

NATIONAL INNOVATION INITIATIVE

May/2007

Innovation Framework Report

Innovation for National Welfare



National Innovation Initiative (NII)

Innovation Framework Report



Innovation for National Welfare



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Competitiveness Forum

TUSIAD-Sabanci University Competitiveness Forum (REF) is a research center formed jointly by the Turkish Industrialists' and Businessmen's Association (TUSIAD) and Sabanci University. Our mission is; to help improve the competitiveness of the Turkish industry in international markets by conducting and supporting research on competitiveness and related issues. Our activities can be grouped in three categories; research, dissemination of knowledge and collaboration. Research activities focus on conducting, promoting and supporting research on competitiveness, innovation and technology management, and conducting, promoting and supporting benchmarking studies.

REF disseminates its accumulated knowledge and practices in regard to its studies, activities, opinions and developments occurring around the issue of competitiveness through both its web site available at www.ref.sabanciuniv.edu and its electronic media named as Competitiveness Bulletin.

REF embarked an assignment in the composition of the Turkish National Innovation Initiative. REF's fundamental task in this respect is coordination and provides its full support necessary for the sake of proper implementation of the Initiative during two years falling between September 1, 2005 and August 31, 2007.

Foreword

This civil initiative has been established in June 2005 to study the innovation process in Turkey. The purpose of this civil initiative namely the National Innovation Initiative is to strengthen the cooperation between private sector, universities and NGO's in the area of innovation policy development process; contribute to the dialogue with the political authorities and the public enterprises; prepare reports and recommendations, and support the activities on building awareness on innovation in public at large. This initiative has been started with 21 Founding Members from business community, universities and NGOs; and has established five Working Groups composed of 109 distinguished members from academia, business community and from NGOs. The Working Groups are: 1. Turkey in 2023 and Innovation, 2. Financing of Innovation, 3. Human Resources and Skills for Innovation, 4. Environment and Infrastructure, and 5. Innovation in the Public Sector. The primary target given to these Working Groups were preparation of a comprehensive "Innovation Framework Report" in their areas of interest with short and medium term proposals and projects. This initiative will study the possibilities of reinforcement of our existing strengths, ensuring the better evaluation of existing opportunities, and evaluate the existing weaknesses, ensuring that the existing threats are transformed into opportunities in the innovation processes. Through this way it is hoped that , substantial contribution will be made to the process of innovation which will play an active role in the progress to be achieved by Turkey in social as well as in economic arena; hence to improve the level of prosperity. A "Panel of Global Consultation" has been established with 6 distinguished individuals from different parts of the world with vast experience in innovation from different perspectives, and their recommendation has been integrated into this report.

This study assumes that all science, technology and innovation related policy documents approved by the Supreme Council of Science and Technology will be implemented, hence, the objectives of the initiative is to develop concrete and viable recommendations regarding the areas that require improvement for the successful implementation of mentioned policies. This study has been carried out on purely voluntary basis and during this process, great number of colleagues have devoted their precious time on the project in spite of their extremely dense work schedules, and have provided invaluable contributions to our work, showing a remarkable example of self-sacrifice. It is our duty to express our gratitude individually to all the esteemed members of our Working Groups, whom we believe have provided the most important contribution to

the success of the National Innovation Initiative, which we anticipate to provide a surplus value in the teaching and implementation of the concepts of innovativeness, creativity and the entrepreneurial spirit. We would also like to express our profound gratitude to the Office of the General Secretary of Turkish Industrialists and Businessmen's Association (TÜSİAD) for the precious support that they have provided to us throughout our studies, to the Panel members; and to Ms. Sema Adalı, Dr. Uğur Müldür, Mr. Serdal Temel, Mr. İrfan Onay and Prof. Dr. Tahir Özgü, both for their contributions as the members of the institutions whom they represent, as well as for the personal interests that they have shown in our work.

Thank you all.

On behalf of the Founding Members and Co-Chairmen of the National Innovation Initiative

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Abbreviations

BTYK: Supreme Council of Science and Technology
EU: European Union
GDP: Gross Domestic Product
ICT: Information and Communication Technology
IGEME: Export Promotion Center
İTU: Istanbul Technical University
KE: Knowledge Economy
KGF: Credit Guarantee Fund
KOSGEB: Small and Medium Industry Development Organization
MPM: National Productivity Center
NGO: Non-governmental Organization
ODTÜ: Middle Eastern Technical University
OECD: Organization for Economic Co-operation and Development
R&D: Research and Development
REF: TUSIAD-Sabancı University Competitiveness Forum
RSYO: Venture Capital Investment Partnerships
SEDEFED: Federation of Industrial Associations
SME: Small and Medium Enterprises
SPO: State Planning Organization
TESK: Confederation of Tradesmen and Artisans of Turkey
TOBB: The Union of Chambers and Commodity Exchanges of Turkey
TPE: Turkish Patent Institute
TTGV: Turkish Technology Development Foundation
TUBA: Turkish Academy of Science
TUBİTAK: The Scientific and Technological Research Council of Turkey
TUBİTAK-TEYDEB: TUBİTAK – the Directorate of Technology and Innovation Support Programmes
TURKAK: Turkish Accreditation Agency
TURKONFED: Turkish Enterprise and Business Confederation
TUSİAD: Turkish Industrialists' and Businessmen Association
UoFT: Under-secretariat of Foreign Trade
ULIS: National Innovation System
US: United States
USAMP (TUBİTAK): University Industry Joint Research Centers
WCI: World Competitiveness Index
YPK: High Planning Council
YÖK: Higher Education Council

Scope

This report summarizes the results of the studies conducted and the recommendations developed by the working groups of the National Innovation Initiative (NII). It is divided into three main sections. The first section presents a description of the concept and the changing nature of innovation. Drawing on the findings summarized in the first section, the following section provides an overview of the main elements of an innovation strategy for Turkey for the period of 2007-2013, in light of the vision formulated by the NII. The last section summarizes the findings of the studies carried out by the NII working groups and recommendation developed for the innovation-based development and economic growth of Turkey.

This study mainly focuses on the factors which would accelerate the improvement of the innovation performance of Turkey. Additional studies are needed to develop the recommendations further and to make them operational. Such studies include, but not limited to, delicate designs and further requirements analysis; allocating proper financing mechanisms; detailing every project proposal, determining the units whose responsibilities are allegedly to implement the projects, and most of all to possess ownership for the proposals to have sustainable management of them.

Innovation Framework Report is channeled information through inputs provided by the Working Group's Draft Report, which ended as of January 30, 2006. Draft Report in Turkish version is also available at [www.webref.sabanciuniv.edu](#). This ending date is a line drawn in terms of developed project proposals, as it could not have been practically possible to take into account the innovation supporting measures borne by the public institutions. Regarding the scope of the Report, there have been several measures and facilities that aim to support innovation and its related ecosystem in Turkey. However, the project proposals are based on the information that and [www.webref.sabanciuniv.edu](#). NII members already have, thus the Report has such a limit, and further does not attempt to cover all the support issues and related developments in Turkey. Additionally, some project proposals might have been already in operation. Such limit is requested to be recognized by the reader as a natural boundary for the Report.

