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Development Agency

İZMİR REGIONAL INNOVATION STRATEGY

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Definitions

R&D

Research and experimental development (R&D) are creative studies conducted in a systematic way, aimed towards increasing the amount of knowledge available to humans, culture and society and utilising this amount for designing new applications.

Innovation

Innovation is realising new or significantly improved products (goods or services), processes, marketing methods or organisational methods in applications, work place organisation or external relations of enterprises.

Open Innovation Model

An innovation model where R&D activities and innovation are the result of cooperation with partners outside the institution (client, supplier, competitor, university etc.).

Closed Innovation Model

An innovation model where R&D and innovation activities are made only using the knowledge and technical infrastructure within the institution and no cooperation or contact is realised with external partners.

Industrial Property Rights

The nonmaterial rights given to persons for their inventions and innovations, new designs and genuine studies by granting certain distinctive marks and thus provide these manufacturer or seller people to have the right to produce and sell such commercial products for a certain time period.

Technology Transfer

This means a new technology developed by university to be submitted to a company in need of such technology, thus enabling its utilisation. The technology transfer process covers the selection, adaptation and utilisation of the technology and includes the mechanical system or technical applications required by the company.

Technology Transfer Office

In such offices technology transfer services are provided starting from informing about new technologies up until final agreements between providers and users of such new technology. Services thus encompass the entire process of new technology development, production and market introduction.

Product Innovation

Creating and/or launching a product that is new or significantly developed/improved regarding its features and utilisation purposes. Innovation in products cover significant improvements/developments in technical specifications, parts and materials, ease of use or other functional properties, and production of a new product that has higher added value than the currently produced product.

Process Innovation

The development and utilisation of a different and new production or distribution method. Thus, it is the development of a more efficient production process due to improvements such as utilisation of less raw materials or realising production within a shorter period. While process innovation may be realised through the use of technology, it may also be possible through the use of better techniques and methods.

Radical Innovation

Creating goods, services and/or systems radically different from existing products or systems. Usually these products, services or systems will completely replace the old ones (i.e. production of electrical cars).

Incremental Innovation

Small and limited innovations made on pre-existing goods or services (i.e. production of cell phones including cameras).

Abbreviations

EU	European Union
USA	United States of America
ARBİS	TÜBİTAK Researcher Information System
R&D	Research and Development
SRP	Scientific Research Projects
EBİLTEM	Ege University Science and Technology Centre
GDP	Gross Domestic Product
İAOSB	İzmir Atatürk Organised Industrial Zone
İİBF	Faculties of Economical and Administrative Sciences
İZKA	İzmir Development Agency
İZTEKGEB	İzmir Technology Development Zone
SME	Small and Medium Scale Enterprises
KOSGEB	Small and Medium Enterprises Development Organisation
OECD	Organisation for Economical Cooperation and Development
OIZ	Organised Industrial Zone
IPR	Industrial Property Rights
TEYDEB	Technology and Innovation Support Programmes Directorate
TEKMER	Technology Development Centre
TPI	Turkish Patent Institute
TTGV	Technology Development Foundation of Turkey
TÜBİTAK	The Scientific and Technological Research Council of Turkey
TurkStat	Turkish Statistical Institute
FTE	Full Time Equivalent
ÜSİMP	University-Industry Cooperation Centres Platform
YÖK	The Council of Higher Education

Executive Summary

One of the most important aims of countries worldwide is improving social prosperity by increasing national industrial competitiveness. Especially after signing the Final Act of the Uruguay Round, incentive policies implemented towards increasing the competitiveness of industry were stopped and instead of this, it was decided to support R&D and innovation activities. In this framework, innovation lights up as the fundamental driving force behind the growth of enterprises.

Currently, the most significant problems of the business world are the highly competitive environment, similar products and services developed elsewhere, and a constant price pressure. Similar products and price pressure forming the most formidable competition took on a new dimension because of the rise of China and India. This pressure mostly affects the countries that based their growth models on competitive advantage based on cheap labour force.

Since the beginning of 1980s, R&D and innovation activities have taken on a significant acceleration throughout the world, new technologies have been developed in many fields based on R&D and innovation and foundations have been laid for many of the largest companies of present day.

As a result, R&D and innovation activities have become the most important aspect of social prosperity and sustainable development. The developed countries of today have been those that created R&D and innovation strategies and allocated necessary resources for such activities in the past.

The highest resource rates allocated from GDP to R&D (GERD – Gross Domestic Expenditures on R&D) belong to Israel with 4.7% and Japan with 3.4%. GERD is 2.7% in USA and 1.8% in EU. The OECD average is 2.3% and is above EU average.

Turkey's GERD as of year 2010 is 0.85% of its GDP. Although this ratio is observed to be very low compared to other countries, it increased by a rate of 44% in the last 5 years. Turkey's aim for the year 2023 is to achieve a GERD of 3% of its GDP.

There is a direct correlation between the magnitude of the resources allocated for R&D and innovation, and the number of R&D projects, patents, new goods and services resulting from such activities. When the number of patents per million people in Turkey between years 2007 and 2010 was compared to other countries, it is observed that Japan has 105 times, China 59 times, South Korea 46 times and India 6 times higher values than Turkey.

According to the different innovation indicators handled within the Global Innovation Index 2011, where the innovation indicators of a total of 125 countries were analysed and listed under different titles, Turkey ranks between the 25th and 96th places among 125 countries.

Turkey takes the 25th place among 125 countries regarding the ratio of R&D financed by the private sector, and 33rd place regarding the number of engineers graduated. The increase of GERD in the recent years has carried Turkey upwards into the first 40 countries in this regard. Turkey ranks at the 41st place regarding the number of researchers per million people, at 51st place regarding the import of products with high-technology and 63rd place regarding the export of the same. Turkey is not yet at the desired level regarding the production and export of high added value products.

When the financing source of the R&D expenditures made, are analysed, as of year 2010 it is observed that the share of private sector is 45%, while the share of public sector is 31% and the share of higher education sector is 20%.

Turkey ranks at the 75th place throughout the world regarding university-industry cooperation. On the other hand, it ranks at the 65th place regarding innovation index and 61st place regarding competitiveness index. Increase of competitiveness is directly proportional to the increase of innovative power.

For Turkey to achieve its deserved place in the race towards R&D and innovation, it is mandatory that all effective aspects should be examined, coordinated improvements should be made at all links of the chain and thus the “Innovation Ecosystem” should be made suitable for development.

The aim of İzmir Regional Innovation Strategy study has been defined as determining the current status of İzmir regarding R&D and innovation to prepare a regional innovation strategy, and in result creating an ecosystem that enables R&D and innovation and forming mechanisms encouraging the development of innovation; thus uplifting İzmir to the state of a province producing and exporting technology.

The study was realised with the cooperation of **EBİLTEM, İZKA** and **TurkStat İzmir Regional Directorate**. The views, opinions and evaluations of **İzmir Innovation Committee** (comprised of the representatives from 30 relevant institutions and organisations) and **İzmir Innovation Technical Committee** (comprised of 13 representatives from different universities of Turkey) were taken into consideration.

İzmir Innovation Committee

This document, which is the first Regional Innovation Strategy that was allocated local resources by a development agency and built by an innovation platform infrastructure with the participation and contribution of local actors, is at a level that may constitute an example also for other provinces in Turkey. For research design, an innovation indicators data set at national and international level has been determined, and care has been shown to stipulate a methodology authentic for Turkey.

İzmir Regional Innovation Strategy study is comprised of outputs of 3 different studies conducted within project context, 5 committee meetings realised with the participation of relevant partners and the workshop where strategic priorities and aims were determined. These research reports are as follows:

- İzmir Regional R&D and Innovation Capacity Analysis
- İzmir Regional Innovation Strategy Field Survey
- Situational Analysis on R&D and Innovation Ecosystem in İzmir

Within the context of İzmir Regional Innovation Strategy, **6 strategic priorities** towards eliminating the determined deficiencies and demands for improving the R&D and innovation potential of İzmir and bring it to a level where technology is produced and exported, and **27 aims** for realising such strategic priorities have been determined. The strategic priorities are as follows:

- Strengthening the research and innovation infrastructure,
- Developing institutional structure and capacity in science and technology fields,
- Developing human resources in science and technology fields,
- Patenting research results and supporting commercialisation,
- Facilitating access to funding,
- Improving the entrepreneurship and innovation ecosystem.

Another important output of the study besides the determination of strategic priorities, aims and actions is creation of the **İzmir Innovation Ecosystem Map**. This map displays the current actors and those who should be within the ecosystem.

In the study, the statuses of all partners that may contribute to the region's technological developments were examined in regards to R&D and innovation indicators. In this context, the quantitative data related to İzmir were obtained especially from TÜBİTAK-TEYDEB, TTGV, KOSGEB, Turkish Patent Institute, Ministry of Science Industry and Technology, Ministry of Finance and YÖK, along with Universities, Research Centres, Institutes, Vocational High Schools, İzmir Technology Development Zone and İzmir Development Agency. In parallel to this, different parameters such as R&D, innovation, support and service diversities, institutional infrastructure and university cooperation were also examined towards the evaluation of members of a total of **21 umbrella organisations** functioning in İzmir. In addition, R&D and innovation indicators of a total of 790 enterprises within 7 prioritised sectors determined for İzmir were also identified with a 90-question survey and face to face interviews. All data obtained were examined scientifically and in depth, thus the R&D and innovation potential of İzmir was determined.

Not only the R&D and innovation indicators were examined but also the existing structure of the Innovation Ecosystem of İzmir was analysed through studying the existence of necessary mechanisms for this issue and the statuses of other institutions.

In the study, it was observed that İzmir got significantly developed in the recent years regarding universities and that it houses a young population –in comparison with the total population– able to feed new universities. The dominance of mostly traditional engineering based faculties and departments in İzmir that are similar in nature, points out the lack of scientific infrastructure for innovation activities to be conducted at actual and interdisciplinary fields. It was observed that there are many Institutes and Research Centres in universities that could serve to support the industry regarding R&D and innovation activities, however it was also seen that cooperation between these centres and industry is not yet realised at a desired level.

As of year 2010, there are 7,240 researchers in different scientific branches and levels at the universities of İzmir. This number constitutes the most significant force of İzmir regarding R&D and innovation. However, when it is evaluated regarding R&D and innovation results, it has been observed that the number and capacity of researchers should be increased. As of year 2010, there are 28 international papers and 7 TÜBİTAK project applications per 100 researchers. 7,240 researchers in İzmir have applied to TÜBİTAK for a total of 1,838 research projects between years 2007 and 2010, of which only 453 (25%) have been supported. This result points out that more emphasis should be placed on knowledge generation necessary for R&D and innovation.

Similarly, it was found out that 7,240 researchers in İzmir have made 51 patent and utility model applications between years 2007 and 2010. While İzmir has a better value than İstanbul and Ankara regarding the number of patents and utility models per researcher, it is still significantly below the level of developed countries.

In parallel to the universities, it is observed that also the industry is not at the desired level regarding project generation. Between years 2007 and 2010, only 416 (1.7%) of 23,749 companies within the manufacture sector of İzmir applied to TEYDEB for R&D project support, and among these, only 259 (1%) were able to

receive support. Project acceptation rate of İzmir companies is higher but the total number of supported projects is lower than those of Ankara and İstanbul.

The fact that there are only 8 R&D Centres founded in İzmir within the context of the relevant R&D Law of the Ministry of Science Industry and Technology, where many large scale companies realise their production activities, also points out that the R&D activities in industry reside at a limited level. In addition, the fact that the total amount of R&D incentives granted to companies in İzmir between years 2007 and 2010 is only 18,910,378.26 Euro, supports the above-mentioned finding.

Similar to the universities, it is seen that companies also significantly remain behind regarding taking the patents for the innovations and discoveries they produced. Between years 2007 and 2010, only 1,064 patent applications were made in İzmir, of which only 145 were approved. According to this information, 1 patent application per 22 companies and 1 patent approval per 164 companies are observed in İzmir between years 2007 and 2010.

One of the reasons why both the universities and private sector have low capabilities towards producing R&D and innovation projects is that university-industry cooperation may only be realised at a limited level and that interfaces such as technology transfer offices are not common enough. Only 19% of the enterprises in İzmir cooperate with universities and research centres regarding R&D and innovation issues. Improving this ratio shall accelerate the development of both the private sector and the academic environment. However, for universities and industry to work better and more effectively together, there is a mandatory need not only for radical changes in understanding the academic and industrial sectors but also for realising legal improvements at the national scale, and strengthening all links of the "National R&D and Innovation Ecosystem" by creating certain supports and mechanisms. Sustainability of the process of research results transforming into social benefits and contributing to socio-economic development may only be possible through these steps.

The existence of too few R&D Centres proves that the companies in İzmir place a lesser emphasis on R&D and innovation compared to other regions. 15% of the enterprises in İzmir have their own independent R&D units, while there are 8 R&D Centres founded as per Law no. 5746 as of year 2010. The share allocated by the enterprises in İzmir from their total turnovers has been at an average of 4.6% between years 2007 and 2010. Again in the same period, a constant increase was observed regarding the ratio of R&D personnel within total personnel, as the value rose from 2.7% in year 2007 to 3% in year 2008, to 3.5% in year 2009, and to 4.5% in year 2010.

The increase in the share allocated to R&D and the number of R&D personnel also provided an increase in the number of new products and services produced. It has been determined that the enterprises in İzmir produced a total of 2,399 new goods and 672 new services between years 2007 and 2010.

In the study conducted, it has been observed that the enterprises in İzmir realised partial innovation projects rather than radical innovations. Developing the R&D and innovation capabilities of enterprises and directing them towards radical innovation shall accelerate the technology production of İzmir. The ratio of the turnover enterprises receive from new products within their total turnover is around 19%. Different aims and actions were designed in the study for increasing this share.

The presence of only one Technology Development Centre in İzmir that provides a platform for universities and industry to meet for producing projects and conduct R&D studies, along with the region's infrastructure needs constitute a situation that should be evaluated for the region's R&D and innovation future. There are 6 Technology Development Centres in Ankara, 5 in İstanbul and 3 in Kocaeli.

Regarding improvement of the R&D and innovation capacity of İzmir, it is also important to prioritise establishing R&D Centres in the sector and to form new mechanisms for encouraging the companies to conduct R&D studies before competition within the partnerships they shall forge.

Another mechanism that would accelerate R&D and innovation works in İzmir is University-Industry Interface Centres. Although 4 out of 9 universities of İzmir have Interface Centres, these centres are generally units

that were recently founded and not gained sufficient effectiveness. This situation that limits generated knowledge as the result of cooperation between industry and society, points out to the fact that also the number of interface centres in İzmir should be increased.

As of now, clustering attempts and clustering development actions in İzmir are underway in Organic Food, Aviation and Space, Machinery Metal Casting, Industrial HVAC, Petro-chemistry, Biomedical (INOVIZ), Furniture and Textile Sectors. These actions and attempts that are at different development levels shall significantly contribute to the development of competitiveness for different sectors by providing İzmir with development regarding R&D, innovation and university-industry cooperation in such sectors. However, correct support mechanisms are required for correctly directing these tasks and efforts and forming clusters employing functions and structures defined in compliance to international norms. Therefore, supporting these clusters and correctly building and managing them are of vital importance for the R&D and innovation future of İzmir.

High Level Strategies

Innovation is discussed in various policies and strategies at both national and international scale.

It is handled by the EU as a priority in development policies since the beginning of 2000s. The Lisbon Strategy, formed in the extraordinary summit held in Lisbon on the 23rd and 24th of March 2000, aims for the EU economy to become the most competitive and dynamic information economy until year 2010. For achieving this aim; various strategies such as preparing for the transition to a knowledge based economy, creating new policies for information society and R&D, and accelerating structural reforms for innovation were stipulated. In this sense, Lisbon Strategy stands out especially with the fact that it is built upon the idea of creating innovation and technological development is the driving force of change, and global competitiveness may be obtained through creating difference in R&D and information technologies field (İKV, 2010; TÜSİAD-SÜ Competition Forum, 2005).

"EU 2020 Strategy" that defines the new economical strategy of the EU along with its aims for year 2020 was declared in year 2010.

Innovation retains its central role in growth and employment increase in the "European Strategy for a Smart, Sustainable and Inclusive Growth" a.k.a. "EU 2020" (İKV, 2010). In this strategy of which fundamental policy is "creating value through knowledge based growth", the actions to be taken in this field have been defined under the title of *Innovation Union*. Innovation Union defines more than 30 different action points such as creating a European Research Area, strengthening the access of innovative enterprises to funding, developing the research and innovation systems, forming European Innovation Partnerships, and activating and capitalisation of the European creative potential, and highlights the steps to be taken in this field (European Commission Internet Page).

The Framework Programmes implemented by the European Union on the other hand are the most common and long-term of the studies aimed towards innovation. This process began back in year 1984 with the 1st Framework Programme and continued on until present day. Between years 1984 and 1988, the Framework Programmes that have started with a budget of 3.4 Billion Euros are now underway with the 7th Framework Programme with a budget of over 50 Billion Euros. The results of the conducted projects have made significant contributions to both the production and the commercialisation of knowledge with the cooperation of participating companies, universities and research centres. EU Framework Programmes have also pioneered the development and universalization of national and regional innovation strategy studies. In many countries, especially in Sweden, Denmark, Germany, France, Portugal and such, regional innovation strategy studies have been conducted. Turkey began participating in the EU Framework Programmes, which constitute the largest research network of the world, by joining the 6th Framework Programme back in year 2004 and is still continuing as a member of the programme.

Innovation is handled in various plans, strategy and policy documents also in Turkey. Relevant strategy documents and the priorities stipulated by them are compiled in Table 1. These strategy documents are; 2011-2016 Science and Technology Human Resource Strategy and Action Plan, 2011-2013 SME Strategy and Action Plan, 2011-2014 Turkey Industry Strategy Document (Towards EU Membership), 2023 Turkey Export Strategy, 2011-2016 National Science, Technology and Innovation Strategy, Turkey Higher Education Strategy, Ninth Development Plan (2007-2013) and –at local scale– 2010-2013 İzmir Regional Plan.

The ratio of our country's R&D expenditures made by private sector within the total amount of R&D expenditure rose from its value of 34% in year 2003 to 45% in year 2010, while the public sector R&D expenditures fell into a constant declining trend. It is aimed for the private sector R&D share to rise to 60% in year 2013 and 66.9% in year 2023. In order to reach this level, the private sector needs to focus more on R&D and innovation. The share of R&D expenditures realised by the public sector within the total R&D expenditure declined from its value of 36% in year 2003 to 31% in year 2010.

The purposes of the generated development plans and innovation strategy reports are to accelerate the generation of knowledge in our country, to convert the generated knowledge to new technological products and services and finally to create an knowledge-based economy.

The decisions taken in the 23rd Meeting of The Supreme Council for Science and Technology on the 27th of December 2011 are also of significance for the development of R&D and innovation in our country. In the meeting, the National Innovation System Year 2023 Goals, towards placing our country within the 10 largest economies of the world in year 2023, have been determined as follows:

- R&D expenditure/GDP 3%
- Private sector R&D expenditure/GDP 2%
- Number of researchers 300 thousand (FTE)
- Private sector number of researchers 180 thousand (FTE)

It has been aimed to develop policy tools for triggering innovation and entrepreneurship in universities, and in this context the following have been decided upon;

- Supporting Technology Transfer Offices,
- Supporting Business Incubators,
- Creating Enterprising and Innovative University Indexes,
- Redesigning Academic Promotion Criterion as to Encourage Entrepreneurship and Innovativeness.

For the determinations, strategies and aims stipulated by İzmir Regional Innovation Strategy to be understood, embraced and correctly implemented, it is of vital importance to take the steps stipulated in these high level policy documents that provide a wider framework and to implement the decisions in question.

Relevant Upper Scale Plan/ Document/Strategy	Development Axis/ Strategic Purpose	Aim/Priority
2011-2016 Science and Technology Human Resource Strategy and Action Plan	Increasing Science/ Technology HR and Improving Sectoral Distribution	Directing the youth towards R&D fields
		Developing career opportunities and improving incomes
		Programmes towards growing Science/Technology HR in line with the R&D demands of private sector
		Increasing technician and equivalent personnel employment
		Science/Technology HR personnel aimed at the priorities and field demands of the country
		Universalising the Science/Technology culture in the society
	Developing the research culture, and the skills and experiences of researchers	Designing mechanisms enabling the development of skills of researchers
		Activating post-doctorate research (post-doc) application
	Improving the work environments of Science/Technology HR personnel	Improving the work environments at universities
		Developing the R&D infrastructure at universities
		Improving the governance at universities
		Improving the work conditions of the researchers in private sector
		Developing inter-sectoral cooperation
		Improving the work conditions at public research centres
	Increasing the Circulation of Researchers	Developing national, inter-sectoral and international circulation mechanisms
		Providing opportunities required for qualified researchers abroad to be employed in the country especially in prioritised fields
	Developing R&D Personnel Employment capacity	Employment of qualified R&D personnel at universities
		Developing R&D personnel employment capacity in private sector
		Developing R&D personnel employment capacity in Public Research Centres
2011-2013 SME Strategy and Action Plan	Developing the Administrative Skills and Institutional Qualifications of SMEs	Facilitating and supporting information access of SMEs regarding administration, institutionalisation, marketing, efficiency, quality, standardisation, industrial property rights, information communication use etc. fields
		Developing and settling the cooperation culture in SMEs
		Supporting qualified labour force employment and developing enterprise personnel qualifications
	Developing the R&D and Innovation Capacity of SMEs	Raising the awareness of SMEs' R&D, innovation and design fields, and supporting their activities
		Creating support mechanisms towards commercialisation of R&D and innovation projects
		Increasing the cooperation between universities and SMEs and large scale enterprises
	Facilitating the Access of SMEs and Entrepreneurs to Funding	Developing entrepreneurship capital, business angels and SME stock market systems

2011-2014 Turkey Industry Strategy Document (Towards EU Membership)	Technological Development of Companies	In order to provide effectiveness of intellectual property system, institutional capacity shall be strengthened, effective cooperation and coordination shall be provided, and a common and settled intellectual rights culture shall be created at society level
		In coordination with the Information Society Strategy; information communication technologies shall be universalised, companies shall be encouraged towards accessing information and realising R&D and innovation activities. The coordination between science and technology strategy and industry strategy shall be strengthened
		Innovation activities and R&D infrastructure shall be prioritised in medium and high technology sectors, and large scale investments, co-investment and comprehensive R&D projects shall be supported
	Regional Development	Cooperative R&D, cooperative supply and marketing activities of enterprises shall be prioritised. Network creation and clustering efforts shall be supported. Founding enterprises at predetermined industrial zones and moving existing ones to such zones shall be encouraged
2023 Turkey Export Strategy	Technological Development and Infrastructure	Innovation–R&D investments and applications shall be encouraged
		Exporters' global competitiveness shall be increased via Sectoral Leadership, Science-Technology and Innovation
		Transition from low qualification human capital to high efficiency/ qualification human capital shall be realised
		Relations between Public–Private Sector–NGOs shall be coordinated.
2011-2016 National Science, Technology and Innovation Strategy	Increasing R&D and Innovation Based Economic Gains in Fields with High R&D and Innovation Capacity	Enabling platforms where partners (university-public-industry) come together, increasing inter-disciplinary researches and encouraging sharing of research results in order to increase spreading and commercialisation of information
		Developing programmes that will support directed and result-oriented projects capable of serving the country's economical and technological development
		Analysing existing physical research infrastructures and encouraging the development of infrastructures required
		By encouraging open innovation –acknowledged as paradigm change in our day–, strengthening the R&D and innovation based roles of the actors comprising the production chain of sectors
	Accelerating R&D and Innovation Capacity in Demand–Based Fields	Increasing R&D and innovation based knowledge generation towards meeting country demands and supporting result-oriented researches
		Developing Science/Technology human resources and providing interaction through inter-disciplinary approaches
		Embracing inter-disciplinary approaches within young people via science society activities
		Developing the private sector's capability towards creating R&D and innovation, and increasing the R&D and innovation activities density within the production chain
		Providing effective use of research infrastructures (research centres etc.) in parallel to national and local demands by developing them in inter-institutional coordination
		Increasing multiple-partner R&D projects as to support spread of information between sectors and disciplines
		Creating governance mechanisms that will increase the interaction between demand-based fields

2011-2016 National Science, Technology and Innovation Strategy	Improving the Existing Supports Aimed at Aiding Bottom-Up Approaches	Encouraging researches that would make universal contributes for filling the scientific gaps in inter-disciplinary fields
		Encouraging basic and practical research projects that would answer the needs of industrialists
	Supporting Researches that Would Constitute Basis to Newly Developing Technologies	Supporting the leading cutting-edge researches of Turkey's academically qualified scientists
		Developing proactive approaches and mechanisms in the support programmes towards leading studies for drawing Turkish and foreign scientists -with international fame in research qualification- to our country
		Developing R&D and infrastructure supports towards leading studies with inter-institutional coordination
	Creating Economical Added Value from New Products, Processes and Services Obtained Through Research Results	Establishing mechanisms that will accelerate the transition of completed research projects into industry
		Universalising and diversifying the doctorate programmes conducted in parallel to demands of industry
		Providing the researchers with more effective benefit from Intellectual and Industrial Property Rights
		Universalising the double-purpose usage of developed key technologies in industry
		Improving the public procurement management system as to include R&D and innovation aspects
		Encouraging company start-up supports based on R&D and innovation to increase the commercialisation capacity of knowledge and technologies
	Drawing System Interactions to Inter-Sectoral and Inter-Disciplinary Direction	Universalising R&D and innovation based cooperation culture that will trigger the interactions between partners at sectoral and local scale
		Developing the cooperation between sectoral and local governance mechanisms and national governance mechanisms
		Improving the interaction and information exchange between public institutions regarding science and technology issues at national scale
		Increasing the technology generation capacity via encouraging R&D based vertical cooperations
		Increasing intra-sectoral and inter-sectoral cooperations within horizontal and vertical cooperations by taking into consideration the different industrial qualities of our country
		Supporting inter-disciplinary common learning environments between researchers
		Providing better functionality to mechanisms that encourage R&D cooperation between universities, industrial and/or public institutions or individual researchers
		Supporting researches that will produce global added value from local resources and qualities

