation system in the country is ignored the ability to convert scientific knowledge to technical knowledge (science into technology). (Iraculture.org, 2009)

More importantly, the knowledge economy index basis (KEI) towards effective utilization of economic development in the community shows, and especially to help us to respect the country's potential ability to create innovation (converting knowledge to wealth) during the 2007 World Bank assessment, our country among 137 countries studied is located in the category 98. While the countries of Vietnam, Azerbaijan, Lebanon are ranked 66th, Jordan (ranked 62nd), Bahrain (ranked 52nd) and Qatar (ranked 42nd). (Iraculture.org, 2009) Regarding on vision and strategy for 2025, Iran should be as a knowledge-based society (knowledge basis), the first advanced level in the region is discussed and the following bases for the Fifth Five Year Plan (2010-2014) in innovation has chosen:

- Assign 3 percent of GDP to research and innovation
- Annual growth rate of 20 percent in postgraduate
- Out realizing the second developed country in West Asia until the end of Fifth Program
- Effective relation between universities, R & D centers and industry
- Access to advanced industries needed
- Support the inventors and innovation
- Development and reform of comprehensive scientific strategic plan

"Important organizations in the national system of innovation include: entrepreneurs, universities, organizations, investors, government agencies related to innovation and competitive policies, laboratories and research centers." (Manteghi, M., 2001)

As mentioned, the national innovation system are included the elements (organizations) and institutions as followed :

Elements include:

Strategic elements of policy regime

- Elements of education and research and development of human resources
- Infrastructure elements, including intermediate and basic infrastructure and hardware, entrepreneurship, finance, international cooperation and other elements of national

And the institutions are:

- Customs official (including laws and regulations)

- Norm of non-formal (including culture and social capital)

In developing countries, including Iran the following factors should be studied: Systematic factors such as lack of decisiveness macroeconomic, low volatility, lack of physical infrastructure (electricity and basic services such as information and communication technology fast and reliable), fragility norm, the lack of social awareness about the innovation, the nature of the possible risk of disagreement entrepreneur, the lack of entrepreneurship, despite the barriers set up at the start of business, lack of public policy tools to support business and management education. (OECD, 2005)

6. Results

On the results of a series of interviews with major stakeholders in Iran's innovation system following subjects are achieved:

- Strengths, Weaknesses, Opportunities and Threats analysis have been listed in Table A1 and then by using the SWOT matrix analysis shown in Table A2 the necessary strategies will be extracted to improve strengths, using opportunities, reduce the weaknesses and minimize the threats of innovation policies in Iran.
- Institutional - functions matrix of the national innovation system of Iran is shown by table A3.

6.1. Strategic Recommendations according to the proposed strategic SWOT analysis

For improving the strengths and achieving the opportunities against National Innovation System of Iran, following strategic recommendation are suggested:

<Table 3> Institutional - functions matrix of the national innovation system of Iran

Institutions \ Functions	F1. General Innovation Policy Making & formulating	F2. Policy formulation and implementation	F3. Research and innovation facilitating and modulating	F4. R&D performing institutions	F5. promoting technology diffusion & human resources	F6. Production of goods and services
Government	√ √					
Parliament	√ √					
High Council of Science, Researches and Technology	√ √					
Ministry of Science, Researches and Technology		√ √				
Ministry of Industries and Mines		√ √				
Other Ministries involved with innovation		√ √				
Industrial, Intellectual Properties and Patent Registration Org.		√	√			
Funds to support innovation and development		√	√			
Special associations and innovation and technology consultants			√	√√	√	
R & D Centers, Knowledge based Co., Technology development and innovation centers			√	√	√	
Universities					√	
Science and Technology Parks, Incubators, Special Economic Regions				√	√	
innovation users, (SMEs, Industries)				√		√ √

6.1.1. SO (Strengths, Opportunities) Strategies

- SO1. Improving plans and development for technology-based skills
- SO2. Doing more investment, especially in the private sector for research and development
- SO3. Encourage and supporting the conversion scientific knowledge to technology and technical expertise to the wealth and enterprising
- SO4. To create and develop the innovative network of SMEs (small and medium enterprises) in the country.
- SO5. Strengthening and planning to provide scholarships for graduate studies by industries
- SO7. To develop innovation in all known areas by using the opportunity of being young and dynamic society
- SO8. Supporting the energy optimizing plans in Industries and universities
- SO9. Encourage, development and supporting the teamwork culture between different groups of scientific, industrial and research teams