Definition of Innovation

“An innovation is the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organizational method in business practices, workplace organisation or external relations.”
Oslo Manual/OECD/EUROPEAN COMMUNITIES,
2005



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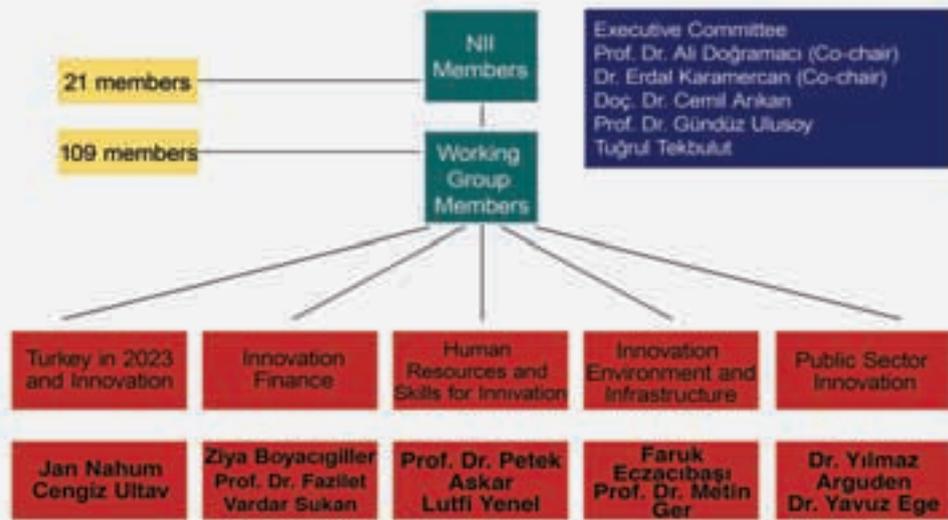
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NII Organization Chart



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The Concept and Changing Nature of Innovation

Introduction

The report “Innovate America” published in 2004 by the Council on Competitiveness in the USA clearly highlights the ever-increasing importance of innovation. According to the report, during the 1980s, the United States faced a competitiveness challenge from Japan, and to restore their competitive position, U.S. businesses, in concert with government policy-makers and business school theorists, developed the new management tools to transition successfully from a mass production to a quality-management culture. A similar trend has been observed in other developed countries since the emergence of TQM in the 1980s. This transition has led to a jump in productivity with the application of new management tools such as lean manufacturing, six sigma and supply chain management.

In today’s world, however, cost and quality are not the key differentiating factors for competitive advantage. It is well recognized that gaining and sustaining the competitive advantage in the global arena requires taking on new challenges such as creating new markets and more values for customers, which no doubt means more and faster innovation.

A Global Perspective: Changing Approaches Towards Innovation:

As we observe today, technology and innovation, both technological and non-technological, are recognized as of crucial importance by many countries. Innovation is at the top of their social and economic agenda, and new approaches are adopted to overcome the impacts of the lack thereof. The European Union (EU) emphasizes that they definitely need a paradigm change by replacing a social framework developed and adapted to an industrial, resource-based society to one which supports innovative growth in a knowledge-based society (European Commission, 2006). At the same time, strong economies of the Union, such as Germany, France and the UK, as well as the other member states, develop national innovation strategies for the same purpose. Similarly, countries like Japan, Taiwan, Singapore and South Korea continuously struggle to dominate global markets by systematically directing the waves of new technologies. China, on the other hand, has become a major issue for many countries in international trade even it today has a share of less than 10 per cent in the world’s economy: Countries develop new competition tactics against and/or together with China to cope with the challenge. Meantime, China itself takes steps systematically to move in the value chain for increased competitive advantage. Another developing country, India, is also progressing rapidly in many fields. For example it has successfully built capacity in software development, in manufacturing and in advanced technology outsourcing.

The Value Created by Innovation: What does it bring about?

A successful innovation process creates value for those directly and indirectly involved. It adds value to customers, manufacturing and industrial processes; creates new markets and efficiencies to the work performed; improves the range and delivery of services; delivers growth and creates new jobs. Adoption and dissemination of innovation increases the knowledge stock of society; supports development of markets and ensures increased welfare and higher quality of life in the long run. Figure 1 illustrates the impact of science, technology and innovation on living standards.

Figure 1: Competitiveness Pyramid of Competitiveness Forum



Source: TUSIAD – Sabanci University, Competitiveness Forum, 2005

Changing Nature of Innovation

Innovation is a complex and multidimensional process which involve many different players. With the recognition of this fact, linear view of innovation has been replaced by the dynamic approach which requires a complex interplay between all actors of an innovation system, such as firms, suppliers, customers, competitors, government bodies, higher education institutes, research laboratories, etc. Today's new approach is a requirement for sensing and understanding customer needs, and responding with fast and innovative solutions. It requires interdependent thinking and collaboration. In the new concept of innovation, firms focus on the value created for customers by products and services developed.

The Global Innovation Outlook (GIO) report published by the International Business Machines (IBM) also presents findings on the changing nature of innovation. The GIO is produced through discussions of thought leaders on today's important phenomena. The aim is not to predict the future but to identify the motivations behind the meaningful changes in individuals, enterprises and the world. According to the results of the studies conducted in 2004 under the GIO, innovation is increasingly

- Global. The widespread adoption of networked technologies and open standards is removing barriers of geography and accessibility. Anyone and everyone can participate in the innovation economy.
- Multidisciplinary. Because the challenges before us are more complex, innovation now requires a diverse mix of talent and expertise.
- Collaborative and open. More and more, innovation results from people working together in new and integrated ways.

Today we know that innovating entrepreneurs are key elements of transformation and commercialization of knowledge. Such an activity requires an interactive process –between enterprises and consumers, governments, universities and other academic institutes, research centers, financial sector players- through which innovation takes place. This process can only take place if a well-structured and dynamic innovation system is established.

Another important aspect of innovation is that it should be supported by a systemic policy framework. The need for such an approach is emerged from the facts that external factors are important determinants of the innovation performances of enterprises. Such external factors include demand created by the market, public policies and innovation infrastructures such as energy, information and communication technologies, transportation, etc. An effective innovation policy seeks to facilitate co-operation between stakeholders of the innovation system, to provide incentives to encourage investment in innovation and to develop a legal, regulatory and financial framework conducive to innovation.

The Penetration Rate of Innovation in Markets is Increasing:

In the past, the penetration rate of new technologies in markets was slower than those introduced today. As exemplified in the report “Innovate America”, it took the automobile 100 years to penetrate 50% of the global market. It took the telephone 75 years and electricity took 50 years. However, the rise of cell phones has been faster than the personal computer and even faster than the Internet.

Innovation Requires a Different Mindset

As agreed by the participants of Global Innovation Outlook, successful and sustained innovation demands a shift away from conventional thinking that innovation is chiefly the domain of an R&D group. Those enterprises which are aware of this change and would like to take steps for change face a new challenge: using traditional methods in solving new problems, and picking the solution that works for everyone. As a result of this approach, enterprises create innovation departments, job titles and hierarchies to develop an organizational structure responding the change. However, organizational structuring is a not solution to this problem.

It should be recognized that innovation is a culture, not a department. There is wide debate about the best ways to create such a culture. Innovation does not magically happen and creating an innovation culture is only possible by a series of actions (IBM, 2006).

European Union and Innovation: A Paradigm Change

The European Commission has recently published a study titled “Creating and Innovative Europe” prepared by a group of experts under the leadership of the Former Prime Minister of Finland Mr. Esko Aho. The study proposes creation in Europe a market that stimulates and encourages innovation and in so doing provides firms with the incentive to raise their R&D level and to apply successfully the full range of new technologies. It is recommended that simultaneous and synchronous efforts are focused on the following areas:

- creating a market for innovative products and services;
- providing sufficient resources for R&D and innovation; and
- improving the structural mobility and adaptability of Europe.

The following is implied by “structural mobility”: mobility means somewhat more than geographical movement. It is about creating structures and changing values to allow movement of institutions, people and resources in a way that accelerates the transition to an Innovative Europe. It is seen as both the symbol and the reality of paradigm change in Europe. Here, the paradigm change implies replacing a social framework developed and adapted to an industrial, resource-based society to one which supports innovative growth in a knowledge-based society.

Cutting across above three areas is a fourth which is treated horizontally, being the necessity for more positive European attitudes and culture towards entrepreneurship and risk taking (European Commission, 2006).

The central recommendation of the expert group is that a “Pact for Research and Innovation” is needed to drive the agenda for an Innovative Europe. As noted in the report, this requires a huge act of will and commitment from political, business and social leaders. The practical and symbolic value of this action is defined as to show that all the drivers of Europe’s innovation ecology are willing to work together to achieve European prosperity, competitiveness and quality of life.