2011-2016 National Science, Technology and Innovation Strategy	Adding More SMEs to the List of Those Dealing in R&D and Innovation	Establishing facilitative mechanisms for meeting the R&D demands of SMEs who does not have R&D qualification within their own body by universities, public research institutes and private sector institutions
		Increasing the capacity of SMEs –that conduct R&D and innovation activities within their own bodies- towards producing common projects with universities and research institutions
		Developing SMEs' skills of technology orientation and management
		Facilitating access to information regarding intellectual and industrial property rights, and universalising and diversifying information distribution activities through SME R&D and innovation supports
		Developing mechanisms towards increasing the R&D and innovation oriented human resource employment in SMEs
		Activating SMEs utilisation of research infrastructures by taking into consideration the demands of SMEs regarding such infrastructures
	Having Existing and New Research Infrastructures Constitute Basis for UBTYS 2011-2016 Strategic Approach	Providing effective, efficient and sustainable usage of existing research infrastructures in parallel to country priorities as to also allow inter-sectoral multi-partner research cooperations
		Monitoring the research infrastructures via a road map of research infrastructures emphasising country priorities with the participation of all relevant actors and preventing infrastructure repetitiveness
		Allocating funding to research infrastructures from EU pre-accession financial aid programmes
		Universalising research centres in universities, structured thematically by also heeding industrial demands and local qualities
		Improving the mechanisms on participation in international infrastructure projects (ESFRI road map etc.) to be strategically selected as per our country priorities and scientific capacity coordination
Turkey Higher Education Strategy	Re-Associating the Education Programmes of High Schools and Vocational High Schools	Having these higher education institutions embedded into local business and employment markets
		Establishing Faculties of Practical Sciences and Practical Technologies in universities
		Habilitating the equipments of these higher education institutions and restructuring their size and distribution
	Increasing the Sensitivity of the Higher Education System towards the Demands of Society and Labour Market	Developing mechanisms to strengthen the society-higher education interaction
		Discovering new approaches in education towards establishing a link between the student and practical reality
	Utilising New Approaches and Technologies in Education	Increasing the use of education technologies, developing learning and reasoning skills with visual-aural tools
	Rapidly Increasing the Doctorate and Post-Doctorate Labour Force within Turkey's Human Capital	Developing ways to habilitate the number of doctorate graduates
		Developing ways to conduct post-doctorate studies within country and abroad
		Making new regulations to increase quality increase in doctorate programmes

Ninth Development Plan (2007-2013)	Increasing Competitiveness	Developing R&D and innovativeness
		Universalizing information and communication technologies
		Realising transition to high added-value production structure in industry and services
		Activating agricultural structure
	Realising Regional Development	Realising development based on local dynamics and potential
2010-2013 İzmir Regional Plan	Developing Regional R&D and Innovation Capacity	Regional Innovation Strategy shall be developed.
		The cooperation between universities and research institutes, and between public institutions and businesses shall be strengthened.
		R&D infrastructure shall be strengthened with key sectors at top priority.
		Innovation, R&D and technology awareness shall be raised.
		Innovation centred enterprises shall be developed.
		Technology capacities of businesses shall be increased and advanced technology use in businesses shall be universalized.
		More effective functioning of İzmir Technology Development Zone, and increase of number of companies within the Zone shall be realized.
	Increasing Institutionalization, Production and Marketing Capacity in Enterprises	Branding shall be supported and the number of geographical indication employing products and brand registrations within Turkey total share shall be increased.
		Effectiveness of enterprises within national and international markets, and their export ratio within Turkey shall be increased.
		Institutionalization of family companies shall be realized.
		Production and quality processes of SMEs shall be improved.
		Finance capabilities of SMEs and their capacity to benefit from current financial grants shall be increased.
	Creating Clustering and Realizing Planned Industrialization	A Clustering Strategy shall be formed until year 2012, cooperation networks supporting clustering shall be developed and clustering awareness shall be universalized.
		Specialized organized industry zones shall be founded and more effective utilization of existing zones shall be realized.
	Strengthening the Production and Service Infrastructure in Sectors	The infrastructures of OIZs, SIAs, free zones and technology development centres shall be strengthened.
	Increasing Employment and Workforce Efficiency	Vocational education shall be developed by considering the intermediate staff needs especially in key sectors.
		Qualified human resources shall be developed especially in key sectors.
	Improving the Urban and Rural Infrastructure	Informatics and communication infrastructure shall be strengthened.

Source: Institutions' Web Sites

INTRODUCTION

Countries and companies have to design their growth strategies by heeding the most fundamental developments of the globalising economy. These global developments are; financial crisis of year 2008, '*outsourcing*' and '*offshoring*' activities within the framework of new global division of labour, China becoming an economical power capable of determining new conditions to global production, the economy of India joining the global world economy as an '*outsourcing*' leader in the services sector, climate change, energy problem and innovation economy.

In this new world, a different period is being experienced in which profitability and growth are defined by science and technology. The needs arise for rapid skill building and new investment field determination in areas such as informatics, clean technologies, biotechnology and nanotechnology.

The financial sector has gradually become the most important sector in USA, constituting 40% of total profitability and causing USA's manufacturing sector to lose significance and the production to move to countries such as China and Vietnam and services to India, Mexico and Chile. These developments have begun constituting the framework of a new division of labour throughout the world: '*Outsourcing*' and '*Offshoring*' (Kırım, 2007).

The most important factors leading to 2008 financial crisis were financial derivative products, low interest applications, non-legislation implementation, long-term residential loans and the securities on these loans.

This economical view has left the business life face to face with a serious demand shrinking, liquidity risk and customer risk. Companies now have to establish not long but short term strategies, and gain a smart cash management and rapid movement capability sensitive to the market in order to survive.

All these developments have led to a serious demand shrinking in USA and Non-USA countries' consumer and investment products markets. The financial liquidity crisis that had begun back in October 2008 has caused recession in almost all developed countries.

Along with the relative decline in the share of industrialised countries within worldwide production, developing countries such as Turkey began becoming the most important producers within world economy. Especially China and India's economies have reached the level of power capable of directing global production. Russia, Brazil and Mexico are other major powers.

With the impact of globalisation, the competition in economy has increased more than ever before and led to a change in the world's economical order. Insufficient growth of world economy and the recession experienced in developed economies have increased the competition between developing market economies such as Turkey even more. Especially in the last ten years, the change in world's division of labour has moved a major part of worldwide production to a global production network comprised of developing countries with labour force advantage such as China and India. On the other hand, industrialised countries provide technology and knowledge to this production network. In the race of competition superiority in world markets, superiority in science, technology and technological innovation is a definitive and fundamental aspect.

Innovation activities enable economical development through creating high added-value products and providing new employment fields, while also directly and positively affecting social life and are used as an effective means to reduce social problems. In addition to this, the development and wealth of countries are measured today by the amount of authentic technologies –in other words, intellectual assets– they own (Yeh-Yun Lin and Edvinsson, 2010).

One of the most significant means of Turkey towards being successful in international competition is R&D and innovation. When Turkey realises and maintains these activities in a strategic framework, it can take its place among innovative countries. However, when current R&D and innovation indicators are examined, it is observed that our country is significantly behind in this category.

R&D investments capable of creating radical innovations are long-term and risky investments. The importance of partnerships and cooperation platforms, enabling information and risk sharing in both international and national level, constantly increases for companies to be able to develop products with competitiveness sufficient in the global market.

Global Innovation Index Report is an actual and important international source regarding making a comparison between countries in terms of innovation indicators. According to the different innovation indicators handled within the Global Innovation Index 2011 where the innovation indicators of a total of 125 countries were analysed and listed under different titles, Turkey ranks between the 25th and 96th places among 125 countries.

Turkey takes the 25th place among 125 countries regarding the ratio of R&D financed by the private sector, and 33rd place regarding the number of engineers graduated. The increase of R&D expenditure within GDP in the recent years has carried Turkey upwards into the first 40 countries in this regard. Ranking at the 25th place regarding the ratio of R&D funded by the private sector, our country ranks at 41st place regarding the R&D realised by the private sector. This finding is an indicator, which points out that the R&D and innovation expenses of the private sector did not provide the expected output. Turkey ranks again at the 41st place regarding the number of researchers per million people, at 51st place regarding the import of products with high-technology and 63rd place regarding the export of the same. It is thus obvious that our country is not yet at the desired level regarding the production and export of high added value products. While ranking at 69th place among 125 countries regarding the amount of R&D support received from abroad, it would not be false to expect that especially with further integration into to EU programmes, Turkey shall experience significant progress in this regard. Also, with the new incentives brought in regards to R&D by Law no. 5746, it is expected that foreign enterprises shall move their R&D and innovation activities to Turkey, and thus R&D culture shall be universalized and a significant development in this indicator shall occur.

Turkey increasing its economic competitive power may be possible only with it being ready and open for technological innovations and its business world becoming more innovative.

Regarding the current status of university-industry cooperation, Turkey has a significantly low rank of 75 among 125 countries. Turkey still not being able to enter among the first 15 countries in this issue, which was discussed by all segments of society for a long time can be regarded as negative. As a result of the desired level of university-industry cooperation not being reached and the lack of official technology transfer offices, there is no information pointing out license incomes in our country. Turkey is among 26 countries within 125 countries that could not provide this data. In our country that houses 165 universities, there is no usable data on technology transfer and the income received from the transfer due to lack of institutionalisation in university-industry cooperation and lack of correct legal regulations and mechanisms for all process segments (Table 2).

Table 2: Turkey's Innovation Index 2011

	Indicators	Ranking/125
1	R&D Funded by Private Sector (%)	25
2	Engineering Graduates	33
3	Total R&D Expenditure/GDP	40
4	R&D Realised by Private Sector (%)	41
5	Number of Researchers/Million Population	43
6	High Technology Import(Excluding re-imported goods) (%)	51
7	Knowledge-Intensive Employment (%)	59
8	High Technology Export(Excluding re-imported goods) (%)	63
9	R&D Support Received from Abroad (%)	69
10	University-Industry Cooperation	75
11	Qualified Research Institutes	82
12	Computer and Information Services Import	96
13	License Incomes	-

Source: The Global Innovation Index, 2011.

It is a known fact that R&D and innovation activities provide a positive effect on countries' competitiveness. When the top 10 countries listed in the Global Competitiveness Index report (another international study conducted between years 2008 and 2010) are examined, it is observed that these countries are also among the most innovative countries listed in the Global Innovation Index report (Table 3).

Ranking at the 1st place in years 2008-2009 on the Global Competitiveness Index, USA declined to the 4th place in years 2010-2011. In this period, USA ranked at the 7th place on the Global Innovation Index. Switzerland ranks at the 1st place in both competitiveness and innovation indexes. The Far East country of Singapore increased its competitiveness during 2008-2010 period and rose from the 5th place to 3rd place. At the same time, Singapore ranks at the 3rd place among 125 countries on the innovation index. European countries such as Finland and The Netherlands also reside among the top 10 countries in both competitiveness and innovation indexes.

Two countries that reside within the top 10 in competitiveness index while lacking this achievement on innovation index are Germany and Japan. For 2010-2011 period, Germany ranked at the 5th place in competitiveness index but at the 12th place in innovation index, while in the same period Japan ranked at the 6th place in competitiveness index but at the 20th place in innovation index.

Turkey is significantly down in both innovation and competitiveness indexes. Rising from 63rd to 61st place among 125 countries in competitiveness index between years 2008 and 2010, our country resided at the 65th place in 2011 innovation index (Table 3).

Table 3: Top 10 Countries and Turkey in Competitiveness and Innovation Indexes

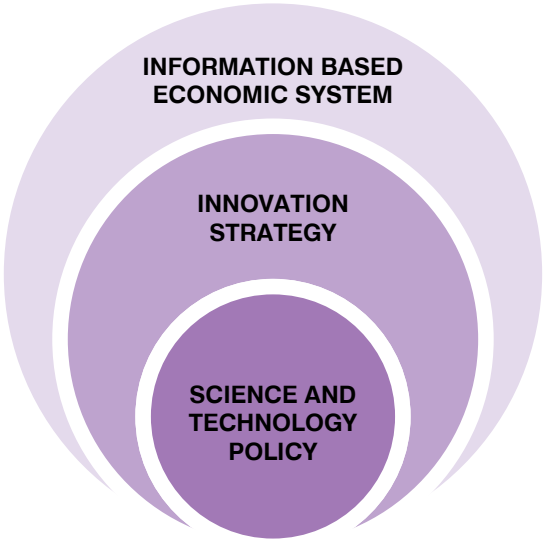
	Competitiveness Index			Innovation Index (2011)
Country	2008-2009	2009-2010	2010-2011	2011
USA	1	2	4	7
Switzerland	2	1	1	1
Denmark	3	5	9	6
Sweden	4	4	2	2
Singapore	5	3	3	3
Finland	6	6	7	5
Germany	7	7	5	12
Netherlands	8	10	8	9
Japan	9	8	6	20
Canada	10	9	10	8
Turkey	63	61	61	65

Source: The Global Competitiveness Index, 2011

All these aspects point out to the fact that R&D and innovation are important means not only to reach economical aims but also to increase social prosperity. In addition, it also highlights the necessity of co-operative and synergic efforts of the government, university, umbrella organisations, non-governmental organisations, professional organisations and other societal segments.

OECD has inspected some member and non-member countries' existing R&D and innovation infrastructures, implemented systems, government policies and supports, and science, technology and industry infrastructures, and established innovation strategies aimed towards increasing the competitiveness of these countries and rendering them stronger against crises. Within the context of these studies that had begun with Sweden in year 2006, innovation strategies have been developed for 12 countries as of the end of year 2011 (OECD, 2011). With these studies, the importance of innovation strategy for OECD countries has been pointed out, the impact of the policies and support mechanisms implemented in the countries has been attempted to be measured, and best applications in this field have been determined. Now, it is known that innovation strategy and its subset of science and technology policy are the most fundamental aspects for the transition into knowledge-based economy.

Figure 1: The Place of Innovation Strategy in Information Based Economies



Source: Innovation Policy, World Bank, 2010

In this study, it was aimed to establish a knowledge based economical system in İzmir with high R&D and innovation capacity within the framework stipulated above. The result of a 10-month study, 3 different comprehensive research studies were made in İzmir, compiling the R&D, innovation and relevant statistical information belonging to the universities, research institutions, umbrella organisations and private sector representatives, and these data were analysed to finalise this report.

Separate strategic priorities that would make İzmir a more innovative region and the aims to have these realised were determined. Within the "Regional Innovation System", the most important factor to success is synchronised planning of the interactions and task sharing between public, private sector and academic institutions and implementing these in coordination.

THE SIGNIFICANCE AND PURPOSE OF THE STUDY

One of the most important means towards increasing the competitiveness of companies, regions and countries is the development of regional innovation strategies. İzmir Development Agency, working in parallel to various strategies towards the development of the region, has accelerated its efforts on clustering and innovation in cooperation with the institutions and organisations in the region as of year 2009. Clustering and innovation in İzmir province is handled as a means of policy for competitiveness, economical growth and increase of employment. These tools are recognised as important aspects for increasing both the region's and the regional companies' competitiveness.

In current day business life, the most significant factor affecting change is observed to be innovation. The way to stand out in the competition race going on between the same products and same services, together with declining profitability, is achieving the ability to constantly change. And the only way to achieve this ability is to employ creativity and innovativeness.

Developed countries establish their innovation strategies not only at national but also at regional and sectoral levels. These strategies aim to raise R&D and innovation awareness in all societal segments and to determine and implement the duties and responsibilities of such segments for the development of awareness.

National level R&D and innovation activities in our country have begun in the recent past. At the very beginning of 1990s, institutions and programmes supporting R&D and innovation were established. Since their establishment, the R&D and innovation activities of different sized enterprises, especially SMEs, were supported by these support programmes and mechanisms. Considering the amounts provided as grants to R&D and innovation activities, Turkey resides at a high place throughout the world.

However, despite various support mechanisms provided by the state, the existence of many companies, and the relatively strong research infrastructure and number of researchers, it is observed that the innovation capacity of both the country and İzmir Region does not yet achieve the desired levels.

The most important purpose of this strategy study is to establish an innovation ecosystem in İzmir where technology based production is carried out and a strong innovation capacity exists. It is aimed to make İzmir a region with high innovation capacity, technology generation and export as a result of planning and implementing R&D and innovation activities with the cooperation of the infrastructure in İzmir, its human resources, all public, private sector and civil society segments.

Another important feature of the study is that, it is the first study aimed at determining the R&D and Innovation capacity of İzmir, and thus it is evaluated as a model study for both İzmir and for Turkey.

MATERIAL AND METHODOLOGY

Material of the Study

The main materials of İzmir Regional Innovation Strategy study are comprised of three fundamental research studies conducted within the context of the project. These studies are as follows:

- İzmir Regional R&D and Innovation Capacity Analysis,
- Status Quo Analysis of the R&D and Innovation Ecosystem in İzmir.
- İzmir Regional Innovation Strategy Field Survey,

The first study conducted within the project context is **"İzmir Regional R&D and Innovation Capacity Analysis"**. The study covering the period of 2007-2010 has been formed by compiling and analysing the secondary data belonging to the universities, research centres, researchers, enterprises benefitting from R&D supports and technology production centres in İzmir. The statistical information in the analysis report has been requested from relevant institutions and organisations by official letters. In this context, data related to approximately 80 indicators from 20 different institutions have been obtained and compiled. These indicators may be found in this report's ANNEX-1.

The second study titled **"Situational Analysis of the R&D and Innovation Ecosystem in İzmir"** comprises of two separate sections. In the first section, the current status of umbrella organisations such as Chambers, Stock Markets, Organised Industrial Zones, Free Zones and Unions and their members regarding issues such as R&D, innovation and industrial property rights (IPR) has been determined. In the second section of the study, the statuses of the universities in İzmir regarding R&D, innovation and industry relations have been examined. In this section, interviews have been made with deans, department heads and academicians who are members of the İzmir Regional Innovation Committee. These interviews have been made face to face with the aid of a survey form developed for this purpose. Engineering, agriculture and aquaculture faculties of universities have been included in the study as institutions generating knowledge. Because it is considered that these faculties directly get involved with the production process of technological, high added value products, enjoying a higher potential of cooperation with the industry regarding R&D and innovation projects. Aside from this, possible contributions of other faculties to studies in the field of R&D and innovation have also been mentioned as necessary.

Another important material of the strategy report is **"İzmir Regional Innovation Strategy Field Survey"**. In this section, Turkish Statistical Institute (TurkStat) has conducted a R&D and Innovation Questionnaire via field survey method on 760 enterprises that are in the sectors defined as prioritised sectors of İzmir -namely, informatics, biomedical, industrial HVAC, processed fruits and vegetables, chemicals and renewable energy sectors- by İzmir Development Agency. Textile sector, another prioritised sector of İzmir, has been visited by the project team, obtaining data and compiling this with TurkStat data for analysis. Therefore, the information referred to within the "İzmir Regional Innovation Field Survey" of the Strategy Report also covers the textile sector.

Methodology of the Study

Within the context of the report, the results obtained from "İzmir Regional R&D and Innovation Capacity Analysis", "Status Quo Analysis of the R&D and Innovation Ecosystem in İzmir" and "İzmir Regional Innovation Strategy Field Survey" have been evaluated and interpreted as a whole. The findings obtained have been shared with the members of **"İzmir Innovation Technical Committee"** and **"İzmir Regional Innovation Committee"** for their opinions. Their opinions, suggestions and evaluations have been received via mid-term evaluation meetings.

In addition to the analysis studies, on the 20th of March 2012, **İzmir Regional Innovation Strategy Workshop** was held for the purpose of creating the İzmir Regional Innovation Strategy and producing the action plan in parallel to the findings obtained. A total of 50 individuals comprising of İzmir Technical Committee of Innovation members, İzmir Regional Innovation Committee members, representatives of relevant public sector, private sector actors, non-governmental organisations and universities in İzmir and representatives from national institutions such as TÜBİTAK, Ministry of Development and Ministry of Science, Industry and Technology participated in the workshop. Aims and actions required to be done for strengthening the research and innovation infrastructure; developing institutional structuring and capacity in science and technology field; developing human resources in science and technology field; patenting of research results and supporting their commercialisation; facilitating access to funding and improving the entrepreneurship and innovation ecosystem issues were discussed by participants.

Therefore, the opinions and contributions produced within the context of the workshop comprised one of the main inputs of this report.

İzmir Regional Innovation Strategy Workshop Participants

1. EXISTING SITUATION

1.1 INSTITUTIONAL CAPACITY IN R&D AND INNOVATION

1.1.1 Academic and Research Infrastructure

Universities

In order for R&D and innovation activities to develop in a region, first there should be structures directing and supporting such activities in that region. At the top of these structures come **Universities, Research Centres, Institutes** and as complement to such **Vocational High Schools**. Universities constitute the most important aspect of R&D and innovation with the various units they employ within their body.

In terms of number of universities, İzmir comes at the third place in the country. There are a total of 9 universities -4 public, 5 private universities- in İzmir, which since the foundation of its first university in 1955 have continued to incorporate various universities (İzmir Regional R&D and Innovation Capacity Analysis).

Table 4: Structures and Establishment Years of the Universities of İzmir

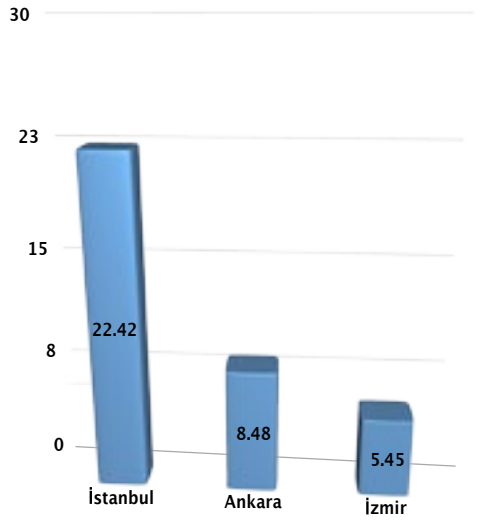
University	Public/Foundation	Year of Establishment
Ege University	Public	1955
Dokuz Eylül University	Public	1982
İzmir Institute of Technology	Public	1992
İzmir University of Economics	Foundation	2001
Yaşar University	Foundation	2001
İzmir University	Foundation	2007
Gediz University	Foundation	2008
Kâtip Çelebi University	Public	2010
Şifa University	Foundation	2011

Source: Internet Pages of YÖK and Universities, Access Date: 6th of May 2012.

Considering its young population structure, industrialisation state and potential, along with being the most socio-economically developed province of the region and other factors of interest, İzmir actually is an attraction centre for establishment of new universities. In case the structure in İzmir placing importance to education directed well, and the determination and monitoring of Turkey, Europe and world labour force demand may be realised comprehensively, İzmir shall be capable of utilising many opportunities in this sense. Also, the inclinations of students in EU member states towards foreign country education may be used as an opportunity for Turkey and İzmir. Determination of Europe and world labour force demand is of vital importance for opening correct programmes in this context.

Regarding its location, İzmir has the opportunity to become a higher education centre for students coming from Middle East, Turkic Republics and Balkans. It is a known fact that cultural diversity is an ecosystem aspect that triggers creativity and innovation.

Figure 2: Percentage Distribution of Universities in İstanbul, Ankara and İzmir (2011)



İzmir is observed to be the region with the highest population per university. Considering its young population structure, industrialisation, regional location and other factors of interest, İzmir actually is an attraction centre for establishment of new universities

Table 5: Population per University in İstanbul, Ankara, İzmir and Turkey

	Turkey	İstanbul	Ankara	İzmir
Population (individuals)	74,724,269	13,624,240	4,890,893	3,965,232
Number of Universities	165	37	14	9
Population per University (individuals)	452,874	368,223	349,350	440,581

Source: TurkStat and YÖK 2012

Despite the positive development of increase in the number of universities, the fact that those universities do not focus on specific fields, prevent distinct development of positive effects such as knowledge generation in diverse fields, specialisation, complementing each other and increase in cooperation potential, leading to inefficient use of resources and diverse young labour force not being able to be drawn to İzmir. Information on the structure in universities shall be provided in detail within the following sections.

Faculties and Departments

Considering the universities functioning as of year 2011, there are a total of 50 faculties in İzmir (İzmir Regional R&D and Innovation Capacity Analysis). This abundance of faculties make a positive effect on the knowledge generation power of İzmir, and raises the R&D and innovation level with the young experts trained and the projects developed.

Although the number of faculties is high, types of faculties do not display the same level in diversity. The existence of too much similarity in universities employing faculties of the same scientific branches such as in engineering faculties, economical and administrative sciences faculties and faculties of science causes the scientific studies and education activities to be conducted at diverse fields to remain limited.

Faculties focusing also on producing knowledge and technology in parallel to the region's strategic priorities in addition to their routine education activities shall bring İzmir to a significant level towards becoming a centre for high added-value products.

The existing faculty units should focus also on information and technology generation in line with the strategic priorities of the region along with their routine education activities.