6.1.2. WO (Weaknesses, Opportunities) strategies

To minimize the effect of weaknesses and achieving the opportunities against National Innovation System of Iran, following strategic recommendation are suggested:

- WO1. Supporting all of four innovation functions, based on Oslo Manual 2005, by National innovation system law
- WO2. Covering two innovation functions (organizational innovation and marketing innovation) added by existed two innovation functions (new product and new process) for registering and recording in Patent Law
- WO3. Supporting all of private and public enterprises, companies and organizations in the field of innovation functions, by National innovation system law
- WO4. Covering the responsibility for innovation policy by Science, Research and Technology High Council
- WO5. Investment toward high-risk finance in the field of research and development and innovation by innovation and development fund
- WO6. Covering the organizational and marketing innovation for registering and recording by Industrial Property Office
- WO7. Deserves to strengthen cooperation with industry and universities offer the potential for academic research projects with industry demand to be used efficiently
- WO8. Establish an organizational interface between state, university and industry with the mission of coordinating at the main pillars of innovation.
- WO9. Providing the possibility of establishing special corporations to record and marketing ideas and research achievements
- WO10. Improving the IT network infrastructure, more secure and more speed and more practical
- WO11. Strengthening the centers for technology development

and localization in small and medium industries such as RTO (Research Technology Organization)

- WO12. Establish a strong Data-based information network bank for easy access between researchers and applicants or users for innovation.
- WO13 Encourage and supporting the Iranian companies to enter in the field of production and trade on a global scale
- WO14. Encourage and providing well conditions to resident and attract the Iranian and international specialists
- WO15. Establish think-tanks included professionals, managers and brains to make innovation policies and planning
- WO16. Defining and approving the Institutional Mapping of Iran's national innovation system

6.1.3. ST (Strengths, Threats) strategies

For improving the strengths and minimize the effects of threats against National Innovation System of Iran, following strategic recommendation are suggested:

- ST1. Supporting the energy optimizing plans in industry and universities.
- ST2. Welcome to globalization as an opportunity for technology development and innovation
- ST3. Development of teamwork culture between different groups of scientific, industrial and research teams

6.1.4. WT (Weaknesses, Threats) strategies

To minimize the effect of weaknesses and threats against National Innovation System of Iran, following strategic recommendation are suggested:

- WT1. Reduce the effects of sanctions in the field of rapid transfer of new technologies and modern technical equipment purchasing.
- WT2. Strengthening the conditions of international cooperation for the development of innovation