Meantime, the EU develops new initiatives related with innovation in order to reach the Lisbon target – of making the Union the most competitive and dynamic knowledge-based economy in the world by 2010 –. The two major initiatives in this respect are the establishment of the European Technology Institute and the launching of the Competitiveness and Innovation Framework Programme.

National Innovation Initiative Recommendations, Common Vision, General Approach and Main Elements



Proposals, Common Vision, General Requirements and Main Elements

Common Vision

It is recognized that a vision for innovation, as one of the most fundamental drivers of development and growth, needs to be agreed by the whole society. The 'common vision' we propose is, within the framework of global innovation economy, to create a Turkey which fulfils the universal and national requirements of **innovation-based development and economic growth**; which aims to implement an **innovation-based and intellectual capital-focused** economic and social development process countrywide; and which allocates resources and gets organized to reach this target. Realizing this vision with the involvement of all stakeholders requires a **national consensus** since innovation concerns the whole society and needs a **collective responsibility**.

General Requirements

•Innovation is a participatory process. Such a process which is backed by an open and collaborative approach requires a well-functioning democratic regime. With the existence of a democratic society, the creation of an innovation and knowledge economy is faster and easier. It also makes the process much more effective, and contributes to the sustainability to a great extent. Therefore, democratization should be accepted as a must for increased welfare, and innovation-based development and economic growth.

An innovating society requires **creative** young generations who are **thinking, questioning and judging** are needed, as well as adult talents who are determined to updating themselves to respond life-long changes. To be able to generate a social and economic system which accommodates such human resources and adopts the principles of innovation-based development and growth, it is important for Turkey, as a country that set the target of becoming a full member of the EU, to reach the highest standards in democracy ...

Main Elements of an Innovation Strategy for Turkey for 2007– 2013 Period

Overview

For the next 20 years and beyond, Turkey's innovation vision will directly be linked with its overall vision as a country. Development of either an innovation or an overall vision for Turkey does not mean predicting its position at the end of year 20 or year 50. Besides, formulating a vision is not a one time action, but a process that must be built step by step together with its components and depending on the real conditions.

The steps to be taken (or not taken) by Turkey in the next 5 and 10 years will influence its future more than ever. Among these steps, those related to innovation will have the utmost impact on the development and growth of the country. Today, it is known that innovation related actions require decision making and resource allocation in many areas; and successful implementation of those actions leads to an improvement in the innovation performances and capacities.

Setting a vision requires the design of a road map as well. Due to the dynamic nature of innovation and knowledge economy, such a road map will not be linear. The pervasiveness of innovation requires development of a dynamic road map and the successful implementation of the road map needs a collective action and high level of commitment.

Public intervention plays a significant role in the development of an innovation economy and an innovative society. Public policy actions mainly aim to reduce or overcome both market failure and systemic failure. Market failures are dealt with the formulation and implementation of policies influencing innovation processes and capacities in enterprises (particularly in the areas of intellectual property rights (IPR), taxation and competition). To tackle the systemic failures that arise from institutions in the national innovation system (NIS), measures and actions are needed both to stimulate a higher and more effective rate of innovation activity in enterprises to improve their competitiveness and to invest in long-term drives such as human capital for innovation. Without recognizing these facts, it will be impossible to face challenges ahead.

From this perspective, the innovation vision has a collective dimension and it brings about a collective responsibility. Developing such a vision requires defining a non-linear development perspective which is based on the dynamics of today's world economy and the forecasts on the development processes of the future.

The other issue is about how we define growth. In creating jobs, increasing the quality of life and reducing inequalities, the quality of growth, rather simply quantity is important. This is mainly because

- Sustainable growth requires total factor productivity (TFP) to rise -providing at least 1/3 of growth- than a rise in the use of production factors; and behind the TFP growth are the factors such as innovation, technological development and skills upgrading as well as their interaction.

- The size of the Turkish economy requires a sector and region-specific approach.
- It is of the utmost importance to develop capabilities and capacities in the emerging sectors such as biotechnology and nanotechnology. It is probable that these sectors will no longer be “emerging” after a decade. The critical thing is to catch up with the world leaders by investing today in capacity building.

Therefore, the target should be to achieve sustainable growth not only by focusing on producing more but also by investing in the future investing in the development of an innovation and knowledge economy and innovative society.

Recommendations on the Main Elements

- Agree on a “national consensus” for the implementation of an innovation-based development and growth model; identify the challenges and issues that Turkey would face in the case of the lack of innovation; transform capabilities into a potential development move to be able to tackle the challenges and develop strategies for this purpose;
- Ensure that the young population, which is a primary resource for innovation, are well-educated; accelerate the implementation of the action plans for effective utilization of these resources; develop and implement new action plans in this area in a coherent, successive and well coordinated manner with all other plans, policies and strategies;
- Mitigate inequalities in income distribution, and reduce knowledge gap between the layers of society in the short run (with the target of removing the gap by 2013); design and take actions to remove the opportunity inequalities faced particularly by women; attach importance to women workforce as a significant resource in innovation-based development and growth, and take necessary structural measures to increase their rate of employment so as to cap their innovation potential; achieve full gender equality and increase the contribution of women in the process of development and growth; create awareness, at the first place, on innovation among mothers to create an innovative generation;
- Develop capabilities to respond the change in the world; support ongoing major projects, and initiate new ones which will help reach this objective;
- Integrate innovation policy with social and economic policies recognizing the pervasive nature of innovation and the diversity of factors influencing it;
- Support leading and interdisciplinary research which underpins innovation;
- Decentralize innovation support activities; develop a human-centric system for effective decision support processes; focus on regionalization in innovation governance and establish linkages with the Development Agencies;
- Create awareness on and disseminate a culture of innovation throughout the whole society;
- Provide stability in the economy and give priority to mitigation of fraud, unequal competition, and non-registered economy to internationally acceptable levels; protect carefully the intellectual property rights with the utilization of public governance, particularly with the justice system’s regulations.

Table Including Proposals for Intra-institutional Task and Responsibility Distribution

Subject	Related Institutions	Coordination*	Critical Success Factor	Expected Result
Agreement on a “national consensus” for the implementation of an innovation-based development and growth model	Politicians, High Planning Council, State Planning Organization, TUBITAK, High Education Council, universities, related non-governmental organization including business organizations	State Planning Organization	Efficient co-ordination and communication, ownership at high levels, ownership at every level, management capability	Increase at welfare, drop at unemployment, more competitive Turkish business enterprises
Establishment of venture capital funds by private sector	Ministry of Finance, State Planning Organization, Capital Markets Board, finance institutes, related non-governmental organizations	In collaboration with the Ministry of Finance and Capital Markets Board	Efficient use of resources for the financial support amounting to USD 150 million between 2007-2013; knowledge dissemination about innovation to financial sector’s stakeholders; knowledge dissemination to private sector about venture capital; perception change in the dynamics of joint business composition	Support for entrepreneurship; increase at the management capabilities of the Turkish firms; provide openness of the Turkish firms’ thinking to innovation

Table above provides project proposals selected as a sample issue one from the Main Elements segment, the other from Financing Innovation segment. The content places information in regard to the (likely) responsible organizational units, as well as critical success factors and expected results as such to turn project proposals into operative elements in practice. The table covers the selected most related institutions, not all the ones. NII suggests the table is applied to other project proposals stated at the report as well.

* Task of co-ordination is proposed in accordance with the Turkish institutional structure. However, it would be wise to authorize a non-governmental organization for the efforts necessary in co-ordination.