Table 6: Information on the Universities of İzmir (2011)

	DEÜ	Ege Uni.	İYTE	Uni. of Economics	Yaşar Uni.	Gediz Uni.	İzmir Uni.	Total
Number of Faculties	13	12	3	6	7	4	5	50
Number of Institutes	10	8	1	2	2	2	2	27
Number of High Schools	11	13	1	3	2	1	3	34
Number of Lecturers (A)	3.373	3.424	523	441	341	57	123	8.282
Number of Students (B)	43.185		2.088	5.973	4.013	1.198	1.354	
B/A	13	13	4	14	12	21	11	12

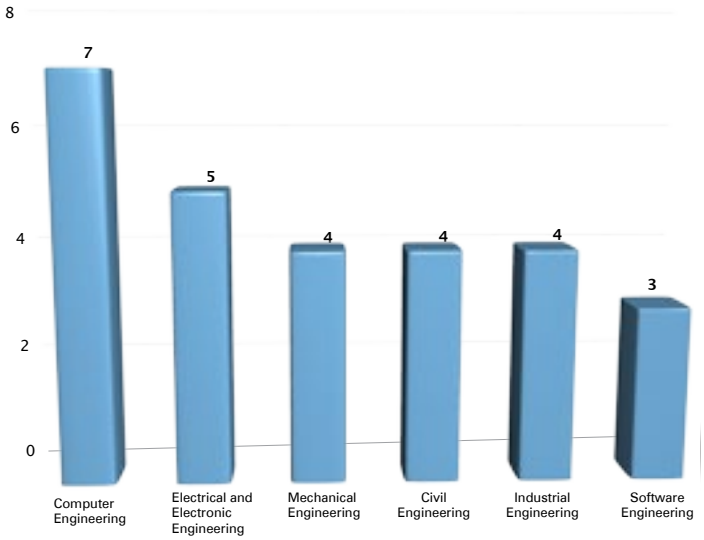
Source: ÖSYM and YÖK (Based on universities functioning as of year 2011)

Another structure definitive in knowledge and technology production is the existence and types of engineering departments. As is the norm in many other regions of the world, İzmir also is a region where education and research activities are conducted dominantly on traditional engineering departments.

There are a total of 20 different active engineering departments in İzmir. Both technical and researcher infrastructure of the engineering departments constitute the greatest innovation potential of İzmir. The existing infrastructure in engineering sciences in İzmir constitutes the source of information and technical support required especially by the industry segment (İzmir Regional R&D and Innovation Capacity Analysis).

However, it is observed that similar to the status of universities and faculties, the structure of engineering departments also could not diversify sufficiently, and that there are numerous engineering departments of the same type. There are 7 computer engineering, 5 electrical and electronic engineering, 4 mechanical engineering, civil engineering and industrial engineering departments, and 3 software engineering departments in İzmir. In addition to the mentioned engineering departments, bioengineering department that trains engineering in life sciences field has been founded first in İzmir throughout Turkey. Leather engineering department can also be only found in İzmir. These departments contribute to the formation and development of diverse sectors in İzmir (İzmir Regional R&D and Innovation Capacity Analysis).

Figure 3: 6 Engineering Departments Found Most in İzmir



Source: İzmir Regional R&D and Innovation Capacity Analysis

For the studies regarding R&D and innovation to develop, it is important to establish interdisciplinary cooperation especially between engineering departments. The technical infrastructure and researcher capacity in these departments are of great potential for İzmir.

For the studies regarding R&D and innovation issues in İzmir to be developed, get more effective and diverse, it is of vital importance to create awareness especially in engineering departments and to establish inter-disciplinary cooperation at different scales between these departments. Establishing new generation engineering departments that would provide the knowledge and technology generation required for the production of high added-value products especially in the sectors prioritised in 2010-2013 İzmir Regional Plan shall positively affect the innovation ecosystem.

İzmir is an outstanding region also in information technologies field. Regarding the distribution of enterprises within İzmir Technology Development Zone, software and informatics field (67%) display a domination over other sectors (İzmir Regional R&D and Innovation Capacity Analysis). There are many computer engineering departments (7 departments) in universities and the number of software engineering departments constantly grows.

İzmir is one of the most suitable regions for the formation and development of sectors related to health with its rich medicinal and endemic flora diversity and natural resources. However, for this potential to be transformed into high added-value products, research, development and knowledge generation should be carried out in universities regarding this field.

The existence of the oldest Faculty of Agriculture in İzmir Ege University and four separate Faculties of Medicine in the province constitute some superiorities for İzmir in this regard. Although the faculties of medicine, dentistry and pharmaceutics dominantly function towards education and services in healthcare field, they also contribute to the development of biomedical technologies in the region with the scientific studies and R&D activities they conduct (İzmir Regional R&D and Innovation Capacity Analysis).

There are different faculties, rich laboratory infrastructures and expert researcher force within the faculties' bodies. However, the application fields developing in healthcare field and the gradually complicating product structures render inter-disciplinary cooperation mandatory. Obtaining new products from medicinal plants, diagnosis kits, prostheses and imaging systems necessitate cooperation from many basic and practical scientific branches.

Regarding health sector, İzmir should focus not only on services but also on development of new products in this field. To that purpose, it is necessary for the faculties providing education and research in health sector to realise R&D cooperation with relevant departments of engineering faculties for realising a change in the sectoral structure currently based on importing of high cost products at both regional and national scale.

The Faculty of Aquaculture and Maritime Faculty in İzmir meet the engineer and expert needs of the sector, and also contributes to the production of projects resulting cooperation in science and technology field.

For R&D and innovation activities, not only practical sciences but also basic sciences play a significant role. Faculties of Sciences are important units where the fundamental knowledge supporting the practice is produced. Aside from generating information, these faculties prepare a basis and provide services for R&D projects of many industries with their existing infrastructure. Employing 19 different departments and numerous researchers from different scientific branches, these faculties of sciences and faculties of arts and sciences contribute power to the R&D and innovation efforts in İzmir. However, as is the case in engineering faculties, faculties of sciences also do not cooperate at a desired level of effectiveness with the industry (İzmir Regional R&D and Innovation Capacity Analysis).

For new products to develop in İzmir regarding healthcare sector, the faculties and engineering departments providing education and research in this sector should make R&D cooperation. Health units should focus not only on services but also on research and development of new products.

Making the technical infrastructure such as laboratories and research centres that were established within the universities' faculties of engineering, sciences and many other units with significant financial

resources be effectively accessible to other departments and universities, the industry and also foreign investors shall support the R&D and innovation activities in the region.

In addition, 72% of the enterprises in İzmir receive accreditation services for export activities from institutions and organisations outside İzmir (İzmir regional Innovation Strategy Field Survey). Accrediting a certain portion of the existing laboratories by heeding sectoral demands shall make it possible for the resources paid to outside institutions and organisations by the industry of İzmir to remain inside the province.

Technical infrastructure such as laboratories and research centres that were established within different units of the universities with significant financial resources allocated should be made effectively accessible to other departments and universities, the industry and also foreign investors.

Faculties of Economics and Administrative Sciences (İİBF) are among the prominent faculties in İzmir in terms of their numbers. While the departments within the bodies of İİBF do not directly affect the enterprises' ability to produce technology, they provide indirect but significant contributions to sectors with R&D and innovation management, process improvement and project preparation/management activities. In this sense, the existence of İİBF departments, especially Economics and Business Departments is an important opportunity regarding the R&D and innovation activities of the region (İzmir Regional R&D and Innovation Capacity Analysis). However, the cooperation in İzmir is limited not only between universities but also between the faculties and departments of the same university. This situation is partially caused from legal regulations and partially from the common and complementary aims and purposes not being able to be defined. Departments under İİBF, especially engineering departments carrying out both mutual education and certificate programmes, and mutual research projects shall increase the level and effectiveness of innovation efforts.

Departments under Economics and Administrative Sciences Faculties carrying out mutual education/certificate programmes and research project shall contribute to the increase of effectiveness in innovation activities.

Institutes and Research Centres

In addition to faculties and departments, institutes also take place among important factors in science and technology field with the doctorate researchers they train and R&D projects they conduct. Aside from 16 Institutes in İzmir (7 Sciences, 3 Health Sciences and 6 Social Sciences Institutes), there are 11 more Institutes that conduct research and serve industry in energy, informatics and healthcare fields. Further to these Institutes within university bodies, another 8 Institutes within jurisdiction of Ministries (Menemen Aegean Agricultural Research Institute, Bornova Agricultural Pest Control Institute, İzmir Olive Cultivation Institute, Bornova Veterinary Control Institute and Aegean Forestry Research Institute etc.) are also among places where business market applies to for their R&D and innovation efforts (İzmir Regional R&D and Innovation Capacity Analysis).

Accrediting of the existing laboratories by heeding sectoral demands shall increase innovation capacity and make it possible for the resources spent by the industry to remain inside İzmir.

Besides the institutes, the Research Centres supporting the development of innovation activities are also among institutions that directly contribute to technology production through both the studies they conduct on their own and the technical support and consultancy services they provide to enterprises. İzmir has a rich structure regarding the number and diversity of research centres, and the services provided in R&D and innovation issues (İzmir Regional R&D and Innovation Capacity Analysis). There are a total of 20 Research Centres within the body of universities.

Vocational High Schools

For R&D and innovation to develop and settle, intermediate actors are required that will use the developed technology and produce economical value. 25 Vocational High Schools (two-years education) and High Schools (four-years education) functioning under different programmes within the universities in İzmir considerably meet this demand (İzmir Regional R&D and Innovation Capacity Analysis). However, the similarity in the programmes of Vocational High Schools constitute one of the most significant obstacles against specialisation in different subjects. Thus, designing new programmes towards the demand of the business market and opening new programmes for the development of new sectors in İzmir is mandatory. In addition to this, providing effective cooperation of vocational high school students with industry and coordinating the practical training programmes of students in line with the purpose shall prove beneficial for both the business market and the students.

Evaluation

It is necessary to diversify the faculties and departments of the universities of İzmir, to open new generation departments and realise specialisation. These steps shall play a role in establishing the innovation future of İzmir, and be directly effective in training human resource and providing development to the sectors. The new generation departments to be opened shall accelerate knowledge generation along with encouraging development of high added value production industries in İzmir and investments being drawn to İzmir in these fields.

Merely opening new departments shall not be sufficient for increasing the innovation capacity of İzmir and bringing it up to a leading position. At the same time, cooperation based on research projects between both the existing and the new departments should be realised. This cooperation should be based on education and certificate programmes at students level along with at mutual research projects level.

Introducing the R&D centres, institutes and laboratories in universities especially with technical features capable of providing different services to industry and other relevant researchers shall have these areas to be utilised more effectively and constitute a platform for new projects to be developed. With a web page to be developed towards that purpose, publicity of these units and the tools and equipments employed by such units may be realised. Such efforts spent shall make it possible for the currently weak cooperation between university and industry in İzmir to be developed.

Bilateral cooperation should be established also between vocational high schools and industry. Fields demanded or to be demanded by the labour force market in İzmir should be determined and establishing new programmes in such fields within universities should be planned. Towards the determination of these fields, an effective field and vision survey should be planned.

1.1.2 Researcher Capacity

The most basic aspect for a region and country to be developed is qualified human resource. In regards to R&D and innovation, it is observed that intellectual capital focuses in universities. Researchers serving with education and research activities in universities and students receiving education in various fields constitute the researcher capacity and human resource.

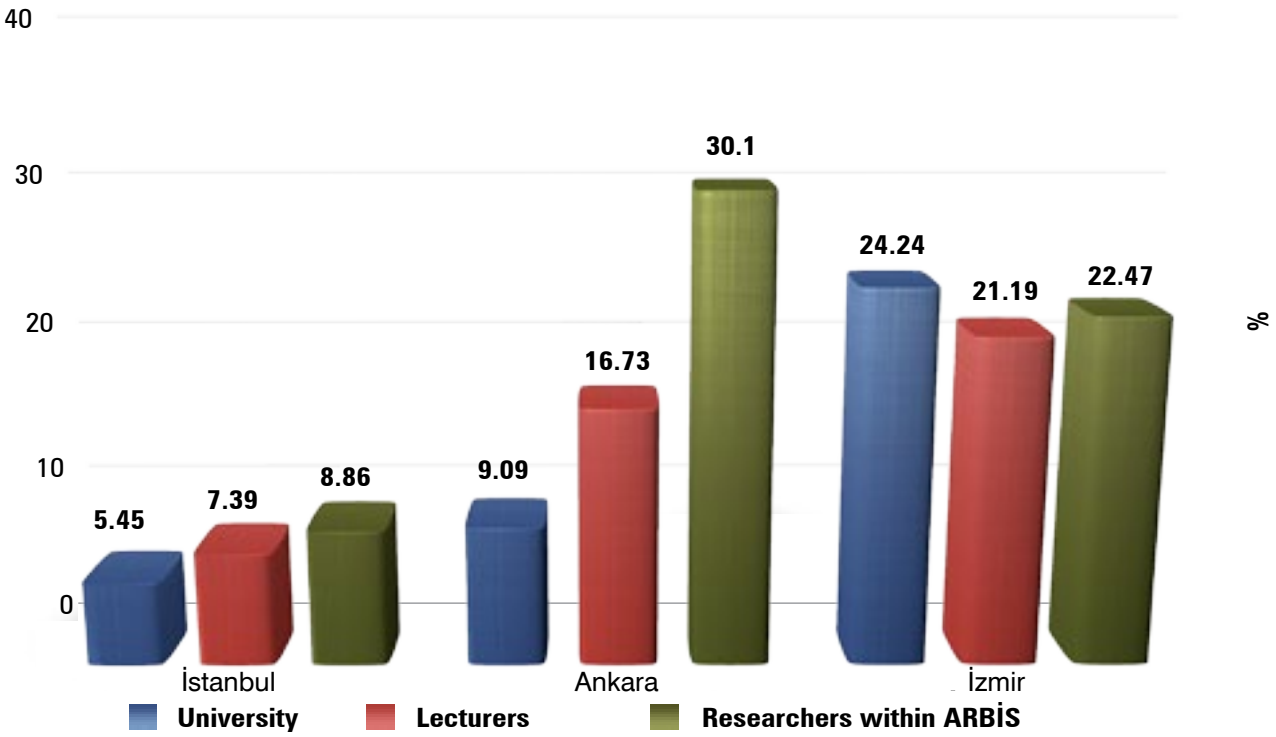
Number of Researchers

Considering the total number of universities, and lecturers and researchers working in universities as of year 2010, İzmir ranks at the third place throughout Turkey (İzmir Regional R&D and Innovation Capacity Analysis).

TÜBİTAK Researcher Information System (ARBİS), to which the researchers have obligation to be registered under for submitting projects to TÜBİTAK and participating in projects, is recognised as a national database where active researchers who develop and conduct projects exist within. As of year 2011, there are a total of 81,674 active researchers registered under ARBİS in Turkey. Regarding the distribution of these researchers within the three major regions, it is observed that there are 24,584 researchers in Ankara (30.10%), and 18,354 researchers in İstanbul (22.47%), followed by İzmir with 7,240 researchers that correspond to 8.86% of Turkey overall value (İzmir Regional R&D and Innovation Capacity Analysis).

İzmir has an important potential regarding R&D and innovation activities with its universities, faculties and departments. For more effective use of this potential, specialisation and inter-department cooperation are necessary.

Figure 4: Distribution of Researcher Capacity within Regions



Source: YÖK, TÜBİTAK

Considering the total number of universities, and lecturers and researchers in universities as of year 2010, İzmir is the third region with highest values in Turkey.

The high number of researchers may be interpreted as an indicator of the potentially high research power of İzmir. Researchers in engineering faculties that is one of the faculties that directly contribute R&D and innovation activities reaching a total number of 1,101 constitute the most important R&D resource of İzmir. When the distribution of these researchers is examined, it is observed the highest number of researchers exist respectively within mechanical engineering (145), computer engineering (131), electrical-electronic engineering (112) and civil engineering (102) departments. Besides these conventional engineering departments, there are also a certain, while lower, number of researchers in new generation departments such as software engineering (36) and bioengineering (29) (İzmir Regional R&D and Innovation Capacity Analysis).

By directing the researcher capacity in İzmir towards the needs and priorities of the province, development of new technological products shall be realised in various fields. The high number of students in universities pushed researchers to education-based activities, leading to a problem of time management for research. Encouraging researchers toward R&D, establishing mechanisms for them to update their level of knowledge, creating opportunities and raising their project design skills shall increase the innovation potential of İzmir.

İzmir has a considerable potential towards R&D and innovation activities with its universities, faculties, departments and researchers. For this potential to be utilised more effectively, specialisation and cooperation between universities and departments should be realised. This cooperation should be realised not only within the university but also between different universities.

When the projects produced in the context of the TÜBİTAK project support most commonly benefitted by researchers in İzmir are examined, it is observed that only 6% of the researchers make project applications (İzmir Regional R&D and Innovation Capacity Analysis, Situational Analysis on R&D and Innovation Ecosystem in İzmir). It is necessary to direct the researcher potential of İzmir towards producing applicable and projects suitable for commercialisation and to support them in this process. Especially for increasing the international experience of young researchers, new support mechanisms should be developed and opportunities should be created for these researchers where they may work and exchange ideas with scientists from foreign countries. The researcher capacity that is considerable regarding its numbers should be supported via short term certificate programmes, seminaries and training courses especially towards increasing their skills of project designing, preparation and management. Evaluations regarding project designing skills of the researcher power are discussed within the section titled Project and Innovation Generation Capacity.

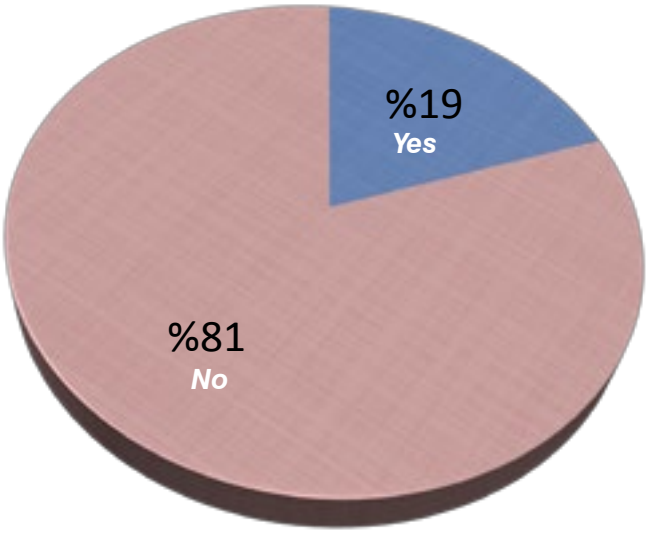
It is expected from the researcher infrastructure to play a significant role in a region for the development of university-industry cooperation and for increasing the R&D and innovation capacity in fields demanded by the industry. Despite the strong researcher structure, 81% of the enterprises of İzmir are not in cooperation with the universities and research centres. Also, only 5% of the enterprises have pointed out the source of idea of their innovation projects as researchers in university (İzmir Regional Innovation strategy Field Survey). These data show us that the cooperation between university and industry is not at the desired level.

> Despite the strong researcher structure, 81% of the enterprises of İzmir are not in cooperation with the universities and research centres. Only 5% of the enterprises pointed out the source of idea for their innovation projects came from researchers in university.

According to the evaluation done by universities, the most important obstacle against cooperation with industry has been pointed out as the lack of mechanisms to encourage and support this cooperation in universities (63%) (Situational Analysis on R&D and Innovation Ecosystem in İzmir).

Increasing enterprises' innovation power by effective use of research power shall accelerate the technological development of İzmir. To that purpose, the number of interface mechanisms that will realise cooperation between university and industry, and support researchers and industrialists in this process

Figure 5: The Status of Industry Making Cooperation with Universities and Research Centres



Source: İzmir Regional Innovation Strategy Field Survey

should be increased. These units shall also have the knowledge produced in universities to meet with the entrepreneurs, increasing the share of high added value products in the region, which is currently 19%, (İzmir Regional Innovation strategy Field Survey) to higher levels.

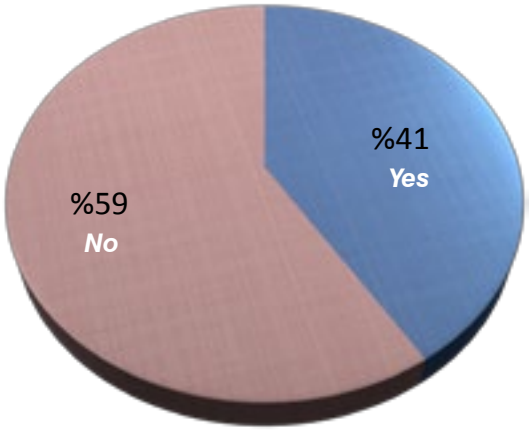
In order to have researchers conduct more research projects aimed towards industry, it is also important to make the projects more accessible to industrialists. Functionalising a portal to be prepared by universities where the expertise areas of academicians in İzmir, the fields they work on and the studies they conduct are introduced, and relevant queries may be done shall provide easy and fast access opportunity for the industrialist to reach the academician and researcher relevant to the specific subject they have demand of.

Expert personnel employment in private sector is yet another issue prominent regarding R&D and innovation. 59% of the enterprises in İzmir experience problem with finding qualified labour force. Enterprises have pointed out lack of qualified labour force (16%) as one of the most significant obstacles against innovation (İzmir Regional Innovation strategy Field Survey). These results show that private sector enterprises are in need of qualified personnel and engineers with expertise and experienced should be trained for increasing R&D and innovation level. An effective cooperation has to be realised between engineering students and enterprises prior to graduation. Engineering students working as a candidate engineer for 1 year in industry prior to completing university shall realise both the student being graduated from university with industrial experience and increase the chances of the industrialist employing an experienced expert.

Engineers with expertise and experienced should be trained for increasing R&D and innovation level of enterprises.

Both the level and types of cooperation between universities, which are the effective force behind R&D and innovation, and industry should be increased.

Figure 6: Access to Qualified Labour Force (2011)



Source: İzmir Regional Innovation Strategy Field Survey

85.4% of the enterprises functioning in İzmir do not have a defined R&D unit, to which we find one of the reasons to be lack of information. Also, 18.9% of the R&D and innovation projects in İzmir result in inconclusive or unfinished ends. Lack of experts and information is observed to be the third most common reason to that, with a value of 11.06% (İzmir Regional Innovation strategy Field Survey).

Evaluation

These findings point out to the fact that it is necessary to realise a meeting point between academic capacity and business market in line with common purposes, in a more effective and result-oriented manner. In order to solve this problem and meet the experienced expert demand of industrialists, "Industry Oriented Doctorate Programmes" should be developed. In these programmes that will be developed along with relevant sector representatives, doctorate topics shall be determined and carried out together with a certain enterprise. Therefore, a concrete need of the enterprise shall be able to be met and the academician shall have the opportunity to make practice in the industry.

Both the level and types of cooperation between universities, which are the effective force behind R&D and innovation activities, and industry should be increased. Project oriented cooperation between universities and industry should be encouraged and accelerated. Formation of mechanisms that will provide such cooperation should be encouraged both within universities and within umbrella organisations. Also, cooperation between different disciplines both within universities and between different universities comes up as an important issue.

Experts specialised in relevant fields should be trained for the purpose of improving R&D and innovation activities in enterprises. To that purpose, creating environments and programmes where students may work with or stay in interaction with enterprises especially during university period shall trigger cooperation.

It is necessary to direct the researcher potential of İzmir to produce applicable projects suitable for commercialisation and to support the researchers in this process in order to increase the researcher capacity.

1.1.3 Project and Innovation Generation Capacity

Another important aspect defining success for competition both between enterprises and at international scale is the capability to produce goods and services that are completely new, different and suitable for becoming economical assets. This capacity may be realised through R&D and innovation efforts. R&D and innovation works that bear significant risk as per their nature also require high amounts of financial resources.

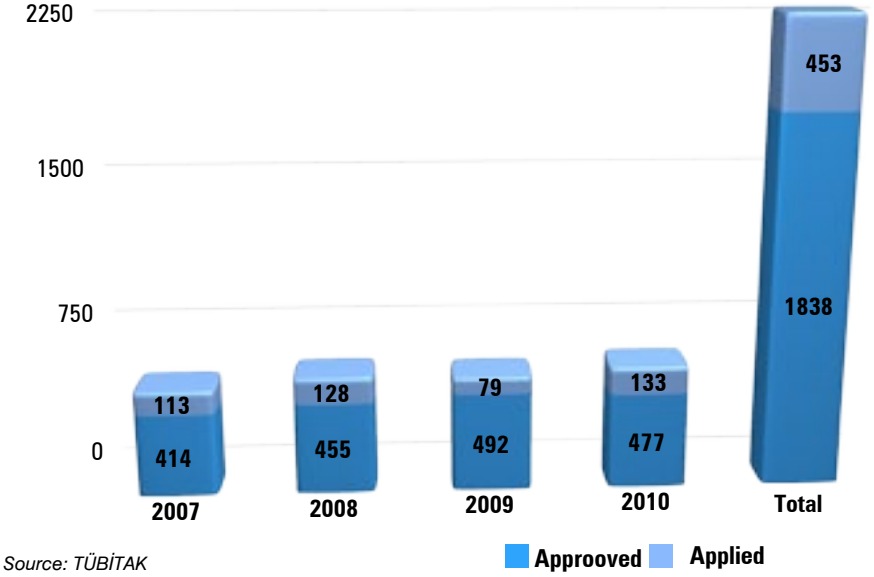
Research Projects

It is observed that only 6% of the researchers in İzmir make project applications to TÜBİTAK. There are 30 project applications in İzmir, 16 project applications in İstanbul and 12 project applications in Ankara per 100 researchers.