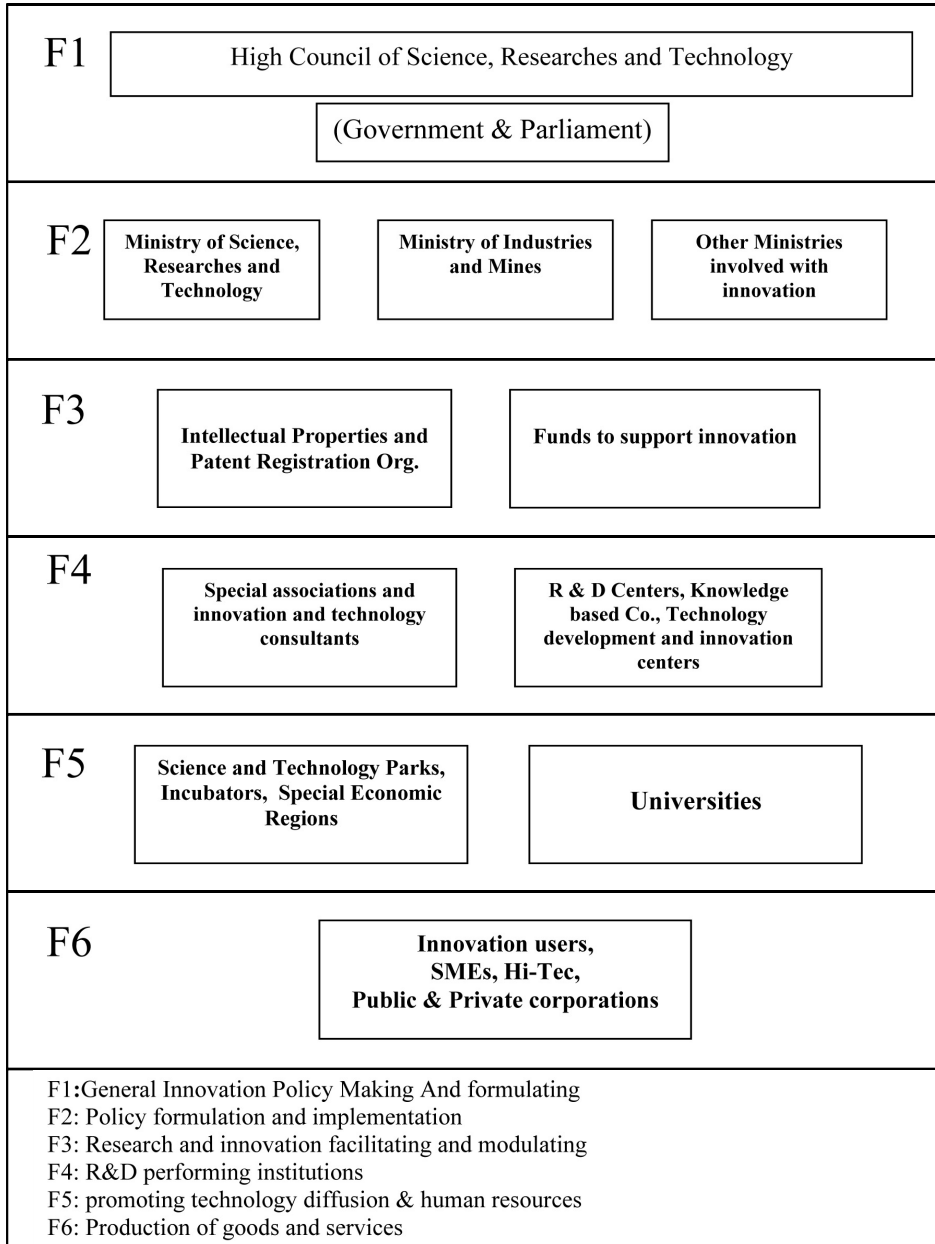
6.2. Scientific Novelties of Research Study are:

- There were discovered strengths, weaknesses, opportunities and threats of the National Innovation system of Iran, particularly lack of supporting of two types of innovation, Organizational innovation and marketing innovation.
- There were discovered the problems of development and coordination of policy of National Innovation System, particularly, There is not any organizational interface between state, university and industry with the mission of coordinating of the main pillars of innovation.
- There were discovered the problems of technology development and innovation process, particularly, Rapid transfer of new technology into the country is suffering from challenges and under sanctions.
- There were discovered the problems of innovation process

support, particularly In the law of supporting the-Based companies and commercializing innovations has not been supported the innovations in all of private and public enterprises

Iran National Innovation System which includes government, parliament, ministries of researches, industries , mines and commerce, funds and banks for supporting innovation, researches and developments, Research and development centers, universities, small and medium en-

■ There was developed a new institutional framework for



Abbreviations: DFU, inter-ministerial research forum; RFU, governmental research commission; KUF, Research and Church Affairs; NHD, Ministry for Trade and Industry; KAD, Ministry of Regional Affairs and Labor Relations; HEI, higher education institutions; KAD, Ministry of Regional affairs and Labor Relations; SND, Norwegian industrial and regional development fund; TI, National Institutes of Technology; VINN, Advisory Institute in Northern Norway; NIS, national innovation system; KEI, knowledge economy index basis; UNCTAD, United Nations Conference on Trade and Development; SME, small and medium scale enterprise; SIVA, Selskapet for industrivekst; EEA, European Economic Area; WTO, World Trade Organization; EU, European Union; NBR, construction; NEK, electrotechnics; NTS, technology; PT, post and telecommunication; GDP, gross domestic product; NAS, Norwegian Standards Association; SWOT, strengths weaknesses- opportunities and threats.