National Innovation Agenda for the Period 2007-2013

CHANGE REQUIRED FOR INNOVATION: AT A GLANCE

The following content (**'National Innovation Initiative Agenda for the Period 2007-2013'**) presents the main elements listed above, as well as some of the recommendations by the NII Working Groups on the innovation environment and infrastructure, innovation finance, human resources and skills and public sector innovation (a summary of the views and recommendations of the working groups are presented in the last section of this report). The content includes brief information which refers to part of the project proposals, and intends to supply an overall view to the reader in regard to the NII's Innovation Agenda.

The table aims to provide an overview of recommendations developed for the 'National Innovation Initiative-Draft Strategy Report'. Both the table and the last section do not include all recommendations provided in the working groups' reports. Complete set of reports containing the views and recommendations of the working groups are published in Turkish on the website of the Competitiveness Forum (www.ref.sabanciuniv.edu), the coordinator of the project.



National Innovation Initiative Agenda for the Period 2007-2013

Main Elements

Change Required For Innovation: At a Glance (2007 – 2013)

Agree on a national pact on innovation-based development and growth model

Recognize the fact that innovation must be an integral part of social and economic policies of the country and embed innovation into other policy areas

Support regarded measures toward women workforce to participate at the Turkish employment system so as to cap their innovation potential

Support leading and interdisciplinary research which underpins innovation

Ensure a proper environment which is knowledge-based and is open to discussion for the young population, which is a primary resource for innovation, are well-educated, and turn the demographic features of Turkey into competitive advantage

Develop regional support systems to the central institutes as well as to decision processes of the same main structure; prioritize regional structures in nationwide innovation governance; establish linkages with the Development Agencies

Create awareness on and disseminate a culture of innovation throughout the whole society

Infrastructure and Public

Change Required For Innovation: At a Glance (2007 – 2013)

Governance and organizational structure of innovation system

Establish a 'National Innovation Formation' headed by the Prime Minister

Establish 'Regional Innovation Formations' with the participation of regional stakeholders

Create a non-governmental organization with the representation from the private sector, universities and civil society

Form an 'Innovation Leaders Network' with the opinion leaders from public and private sectors, and other relevant organizations

Stimulating a higher and more effective rate of innovation activity in the private sector

Create a national business environment and regulations conducive to innovation

Encourage investments in risky areas

Stimulate adoption of innovation-based value creation model by enterprises

Creating innovation interfaces

Increase the number of 'Innovation Relay Centers'

Establish 'Technology Transfer Offices' at universities

Develop measures to stimulate the creation of incubators outside of the 'technology development zones'¹ as well

Create awareness on the importance of networks; allocate funds for supporting the establishment of networks, and disseminate success stories

Revise IPR legislation and strengthen IPR enforcement to foster a higher and more effective rate of innovation, at the same time ensure providing the proper conditions so that IPR does further stimulate innovative activities

Develop broadband infrastructure in line with the e-Europe standards

Develop an appropriate policy mix to meet the target of increasing the GERD as a percentage of GDP² by means of providing more diverse and enlarged support schemes

Ensure the participation at the EU Seventh Framework Programme as well as the Competitiveness and Innovation Framework Programme

In order to stimulate university-industry collaboration, revise the existing revolving fund regulations at universities and make necessary legal and financial changes to permit contract-based research; the academic promotion regulation to foster innovation at universities

Support innovation both at public sector and local governments; adopt a public procurement policy that supports and stimulate innovation

¹ Establishment of 'Technology Development Zones' (technoparks) are stimulated by a law which provides tax exemptions and other incentives to tenant companies and researchers. Due to the incentives provided, incubators are preferred to be created in these zones.

² According to the targets set in 2004, the government aims to increase the share of GERD/GDP to 2% by 2010 from 0.6% in 2002.

Pivotal Skills

Create a culture of innovation at all levels of education: from pre-school to primary and high school; in this framework consider the developments and outcomes of Education Reform Initiative-ERI (information regarding the ERI is available in Turkish at the REF's web site)

Allocate funds for disseminating entrepreneurship education and training courses

Develop an innovation culture at universities, in order to achieve the target;

Restructure the learning process and university governance system

Integrate widely the concepts of entrepreneurship, innovation and creativity into the curricula

Develop professional graduate programs

Revise the regulations and develop incentives to encourage research as a career path, including the human resources wise benefits; promote the mobility of researchers between universities, non-governmental organizations and the private sector

Create incentives to attract Turkish Diaspora to Turkey as researchers, entrepreneurs as well as managers

Develop special training programs for upgrading problem solving, innovation, creativity and effective resource allocation capabilities of employees and managers at public sector and local governments.

Financing Innovation

Financial supports envisaged for 2007 – 2013 period:

Provide seed capital for an average of 1000 entrepreneurs annually (with an amount between TRY 20-30k)

Provide early-stage capital for an average of 100 entrepreneurs per year (with an amount between TRY 200-400k)

Adapt the “fund of funds” model (similar to the Yozma program of Israel) to stimulate the establishment of venture capital funds by the private sector (i.e. the government to allocate a total budget of USD 150 million and help create 15 venture capital funds by providing up to \$10 million for each fund which would be a maximum of the half of the fund size and the rest would be financed by the private sector) (Summary information is provided in Turkish relating to the Yozma Programme at the Accompanying Report which is available at the REF’s web site)

Adapt the ‘Small Business Innovation Research ‘ (SBIR) program of the USA (i.e. public organizations with an investment budget and the local governments to set aside 2% of their budget to support research and innovation projects of entrepreneurs whose in relation to offering solutions to these institutions’ difficulties in any means during their governance course)

Establish business angels networks including the local ones

Develop mechanisms to support joint projects which concerns all innovation stakeholders (Summary information is provided in Turkish relating to the Safe Drive Project at the Accompanying Report which is available at the REF’s web site)

Projects

Select three generic technology fields and establish at least 5 centers of excellence for each of them within the period of 2007-2013. Make necessary investments and support projects for developing R&D capabilities in these centers.

Initiate pilot studies in two regions to be selected for the establishment of regional innovation systems, and finalize these studies in two years. Transfer knowledge and experience to the other regions for conducting similar studies in all of them during the period of 2009-2013.

Sustain design capacity in the sectors such as automotive to have Turkey become a manufacturing base; develop design activities to stimulate innovation and R&D toward the target for becoming more productive in consumer electronics and in other such sectors based upon a strong structure; in the course to design improvement capacity, develop competence in the design of investment goods

Structural change in public procurement processes is highly needed in Turkey to stimulate knowledge, innovation, technology and capital formation-accumulation, as well as to resolve unemployment problems to drive internal resources in the country. Complete necessary studies for restructuring public procurement policies which are harmonized with innovation based Turkish development and growth policies, and finally put it as a law

Mega Project: With the ownership of policy-makers primarily including the politicians in the Parliament, develop a project that will create excitement in the world and in the country, be promoted as a national target and supported by sufficient level of resources

Infrastructure and Public

Overview

Innovation performance of a country is one of the key drivers for achieving sustainable economic growth, resolving problems such as unemployment and regional disparities, and for increasing the quality of life. On the way to innovation-based development and growth, priority should be attached to creating awareness on and demand for innovation among all stakeholders (society, enterprises, government, education and research organizations, public bodies, etc.). The other important issues are the development of an innovation policy with the involvement of all stakeholders, and the establishment of well-functioning of national and regional innovation systems. This requires high-level political commitment, and an appropriate and effective governance system.

Since the enterprises are at the heart of the innovation process, it is of the utmost importance to create a climate and infrastructure which stimulates innovation, enables knowledge and technology flows at national and international levels, facilitates the commercialization of research results, encourages the establishment of innovation-based enterprises that create jobs, and attracts quality foreign direct investment.

As noted above, the primary issue to consider in innovation-based development and growth is awareness raising. Raising awareness on innovation should be supported by different activities addressed to different layers of the national innovation system. Awareness on innovation requires a culture which supports openness to change, co-operation; respect to intellectual products; risk-taking, and tolerating failure while rewarding success.