Universities come at the top of the institutions producing projects. Researchers employed in universities bear the potential of producing projects in their own scientific branches. In an ideal ecosystem, produced projects first produce scientific knowledge, leading to patentable knowledge, which produces technology and then commercialised products that is the aim of all countries. In this long and formidable process that covers knowledge turning into patent and commercialised product, it is necessary to emphasise new studies and to support and encourage efforts towards that purpose.

The share allocated by the universities in İzmir to Scientific Research Projects (SRP) from their budgets is approximately 77 Million TL. Another resource that researchers obtain funds from for their projects besides university resources is TÜBİTAK. When the projects produced in the context of the TÜBİTAK project support most commonly benefitted by researchers in İzmir are examined, it is observed that only 6% of the researchers make project applications (İzmir Regional R&D and Innovation Capacity Analysis, Situational Analysis on R&D and Innovation Ecosystem in İzmir). This result points out to the fact that a 94% portion of the researcher capacity in İzmir deal dominantly in education activities and do not/may not participate actively in efforts towards producing innovation. The number of projects produced towards knowledge generation by researchers in İzmir during 2007-2010 period is 1,838. This number is 2,208 in İstanbul and 2,882 in Ankara.

Figure 7: The Number of Projects Applied to/Approved By TÜBİTAK from İzmir (2007-2010)

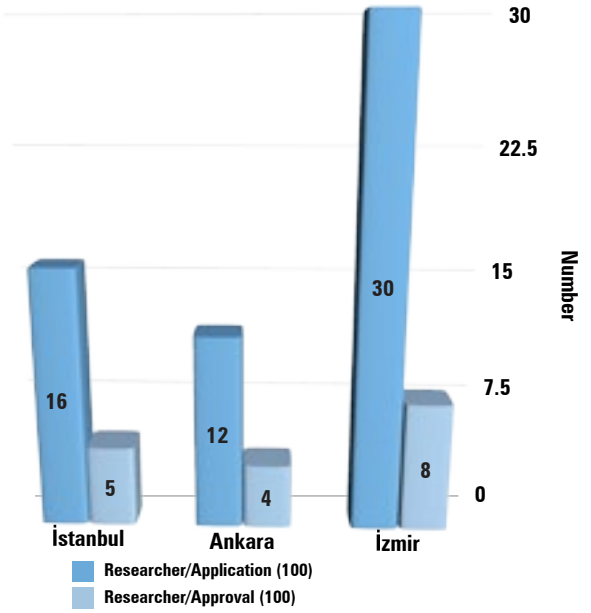


Source: TÜBİTAK

The analysis of these numbers per researcher points out to 30 project applications in İzmir, 16 project applications in İstanbul and 12 project applications in Ankara per 100 researchers (İzmir Regional R&D and Innovation Capacity Analysis, Situational Analysis on R&D and Innovation Ecosystem in İzmir). Therefore it may be mentioned that the researcher power in İzmir is more active compared to other regions and that efforts made towards increasing the number and capacity of research power shall play an important role in the development of the region's capacity towards R&D and innovation.

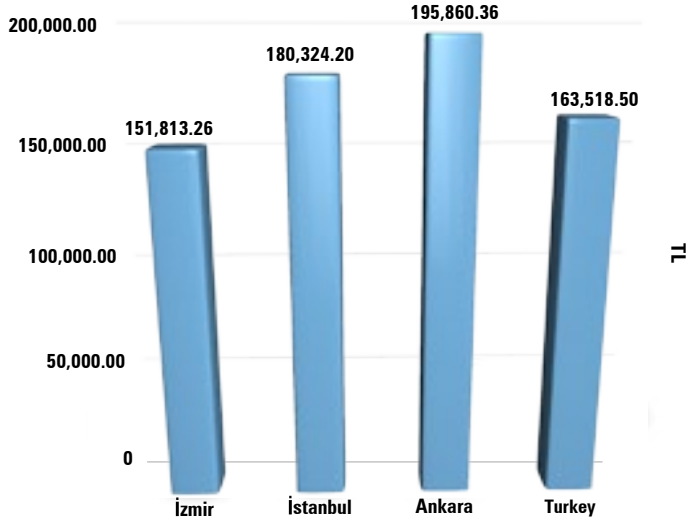
There is a direct correlation between the complexity of the produced project, its technological content, period, local cost and the size of the budget allocated to the project. The expenses per project, in other words the funds received from TÜBİTAK between years 2007 and 2010, occurred to be 151,813.26 TL in İzmir while the same value was 180,324.20 TL in İstanbul, and 195,324.20 TL in Ankara (İzmir Regional R&D and Innovation Capacity Analysis, Situational Analysis on R&D and Innovation Ecosystem in İzmir). According to this, it is concluded that the R&D conducted in İzmir has been realised with lower costs compared to other regions. This situation may be evaluated as another advantage of İzmir regarding R&D and innovation.

Figure 8: Number of Applied and Approved Projects per 100 Researchers



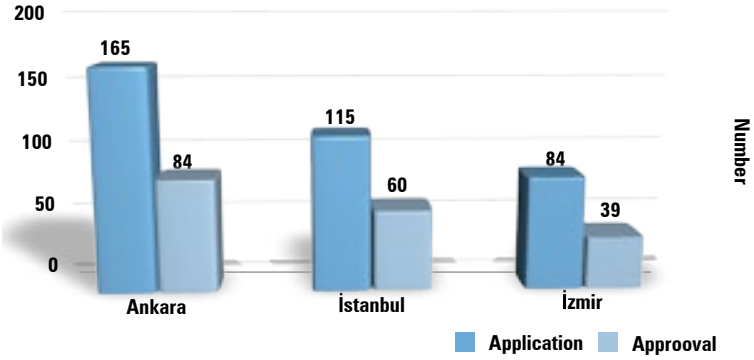
(2007-2010) Source: TÜBİTAK

Figure 9: Average Project Budget of TÜBİTAK Projects (2007-2010)



Source: TÜBİTAK

Figure 10: San-Tez Projects Per Region (2007-2010)



Source: Ministry of Science, Industry and Technology

The rate of approval for projects produced and submitted in İzmir is around 25% (İzmir Regional R&D and Innovation Capacity Analysis, Situational Analysis on R&D and Innovation Ecosystem in İzmir). This status points out to the fact that only one out of four proposed projects is supported, leading to lower number of researchers being able to participate actively in research and development activities.

University – Industry Mutual Projects

During the last 30 years, forming projects enabling the industry to directly produce technology has also become a duty of universities in addition to academic projects producing knowledge towards scientific and practical means. University-industry mutual projects prepared and conducted to that purpose are supported under the **San-Tez Programme** of the Ministry of Science, Industry and technology. The total number of San-Tez projects applied from İzmir between years 2007 and 2010 is 84, of which 39 projects were approved (46%) and supported. These values are 165 application, 84 approval (51%) in Ankara, and 115 application, 60 approval (52%) in İstanbul (İzmir Regional R&D and Innovation Capacity Analysis).

Considering the researcher potential in universities of İzmir and the number of enterprises actively dealing in sector, the proposed and approved number of projects is significantly lower than the level that is required by İzmir and for accelerating its technological development.

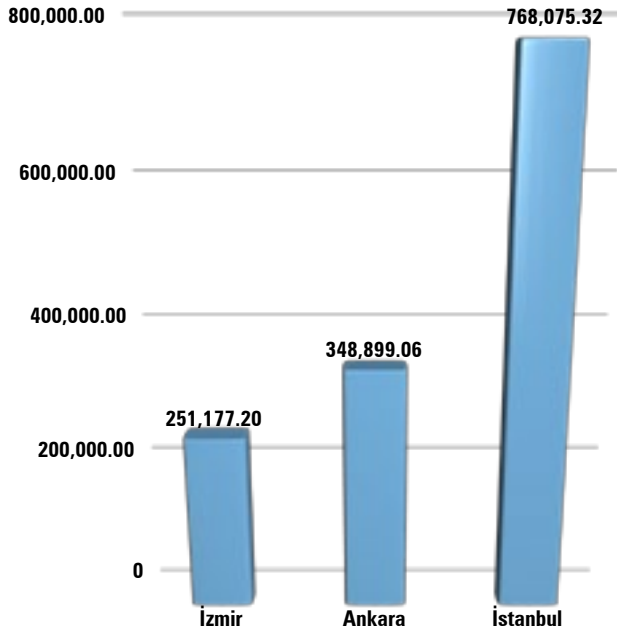
As is the case with scientific projects, the average budget per San-Tez Projects is also lower than other regions in İzmir (251,177.20 TL). Average budget is 348,899.06 TL in Ankara, and 768,075.32 TL in İstanbul (İzmir Regional R&D and Innovation Capacity Analysis). In addition to the infrastructure and opportunities, the fact that R&D and innovation activities' costs are lower than the other two major regions also constitutes an advantage for publicising İzmir as an R&D attraction centre and for providing branding to the province.

Turning Research into Scientific Papers

Outputs of research projects are scientific knowledge that is the most important input of R&D and innovation. One of the most important aims of researchers is their project results being published in international academic journals and the number of references.

Researchers in İzmir have produced a total of 7.6% (6,719 papers) of the overall papers produced in Turkey between years 2007 and 2010. Considering there are 7,240 active researchers in İzmir, it is observed that number of papers per researcher for the last four years is 0.9 in İzmir, which is also 0.9 in İstanbul and 0.8 in Ankara (İzmir Regional R&D and Innovation Capacity Analysis). This situation points out that our researchers display a lower performance than that in developed countries in knowledge generation -an important input of technology production- as is the case with project production. While this result may have different reasons at national scale, generation of academic knowledge should still be supported and encouraged in İzmir for newly produced knowledge will have significant contribution to increasing the technology production capability of İzmir.

Figure 11: Average Budget of San-Tez Projects (2007-2010)



Source: Ministry of Science, Industry and Technology

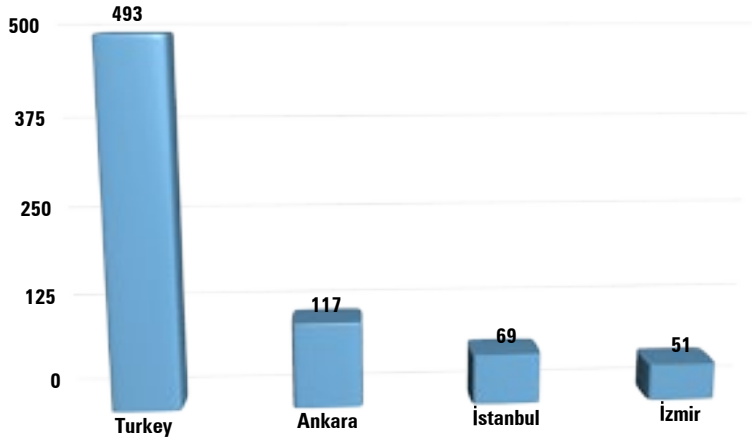
Turning Research into Patents

Patent is one of the R&D and innovation indicators of countries. And the most important source of patents is the projects produced and implemented. The number of patent applications is 51 and the number of approved patents has been 11 in İzmir during 2007-2010 period, while the same values have been respectively 69 and 28 İstanbul, and 117 and 22 for Ankara.

Considering the patent and utility model applications, the number per 1000 researchers on Turkey average is 6, which occurs to be 3.8 for İstanbul, 4.8 for Ankara and 7 for İzmir (İzmir Regional R&D and Innovation Capacity Analysis). Although İzmir displays a performance above that of Turkey regarding the number of patent applications per researcher, these numbers still show that researchers are unable to produce project towards practice or these project results could not be patented sufficiently. One of the reasons to this is that universities do not have sufficient information regarding industrial property rights. Only 25% of relevant departments in İzmir universities are knowledgeable in industrial property rights (Situational Analysis on R&D and Innovation Ecosystem in İzmir). These results point out that the researchers should be directed towards projects dominantly aimed at practice, and studies should be conducted towards developing new policies and methodologies for patenting project results.

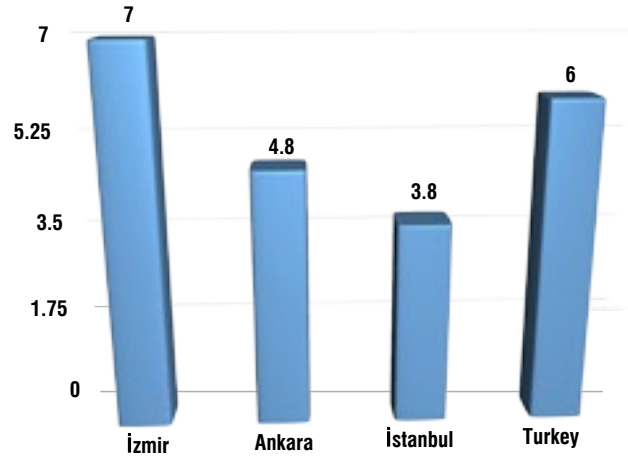
Considering the patent and utility model applications, the number per 1000 researchers on Turkey average is 6, which occurs to be 3.8 for İstanbul, 4.8 for Ankara while it is 7 for İzmir.

Figure 12: Distribution of Patent and Utility Model Applications Produced in Universities Per Region (2007-2010)



Source: Turkish Patent Institute

Figure 13: Number of Patents and Utility Models per 1000 Researchers (2007-2010)



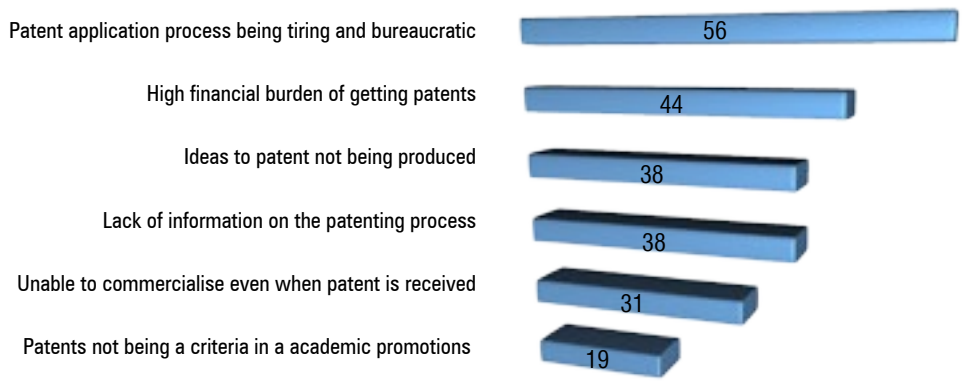
Source: Turkish Patent Institute and ARBİS

According to the study conducted, it is seen that the most important obstacles against the academicians getting patents are listed as; 64% - patent application process being tiring and bureaucratic, 44% - high financial burden of getting patents, 38% - ideas to patent not being produced and 38% - lack of information on the patenting process (Situational Analysis on R&D and Innovation Ecosystem in İzmir).

With project preparation and implementation, R&D and innovation, and industrial property rights trainings especially towards researchers, many more researchers may be encouraged to produce projects.

Directing researchers towards subjects that are important and strategic for İzmir shall contribute to the solution of existing problems and enable new sectors to develop in the region.

Figure 14: Obstacles against Universities Getting Patents (%)



Source: Status Quo Analysis on R&D and Innovation Ecosystem in İzmir

Evaluation

In conclusion, for increasing the innovation performance of İzmir it is necessary to create policies, strategies and mechanisms that shall enable creating opportunities towards developing the skills and knowledge of researchers, channelling these into inter-disciplinary research projects towards practice, supporting basic and practical research studies, encouraging knowledge and technology production along with protecting the produced knowledge with patent registration.

While the number of university-based enterprises (Spin-Off) and patents is significantly high in currently developed countries, this same value is observed to be very low in our country. In order to increase number of patents and to turn these patents into commercial products, first it is necessary to take certain measures and make regulations at national scale.

For İzmir to be able to compete stronger at national and international scale, it is necessary to make it a region where many researchers produce projects, and where these projects lead to patents and the patents turn into commercial products. To that purpose, it is vital to first increase the project preparation and production skills of researchers. Especially with project preparation and implementation, R&D and innovation, and industrial property rights trainings towards researchers, many more researchers may be encouraged to produce projects.

Directing researchers towards subjects that are important and strategic for İzmir shall contribute to the solution of existing problems and enable new sectors to grow in the region. Meeting such projects with industry shall tag along the production of higher added value products by enterprises.

1.2 INFRASTRUCTURE SUPPORTING R&D AND INNOVATION

1.2.1 Supporting Organisations and Services

For R&D and innovation activities to develop and rise to the desired level; it is necessary to provide a suitable environment, encourage and support efforts to that end, and most importantly to inform relevant institutions and organisations in an effective and correct manner to be included into these processes.

One of the most important aspects in innovation ecosystem is to provide awareness regarding innovation. Umbrella organisations comprised by industry representatives have important roles to play for raising this awareness.

There are numerous umbrella organisations in İzmir such as **chambers, stock markets, associations, unions, federations and OIZ administrations**. These institutions strive towards increasing the competitiveness of their members as a fundamental aim, along with the functions they employ within the framework of laws. In this context, one of the most important duties of these institutions is to raise R&D and innovation awareness among their members to have them to produce and sell more innovative and technological products.

For enterprises to achieve a more innovative structure, umbrella organisations' statuses regarding their communication capacity with the members, the supports provided, content and publicity of the supports, and their physical infrastructures play a definitive role.

In the study conducted it has been observed that the communication and publicity levels of umbrella organisations active in İzmir with their members is above average level (Situational Analysis on R&D and Innovation Ecosystem in İzmir). Communication, an important asset in creating the innovation atmosphere, is also a phenomenon triggering the development of different project topics between both enterprises and institutions.

While the cooperation of the umbrella organisations with universities in İzmir is at a certain level (60%), the organisations' cooperation and project designing level with their own member enterprises is considerably (35%) low (Situational Analysis on R&D and Innovation Ecosystem in İzmir).

It is necessary to raise the level of knowledge of the enterprises in İzmir regarding all stages of R&D and innovation process such as industrial property rights, project preparation and implementation, technology transfer and licensing.

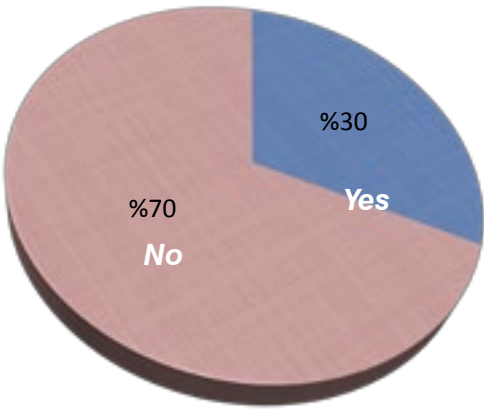
The obtained findings point out that the enterprises effectively follow their umbrella organisations and their activities. However, members to umbrella organisations have been found out not to have a strategy or policy to follow especially R&D and innovation activities. It is observed that only 30% of umbrella organisations have innovation policies where strategic innovation aims were stipulated, and 70% lack any such strategy or policy.

90% of the umbrella organisations have stated they do not have a system monitoring the innovation activities of their members, while 78% confessed have that they are in need of such a system. This is an important proof that the existing communication is a unilateral relation (Situational Analysis on R&D and Innovation Ecosystem in İzmir). Within the confines of this unilateral relation, activities of enterprises may not be monitored effectively, and necessary directing and expected impact may not be realised.

Another duty of umbrella organisations as supporting organisations to the innovation ecosystem is granting supports towards R&D and innovation. The support provided by umbrella organisations in İzmir to R&D and innovation efforts is first and foremost the support of "directing and informing" (Situational Analysis on R&D and Innovation Ecosystem in İzmir). While information support is the most common support, the fact that enterprises point out lack of information as one of the obstacles against innovation (İzmir Regional Innovation Strategy Field Survey) is an indicator of the need towards improving the quality of the educative services and information given at umbrella organisations and providing coordination.

Almost all of the umbrella organisations supporting R&D and innovation provide information and direction services, while only one institution provides information and support regarding access to financial resources such as risk capital vital to R&D and innovation (Situational Analysis on R&D and Innovation Ecosystem in İzmir). Considering the fact that 44% of the unfinished projects of enterprises in İzmir have been halted due to financial reasons, it may be seen that there is a certain necessity towards a new formation in İzmir (İzmir Regional Innovation Strategy Field Survey).

Figure 15: Existence of an Innovation Policy and Strategy



Source: Status Quo Analysis on R&D and Innovation Ecosystem in İzmir

For innovation to be embraced as a common way of business life in İzmir, it is necessary to sufficiently inform the enterprises in İzmir regarding all stages of R&D and innovation process such as industrial property rights, project preparation and implementation, technology transfer and licensing. However, the findings

point out that the umbrella organisations in İzmir are not effective enough in such issues (Situational Analysis on R&D and Innovation Ecosystem in İzmir).

Evaluation

Umbrella organisations where establishments such as* chambers, stock markets, associations, unions, federations and OIZ administrations *come together to organise outstand within the innovation ecosystem with the services they provide to enterprises in terms of R&D and innovation. These institutions strive towards increasing the competitiveness of their members as a fundamental aim, along with the functions they employ within the framework of laws. In this context, one of the most important duties of these institutions is to raise R&D and innovation awareness among their members to have them to produce and sell more innovative and technological products.

It is vital for umbrella organisations to provide support in terms of information, education, awareness raising, project preparation, forming cooperation, monitoring, strategy creation on R&D and innovation to member enterprises. The services provided by umbrella organisations regarding these fields in İzmir should be developed. It shall also be appropriate to increase the capacity of such organisations in the abovementioned fields.

It is also important for the individuals and institutions providing consultancy services in this area to be expert and qualified for realising effectively and correctly informing enterprises and umbrella organisations. Training and accreditation of the individuals and institutions providing consultancy services shall provide greater success to enterprises through improving the quality of the information, direction, project preparation and production services provided to enterprises and umbrella organisations.

1.2.2 Financial Supports Towards R&D and Innovation

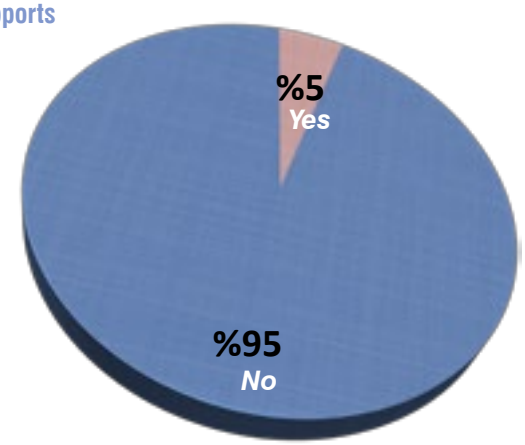
Lack of an established risk capital in İzmir disrupts the financial component towards innovation.

R&D and innovation activities require long term and comprehensive financial resources depending on their topics. In regions and countries where no financial support mechanisms exist, it is not possible for a technological product to be developed and produced. Lack of an established risk capital in İzmir disrupts the financial component of innovation.

TÜBİTAK-TEYDEB, TTGV, KOSGEB, Ministry of Science Industry and Technology San-Tez Programme and İZKA provide financial support to R&D and innovation project prepared and implemented by enterprises -SMEs coming foremost- by themselves and/or in cooperation with universities (İzmir Regional R&D and Innovation Capacity Analysis).

In the study, umbrella organisations have pointed out that such public supports towards R&D and innovation are partially accessible and effective, while 95% of these institutions stated that their own members may not benefit effectively from said supports (Situational Analysis on R&D and Innovation Ecosystem in İzmir). This finding has been confirmed with the field survey, as it was seen that very few enterprises actually benefitted from R&D and innovation supports.

Figure 16: Rate of Benefitting Effectively from Public Supports



Source: Status Quo Analysis on R&D and Innovation Ecosystem in İzmir

Approximately 41% of the enterprises in İzmir fund their R&D and innovation projects with their own shareholder's equities. This high rate points out to the trust of enterprises towards R&D and innovation along with the support and emphasis given to innovation projects by enterprise executives.

13% of the enterprises receiving financial support have gotten it from central public institutions/organisations, 4% from local or regional public institutions, and 0.1% from EU institutions. 7% of the enterprises receiving support from central public institutions/organisations have gotten it from KOSGEB, 5% from TÜBİTAK-TEYDEB, 1% from Ministry of Industry-SANTEZ, 0.4% from TTGV and %0.5 from other institutions/ organisations. Also, the data obtained show that some enterprises have received support from more than one central public institutions/organizations (İzmir Regional Innovation Strategy Field Survey).

58% of the enterprises strive to provide not only financial but also high level immaterial support to their innovation projects. Also, 60% of the enterprises have stated that they have the projects be embraced by all executives and employees, and 58% have stated that they have the project be implemented in line with the aims by making the necessary research prior to the project. These results point to the level of project management and the fact that enterprises in İzmir have a positive view on innovation projects (İzmir Regional Innovation Strategy Field Survey).

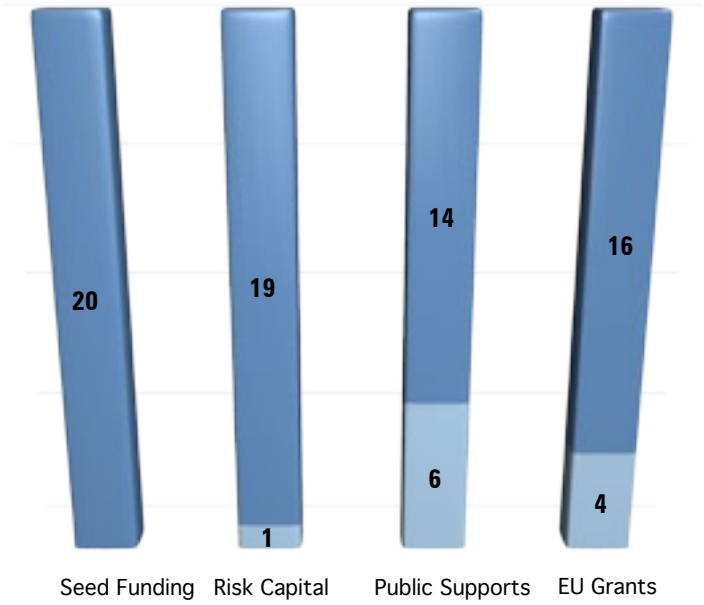
Organisations within innovation ecosystem have evaluated the reasons for enterprises not being able to benefit from public supports per priority as below (Situational Analysis on R&D and Innovation Ecosystem in İzmir);

- Lack of information/awareness,
- Lack of project preparation skills,
- Hesitation due to excess bureaucracy,
- Lack of direction,
- Lack of providing co-financing.