<Figure 1> Suggested Modified institutional mapping for NIS of Iran

terprises, private and public corporations.

- There were suggested ways for the modification of Iran National Innovation System, particularly by using good strategies for approving laws in parliament such as: Improving plans and development for technology-based skills, Encourage and supporting the conversion scientific knowledge to technology and technical expertise to the wealth and enterprising, Strengthening and planning to provide scholarships for graduate studies by industries, Establish a strong Data-based information network bank for easy access between researchers and applicants or users for innovation.

7. Conclusions and Discussions

In this research study on the results of a series of interviews and completing the designed questionnaires (more than 100 sessions) with major stakeholders in Iran's innovation system that 64% of them were PhD and Master Degree holders, have been listed Strengths, Weaknesses, Opportunities and Threats against NIS of Iran, and they are shown in Table1.

- According to the law of supporting the Knowledge-Based companies and commercializing innovations and inventions in August 2010 that the Parliament has passed, it specifies the role of law in innovative companies, the High Council of Science and Technology, Ministry of Science, Research Technology, innovation and development banks and funds, which will be established in the year 2013, but the law doesn't cover other private and public enterprises and firms.
- According to patent and innovation law, recording of new products or production processes in the law can be registered and recorded.
- High Council of Science and Technology has the responsibility to follow-up the law of supporting the Knowledge – Based companies and commercializing innovations and inventions, but High Council of Science and Technology doesn't cover the policy, planning and follow-up two identified functions of innovation (organizational innovation and marketing innovation).
- Responsibility for innovation policy and planning based on legislation is the job of High Council of Science and Technology.
- After 2013, 0.5 % of GDP will be assigned to innovation and development fund.
- Using Think-Tanks included specialists, top managers and brains for innovation policy making and formulating is evaluated in average level.
- R & D methods by different centers in the ministries of Science, Technology, Industries and Mines has been developed, but there is not a unique centralized agency for investigation and preparation methods databases containing R & D results.
- There is not any organizational interface between state, university and industry with the mission of coordinating of the main pillars of innovation.
- Industrial Property Office registers and records the innovative new products and new process, but it doesn't cover two innovation functions (organizational innovation and marketing innovation).
- Supporting the innovation by local institutions and municipalities such as the Local state is evaluated in average level.
- Any banks or investment funds do not support investment with financial risk right now, but on the basis of Parliament law, after 2013, innovation Fund with initial capital of \$ 3 billion will be established to support this investment for innovation and researches. Official and legal institutions for registration and marketing of research ideas and achievements do not exist.
- Offering the graduate studies scholarship by industries is evaluated weak.
- Centers for technology transfer and technology forecasting by university and industry collaboration are evaluated very poorly.
- The potential for Iranian companies to enter the production and trade on a global scale is a fairly good evaluation
- Rapid transfer of new technology into the country is suffering from challenges.
- High-speed and secure networks infrastructure and IT applications are evaluated poorly.
- Social capacity to learn from the successful and unsuccessful international experiences is evaluated in average level.
- The centers for technology development and localization in small and medium industries such as RTO (Research Technology Organization) are evaluated very poorly.
- Approach of women to enter to the colleges and graduate studies have been increased the potential of laboratories and research centers.
- Globalization as an opportunity to develop innovative technology is suffering from challenges.
- Young age average for next ten years is a dynamic opportunity for innovation functions.
- Purchasing the modern and technical equipments cause of sanctions are suffering from challenges.
- Data based information network to facilitate access between researchers and applicants is evaluated poorly.
- Methods and processes to access researchers and Industry is evaluated in average level.
- Academic research projects in the universities have a good ability for innovative solutions if the industry sector offers its problems.
- The interaction between the applicants and provide innovation in industry research and innovation in universities is evaluated in average level.
- The level of enjoying the industry and universities structure

and government support is evaluated in average level.

- Potential of universities to support research and innovation is an opportunity.
- Culture of teamwork between different scientific and industrial research groups, is good.

Based on this research study the modified institutional mapping of Iran is suggested by Figure 1.

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