Commitment and governance are the other two important issues to be considered. In Turkey, although the science and technology policies which date back to 1960s have been integrated with innovation policies starting from the mid-90s, they are not implemented successfully due to the lack of commitment³ and ineffective innovation governance, which in turn leads to fragmented policy efforts and results.⁴

³TUBITAK, 'Research, Development and Innovation in Turkey', Mayıs 2004

⁴Elçi, S., Avrupa Komisyonu, European Trend Chart on Innovation, 'Annual Innovation Policy Trends and Appraisal Report Turkey, 2004-2005'

Recommendations-1

Governance and organizational structure of innovation system

- A high level structure is required to achieve commitment, raise awareness and coordinate the design and implementation of innovation policies. Establish a **National Innovation Formation** under the leadership of the Prime Minister which will be shaped by the representatives of the stakeholders of the national innovation system and will operate in a participatory and collaborative manner. It is beneficial to highlight one of the crucial approaches within this proposal: when a project proposal by the NII is born, it is acknowledged that if any current structure exists, the country is better off enhancing the current structure's efficiency instead of developing a new one. When proposing a new sort of organizational formation, it is accepted as a generally applied principle for the whole process. Further, the NII considers it appropriate to re-design the task and responsibilities if any overlapping does exist among two or more institutions in the country. For the sake of coordination, such approach eventually prevents the leakage of resources.
- Due to size of the country and the high regional disparities and imbalances, it is inevitable for Turkey to design and implement regional innovation strategies and establish regional governance structures. For that reason, establish **Regional Innovation Formations** with the representation of regional stakeholders (regional governments, universities, chambers of industry and commerce, professional associations and etc.), and link them with the Development Agencies to ensure coordination and integrity.
- Create a **non-governmental organization** (NGO) for increasing the commitment of civil society stakeholders on innovation-based development and growth, and conducting and coordinating studies in this area. The organization should have a cadre of professional managers.
- Establish an **Innovation Leaders Network** with the participants from public and private sectors, academia, civil society organizations and trade unions to continuously investigate the needs for an effective innovation policy and innovation performance measures (well-defined and well-established measures are needed to evaluate the innovation performance of the country, results of which would be shared with the society and policy-makers who would refer and use them as an input to the policies and strategies).

Summary of Recommendations

Establish a National Innovation Formation headed by the Prime Minister;

Establish Regional Innovation Formation by regional stakeholders;

Create a non-governmental organization with the representation of the private sector, universities and civil society;

Establish an 'Innovation Leaders Network' with the opinion leaders from public and private sectors, and other relevant organizations.

Recommendations-2

Legislations, Regulations and Supporting Systems

- Increase awareness on the importance of innovation among the private sector, universities, government and NGOs. Awareness raising is important to ensure commitment to designing and implementing an effective innovation policy, embedding innovation in other policy areas, establishing an effective governance structure and a well-functioning system of innovation. Put innovation at the epicenter while setting the regulations in regard to the innovation-based growth and development models, ensure the continuity in supporting innovative human resources as well as the enterprises, provide interfaces which the business community is in need of during the whole phases of innovation processes, provide excellence in science.
- Create a business environment and regulations at the national level conducive to innovation. At the same time, encourage the private sector to adopt innovation-based value creation model and invest in risky areas. Having emphasized the risky areas; it is meant that innovation inherently occupies risk in its nature in regard to become commercially successful; there is risk at technologically complex products and services, a risk when the product or service is presented to the market; there are risks for new enterprises as well as for new initiatives in the areas of technology, social and economic domains in the sense that they are adopted by the market.
- Support innovation at both public sector and local governments; and revise public procurement policies to support innovation.
- Revise the IPR legislation and strengthen IPR enforcement to foster a higher and more effective rate of innovation in enterprises, at the same time pay attention to ensure that IPR does not impede innovativeness of the whole environment.
- Create a culture of innovation among children starting from preschools; and develop programs at TVs, science centers and science parks. Develop and implement of curricula, competitions and other supportive activities jointly by public and private sectors, universities and NGOs; design common public places, in way to stimulate creativity and innovation among children (e.g. by forming “innovation corners” at shopping malls).
- Organize an “Innovation Award” and develop an “Innovation Model” to be adopted by firms applying this award. Use the award and success stories as a tool for dissemination of awareness on innovation throughout the country.
- Encourage enterprises to establish performance measurement and feedback mechanisms to be used during the innovation process.

Legislations, Regulations and Supporting Systems

- Establish monitoring and evaluation mechanisms for innovation policy actions according to the good practice criteria (involve systematically external experts, evidence based, etc.)
- Establish broadband infrastructure in e-Europe standards, an inevitable dimension to provide a growth strategy based on knowledge and innovation
- Develop an appropriate policy mix to meet the target of increasing the GERD as a percentage of GDP
- Develop necessary skills of which are conducive to innovation for SMEs, an imperative business dimension, deemed as being the main drivers of innovation
- Ensure both Turkey's and Turkish businesses' effectiveness in the related areas during the preparation phases of international standards and specifications

Summary of Recommendations

Create awareness on innovation throughout the whole society;

Place innovation-based development and growth model at the heart of legislative regulations;

Revise existing revolving fund regulations at universities and make necessary legal and financial changes to encourage contract research;

Support innovation both at public sector and local governments; restructure public procurement policies to support innovation;

Create a business environment and regulations at the national level conducive to innovation; encourage investments in risky areas; adopt innovation-based value creation model by enterprises;

Revise IPR legislation and strengthen IPR enforcement to foster a higher and more effective rate of innovation;

Develop programs on innovation for children and disseminate these programs at and outside schools (e.g. by forming “innovation corners” at shopping malls)

Develop a “Firm innovation model” and organize innovation awards to promote the use of the model;

Encourage enterprises to establish performance measurement and feedback mechanisms to be used during innovation process;

Establish monitoring and evaluation mechanisms for the innovation policy actions according to the good practice criteria (involve systematically external experts, evidence based, etc.);

Develop broadband infrastructure in e-Europe standards;

Develop an appropriate policy mix to meet the target of increasing the GERD as a percentage of GDP;

Develop necessary skills of which are conducive to innovation for SMEs;

Ensure Turkey’s and Turkish businesses’ effectiveness upon international standards and specifications

Recommendations-III

Creating Innovation Interfaces

- Create missing elements of the national and regional innovation systems, and increase interaction and co-operation between them (for instance, establish secondary stock markets to assist venture-capital firms, and non-for-profit technology transfer offices at universities to facilitate knowledge and technology transfer between the private sector and universities).
- Increase the number of Innovation Relay Centers as important intermediaries in regional innovation systems, further recognize them as imperative interfaces that also contribute to the speed of innovation.
- Develop measures and make necessary legislative changes for establishing incubators outside of the technology development zones as well. Ensure that support mechanism's base structure provides a proper setting towards a close interaction among universities, industries and young entrepreneurs.

Summary of Recommendations

Create missing elements of the national and regional innovation systems, increase interaction and co-operation between them;

Increase the number of Innovation Relay Centers;

Establish technology transfer offices at universities;

Develop measures for establishing incubators outside of the technology development zones as well

Recommendations- IV

Developing Clusters and Networks in Turkey

It is a well-known fact that clusters endow with positive impacts on the competitiveness levels of SMEs (a cluster is defined an economic environment in which companies act in an organized manner within a geographically closed area). Looking at the resources for those positive impacts, the primary factors are comprehended as; decline in the operational costs; development of new skills for R&D; creation of synergy mechanisms for problem solving; reaching to infrastructure relatively easier and in a faster manner. Along with this framework:

- Map clusters (both in traditional and technology intensive sectors), analyze their needs and innovation performances, and develop strategies and action plans for their development to increase innovation activities of the private sector.
- Create awareness on the importance of networking; provide knowledge and support for the formation of innovation networks; train intermediaries and network managers; establish a fund jointly with the private sector and sectoral organizations to support the creation of networks; monitor and evaluate impacts and outcomes of networking activities; disseminate evaluation results and success stories; and stimulate interaction and co-operation with international networks for integration with global innovation systems.