It shall be made possible for enterprises in İzmir to benefit more from funds. the rate of financially supported enterprises' R&D and innovation efforts being inconclusive is low and number of patent applications is high compared to unsupported enterprises

Studies to be made towards eliminating the abovementioned deficiencies shall increase access to funding resources, enabling enterprises to realise projects with new and different topics and scales. As a matter of fact, the rate of financially supported enterprises' R&D and innovation efforts being inconclusive is low and number of patent applications is high compared to unsupported enterprises. As of year 2010, number of average patent applications of financially supported enterprises occurred to be 0.27, while the same value was 0.12 for unsupported enterprises. Similarly, inconclusive R&D and innovation activities correspond to 76% of the projects in unsupported enterprises while this value happened to be 24% in supported enterpri-

Figure 17: Financial and Directional Support on R&D and Innovation (2011)



Source: Status Quo Analysis on R&D and Innovation Ecosystem in İzmir

ses (İzmir Regional Innovation Strategy Field Survey).

In addition to the inadequacy of institutions providing financial support, the number of institutions providing information support in this regard to enterprises in İzmir is also considerably low. None of the total 20 umbrella organisations provide information and support regarding seed funding, only 1 provides information and access support on risk capital, while 4 organisations provide information on EU grants and 5 organisations provide information on public supports (Situational Analysis on R&D and Innovation Ecosystem in İzmir).

Another important funding resource for research projects is EU funds. Although there are many different and effective programmes on R&D and innovation at national scale, it has been observed that the institutions and organisations in İzmir may not benefit from such supports at the desired level (99.8%) (İzmir Regional Innovation Strategy Field Survey).

Evaluation

The rate of enterprises benefitting from regional, national and international funds for R&D and innovation is at a low level. For increasing the rate of benefitting from such supports, it is necessary to create more effective and purpose-oriented support programmes for enterprises.

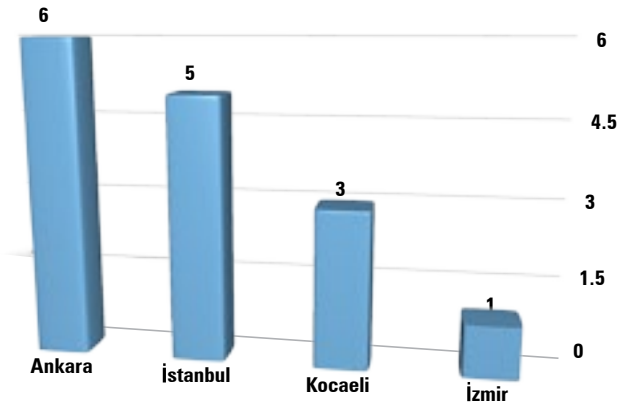
Increasing the level of support currently provided by umbrella organisations and enriching their contents shall increase the innovation capacity of the enterprises, thus creating improvement in the use of such funds.

1.2.3 Innovation Centres

For regional innovation movement, special physical spaces, where R&D and innovation activities may be carried out effectively and in line with purpose, are also required along with the financial support received from relevant institutions and organisations. Places such as technoparks, science parks, business incubation centres come foremost among these physical spaces. Such spaces constitute one of the most important resources of innovation with the enterprises and entrepreneur housed within. Therefore, it is necessary for such places to be established in compliance to the region's needs in terms of both quality and quantity.

There are only 8 R&D Centres in İzmir which put 50 enterprises into the list of top 500 industrial establishments of Turkey. The number of these centres should be increased.

Figure 18: Number of Technology Development Zones per Region (2010)



(Note: Inactive TDZs are included.)

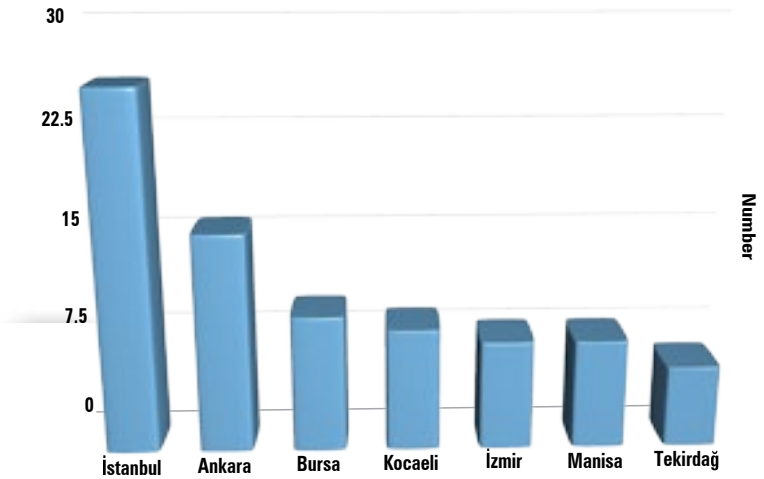
İzmir Technology Development Zone (İZTEKGEB), KOSGEB-TEKMERs, R&D Centres established within the context of support received from the Ministry of Science, Industry and Technology, and other enterprises producing technology with government R&D support come at the top of the innovation centres in İzmir (İzmir Regional R&D and Innovation Capacity Analysis).

It has been observed that the enterprises functioning in İZTEKGEB and TEKMERs are among the most innovative enterprises of İzmir (İzmir Regional Innovation Strategy Field Survey) and the importance of the units in question have thus been found out again for the innovation future of İzmir with this aspect of theirs. Developing the infrastructure of İZTEKGEB is of vital importance for İzmir. However, considering the existing industry and academician infrastructure of İzmir, it may also be seen that new, specialised technology development centres are also required (İzmir Regional R&D and Innovation Capacity Analysis, Situational Analysis on R&D and Innovation Ecosystem in İzmir).

KOSGEB-TEKMERs established within KOSGEB Southern Service Centre and in the campuses of Ege and Dokuz Eylül Universities house innovative and creative enterprises. Developing the physical conditions of these centres shall benefit İzmir especially regarding attracting creative young people to the region.

There are 8 R&D Centres founded in İzmir with the support of the Ministry of Science Industry and Technology as per the Law on Supporting the Research and Development Activities no. 5746 as of year 2010. With this value, İzmir ranks at the fourth place following İstanbul, Ankara, Bursa and Kocaeli (İzmir Regional R&D and Innovation Capacity Analysis). It would be expected to be more R&D centres in İzmir which put 50 enterprises into the list of top 500 industrial establishments of Turkey.

Figure 19: Distribution of R&D Centres per Province (2011)



Source: Ministry of Science, Industry and Technology

According to the study, enterprises that have R&D Centres are more innovative and employ more qualified personnel compared to those which do not have (İzmir Regional Innovation Strategy Field Survey). Because the main duty of these centres is producing R&D and innovation projects, increasing their numbers shall contribute significantly to improving the innovation level of İzmir. Therefore, it shall be beneficial to create support and incentive mechanisms towards establishing new R&D Centres.

R&D Centres within context of the Ministry of Science, Industry and Technology may only be founded by large scale enterprises. The rate of small and medium scale enterprises employing independent R&D units within their bodies is around 15% (İzmir Regional Innovation Strategy Field Survey). Enterprises in İzmir mostly comprise of SMEs. R&D units to be established within these enterprises and the engineers

and experts to be employed within these units shall accelerate the innovation works of both their own enterprises and entire İzmir. 78% of entire doctorate personnel in İzmir are employed in enterprises with R&D units, and 22% are employed in enterprises without R&D units. Also, the total turnovers of enterprises with R&D units are significantly higher than that of enterprises without R&D units (İzmir Regional Innovation Strategy Field Survey).

As was expected, the study has pointed out that enterprises with R&D units are more innovative, employ more qualified personnel and have higher profit rates compared to those that are not innovative like them (İzmir Regional Innovation Strategy Field Survey). These findings also show the importance of R&D units. For enterprises that are unable to create their own R&D units, it may be suggested to develop new products and services by cooperating with universities and/or other R&D institutions and organisations, or to cooperate with other enterprises towards establishing "Mutual R&D Centres" on pre-competition subjects.

R&D units to be established within SMEs and the engineers and experts to be employed within these units shall accelerate the innovation works of both their own enterprises and entire region.

Evaluation

In conclusion, İzmir is not at the level it needs to be in both quantitative and qualitative terms regarding innovation centres. Improving the technical and physical conditions of existing centres and founding new ones shall contribute to the innovation activities to achieve higher levels and approaching the aim of "a province that does not only imports and uses technology but also produces and exports technology".

1.2.4 Interface Organisations

Existence of organisations functioning towards the aim of bringing together information and implementation is a significant necessity for the development of technology in a region and country. These units that support especially to the process of knowledge produced in universities being submitted to industry for implementation and then to the society as a product are inseparable parts of the innovation ecosystem. In an environment where these organisations do not exist and/or lack necessary skills and infrastructure, it is hard for innovation activities to thrive. In present day, these interface organisations function under different names such as University-Industry Cooperation Centres, Industrial Cooperation Offices, Technology Transfer Offices and Knowledge Licensing Offices.

4 out of 9 universities in İzmir have an interface organisation to provide cooperation with the industry (İzmir Regional R&D and Innovation Capacity Analysis, Situational Analysis on R&D and Innovation Ecosystem in İzmir). In addition to eliminating the infrastructure and superstructure deficiencies of the existing interface organisations, these organisations providing services also to other universities with the cooperation and coordination they will create between themselves in short and medium term shall provide contribution to the issue at hand. And in the long term, establishment of new interface centres in universities that lack them shall improve the currently weak cooperation level between university and industry in İzmir (İzmir Regional Innovation Strategy Field Survey).

Inadequacy of university-industry cooperation mechanisms prevents the formation of mutual project ideas between enterprises and universities. As of now, only 5% of all projects produced within the industry in İzmir are pointed out to have their origins of idea as universities (İzmir Regional Innovation Strategy Field Survey).

Interface organisations shall not only contribute to the transfer of produced ideas but also to the production of new ideas and projects. With supports given by these organisations regarding issues such as R&D, innovation, industrial property rights and project preparation/implementation, researchers shall be encouraged to produce more projects, contributing to increase in the number of projects per researcher (İzmir Regional R&D and Innovation Capacity Analysis). As a chain reaction, increasing the number of projects shall lead to an increase of university-origin patents and thus positively affect the number of spin-off enterprises and commercialised projects.

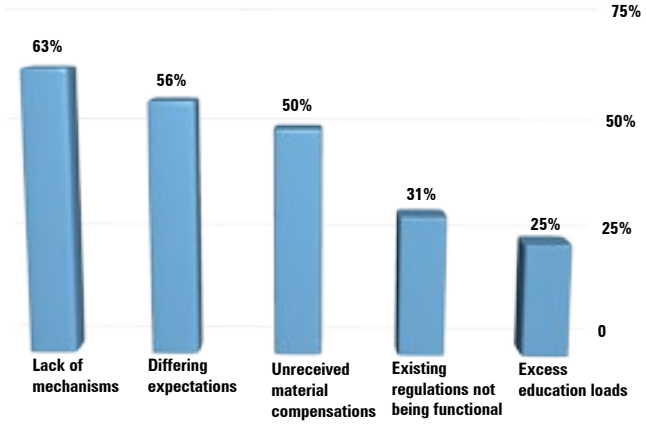
In conclusion, developing interface both quantitatively and qualitatively shall provide positive results by shortening the meeting period of knowledge produced in universities with the industry.

However, universities list the lack of mechanisms encouraging and supporting such a cooperation by 63%, expectations differing between industry and university by 56% and not receiving the material compensation deserved after cooperation with industry by 50% as top obstacles against the cooperation between universities and industry (Situational Analysis on R&D and Innovation Ecosystem in İzmir).

In addition to eliminating the infrastructure and superstructure deficiencies of the existing interface organisations, it is also necessary to improve the cooperation between them.

Interface organisations should not only contribute to the transfer of produced ideas but also to the production of new ideas and projects.

Figure 20: Obstacles against the Cooperation between University and Industry (%)



Source: Status Quo Analysis on R&D and Innovation Ecosystem in İzmir

For the technological development of İzmir, a new cooperation between university and industry should be realised towards the production of new, technological, high added value products.

Therefore, merely founding interface organisations will not be enough for activating the university-industry cooperation potential. Different mechanisms should be established towards encouraging both sides towards cooperation.

In the study conducted among the researchers in İzmir, 3 most effective aspects for encouraging researchers towards cooperation with industry were listed respectively as; material compensation for efforts being received (69%), cooperation efforts contributing to academic promotions (63%) and assigning higher supports to projects done with industry (50%) (Situational Analysis on R&D and Innovation Ecosystem in İzmir).

Considering the characteristics of the projects carried out by industry and university, it is observed that cooperations based on test and analysis services and solution of a certain problem are dominant (İzmir Regional Innovation Strategy Field Survey, Situational Analysis on R&D and Innovation Ecosystem in İzmir). It becomes obvious that a new cooperation level between university and industry should be achieved towards the production of new, technological, high added value products for the sake of the technological development of İzmir. As of now, the ratios of enterprises producing new goods and/or services (25%) and enterprises producing high added value products (19%) are not at sufficient levels in İzmir (İzmir Regional Innovation Strategy Field Survey).

Evaluation

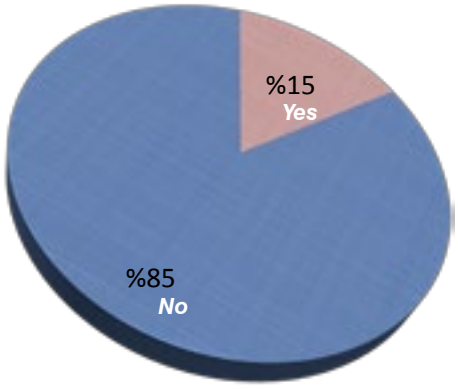
In conclusion, in addition to from activities aimed at increasing the servicing quality of existing interface organisations in İzmir, preparations towards founding new units should be started and support mechanisms should be established. An effective coordination should be started among these organizations and the communication with umbrella organisations should be developed. Sustainable relations should be established between zones where enterprises are clustered –especially OIZs– and interface organisations, and interface organisations should be constantly publicised to enterprises. Education and national/international practical training programmes should be designed for the experts to be employed in such organisations.

1.3 EXISTING SITUATION OF INNOVATION IN PRIVATE SECTOR

1.3.1 Innovation Status in Enterprises

Activities of enterprises are at the top of the aspects affecting economical development directly and from various channels. There is a direct correlation between the commercial performance of enterprises and the economical indicators of regions and countries. The firs rule of becoming a region and country that develops successful and new technologies in the innovation ecosystem and produces technology is housing enterprises with high innovation levels. In this section, innovation levels of enterprises is discussed in the context of various indicators.

Figure 21: Existence of R&D Departments



Source: İzmir Regional Innovation Strategy Field Survey

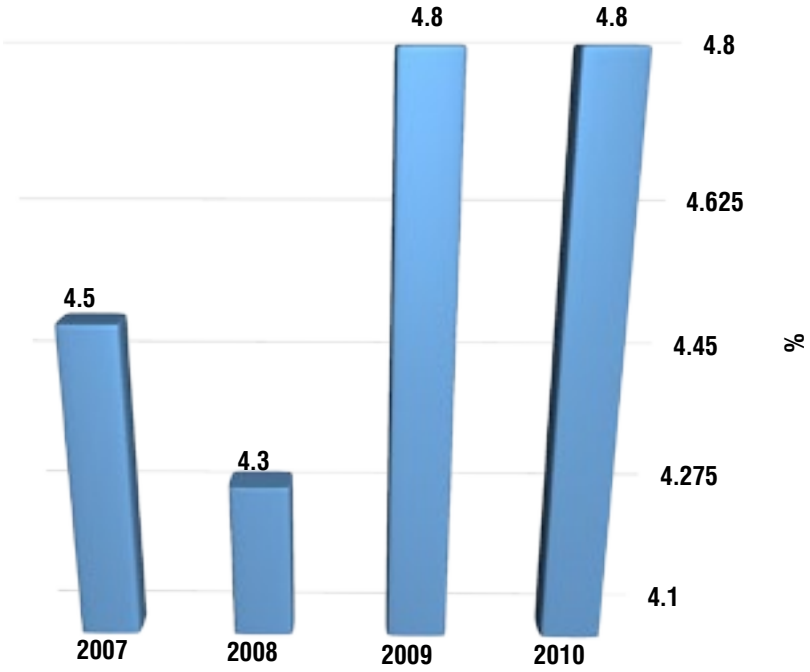
R&D Units

Innovation level of enterprises may be measured with different indicators. The most fundamental among these indicators is the existence of R&D units. An independent R&D unit within enterprise body shall increase the innovation level of the enterprise, therefore of the country, with the R&D and innovation activities it will conduct. The ratio of enterprises with their own R&D departments is at a considerably low level of 15% in İzmir (İzmir Regional Innovation Strategy Field Survey). This result points out to the fact that a significant portion of the enterprises in İzmir do not conduct R&D activities or only carry out R&D and innovation projects at certain times without changing their organisational structure.

Share Allocated for R&D

Establishing R&D units (departments) is not by itself a sufficient condition for being able to create successful R&D projects. The size and continuity of the share allocated for R&D activities is another important indicator. The share allocated from turnovers by enterprises in İzmir to their R&D activities occurred to be 4.5% in year 2007, 4.3% in year 2008 and 4.8% in years 2009 and 2010. Four-year average of the share allocated to R&D from turnovers is 4.6%. In the same period, a total annual average of 824,772 Euros was

Figure 22: Share Allocated for R&D (%)



Source: İzmir Regional Innovation Strategy Field Survey

spent by enterprises for R&D activities (İzmir Regional Innovation Strategy Field Survey). However, no measurement or monitoring is done at regional scale on the effectiveness of these R&D expenditures. Performance measurement of R&D units in terms of quantitative indicators to be determined, and creating mechanisms for further encouragement of successful R&D units shall provide effectiveness increase to these units.

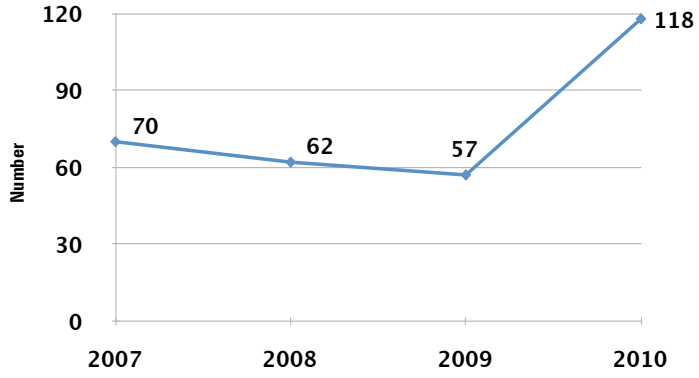
The share allocated from turnovers by enterprises in İzmir to their R&D activities occurred to be 4.5% in year 2007, 4.3% in year 2008 and 4.8% in years 2009 and 2010. In the same period, a total annual average of 824,772 Euros was spent by enterprises for R&D activities

Patent Applications

Although the share allocated by enterprises to R&D encourages hope for the future, production of high added value products is expected at the end of these activities. One of the most important outputs of R&D studies are patents produced. It has been determined that 790 enterprises visited in the context of the field survey made a total of 307 patent applications during the period of 2007-2010. According to this, it had been necessary for enterprises to spend an average of 10,746 Euro R&D expenditure to create 1 patent in İzmir (İzmir Regional Innovation Strategy Field Survey).

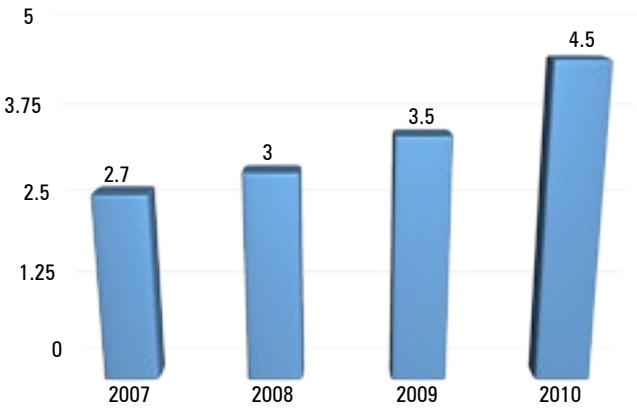
When the total number of enterprises and the number of proposed patents in İzmir are compared, it is seen that the number of patents remain significantly behind the number of enterprises. Although this has various reasons, among the top reasons come the level of innovation of the projects realised by enterprises being low and/or a very limited number of enterprises carrying out R&D and innovation activities (İzmir Regional Innovation Strategy Field Survey). In the field survey made, it has been observed that only 5% of all enterprises produced radical innovations (İzmir Regional Innovation Strategy Field Survey).

Figure 23: Number of Patent Applications per Year in Innovative Sectors of İzmir



Source: İzmir Regional Innovation Strategy Field Survey

Figure 24: The Ratio of R&D Personnel within Overall Number of Employees (2011)



Source: İzmir Regional Innovation Strategy Field Survey

Human Resource

Another one of the important innovation indicators due to making enterprises more innovative is the number of R&D personnel. The ratio of people employed in the R&D departments within overall employees in the enterprises of İzmir occurred to be 2.7% in year 2007, which rose to 3% in 2007, 3.5% in 2009 and 4.5% in 2010. This constantly increasing ratio has born the result of increased number of patents and higher turnover for enterprises.

The ratio of people employed in the R&D departments within overall employees in the enterprises of İzmir occurred to be 2.7% in year 2007, which rose to 3% in 2007, 3.5% in 2009 and 4.5% in 2010

Therefore, it is seen that enterprises carrying out innovation activities by allocating more resources makes a positive impact also on commercial performance, as was expected (İzmir Regional Innovation Strategy Field Survey).

Table 7: R&D and Innovation Indicators of Enterprises

Year	Share Allocated to R&D (%)	Ratio of R&D Personnel (%)	New Goods (Total)	New Services (Total)	Patent Applications (Total)
2007	4.5	2.7	344	72	70
2008	4.3	3.0	495	139	62
2009	4.8	3.5	627	189	57
2010	4.8	4.5	873	272	118

Source: İzmir Regional Innovation Strategy Field Survey

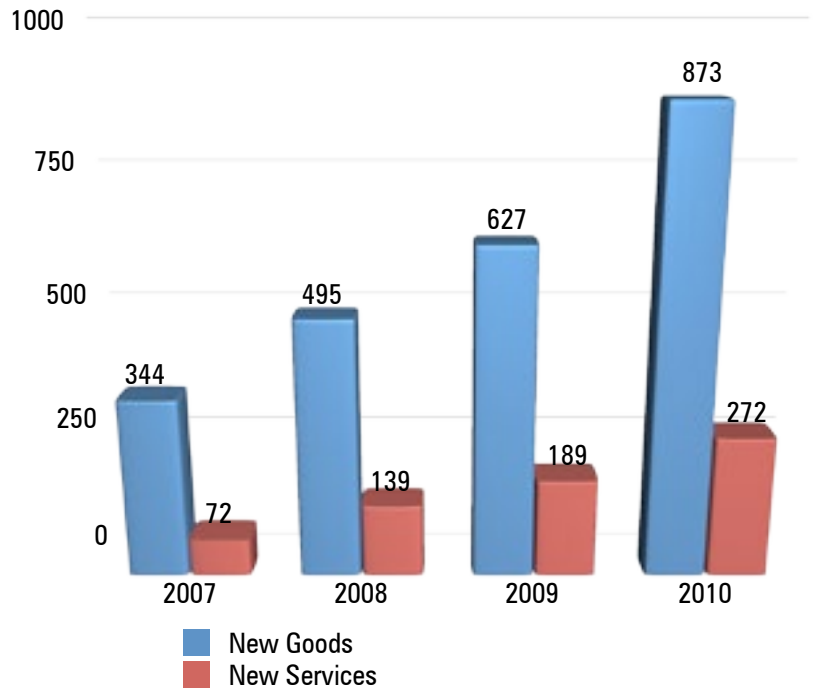
It has been observed that while during the 2007-2010 period the number of total employees displayed declines in some years, the number of R&D personnel did not decrease (İzmir Regional Innovation Strategy Field Survey), even increased on the spite. This finding is hope encouraging due to showing the determination of enterprises in İzmir towards R&D and innovation.

The obtained findings points out to the necessity of enterprises allocating more resources to R&D and innovation activities and employing more R&D personnel in order to strengthen R&D and innovation efforts. Employing people trained and experienced in issues such as R&D, innovation and project management shall enable enterprises in İzmir to create more projects, leading to more innovation outputs and economical success. Enterprises employing engineers who completed doctorate degrees on their products and activities especially in R&D and innovation units shall increase the number of projects along with making a positive effect on project results.

Enterprises employing engineers who completed doctorate degrees on their products and activities especially in R&D and innovation units shall increase the number of successfully implemented projects.