It is observed that both networks and clusters will benefit from some projects planned in Turkey in the sense that these projects will bear some fruitful results to meet for those abovementioned necessities: probably in the beginning of the year 2007, an EU supported cluster mapping project is expected to be initiated; projects executed at Bartın and Adıyaman regions that supported by the KOSGEB have already been concentrating on clustering issues; an innovation project supported by TUBITAK and co-ordinated by REF; and SMEexcel, a Leonarda da Vinci project co-ordinated by REF are all some examples that are anticipated to address several issues toward having concrete achievements at networking and clustering in Turkey.

- Participate in the ‘Seventh Framework Programme’ as well as the ‘Competitiveness and Innovation Framework Programme’ of the EU which aim to develop the skills for innovation in the Union.
- Build networks to create synergies for implementing multi-partnership projects to fulfill the objectives of the Turkish Research Area (TARAL). Form technology platforms within these networks to contribute to technology foresight activities.

⁵ September 2004, the Supreme Council of Science and Technology (BTYK) decided to create the “Turkish Research Area” (TARAL) as a platform for the private and public R&D sectors and the non-governmental organisations to define strategy foci and collaborate in R&D issues (Elci, 2006)

Summary of Recommendations

Map clusters and develop strategies and action plans for their development to increase innovation activities of the private sector;

Create awareness on the importance of networking; establish a fund for stimulating their creation and for disseminating success stories;

Encourage interaction and co-operation between the networks in Turkey;

Participate in the EU Seventh Framework Programme and the Competitiveness and Innovation Framework Programme;

Stimulate the implementation of multi-partnership projects under the Turkish Research Area (TARAL) and the creation of technology platforms

Pivotal Skills

Overview

Human capital (the skills, knowledge, creativity and experience of individuals) is the most valuable resource for innovation. Therefore, it is of crucial importance for a country to invest in human capital by improving the formal education, vocational training and life-long learning opportunities, and to develop the innovation skills of managers and staff.

Creating a culture of innovation is a critical factor in the development of human capital. Developing innovation skills and creating awareness should start at the early ages of an individual with the support of the family, and promoted throughout his or her life-time.

Skills and knowledge required for innovation do not only involve technical knowledge but also managerial and marketing skills, social, economic, organizational and administrative knowledge. For this reason, developing human resources for innovation means equipping individuals with a wide range of skills and capacities, as well as with the capabilities to engage in multidisciplinary teamwork.

A summary of main principles proposed by the NII Human Resources and Skills Working Group is presented below:

Figure 2: Components in the development of an innovation culture



Source: National Innovation Initiative- Interim Report of Human Resources and Skills Working Group, 2006

Commitment

It is important to create an understanding of the imperativeness of innovation and to agree on a common commitment on human capital development for innovation.

Creating awareness in society

Involving mass media in awareness raising activities is important for raising awareness of the society.

Museums

Increasing the number of science and technology museums which are established by universities, large companies and the government is important.

Institutionalization

Creating an association on innovation that will be active in raising awareness, creating a culture and increasing commitment on innovation, among other things, is recommended.

Innovation Education

Developing innovation skills should be integrated in the curricula from preschool to tertiary education. Training teachers of all grades and raising awareness among them should be given priority.

Measurement and evaluation

A system of measurement and evaluation should be established to asses the impact and effectiveness of innovation education. In addition, a feedback mechanism should be developed to get the best benefits from outcome measurement and evaluation. Application of innovation metrics will support human resources management systems.

Awards and similar activities

Awards, reward systems and activities encouraging development of innovative solutions to social problems should be promoted. It is important to stimulate co-operation with NGOs which are active in these fields and to establish private-public partnerships for the organization of such activities. Development of an innovation culture at enterprises should also be fostered by developing reward systems and supportive activities (such as by organizing “invention days” or by rewarding patenting).

University-Industry Interactions

University-industry interactions should be promoted to develop human capital in line with the needs of the industry (by developing curricula according to the requirements of the private sector, through a higher mobility of people from universities to industry and vice versa, by transferring knowledge and technologies from research to industry and vice versa, etc.). Both at post-graduate studies as well as at industry level practices, sharing and disseminating successful case studies will increase the number of innovative activities. Academics should be allowed to have their sabbatical at industrial organizations. Furthermore, experience sharing events between university and industry as well as within their own organizations of these institutions will boost necessary communication skills and interactivity for innovation.

Figure 3: Developing innovation skills

DEVELOPING INNOVATION SKILLS					
Programs Supporting Innovation			System	Activities	
Education of Educators	New Education Program Support	Innovation Branch	Measurement, Evaluation, Rewarding Systems	Weekend Activities, Courses + Contests	PRIMARY EDUCATION
Education of Educators	New Education Program Support + Innovation in Vocational Schools	Elective Course	Measurement, Evaluation, Rewarding Systems	Social Responsibility Programs + Contests	SECONDARY EDUCATION
Education of Educators	Innovation in Vocational High Schools	Sabbatical + Elective Compulsory Course + Interdisciplinary Approach in Industry	Measurement, Evaluation, Rewarding Systems	Social Responsibility Programs + Contests	UNDER-GRADUATE EDUCATION
Education of Educators	Innovation Entrepreneurship Graduate Programs	Case Studies	Measurement, Evaluation, Rewarding Systems	Social Responsibility Programs + Contests	GRADUATE EDUCATION
Seminar Institutional Education	Experience Sharing Meetings	Case Studies	Implementation of Innovative Standards in HR & Rewarding Innovative Solutions	Encouragement of Patenting + Invention Days + Contests	INSTITUTIONAL ENTREPRENEURSHIP

Source: National Innovation Initiative- Interim Report of Human Resources and Skills Working Group, 2006

Pivotal Skills for Innovation

Recommendations

- Develop an innovation culture at all levels of education and redesign the curricula accordingly.
- Increase the compulsory education period to 12 years.
- Ensure the diffusion of innovation by means of taking patterns from the Education Reform Initiative (www.erg.sabanciuniv.edu) to reflect on to other issues in necessary fields.
- Adopt international certification in education and IB degree at high schools. Develop vocational certificate training system in co-operation with the vocational high schools, professional chambers, chambers of industry and trade. Also, conduct audits on these programs by independent bodies.
- Universities to take an active role in nurturing innovation and entrepreneurial culture while continuing to create knowledge and pursuing scientific excellence. In line with this requirement, restructure the education process and university governance system; and revise academic promotion regulations to promote commercialization of research results.
- Create professional graduate programs at universities to foster university-industry co-operation by using the model supported by the State Planning Organization, and established in Anadolu University in Eskisehir, Turkey, and involve all stakeholders in the design and development of these programs. Reference sources prepared to diffuse such successful initiatives to other potential areas will boost comprehension and intellectual capacity; support the diffusion of good models and patterns; last but not the least raise awareness necessary for innovation.
- Position researchers as an occupation in the employment system, revise the regulations and develop incentives to encourage being researcher as a career path.
- Provide mobility of researchers between universities, NGOs and the private sector through various measures. Create a program (similar to the EU Marie Curie actions) for the stimulation of mobility of researchers in Turkey.
- Establish triple helix model of university-industry-government interactions to promote innovation, and make the ties much stronger existed among the constituent parts of triple helix for long term inventions and the course of execution into practice.

Recommendations

- Develop a common understanding on the importance of life-long learning in individual, institutional and national development, and create mechanisms and provide opportunities for life-long learning that meet the needs of a wide variety of learners.
- Attract and retain the “high potentials” and reverse brain drain. Also, develop incentives to attract Turkish Diaspora to Turkey as to work as researchers or managers, or to create their innovation-based companies as entrepreneurs, and to establish international networks to transfer knowledge to Turkey.
- Develop the concept of “Anatolian Science Centers” and establish three centers in different regions (for example in Izmir, Malatya and Gaziantep). Create an enterprise to design and produce show units for the science centers. Main instruments of the Anatolian Science Centers project is; commission Bilim Merkezi Vakfi (Science Center Foundation) as the responsible body and executing body; develop the project for two years; put nearly YTL 3.8 million budget for implementing the Centers’ events.
- Develop legislations to provide tax exemption for education and training expenditures of companies to encourage investments in human capital development at firm level.
- Develop special training programs for upgrading problem solving, innovation, creativity and effective resource allocation capabilities of employees and managers at public sector and local governments.

Summary of Recommendations

Create a culture of innovation at all levels of education; within the same perspective, focus on to the progress and consequences of Education Reform Initiative;

Adopt international certification in education;

Develop and implement vocational certificate training system;

Allocate funds for disseminating entrepreneurship education;

Restructure the learning process and university governance system to develop an innovation culture at universities; integrate entrepreneurship, innovation and creativity in the curricula; develop professional post-graduate programs;

Create incentives to attract Turkish Diaspora to Turkey as researchers, entrepreneurs and managers;

Establish science centers throughout the country;

Revise the regulations and develop incentives to encourage research as a career path; promote the mobility of researchers between universities, non-governmental organizations and the private sector;

Provide tax exemption for education and training expenditures of companies;

Develop special training programs for upgrading problem solving, innovation, creativity and effective resource allocation capabilities of employees and managers at public sector and local governments

Innovation Finance

Overview

The report prepared by the Innovation Finance Working Group focuses on technological innovation and new technology-based entrepreneurship rather than taking a broader approach by considering the other forms of innovation (such as organizational and marketing innovation) and innovation in all sectors. While the working group recognizes the need for innovation in all sectors, they give priority to financing of research and innovation projects carried out in the high-tech fields like nanotechnology, biotechnology, aeronautics and space, advanced materials and micro-electro-mechanical systems. The reasoning behind this approach is that the group considers that sustainable competitive advantage could only be achieved by developing high value-added products and services through technological innovation. Four broad types of finance can be mobilized to foster technological innovation:

- State support is provided for basic and applied research
- State support provided for product and process development projects of industry
- Seed finance and start-up support for the creation of new technology-based firms (through business angels and venture capital investments, etc.)
- Later stage financing for the technology companies

On the other hand, the National Innovation Initiative is of the opinion that innovation finance mechanisms should also address traditional sectors such as textile and food, which are critical for Turkey, and that new incentives are required to increase rates of non-technological innovation in enterprises as well.

The working group has set the main objective of innovation finance as “**to better manage and harmonize supply and demand**”. They emphasized that there are two major issues in that respect:

- The number and variety of supply institutions are insufficient,
- Demand is low, and the quality of demand is insufficient

The group focuses on the following to deal with the supply issue:

- Legislative regulations are needed to create new supply institutions,
- The supply chain needs to be completed,
- Support mechanisms are needed to be developed at each stage of the supply chain.

For the demand issues, the group focuses on the need for

- Supporting the processes of innovation idea generation,
- Creating awareness and developing a culture of innovation,

Overview

- Investing in education and training to develop human capital for innovation,
- Disseminating success stories and encouragement,
- Enhancing the role of public procurement as a driver of innovation

In addition, the existing conditions for the supply and demand should be improved, and the mechanisms for monitoring, evaluation and feedback need to be established.

Since technological innovation is complex and risky, different financing mechanisms are required at different stages of the innovation process. While policy measures such as subsidies, fiscal incentives and soft loans are important to leverage to stimulate innovation, development of the venture capital market and business angels network is critical for providing early stage finance to innovative businesses.

Considering the innovation policy mix in Turkey, financing innovation is one of the priorities and there are schemes implemented by various organizations. On the other hand, the financing mechanisms available are limited with subsidies and loans for research and innovation. Although in existence for more than a decade, Government incentives for innovation have been limited and insufficient for enterprises. Total combined amount of funds disbursed between 1992 and 2004 by the two main innovation financing agencies, (the Technological Innovation Support Programs Directorate of the Scientific and Technological Research Council of Turkey (TUBITAK-TEYDEB) and Technology Development Foundation of Turkey (TTGV)), is €250.42 million, which is a very small amount compared to the R&D spending of the business sector in Turkey⁶(Elci, 2006). Nevertheless, the government support programs implemented in Turkey has helped create awareness and invest in research and innovation by the private sector.

The conditions of finance and the implementation process of the existing financing programs are the two most important issues for companies. Problems like delays in payments and provision of collaterals are seen as the major impediments by entrepreneurs.

As a result, the policy measures fail to respond to the demand of entrepreneurs and companies in innovation financing. Consequently, there is a need for reviewing and revising existing innovation policy measures in order to respond better the needs of the private sector and to make them more user-friendly (Elci, 2006).

⁶ According to the results of the R&D survey of the Turkish Statistical Institute, R&D spending of the business sector in 2000 was €157.86 million.

Overview

Another area requiring government intervention is the development of the venture capital and private equity which are under-developed in Turkey. As highlighted in the 'Turkey Country Economic Memorandum' by the World Bank, increasing access to finance for innovative start up will also require policies to support development of the venture capital industry. There are only four VC funds in Turkey and the total percentage of VC investment over GDP is close to nil. Key factors hindering VC development on the supply side include: the instability of the macro environment until very recently, low FDI levels until 2005, immature and limited liquidity of the capital market (the market capitalization of Turkey's stock exchange is US\$68 billion, versus US\$14.2 trillion in the United States and US\$726 billion in Spain, for example¹⁷⁴), insufficient exit mechanisms that make IPOs rare in Turkey, and lack of limited rights for, and protection of, minority shareholders. Key factors hindering VC development on the demand side are the cultural and managerial practices of Turkish firms and entrepreneurs, which negatively affect the quality and quantity of deals. These include traditional family ownership and management, weak corporate structures, confidentiality concerns of entrepreneurs who are reluctant to share ideas, ownership and control, and firms' accounting practices (e.g., different accounting books kept for different purposes like taxation, banking and management), which make company valuation difficult. The impact of these factors is exacerbated by the low levels of awareness of venture capital investments and the limited capabilities of firms and entrepreneurs to transform their ideas into business plans (World Bank, 2006).

- Review and revise all existing innovation policy measures in order to respond better to the needs of the private sector, to eliminate bureaucracy and to make them more user-friendly.
- Review and revise the definitions of R&D and innovation in the support programs of all implementing agencies according to the latest editions of Oslo and Frascati Manuals of the EU and OECD.
- Strategically focus the policy mix on priorities and develop new policy measures for the areas which are not covered by existing schemes.
- Develop initiatives to increase rates of non-technological innovation in enterprises.
- Foster creation of seed capital funds by a wide range of organizations, such as universities, large companies, banks and public bodies. Provide seed finance of TRY 20-30k to around 1000 young innovative entrepreneurs (preferably university students) per year.
- Improve the environment and provide incentives for the establishment of venture capital and other private means to finance innovative start-ups by learning from and adopting international best practices (in particular inform the experience of the USA). Aim to provide early-stage innovation finance to around 100 companies with an amount between TRY 200-400k per year.
- Improve the environment and provide incentives to attract foreign venture capital companies both to increase the amount of funds available for entrepreneurs and to help development of venture capital management capabilities by Turkish experts.
- Consider the USA venture capital model for potential success stories, and in this perspective pay attention to;
 - Minimizing the financial risk for entrepreneurs (mitigate the risk of default)
 - Ensuring that the business model is supported by a collaboration between capital provider and entrepreneur
 - Making decisions in mutually agreed terms for new investments (new financing needs, buy-outs etc.)
 - Awarding mechanisms should be based upon the stocks, and has to provide advantages for future terms.
- Adapt the “fund of funds” model (similar to the Yozma program of Israel) to stimulate the establishment of venture capital funds by the private sector involving at least one foreign partner (i.e. the government to allocate a total budget of USD 150 million (for the period of 2007-2013) and help create 15 venture capital funds by providing up to \$10 million for each fund which would be a maximum of the half of the fund size and the rest would be financed by the private sector)