The total number of doctorate degree personnel employed in the prioritised sectors og İzmir is 45 as of year 2010. Considering that the total number of employed R&D personnel is 1,101 as of year 2010, it is observed that the ratio of doctorate degree personnel within overall R&D personnel is 4% (İzmir Regional Innovation Strategy Field Survey). Efforts towards increasing this rate such as encouraging the industry towards employment of doctorate degree personnel and universalizing programmes towards training doctorate degree personnel able to meet industry's demands shall realise efficient use of qualified human resource, and contribute to stopping the brain drain and making İzmir a centre of attraction for qualified labour force. According to the research, employment of doctorate degree personnel is concentrated in enterprises with their own R&D departments. In this context, the abovementioned policies should be implemented along with the policies aimed at supporting the establishment of R&D units in enterprises.

Figure 25: New Goods and New Services Produced



Source: İzmir Regional Innovation Strategy Field Survey

Production of New Goods and Services

Another one of the most important aims of innovative enterprises is to produce high added value goods and services that do not exist and do not have a substitute in the market. To that purpose, new ideas are constantly developed, new projects are prepared and implemented. It has been observed that the enterprises in İzmir created a total of 2,339 new or significantly improved goods and 672 new services between years 2007 and 2010 (İzmir Regional Innovation Strategy Field Survey). Enterprises should be encouraged and supported towards that end in order to create and spread innovation economy in the region and country.

Approximately 9% of all enterprises in İzmir declared the products they produce definitely do not have another competition/substitute. In the same study, it has been determined that enterprises use respectively price, product quality and delivery on time aspects as the most effective means in competition, and innovativeness is among the last means they use in competition (İzmir Regional Innovation Strategy Field Survey). This finding points out that a large portion of products produced by enterprises have competitors in the market, which reduces profit margin per product for the enterprises.

The low rate of enterprises developing new goods and/or services in İzmir (25%) also constitutes an adverse situation regarding the innovation future of İzmir (İzmir Regional Innovation Strategy Field Survey). However, the gradual increase of these numbers per years encourages hope. Especially young enterprises develop more new goods and services (İzmir Regional Innovation Strategy Field Survey). Encouraging the establishment of enterprises that have projects aimed towards innovative products and services shall improve the innovation level of İzmir.

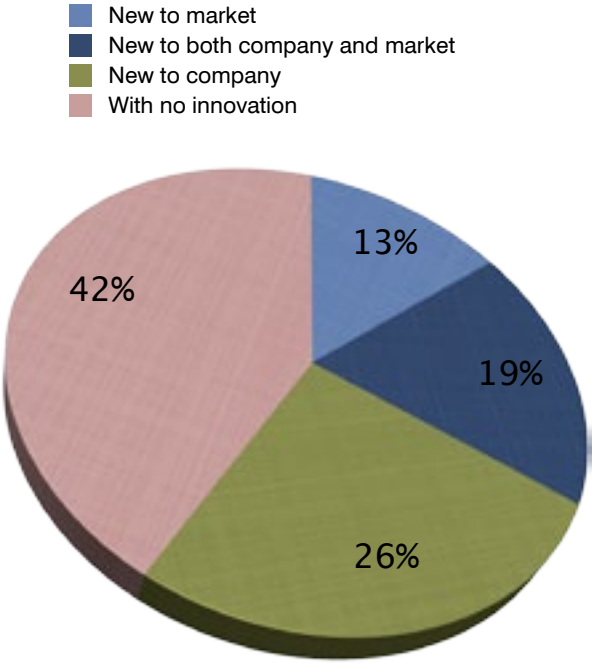
The aim of R&D and innovation activities is to realise the production of goods and services that may be of high added value and create a demand in the market. The share of high added value products within overall turnover is at a considerably low level in İzmir. The share of innovative products (products that are new for both the company and the market) within overall turnover is 19%, while the same value is 13% for products new to the market 13%, 26% for products new to the company, and 42% for products without innovation (İzmir Regional Innovation Strategy Field Survey). In order to develop such goods and services, inter-disciplinary studies, significant financial resources, long periods and an innovative ecosystem where all partners work in synergy and coordination.

Evaluation

When examined in terms of innovation indicators, it is observed that İzmir is not exactly at an innovative level but is moving towards a better level through time with the individual efforts of enterprises. For this development to gain continuity and to accelerate, these indicators have to be regularly compiled and evaluated, and necessary measures and support mechanisms have to be developed in compliance to the obtained results.

Creating R&D units in enterprises should be encouraged and different mechanisms should be developed towards effective functioning of these units. Enterprises should be informed of new opportunities on different fields, leading them to different products with new technologies. To that end, different project proposals announced at both our country's universities and at international scale should be publicised and notified to enterprises. Especially entrepreneurs with projects should be supported depending on the qualities of projects and foundation of project-based enterprises should be realised.

Figure 26: Share of Innovative Goods and Services within Overall Turnover



Source: İzmir Regional Innovation Strategy Field Survey

The share of innovative products within overall turnover is 19%. In order to improve this value, inter-disciplinary studies, significant financial resources and an effective innovative ecosystem.

1.3.2 Quality of the Innovation Made in Enterprises

The most important aim of R&D and innovation efforts is to have enterprises develop new and innovative goods and services that will provide competitive advantage. In addition to this, innovation activities are also carried out towards developing and improving existing products. In this section, qualitative rather than quantitative aspects of innovation done by enterprises shall be discussed.

Radical – Incremental Innovation

When the largest enterprises of present day are examined, it is observed that one of the most important common features of these is the emphasis they place on R&D and innovation. The size and frequency of the innovation activities conducted is significantly important regarding the economical performance of enterprises. Innovation projects conducted with larger budgets and R&D personnel towards producing a brand new product or service have always been the aim of enterprises, but only those enterprises with economical power have been successful in this aspect. Efforts made by allocating sufficient financial resources and personnel to R&D and innovation activities make it possible for more **radical innovations** to emerge. Radical innovations realise the production of products with higher added value and constitute the type of innovation that is needed both at national scale and at İzmir.

In the field survey conducted, it has been determined that a major portion of the innovation projects done in İzmir do not contain any radical innovation. Only 25% of all enterprises deal in innovation activities, and only 5% include radical innovations (İzmir Regional Innovation Strategy Field Survey). Increasing the number of enterprises producing radical innovation and the number of such projects shall accelerate the development of new goods and services in İzmir.

Only 25% of all enterprises deal in innovation activities. Only 5% of the innovation activities include radical innovations. Increasing the number of enterprises producing radical innovation and the number of such projects shall accelerate the development of new goods and services in İzmir

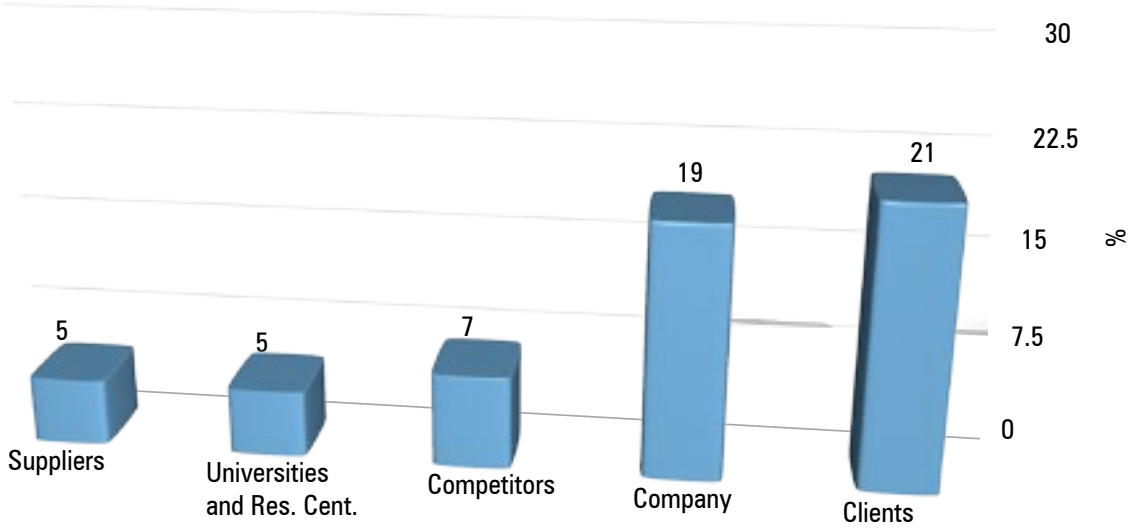
One of the reasons why enterprises dealing in innovative efforts produce incremental innovation rather than radical innovation is the lack of financial resources, while another is lack of technical information. The most important reason (44%) behind the enterprises' R&D and innovation projects not being able to be completed in İzmir is lack of equity capitals (İzmir Regional Innovation Strategy Field Survey). This result points out that the enterprises in İzmir fund an important portion of their R&D and innovation activities by their own equity capitals. It is hard to meet the high amount of financial resources required for a project including radical innovation only with the equity capital.

Open – Closed Innovation Model

It is observed that enterprises successful in innovation efforts implement *Open Innovation* model (Chesbrough, 2003). According to this model, enterprises should use not only their own employees but also their commercial partners and universities for achieving innovative ideas.

In the conducted study, it has been revealed that only 7% of the enterprises in İzmir use open innovation model, and a large part of them do not cooperate with their suppliers, clients and competitors within R&D and innovation processes (İzmir Regional Innovation Strategy Field Survey). Hence, it may be said that the enterprises in İzmir implement *Closed Innovation* model.

: The Origin of R&D and Innovation in Enterprises



Source: İzmir Regional Innovation Strategy Field Survey

Approximately 21% of the enterprises in İzmir pointed out their clients as the origin of their innovative ideas (İzmir Regional Innovation Strategy Field Survey). This result shows that the innovation activities of enterprises in İzmir are demand-based. The second most used innovation origin has been observed to be the enterprises' own employees and units (19%). Suppliers, competitors and universities have an approximate share of 5% regarding achieving innovative ideas (İzmir Regional Innovation Strategy Field Survey). All these results show that İzmir did not yet move to Open Innovation model and that Closed Innovation model is still dominantly in effect.

For producing radical innovation, access of enterprises to different knowledge bases should be accelerated and new sources of knowledgeshould be opened. To that end, enterprises in İzmir should be encouraged to move on to open innovation model.

Another proof of enterprises implementing closed innovation model is the low level of cooperation with universities. Only 19% of the enterprises have indicated that they cooperated with universities on R&D and innovation projects, and the most common aim of such cooperation is, respectively, increasing the quality of existing products, test and analysis services and student based cooperation. Cooperation purely based on developing a new product with universities is a priority finding a place at the fourth place in that list (İzmir Regional Innovation Strategy Field Survey).

Enterprises in İzmir should be encouraged to move on from Closed Innovation model to Open Innovation model that provides more effective flow of information and cooperation.

In İzmir, enterprises dominantly realise product innovation. 14% of enterprises conduct R&D and innovation projects for producing and developing new goods, while only 5% develop projects for producing new services. The services sector in İzmir should be developed and innovations should be realised also in this field. Developing new services shall provide development not only to the services sector but also manufacturing sector along with it.

It is important to produce innovation also in the services sector in İzmir. Development of new services shall contribute not only to the development of services sector but also manufacturing sector along with it.

Evaluation

In addition to the number of enterprises dealing in innovation being low, the innovations realised containing incremental innovation rather than radical innovation also is one of the obstacles against İzmir becoming a region producing high added value products. Also, enterprises mostly realising innovation on products caused fewer realisations of services innovation. Within R&D and innovation processes, enterprises should implement the Open Innovation Model with which they are in more cooperation with their suppliers, clients and competitors.

1.3.3 Competitiveness of Enterprises

Enterprises where R&D and innovation works are carried out intensively are generally leader in their field or followers close to the leader. Resources they allocate to R&D and innovation make it possible for them to develop new products, to register their patents and thus become authorised to produce the product in question within the sector. In that sense, innovation is the most important tool towards increasing both the commercial performance and the competitiveness of enterprises.

Innovation as an Aspect of Competition

It has been determined a major part of the enterprises in İzmir produce and market goods and services that have similar or substitute products in the market (İzmir Regional Innovation Strategy Field Survey). Enterprises producing insufficient R&D and innovation are not the only reason of that; it is also because they do not sufficiently protect the products they produced in result of their R&D and innovation activities with patents. This situation causes the property rights of the products -produced through their own studies- by others, thus reducing competitiveness of enterprises.

Another important tool towards competition besides quality is the “delivery time” of the products (İzmir Regional Innovation Strategy Field Survey). Especially the existence of relatively developed logistics establishments and presence of an effective railroad, maritime and airways system in İzmir have brought a significant competition advantage to enterprises in İzmir. Also, the geographical proximity of İzmir to Europe, Asia, Africa and Middle East countries shortens the delivery time of products. These superiorities of İzmir should be publicised for attracting international enterprises to invest in the region.

Another important tool for enterprises in competition is “product price” (İzmir Regional Innovation Strategy Field Survey). Competition made over price shall bear the result of enterprises not achieving the commercial performance they expect. Such enterprises are generally those who do not deal in R&D and innovation activities.

Because most innovation projects of enterprises do not contain radical innovation, only 30% of all enterprises in İzmir have aimed to become leader in technology production and only 28% have succeeded in subjects such as launching new goods and services to the market and producing technology (İzmir Regional Innovation Strategy Field Survey).

Design skills of enterprises are not at a level to provide a competition advantage to them (İzmir Regional Innovation Strategy Field Survey). This lack of qualification in enterprises create an adverse situation regarding competition, bringing up yet another topic on which projects should be produced. Industrial Design department that provide education in two universities in İzmir is a significant opportunity for the future of business market. Cooperation between these departments and industry should be both developed at student scale and at researcher scale, and pilot implementations should be realised in this regard.

Merely directing enterprises to R&D studies is not sufficient for getting the desired results. The important thing is to realise effective R&D and innovation projects in a purpose-oriented manner with correct tools and equipment. Only 6% of all enterprises got utterly satisfied with the results compared to their allocated resources while it has been observed that allocated resources failed to meet the expected performance in 94% of the enterprises (İzmir Regional Innovation Strategy Field Survey).

To that end, enterprises should be trained and directed in regards to preparing and implementing R&D and innovation projects. It has been observed that enterprises received supports on R&D and innovation project preparation, benefitting from financial resources, project creation and implementation from consultancy firms instead of universities. Training personnel of the firms and units providing R&D consultancy, increasing their qualifications and thus service qualities shall increase the effectiveness and success of projects.

Evaluation

The fact that enterprises in İzmir established their competitiveness on aspects such as quality, product delivery time and price instead of R&D and innovation shall not provide a long term competitive advantage to the enterprises in İzmir. Therefore, new methodologies should be developed towards increasing the competitiveness of İzmir, directing enterprises to R&D and innovation and encouraging the production of niche products. The Industrial Design departments in the region present an opportunity for developing the design skills of enterprises up to a level able to provide a competitive advantage. Increase in the R&D and innovation capacity shall also bring along competitiveness. For achieving that purpose, enterprises should be trained and directed towards creating and managing R&D and innovation projects. Providing sufficient amount of protection with patents for products obtained through studies is also of importance regarding competitiveness.

1.3.4 Innovation Atmosphere in Enterprises

For emergence of innovation, existence of financial resources and human resources are not by themselves sufficient. Along with these two aspects, the environment required for innovation should also be provided. This should be an environment where employees may continuously improve themselves, where institutions have a systematic structure towards accumulating internal and external innovative business ideas and can use information technologies effectively, produced information spreads rapidly, sufficient resources are allocated for R&D, innovation and technology use, and innovative approaches are embraced at all stages of the process.

Lack of effective information exchange between units and employees in enterprises, lack of an incentive system for employees towards producing new project ideas, and lack of an effective training to be given to employees affect enterprises' innovation management capabilities adversely.

Obstacles against Innovation

Unless innovation activities are supported and encouraged by senior management in enterprises, the chance of success in this field is almost null. It has been determined that enterprise executives in İzmir provided an average amount of support to innovation activities (İzmir Regional Innovation Strategy Field Survey). These supports, which could also be in the manner of immaterial support along with material support, and forming the correct team and correct system, provide more convenient access to innovative ideas for enterprises.

For the R&D and innovation works in İzmir to accelerate and for an effective innovation ecosystem to be formed, the obstacles against innovation should be found and eliminated, and the absent actors that could support this ecosystem should be included into the system. It has been determined that the most important obstacle against innovation in İzmir was (25%) financial resources (İzmir Regional Innovation Strategy Field Survey). However, it is considerably thought-provoking that access to funding is still pointed out as the most important obstacle against innovation despite the existence of many existing national grants towards R&D and innovation. This situation shows that these support mechanisms are not publicised effectively and the enterprises are not at the capacity enabling them to benefit from such supports.

The second most important obstacle against innovation is the problems experienced in accessing government supports (21%) (İzmir Regional Innovation Strategy Field Survey). It is also thought-provoking to have access to government supports as one of the most important obstacles against innovation when 30% of umbrella organisations provide information and assistance to their members regarding access to such supports (Situational Analysis on R&D and Innovation Ecosystem in İzmir). By training the information reproducers in this field through certificate programmes to be developed, and therefore by increasing their qualifications and service qualities, the rates of benefitting from such supports shall be improved.

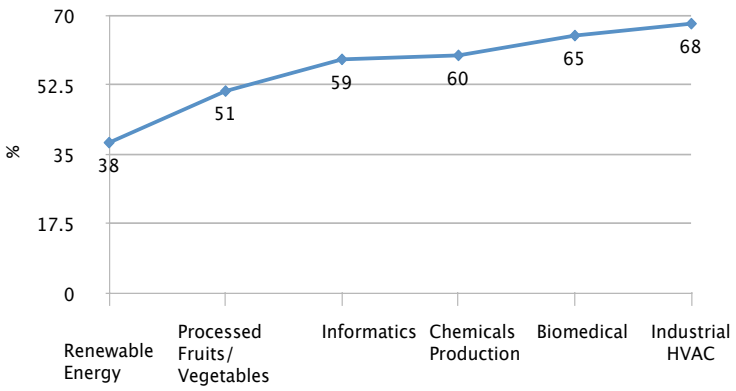
The third most important obstacle against innovation is the insufficiency of qualified labour force (16%) (İzmir Regional Innovation Strategy Field Survey). It should also provoke thoughts to see finding qualified labour force as a problem despite the presence of many universities, faculties, departments and vocational high schools. This situation may be explained through two reasons; the first is the conflict between the qualifications of students graduated from universities and the qualifications sought after by the industry, and the second is the hesitation in the market to pay sufficient salaries to be able to employ qualified personnel.

Especially the three or four sectors having the most difficulty in finding qualified labour force may hold mutual training programmes with universities, and it would also be beneficial for them to cooperate in issues such as industry doctorate programmes and industry experience certificate programmes relevant to their own fields.

Another important obstacle against innovation is the existing tender applications (16%) (İzmir Regional Innovation Strategy Field Survey). Lack of consideration to procure innovative products in tenders pushes enterprises to produce more economical (cheaper) goods and services instead of developing new products. And this causes an excess density of the same goods and services competing over price and quality in İzmir.

Another obstacle against innovation listed with a somewhat lower priority is lack of information. It is very thought-provoking that only 7% of all enterprises list lack of information on innovation management among obstacles against innovation. Considering the low rate of enterprise-university cooperation in İzmir, this data points out that enterprises consider themselves to be sufficiently knowledgeable in many fields, which is actually the most important risk against innovation.

Figure 28: Qualified Labour Force Problem Experienced in Sectors



Source: İzmir Regional Innovation Strategy Field Survey

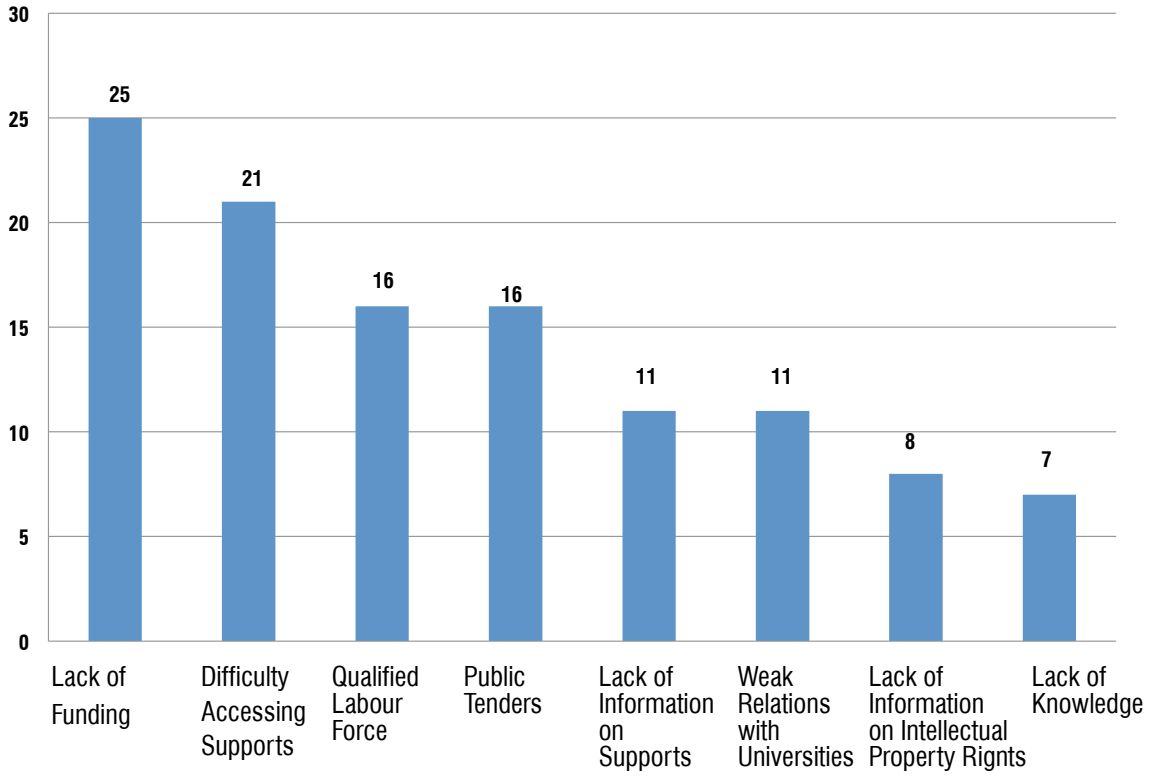
Evaluation

In conclusion, it is observed that the enterprises in İzmir could not yet create an effective or comprehensive innovation atmosphere within their bodies. R&D employees should be informed and trained on fields such as R&D and innovation management via different education models. While encouraging with new methods the enterprise employees to produce new ideas, suitable mechanisms and tools should be developed towards also utilising out-of-company resources such as universities as effective sources of innovation. Efforts made to that end shall transition enterprises from closed innovation model to open innovation model, providing sustainability to these efforts.

In spite of the existence of numerous and various grant support mechanisms in place for R&D and innovation within our country, the most important obstacle against innovation in İzmir has been found out to be funding. This result points out the necessity of aiding enterprises in accessing these supports and making such supports more understandable and accessible for enterprises. The number of qualified consultants should be increased via special training programmes.

Experiencing problem in finding qualified labour force and these problems adversely affecting innovation performance show that there is a certain lack of coordination between sides in a metropolitan city where thousands of students get graduated every year. To solve this dilemma, different projects such as Industry Experience Certificate and Industry Oriented Doctorate programmes should be developed and supported.

Figure 29: Obstacles against Innovation



Source: İzmir Regional Innovation Strategy Field Survey

1.3.5 Innovation in Enterprises According to Prioritised Sectors

In this section, evaluations over the data gathered per sectors in the context of İzmir Regional Innovation Strategy Field Survey shall be expressed. In the study titled İzmir Regional Innovation Strategy, information is compiled on 7 sectors deemed to have high R&D and innovation potential, which have been defined as prioritised in 2010-2013 İzmir Regional Plan, outstanding as per the number of companies they cover, their employment, export values or compatibility to regional resources in İzmir Rising Sectors Analysis and İzmir Clustering Analysis studies. These sectors are as follows:

- Informatics,
- Biomedical Industry,
- Industrial HVAC Devices,
- Processed Fruits-Vegetables,
- Chemicals (Plastic Raw Materials, Painting and Cleaning Substances)
- Textile,
- Renewable Energy (Wind, Solar, Biomass and Geothermal Energy) and Environmental Technologies.

Determined sectors have been examined with priority in this sense, and it is aimed to have the knowledge and experience gathered from this examination constitute an example for extending the study to cover other sectors in the future. Also, it is expected that the developments to be obtained in these sectors shall directly and/or indirectly affect other sectors and have high added value.

Activity Spaces of Enterprises

Enterprises being together spatially, thus being in close proximity to knowledge and experience sharing, communication, cooperation and physical research opportunities are important variables regarding the strengthening of R&D and innovation capacity.

10% of the enterprises in informatics sector function within Technoparks/TEKMERs, while it is observed that the enterprises in other sectors questioned within the context of the study are observed not to function within Technoparks/TEKMERs. It is necessary to approach Technoparks and TEKMERs to being centres housing different sectors instead of serving dominantly to informatics sector.

Due to the physical features of TEKMERs and Technoparks being limited, enterprises other than informatics sector are forced to make R&D studies within their own bodies. Thus, the physical infrastructure demand of the existing technology development zone in İzmir along with the importance of specialised technology development zones outstand as significant factors.

When the R&D expenditures of enterprises per place of activity are listed, it is observed that the highest expenditures were made by enterprises within organised industrial zone, followed by enterprises dealing in R&D in their own campuses and TEKMERs/Technoparks.

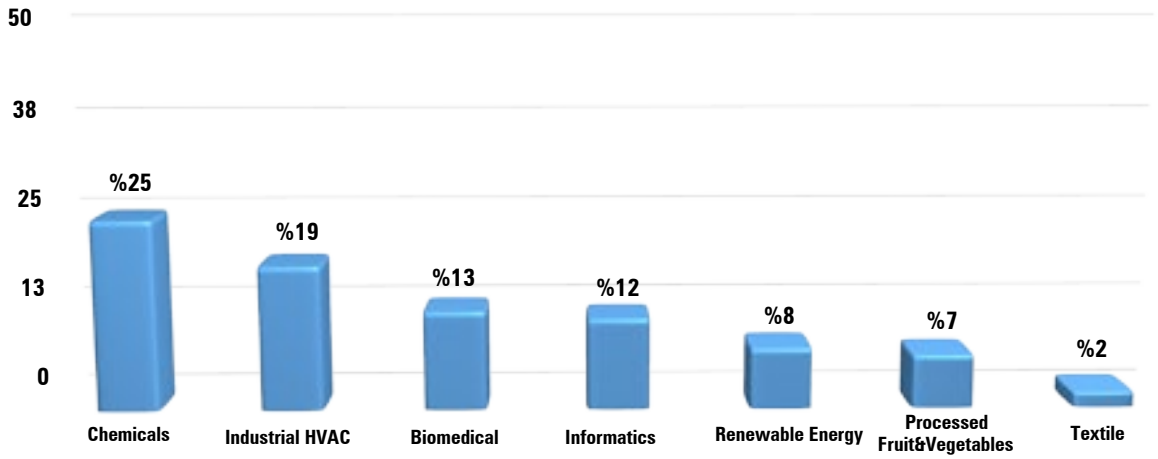
As was mentioned before, it is necessary to direct enterprises to organised environments and support them to maintain activities in such spaces for encouraging sectors towards R&D and innovation and having them benefitting from external economies.

R&D and Innovation Units

Existence of R&D and innovation units in enterprises is of vital importance for realising such studies, and for their effectiveness and sustainability. Existence of R&D and innovation units also increases the employment of qualified personnel.

When the abovementioned prioritised sectors of İzmir were examined, it has been found out that there are enterprises with their independent R&D units in all sectors, albeit few in numbers. This evaluation of sectors with independent R&D units points out that the highest ratio of R&D units are present in Chemicals sector (25%). This sector is followed respectively by; Industrial HVAC (19%), Biomedical (13%), Informatics (12%), Renewable Energy (8%), Processed Fruits and Vegetables (7%) and finally Textile (2%) sectors.

Figure 30: Ratio of Enterprises with R&D Units per Sector

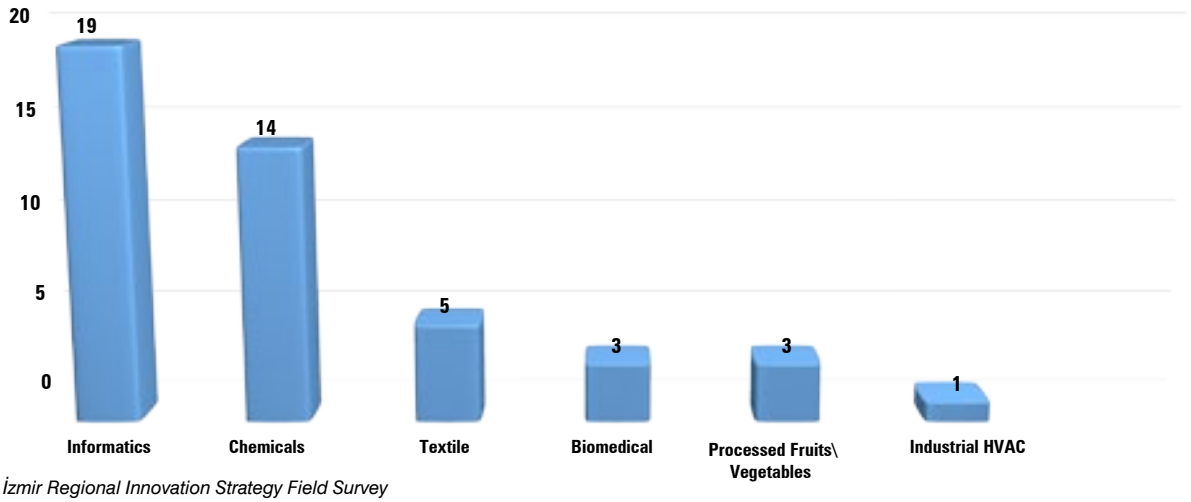


Source: İzmir Regional Innovation Strategy Field Survey

Human Resource

Employment of doctorate-degree personnel is low considering İzmir, a large industry and commerce centre of its region. Among 722 enterprises dealing in 7 sectors, only 30 enterprises employ doctorate-degree personnel. Total number of doctorate-degree personnel employed in these enterprises is 45. The highest number of doctorate-degree personnel is in Informatics sector (19), followed by Chemicals (14) and Textile (5) sectors.

Figure 31: Number of Doctorate-Degree Personnel per Sector



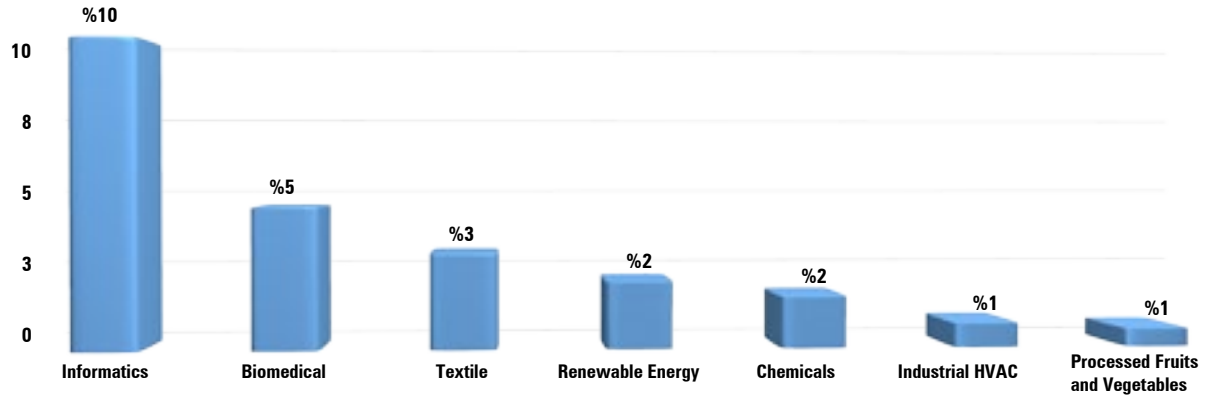
Source: İzmir Regional Innovation Strategy Field Survey

Increasing the number of doctorate-degree personnel in İzmir shall contribute to the development of both university-industry cooperation and the R&D and innovation skills of companies. In this field, especially the prioritised sectors that look promising for İzmir should be encouraged and supported. Steps taken by these sectors shall realise both the development of industry oriented doctorate programmes and acceleration of attracting the brain drain back to İzmir.

R&D Expenditures

R&D expenditures, which is one of the main indicators of enterprises' R&D efforts, displays wide variances from sector to sector. First of all, a certain level of R&D expenditure is made in all sectors. The sector allocating the highest share to R&D from overall turnover is Informatics sector with a value of 10%. Informatics is followed by Biomedical by 4.6%, and Textile by 3.1%. Renewable Energy comes at fourth place by 2.2%, followed respectively by Chemicals sector by 1.7% and Industrial HVAC sector by 0.8%. Processed Fruits and Vegetables comes at the last place with a value of 0.6%.

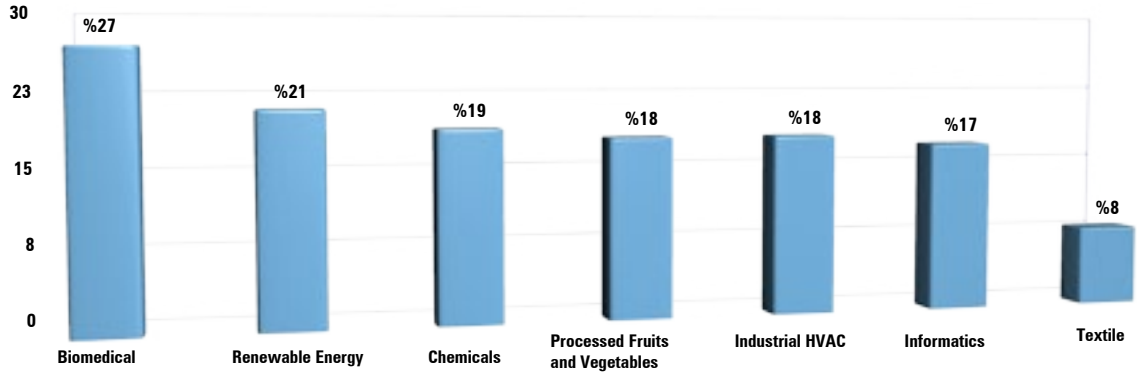
Figure 32: Share of R&D Expenditures within Average Turnovers per Sector



Source: İzmir Regional Innovation Strategy Field Survey

The low R&D expenditure in Renewable Energy sector is a conspicuous finding. In this sector for which highest level of R&D studies are carried out and large financial resources are allocated throughout the world, the low level of R&D expenditures observed in İzmir is a topic to be evaluated in depth, especially considering the renewable energy potential of the province. Increasing the R&D and innovation capacity in this sector shall enable İzmir to become a regional centre, increase local technology production and decrease foreign-dependency at national scale.

Figure 33: Cooperation of Sectors with Universities or Research Centres



Source: İzmir Regional Innovation Strategy Field Survey

Cooperation with University

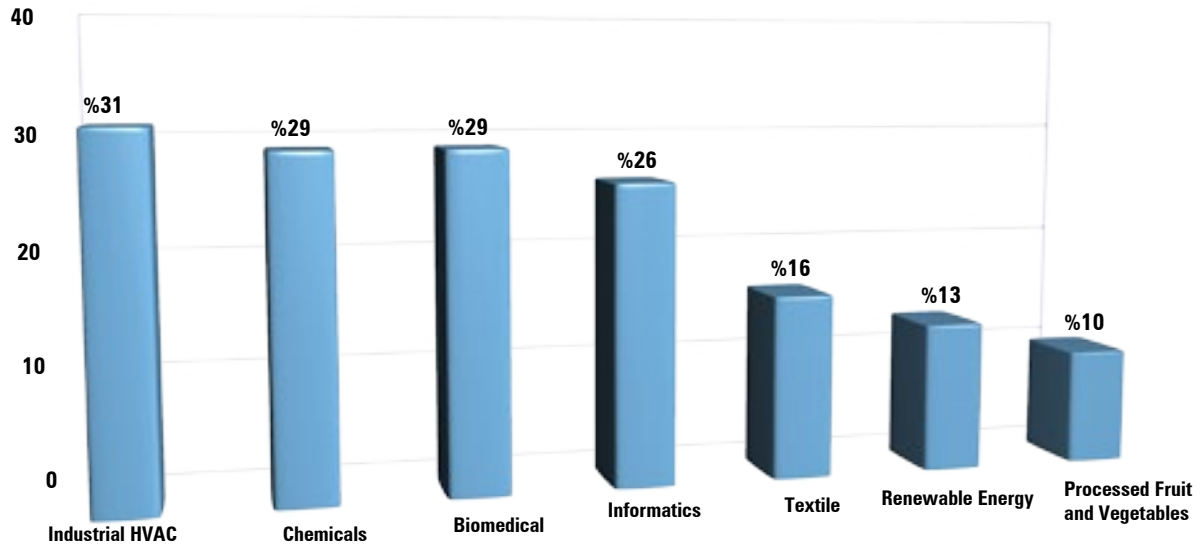
It is observed that a significant awareness is born regarding cooperation with universities and many enterprises made cooperation with universities on different topics. The sector with the highest cooperation with Universities and Research Centres occurred to be Biomedical sector by 27%. Biomedical sector is followed respectively by Renewable Energy by 21%, Chemicals by 19%, Processed Fruits and Vegetables and Industrial HVAC by 18%. Informatics and Textile sectors take the last places with 17% and 8% respectively.

Innovation Performance of Sectors

One of the main indicators of innovation level is the capability and skill to produce new goods and services. As was mentioned previously, for the enterprises to be able to effectively produce new goods and services and for this to gain sustainability, there is initially the need for the existence of an R&D unit supplied with qualified personnel. In line with these evaluations on capacity, how fares the innovation generation capacity in İzmir at sectoral basis?

31% of enterprises in Industrial HVAC sector, 29% of Biomedical and Chemicals sector, 26% of Informatics sector, 16% of Textile sector, 13% of Renewable Energy sector, and 10% of Processed Fruits and vegetables sector are able to provide new goods and services. Therefore, Industrial HVAC sector outstands among others regarding innovation performance.

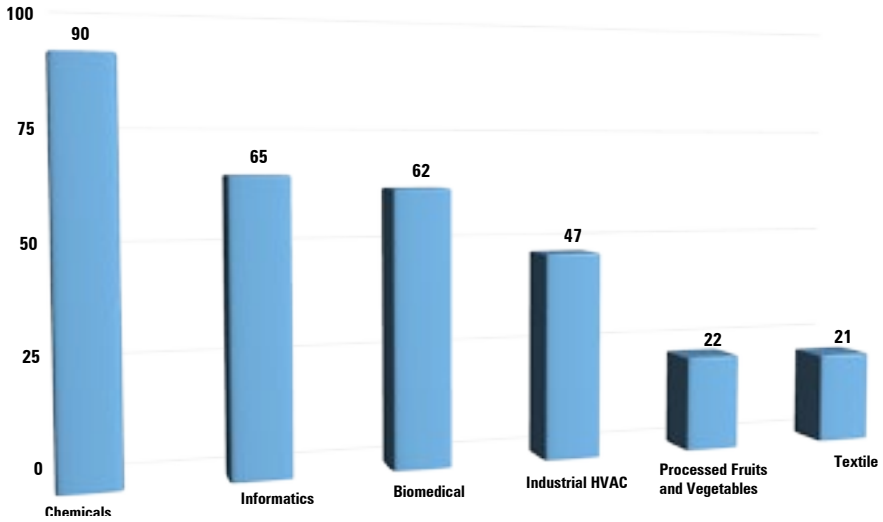
Figure 34: Presenting New or Significantly Developed Goods/Services per Sector



Source: İzmir Regional Innovation Strategy Field Survey

Another important indicator of R&D and innovation capacity is number of patents. Examining the number of patent applications as result of R&D and innovation efforts of prioritised sectors in İzmir lets us observe that the sectors are far from desired level. In the field survey covering the period of 2007-2010, it has been determined that the highest number of patent applications were done by the Chemicals sector with 90 patent applications, followed by Informatics sector with 65 applications, Biomedical with 62 applications, Industrial HVAC with 47 applications, Processed Fruits and Vegetables with 22 applications and Textile with 21 applications. No patent applications were made by Renewable Energy sector within said period. In conclusion, it is observed that Informatics sector outstands among others regarding number of patent applications.

Figure 35: Total Number of Patent Applications per Sector during 2007-2010 Period



Source: İzmir Regional Innovation Strategy Field Survey

Evaluation

The study that covered 2007–2010 period and 7 sectors has revealed that there are differences at sectoral scale on R&D and innovation in İzmir. Informatics companies are concentrated more so than others in innovation centres such as Technoparks and TEKMERs. Other sectors are not observed to function in these environments. Enterprises making highest amount of R&D expenditure function within OIZs. Concentration of enterprises in sites such as OIZ, Free Zone, Technopark, TEKMER where they are together, have ease in knowledge and experience sharing and benefit from external factors comes up as an important criteria.

Although there are enterprises employing independent R&D units within their bodies in all sectors, it is possible to increase them in number. Chemicals sector has been revealed to be the sector with the highest number of enterprises employing R&D units. Increasing the number of R&D units and the qualified personnel in such units shall serve towards both the university-industry cooperation and the development of R&D and innovation capabilities of companies.

R&D expenditure, which is one of the main indicators of enterprises' R&D activities, displays wide variances from sector to sector. It is hope encouraging that at least a certain level of R&D expenditure is made in all sectors. The sector that allocates highest share from turnovers is Informatics sector by 10%. The low level of R&D expenditures in Renewable Energy sector is striking.

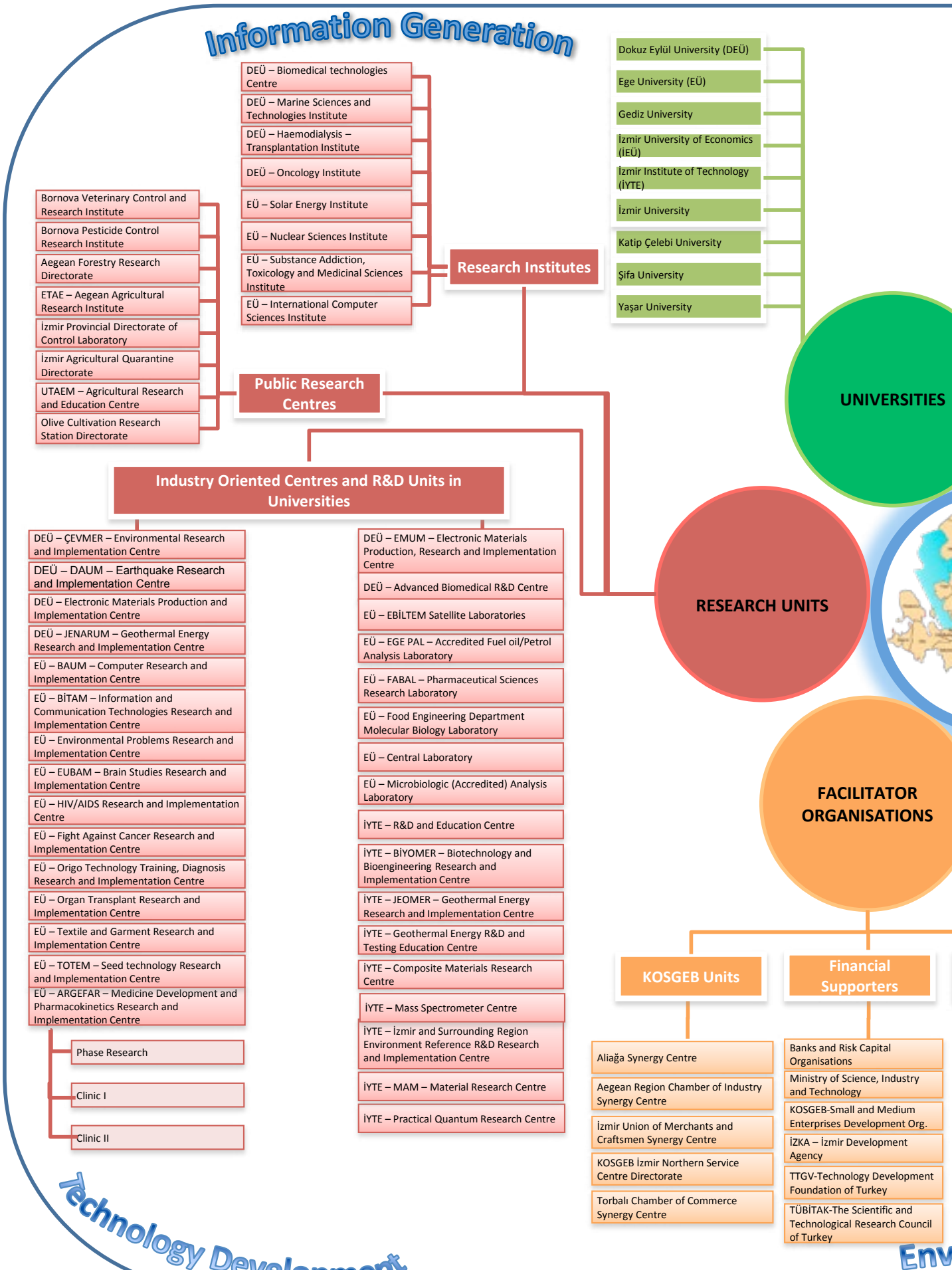
It is seen that significant differences form within sectors regarding cooperation with universities and many enterprises cooperate with universities on different topics. The sector that showed highest cooperation with Universities and research Centres occurred to be Biomedical by 27%.

In the light of all these information, it has been observed that 31% of enterprises in Industrial HVAC sector, 29% of Biomedical and Chemicals sector, 26% of Informatics sector, 16% of Textile sector, 13% of Renewable Energy sector, and 10% of Processed Fruits and vegetables sector are able to provide new goods and services.

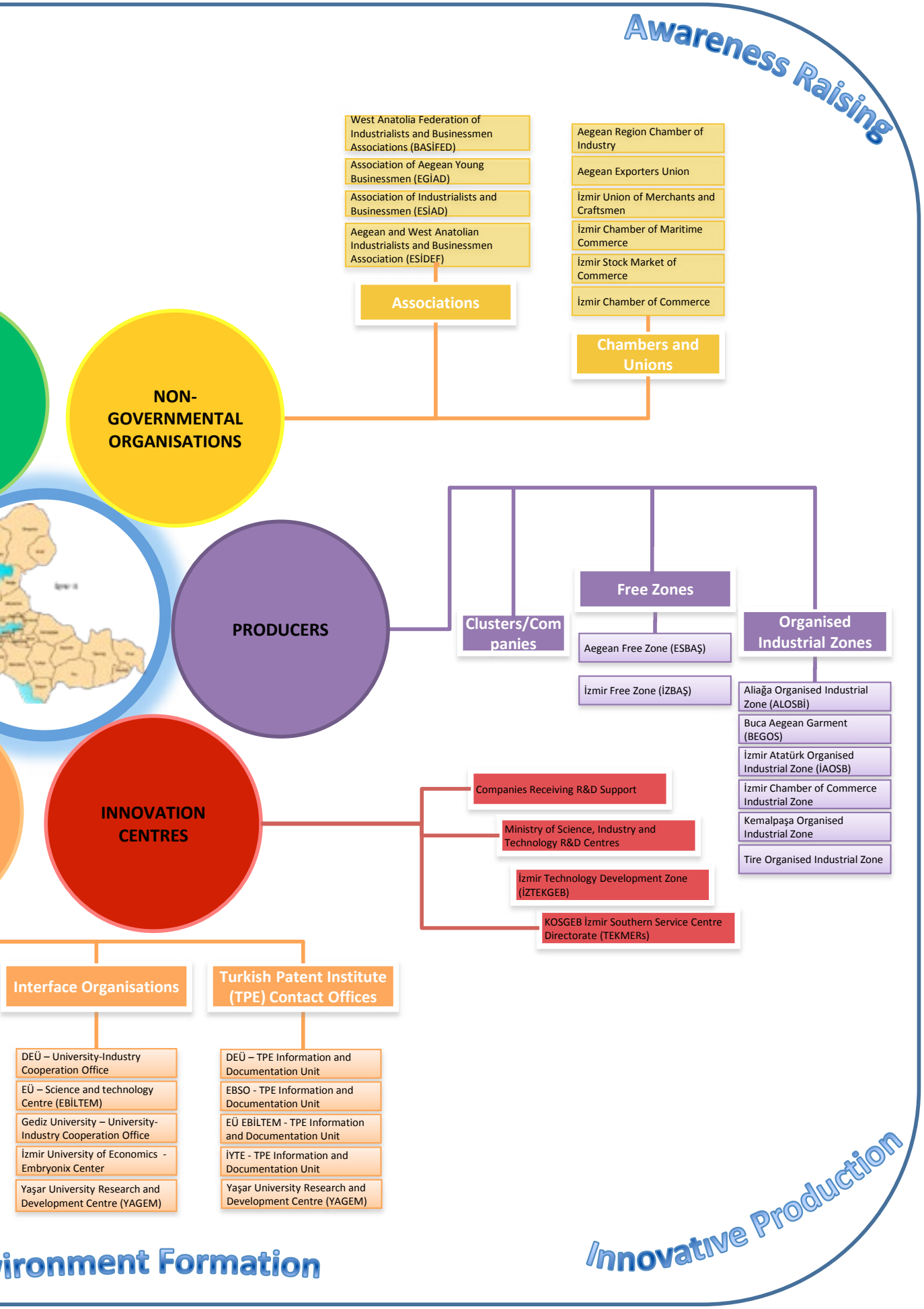
Most patent applications have been made by Chemicals sector with 90 patent applications, followed by Informatics sector with 65 patent applications, while no patent applications have been made by Renewable Energy sector.

In this study, important clues have been obtained towards determining the R&D and innovation status of İzmir industry. Within the context of evaluating the R&D and innovation capacity of the industry of İzmir, inclusion of other sectors in different studies shall lead to more knowledge and thus to a wider sectoral perspective.