Innovation Finance

Recommendations

- Enhance the role of public procurement as an important driver of new innovative products and services by enterprises. Implement necessary legislative changes for this purpose in line with the rules of the World Trade Organization to boost innovation through public procurement particularly in the fields of defense, health, energy, agriculture, transportation, education and public works.
- Adapt the 'Small Business Innovation Research'(SBIR) program of the USA (i.e. public organizations with an investment budget and local governments to set aside 2% of their budget to support research and innovation projects of entrepreneurs designed to solve their problems).
- Encourage and support R&D projects designed and implemented involving the co-operation of a large group of stakeholders to foster long-term co-operation in innovation.
- Develop and implement incentives for the organization of match-making events to bring entrepreneurs and investors together and an interdisciplinary specialist team that would organize such events also by providing support to the development of good business plans.
- Create and implement measures to attract quality foreign direct investment (FDI) which would carry out innovation activities in Turkey in co-operation with the Turkish industry and the universities/research centers. Attach specific importance to the strengthening of IPR enforcement as one of the primary requirements of pulling quality FDI; structure "cut innovation" processes, develop associated skills in several areas appropriate to cut innovation such as in embedded software development.
- Develop measures to benefit from off-set arrangements for stimulating innovation.
- Encourage development of entrepreneurs' networks and ensure them to operate as virtual networks as well. Support development of a portal on entrepreneurship.
- Encourage business angel investments by raising awareness and developing incentives to provide early-stage funds for innovative start-ups. Stimulate the creation of business angels networks.
- Design and implement the R&D and innovation programs in consultation and co-operation with the relevant organizations to ensure the effective and efficient management of resources allocated for research and innovation. Safe Drive Project is one of the samples in this sphere that could be taken as an example; a project supported by the State Planning Organization executed among Renault, TOFAS (FIAT licensed one of the largest manufacturers) and Ford, as well as Istanbul Technical University and Sabanci University.

Summary of Recommendations

Review and revise all existing innovation policy measures according to the needs and requirements;

Provide seed finance of TRY 20-30k to around 1000 young innovative entrepreneurs per year;

Provide early-stage innovation finance to around 100 companies with an amount between TRY 200-400k per year;

Adapt the “fund of funds” model (similar to the Yozma program of Israel) to stimulate the establishment of venture capital funds by the private sector by allocating USD 150 million for 15 funds for the period of 2007-2013;

Adapt the ‘Small Business Innovation Research’(SBIR) program of the USA;

Enhance the role of public procurement as an important driver of new innovative products and services by enterprises;

Develop a system for the Turkish firms which are capable of executing defense projects to gather their bid, a mechanism in which priority is given to these firms set in accordance with WTO rules;

Target collaborative R&D projects and develop an appropriate financing scheme;

Develop and implement incentives for the organization of match-making events and support development of interdisciplinary specialist teams to coordinate such efforts;

Review and revise the definitions of R&D and innovation according to the Oslo and Frascati Manuals of the EU and OECD;

Develop measures to benefit from off-set arrangements for stimulating innovation;

Support development of an entrepreneurs’ portal;

Stimulate development of business angel networks;

Develop mechanisms to support joint projects which concern all innovation stakeholders (Safe Drive Project)

Public Sector Innovation

Overview:

- Public policy is the main determinant of the innovation processes and capacities in enterprises since public intervention plays an important role to reduce or overcome both market failure and systemic failure. For this purpose, public intervention is needed to formulate and implement policies for competition, intellectual property rights, bankruptcy, entry, etc. in a way to stimulate innovation. It should also seek to eliminate the failures arise from institutions by providing incentives to encourage enterprises to invest in innovation, and by investing in human capital. This way, public sector undertakes an important role in the innovation process and in the adoption and dissemination of innovation.

The other significant role of public sector is related with its productive capacity. As a producer of goods and services, public sector must innovate to increase the productivity and efficiency, and to create an egalitarian society. This requires the development of an innovation culture, awareness and skills among public servants as well as an approach to stimulate innovation in public sector management.

The following examples illustrate the high impact of public sector innovation in a country: (1) After the '1967 Arab-Israeli War' where in a pre-emptive strike, the Israeli Air Force destroyed half of the Egyptian Air Force on the first night, and 452 Arab aircrafts by the end of the six days, Swedish Air Force decided to take precautions by spreading aircrafts on the intercity main roads. For this purpose, Saab fighter jets were designed so that they would be able to take off and land on plain roads. This also eliminated the need for constructing airports throughout the country. (2) US Government started to offer web-fill-in forms for tax payers. The forms are filled out by entering basic data and then the system automatically makes calculations. This process provides cost effectiveness and efficiency, as well as better services and better value for tax-payers.

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Recommendations:

Raise awareness and develop a strong commitment on innovation within all government bodies on the significant role played by public sector in the innovation system;

Develop an innovation culture, awareness and skills among public servants as well as an approach to stimulate innovation in public sector management;

Create a culture of continuous innovation among public servants and managers to produce higher values from public assets

National Innovation Initiative Projects



Centers of Excellence

Select three generic technology fields and establish at least 10 centers of excellence for each of them within the period of 2007 and 2013. Make necessary investments and support projects for developing R&D capabilities in these centers

Pilot Projects for Turkey's Innovation Vision

In order to start implementation of recommendations in line with the vision formulated by the National Innovation Initiative, initiate pilot studies in two regions for the establishment of regional innovation systems; finalize these studies in two years. Transfer knowledge and experience to the other regions for conducting similar studies in all of them during the period of 2009-2013.

Design Capacity

Develop design capacity in the sectors such as automotive and consumer electronics to increase the efficiency of innovation and R&D activities; also develop capacities in the design of investment goods

Public Procurement Project

A structural change in public procurement system is needed in Turkey, as public procurement is a strong value adding dimension to stimulate employment dynamics, to tap internal resources existed within and around knowledge, innovation, technology, and capital formation. Thus, review EU and World experiences in public procurement policies so as to have new regulations conducive to innovation which are deemed to be certainly going to work in harmony with other Turkish innovation-based growth and development policies

Mega Project

With the ownership of policy-makers and the government, develop of a project that will create excitement in the world and in the country, be promoted as a national target and supported by sufficient level of resources. Mega Project is suggested to be structured in health, agricultural biotechnology, production of Turkish satellite system and in similar areas

References

Arikan, C., Akyos, M., Durgut, M., Goker A. (2003) National Innovation System, Conceptual Framework, Turkey Overview and Country Examples, TUSIAD Publications, October 2003, Istanbul

Council on Competitiveness (2004); National Innovation Initiative 21st Century Working Group Final Report, December 15, 2004

European Commission (2006); Creating an Innovative Europe, Report of the Independent Expert Group on R&D and Innovation appointed following the Hampton Court Summit and chaired by Mr. Esko Aho, European Communities

Elci, S. (2006), European Trend Chart on Innovation, 'Annual Innovation Policy Trends and Appraisal Report Turkey, 2004-2005, European Commission

Freeman, C. & Soete (1997): The Economics of Industrial Revolution, Third Edition, Cambridge Mass.: The MIT Press

IBM (2006); Global Innovation Outlook 2.0, 2005, International Business Machines Corporation,

IBM (2004); Global Innovation Outlook, printed November 2004, International Business Machines Corporation,

Schumpeter, J.A. (1934): Theory of Economic Development, Cambridge Mass.: Harvard Economic Studies Vol. XLVI

Sengupta, J. (2004): Competition and Growth, Houndmills: Palgrave Macmillan.

TUBİTAK (2004), 'Research, Development and Innovation in Turkey', May 2004

World Bank (2006), 'Turkey Country Economic Memorandum: Promoting Sustained Growth and Convergence with the European Union'