1.4 İZMİR INNOVATION ECOSYSTEM MAP



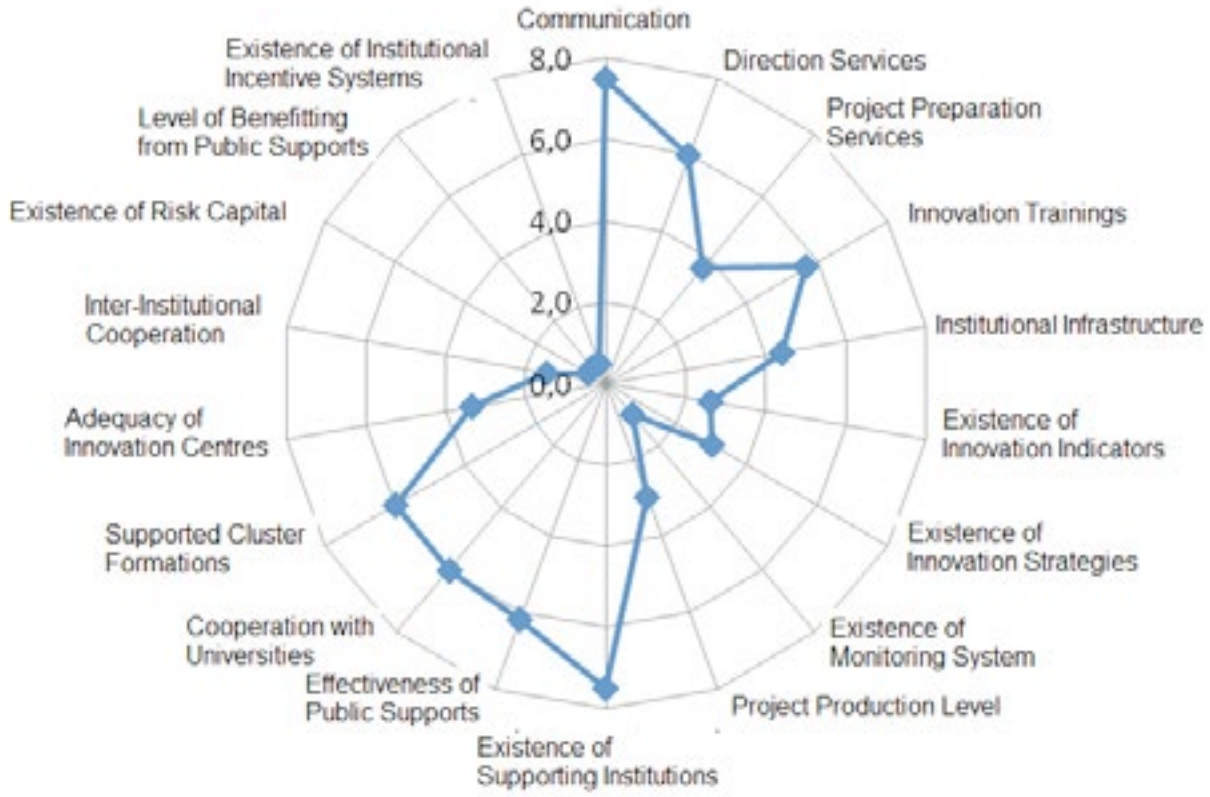
ON ECOSYSTEM



Innovation ecosystem features as a living organism with all due aspects and partners. Absence of one of these aspects and failure to carry out its expected duties cause inability to achieve the desired results, therefore collapse of the whole system. All aspects in this system are of equal significance and it is expected from these partners to work in coordination not competition among themselves.

In result of the study made for determining the current status of innovation ecosystem in İzmir, levels of factors revealed have been comparatively examined. 2 out of 18 factors have been found to be at high level, 6 at medium level and 10 at low level.

Figure 36: İzmir Innovation Ecosystem Factors Map



Two high level factors are “Communication” and “Existence of Supporting Institutions”. The communication between institutions and companies being high is a factor that is very significant for announcing information and opportunities, and effective for the development and maturing of the innovation ecosystem. Existence of institutions supporting R&D and innovation is one of the most effective factors to the ecosystem and this factor is observed to be at a high level in İzmir. On the other hand, “Effectiveness of Public Support” occurred to be at medium level and “Level of Benefitting from Public Supports” at low level, pointing out to the fact that companies are unable to use such support opportunities effectively enough. “Cooperation with Universities”, “Supported Cluster Formations”, and “Direction Services” factors are observed to be at an above-average level, pointing out that the ecosystem has a certain level of development regarding these factors. However, besides the existence of these factors, it is also important whether or not they are utilised effectively. Cooperation with universities is observed to have a high level of effectiveness while project cooperations conducted with universities remained at considerably low levels.

“Innovation Trainings” and R&D and innovation oriented “Institutional Infrastructure” are among the medium level factors of İzmir innovation ecosystem. Especially designing the innovation trainings with more coordination and in a purpose-oriented manner shall increase innovation awareness and innovation outputs in İzmir.

The factors of “Project Preparation Services”, “Project Production Level” and “Inter-Institutional Cooperation”, which should direct companies in İzmir towards establishing R&D and innovation projects, are at significantly low levels of development. It may not be expected from an innovation ecosystem to produce successful results when devoid or significantly lacking of such factors. Other main factors to an innovation ecosystem are adequacy of innovation centres, and existence of innovation strategies and risk capital. However, both factors are practically non-existent in İzmir, leading to an absence in İzmir innovation ecosystem.

For innovation activities to be conducted and universalised, all segments from knowledge generating organisations to technology production institutions should be in a conscious cooperation and coordination. Chambers, associations, unions and federation that exist in İzmir with their thousands of member enterprises are among places where awareness raising efforts towards R&D and innovation are/to be conducted. An active awareness work carried out by such structures, leading to awareness raising in their members and society, shall strengthen the foundations of the innovation ecosystem.

As the most fundamental input of innovation is “knowledge”, the point of origin for the Innovation Ecosystem is comprised of knowledge generating organisations. İzmir houses an important part of innovation ecosystem with its 9 universities, faculties under these universities, 7,240 researchers dealing in education and research activities in different scientific branches and thousands of engineers graduated.

In addition to universities that constitute one of the main aspects of innovation ecosystem, Research Units, which partially generate knowledge and produce technology and/or indirectly contribute to technology development with the studies, projects they conduct and services they provide, also constitute an indispensable part of innovation ecosystem. İzmir is one of the richest regions regarding Research Units. 53 research units within university structures and within public institutions that support many sectors and academic studies constitute another important part of İzmir innovation ecosystem.

One of the most important obstacles against improvement of innovation activities in a region is the failure to provide the information to the industrialist and entrepreneur, failure to establish healthy communication between these two segments, and failure to turn the knowledge and experience obtained into a commercial asset. Although this has various reasons, the following are among the most important:

Structures that should provide contact between university and industrialist/entrepreneur not being sufficient and/or these structures not functioning with their duties at the desired level,

Deficiency of financial resources that should assist in the commercialisation of ideas produced either in universities or by entrepreneurs,

Lack of institutions that should provide information and support enterprises regarding their product development and innovative production processes.

Another component of innovation ecosystem is facilitator organisations and structures. These structures play a facilitative and encouraging role in the formation and development of R&D and innovation process, and conveying it to the society. As is the case throughout Turkey, central and local institutions provide financial resources towards R&D and innovation also in İzmir. Supports provided by institutions such as Ministry of Science, Industry and Technology, TÜBİTAK-TEYDEB and KOSGEB are encouraging towards innovation efforts. İzmir Development Agency (İZKA) provides technical and financial supports in line with the region’s demands and priorities in addition to its strategy development studies towards improvement of the innovation ecosystem.

Another facilitator structure within İzmir innovation ecosystem is constituted by KOSGEB Synergy Units and TPI Information and Documentation Units. These structures provide faster and clearer information to industry sector and universities on varying subjects such as accessing financial supports and Intellectual Property Rights. It is of importance that these structures design financial support programmes that complement the duty, jurisdiction and responsibility areas of each other in line with the region’s demands and priorities.

“Interface Organisations”, which provide information exchange and cooperation between university and industry, constitute the key point of facilitator structures. These active organisations play a key role in both solving the actual problems of industry and development of nre technologies by establishing a continuous communication between universities and industry, and support innovative production processes. While already partially existent in İzmir, qualitative and quantitative development of such structures shall help create a more encouraging innovation environment.

Innovation Centres are places where R&D and innovation activities are supported and are conducted as a purpose by their own. Technology Development Zones, Technoparks, TEKMERs, Clusters and enterprises’ R&D units constitute an important part of this structure. İzmir has various “Innovation Centres” such as 2 TEKMERs, 1 Technology Development Zone, clusters at different stages of development, enterprises aiming towards innovation in their products, processes and services by benefitting from national and international R&D supports; which in their entirety constitute a part of the innovation ecosystem. However, increasing the number of these structures and improving their service quality by eliminating existing problems shall develop the innovation activities in İzmir.

The places where technologies developed within the innovation ecosystem are transformed into products (i.e. innovative production) and presented to the society are Free Zones and Organised Industrial Zones housing individual enterprises and manufacturer enterprises. 2 Free Zones and 6 OIZs in İzmir support product development and innovative production processes with the external economies they create and various services they provide to enterprises.

For continuous increase in innovative activities within the ecosystem, these structures should be able to work solidly and in harmony and synergy with each other. It is required to form a mechanism that monitors the functioning of regional innovation system and cooperation culture should be empowered.

STRATEGIC PRIORITIES AND AIMS

İzmir Regional Innovation Strategy has been prepared for the purposes of determination of existing R&D and innovation potential of İzmir, determination of aspects constituting this potential, bringing out and planning of activities to increase the R&D and innovation power of İzmir, and forming policy suggestions towards that end.

6 strategic priorities and 27 aims have been defined under the strategy.

1. Strengthening the research and innovation infrastructure (5 Aims),
2. Developing institutional structure and capacity in science and technology fields (6 Aims),
3. Developing human resources in science and technology fields (5 Aims),
4. Patenting research results and supporting commercialisation (3 Aims),
5. Facilitating access to funding (3 Aims),
6. Improving the entrepreneurship and innovation ecosystem (5 Aims).

Activating the activities towards implementation of the strategy after the completion of this study is of vital importance. Especially actors in the innovation ecosystem should be coordinated so that they place these actions within their own strategic plans and work programmes for putting into effect the relevant aims and actions. Also, cooperation and coordination is necessary for the strategy to be known and embraced at regional and national scale, for the potential of central institutions and organisations to be activated towards the relevant aims, and for the strategy to be reflected on the Tenth Development Plan, programmes and strategy documents of relevant institutions and organisations.

In the following section, strategic priorities, the aims belonging to them and necessary actions to be taken towards these aims are explained.

Strategic Priority 1 (SP1): Strengthening the research and innovation infrastructure

Research infrastructure is about the technical and structural spaces and equipments required for realising the research and development activities. Aspects at a wide variety such as public institutions and private sector research centres, laboratories, technology transfer offices, technology development zones etc. all take place under the title of research infrastructure.

In İzmir, there are 11 Institutes that conduct research towards practices in different fields such as energy, informatics and healthcare and provide services to industry, 8 Institutes under Ministry and other public institutions and a total of 20 Research Centres within the body of universities. However, because the existing level, deficiencies and demands of this infrastructure are not clearly known, they may not be benefitted from at the desired level for new technology development and cooperation with industry.

Within the context of this strategic priority, first a status quo analysis and demand analysis shall be done on the existing research infrastructure of İzmir, existing mechanisms providing R&D and innovation shall be strengthened and new infrastructure formations shall be supported. By developing the technical laboratory infrastructures of universities, they will be made ready for both producing knowledge and meeting the demands of industry. For strategically important sectors crating high added value; establishment of specialised laboratories, creating a centre of attraction and establishing centres of excellence in prioritised sectors shall be encouraged.

There are 5 aims defined under the strategic priority of Strengthening the Research and Innovation Infrastructure.

SP1A1: Physical infrastructure in universities towards research and technology development shall be established and existing infrastructure shall be improved

SP1A2: Infrastructure of İzmir Technology Development Zone shall be improved, establishment of specialised Technology Development Zones and Business Incubation Centres in İzmir shall be supported

SP1A3: Increasing the number of R&D units in enterprises and R&D centres shall be encouraged

SP1A4: Region's capacity towards creativity and design shall be increased

SP1A5: Communication infrastructure of the region shall be developed in order to strengthen the local, national and international information exchange and communication with networks

In the table below, upper scale plans, documents and strategies relevant to this strategic priority are shown.

Relevant Upper Scale Plans / Documents / Strategies	Development Axis / Strategic Purpose	Priority
2011-2016 Science and Technology Human Resource Strategy and Action Plan	Improving the work environments of Science/ Technology HR personnel	Developing the R&D infrastructure at universities
		Improving the work conditions of the researchers in private sector
		Improving the work conditions at public research centres
2011-2014 Turkey Industry Strategy Document (Towards EU Membership)	Technological Development of Companies	Innovation activities and R&D infrastructure shall be prioritised in medium and high technology sectors, and large scale investments, co-investment and comprehensive R&D projects shall be supported.
2011-2016 National Science, Technology and Innovation Strategy	Increasing R&D and Innovation Based Economic Gains in Fields with High R&D and Innovation Capacity	Analysing existing physical research infrastructures and encouraging the development of infrastructures required
	Accelerating R&D and Innovation Capacity in Demand–Based Fields	Providing effective use of research infrastructures (research centres etc.) in parallel to national and local demands by developing them in inter-institutional coordination
	Adding More SMEs to the List of Those Dealing in R&D and Innovation	Activating SMEs utilisation of research infrastructures by taking into consideration the demands of SMEs regarding such infrastructures
	Having Existing and New Research Infrastructures Constitute Basis for UBTYS 2011-2016 Strategic Approach	Providing effective, efficient and sustainable usage of existing research infrastructures in parallel to country priorities as to also allow inter-sectoral multi-partner research cooperations
		Monitoring the research infrastructures via a road map of research infrastructures emphasising country priorities with the participation of all relevant actors and preventing infrastructure repetitiveness
		Universalising research centres in universities, structured thematically by also heeding industrial demands and local qualities
Turkey Higher Education Strategy	Re-Associating the Education Programmes of High Schools and Vocational High Schools	Habilitating the equipments of these higher education institutions and restructuring their size and distribution
2010-2013 İzmir Regional Plan	Developing Regional R&D and Innovation Capacity Strengthening the Production and Service Infrastructure in Sectors	R&D infrastructure shall be strengthened with key sectors at top priority.
		The infrastructures of OIZs, SIAs, free zones and technology development centres shall be strengthened.

Aim 1 (SP1A1): Physical infrastructure in universities towards research and technology development shall be established and existing infrastructure shall be improved

The most important input of technology generation is knowledge. Countries that desire to produce and export their own technologies should primarily employ the power to generate knowledge and constantly develop this power.

When the research potential of İzmir is examined, it is observed that there are a total of 7,240 researchers, 9 universities, 20 different engineering departments, 11 institutes researching and providing service to industry in different fields, 8 research institutes under public departments, 20 research centres under universities, and 25 high schools and vocational high schools.

Despite all its infrastructure and human resource assets, İzmir is behind its own potential regarding knowledge generation, bringing knowledge together with private sector and turning the knowledge to commercial products. Between years 2007 and 2010, the number of supported projects per 100 researchers occurred to be only 8. Again in the same period, the number of conducted San-Tez projects is 39 and number of registered patents/utility models is 11.

Mentioned opportunities provided by universities with strong technical features could not be effectively brought together with private sector. Only 5% of enterprises see universities and research centres as very important origins of idea in R&D and innovation processes, and for over half of them these structures have no importance whatsoever as origin of idea regarding innovation.

Technical characteristics of the existing infrastructure are not known either by private sector or other researchers, and thus, the level of benefitting from the infrastructure by other researchers and industry remains at a minimum level.

In the context of this aim, initially the existing status of universities' physical infrastructures towards research and technology development and the services provided shall be determined, and an inventory study shall be conducted. In addition to this, the infrastructures and superstructures of centres and laboratories shall be improved to employ properties suitable to serve prioritised sectors of İzmir. New laboratories shall be established and existing ones shall be accredited as necessary in prioritised areas and new areas to be determined, in result of demand analysis studies. All laboratories and centres shall be announced to private sector and academicians via internet, realising publicity and cooperative use of such structures.

In this context, the infrastructure to be strengthened shall be handled within a wide range from special accreditation for prioritised sectors to formation of test and analysis infrastructures and establishment of specialised technoparks. After analysing the existing physical research infrastructures towards sectors with high R&D, innovation and clustering potential, development of infrastructures required towards making İzmir a centre of attraction for qualified labour force shall be supported.

Aim 2 (SP1A2): Infrastructure of İzmir Technology Development Zone shall be improved; establishment of specialised Technology Development Zones and Business Incubation Centres in İzmir shall be supported

Technology Development Zones also provide tax advantages on R&D and innovation activities in addition to infrastructure opportunities to companies dealing in R&D, thus supporting innovation activities. As of year 2010, there are a total of 43 technology development zones in Turkey, of which 6 are situated in Ankara, 5 in İstanbul, 3 in Kocaeli and 1 in İzmir.

A 25% portion of all enterprises in İzmir makes innovation. The share of innovative products within overall turnover of enterprises is around 19%. Improving these values, encouraging more enterprises to deal in innovation and increasing the income the companies obtain from new products should be realised. Enterprises in İzmir see lack of funding as the most important obstacle against innovation by 25%, and insufficient cooperation with universities by 11%.

For increasing the number of companies and improving services in the existing technology development, its infrastructure should be improved.

New specialised technology development zones shall be founded and functionality of technoparks shall be increased by keeping track of the sectoral structure in İzmir, academic qualifications, relevant infrastructure and international trends. Mechanisms shall be developed towards monitoring the performances of existing and new technology development zones.

Aim 3 (SP1A3): Increasing the number of R&D units in enterprises and R&D centres shall be encouraged

For technology production activities to become successful, it is initially necessary for enterprises to have the necessary administrative knowledge on R&D and innovation process. In addition to this, technical infrastructure and easy access to human resources is also effective in determining the success of this process.

A 95% portion of enterprises in İzmir are unable to benefit from public grants. The top reasons to that are lack of information and awareness, inadequacy in project preparation, design and management processes, bureaucracy and lack of direction. Especially enterprises' R&D and innovation units should employ the abovementioned skills. However, only 15% of all enterprises in İzmir have defined R&D units.

Another means to realise studies on R&D and innovation is going into cooperation with universities. The number of enterprises cooperating with universities in İzmir is 19%. The ratio of enterprises utilising Open Innovation Model that covers such cooperation processes is only 7%, while the ratio of enterprises utilising the opposite Closed Innovation Model is 93%. Only 6% of enterprises are highly satisfied with the results they obtained compared to the resources they allocated for R&D. These information points out that a major part of enterprises do not go into any cooperation with their suppliers, clients and competitors, therefore do not obtain satisfying results from their efforts.

Technology development activities could also be carried out via R&D centres the companies may establish within their own bodies as per Law on Supporting the Research and Development Activities no. 5746. With this application, supports and incentives are received from the government for R&D and innovation activities. With this mechanism that may be benefitted from by companies who employ at least 50 fulltime R&D personnel, it is aimed for companies to be able to maintain R&D and innovation activities and produce technology also outside technology development zones.

As of year 2011, the number of R&D Centres that is 26 in İstanbul, 16 in Ankara, 10 in Bursa and 9 in Kocaeli, is only 8 for İzmir, which succeeded to put 50 enterprises into the list of 500 biggest establishments of Turkey. In addition to the mentioned centres owned by large companies, a few of the SME level companies (15%) also have independent R&D Units.

In the context of this aim, different studies towards creating an R&D culture in enterprises shall be arranged, and establishment of R&D centres in enterprises and mutual utilisation of such centres by other enterprises and universities within pre-competition cooperation framework shall be encouraged, while also taking into consideration the sectoral priorities in İzmir.

Aim 4 (SP1A4): Region's capacity towards creativity and design shall be increased

It has been observed that the enterprises in İzmir use respectively price, product quality and delivery in time aspects as most effective means of competition, while design skills are not at any level capable of providing an advantage in competition.

Through this aim, the design infrastructure of İzmir shall be strengthened. The industrial design departments in the universities of İzmir constitute a significant opportunity for the future of labour force market. Therefore, studies towards improving the infrastructure and expert demands of said departments shall be made. It shall be encouraged to have successful students graduating from these departments to be able to realise short term practical training and studies in relevant foreign enterprises and organisations. Also, mechanisms shall be formed towards financially supporting the projects to be carried out between existing design departments and private sector.

Aim 5 (SP1A5): Communication infrastructure of the region shall be developed in order to strengthen the local, national and international information exchange and communication with networks

In innovation activities, realising access to information, sharing and sustainability is an important topic. Realising these aspects contributes to knowledge generation by academic society, while also increasing the speed of technology production of private sector.

An effective cooperation and coordination between institutions in İzmir could not yet been provided. In addition to this, the cooperation level between umbrella organisations and their member enterprises is also low. 90% of umbrella organisations do not have a system with which they may monitor the innovation performance of their members, while 78% of them confessed that they in need of such a system.

Within the context of this aim, formation of structures such as pre-competition network structures and university-industry cooperation platforms towards strengthening R&D and innovation cooperation in the region and cooperative operation of them shall be supported towards strengthening R&D and innovation cooperation, and an effective communication mechanism shall be created at local scale between umbrella organisations, enterprises and universities. With this communication mechanism, mutual operation and cooperation of mentioned institutions shall be realised. In this context, creation of mutual benefit projects and forming cluster governance mechanisms with regional, national and global partners is stipulated.

International networks that would accelerate the access of İzmir to the knowledge and technology required for R&D and innovation shall be utilised, therefore, provided opportunities shall be directly conveyed to relevant organisations towards accelerating the development of the region.

Strategic Priority 2 (SP2): Developing institutional structure and capacity in science and technology fields

The priority of developing institutional structure and capacity in science and technology fields covers regional aspects on institutional capacity other than human resources.

A strong capacity shall realise performance monitoring on R&D and innovation activities, coordination/communication/cooperation between different units, information exchange, more project creation and more entrepreneur emergence. It shall also support universities to realise more frequency and more effective cooperation both within themselves and with private sector and convert academic studies into input for industry. Institutional structuring of 'umbrella organisations' such as chambers, associations, professional organisations, NGOs and OIZs is of vital importance for them to provide services to their members with a more frequent, planned and strong communication. All these organisations realising their activities within awareness on industrial and intellectual property rights is also of significance for institutional capacity and structuring.

There are 5 aims defined within the context of this strategic priority.

SP2A1: A monitoring mechanism shall be created for the purpose of real time tracking of innovation indicators in İzmir

SP2A2: Implementation of innovation-based strategy and providing direction at regional scale shall be realised by establishing an "İzmir Science, Technology and Innovation Council"

SP2A3: Improvement of existing university-industry interface organisations and establishment of new ones shall be supported

SP2A4: Project design and entrepreneurship capacities of universities and enterprises shall be increased

SP2A5: Innovation capacities and cooperation skills of universities and enterprises shall be increased

SP2A6: Innovation-related capacities and supports of umbrella organisations shall be increased

In the table below, High Level Plans, documents and strategies relevant to this strategic priority are shown.

Relevant High Level Plans / Documents / Strategies	Development Axis / Strategic Purpose	Priority
2011-2016 Science and Technology Human Resource Strategy and Action Plan	Improving the work environments of Science/Technology HR personnel	Developing inter-sectoral cooperation
2011-2013 SME Strategy and Action Plan	Developing the Administrative Skills and Institutional Qualifications of SMEs	Developing and implementing the cooperation culture in SMEs
	Developing the R&D and Innovation Capacity of SMEs	Increasing the cooperation between universities and SMEs and large scale enterprises
2011-2014 Turkey Industry Strategy Document (Towards EU Membership)	Technological Development of Companies	In order to provide effectiveness of intellectual property system, institutional capacity shall be strengthened, effective cooperation and coordination shall be provided, and a common and settled intellectual rights culture shall be created at society level.
		In coordination with the Information Society Strategy; information communication technologies shall be universalised, companies shall be encouraged towards accessing information and realising R&D and innovation activities. The coordination between science and technology strategy and industry strategy shall be strengthened.
2023 Turkey Export Strategy	Technological Development and Infrastructure	Relations between Public – Private Sector – NGOs – Universities shall be coordinated
2011-2016 National Science, Technology and Innovation Strategy	Accelerating R&D and Innovation Capacity in Demand–Based Fields	Increasing multiple-partner R&D projects as to support spread of knowledge between sectors and disciplines
	Creating Economical Added Value from New Products, Processes and Services Obtained Through Research Results	Establishing mechanisms that will accelerate the transition of completed research projects towards commercialization
	Drawing System Interactions to Inter-Sectoral and Inter-Disciplinary Direction	Universalising R&D and innovation based cooperation culture that will trigger the interactions between partners at sectoral and local scale
		Improving the interaction and information exchange between public institutions regarding science and technology issues at national scale
		Increasing intra-sectoral and inter-sectoral cooperations within horizontal and vertical cooperations by taking into consideration the different industrial qualities of our country
	Adding More SMEs to the List of Those Dealing in R&D and Innovation	Increasing the capacity of SMEs –that conduct R&D and innovation activities within their own bodies- towards producing common projects with universities and research institutions
Turkey Higher Education Strategy	Increasing the Sensitivity of the Higher Education System towards the Demands of Society and Labour Market	Developing mechanisms to strengthen the society-higher education interaction
2010-2013 İzmir Regional Plan	Developing Regional R&D and Innovation Capacity	The cooperation between universities and research institutes, and between public institutions and businesses shall be strengthened
	Improving the Urban and Rural Infrastructure	Informatics and communication infrastructure shall be strengthened.

Aim 1 (SP2A1): A monitoring mechanism shall be created for the purpose of real time tracking of innovation indicators in İzmir

Because data on R&D and innovation activities are provided by different institutions and organisations and these organisations do not have a common database, it is very difficult to access the information in question at province, region and country scale.

Examining, interpreting and monitoring existing information is of vital importance for creating realistic and relevant aims.

Within the context of this aim, an Innovation Monitoring System shall be established with which information such as R&D, innovation, industrial property rights, technology transfer, licensing and university-industry cooperation shall be constantly monitored. The system to be established shall exchange with relevant institutions and society the information it obtained on a periodical basis in accordance to determined indicators, publicising the innovation level and performance of İzmir, analysing comparison analyses with other regions and provide a higher awareness on this aspect.

The data to be obtained through the abovementioned monitoring system shall also enable tracking on İzmir Regional Innovation Strategy studies and make it possible to conduct similar studies to be done faster and periodically.

Aim 2 (SP2A2): Implementation of innovation-based strategy and providing direction at regional scale shall be realised by establishing an "İzmir Science, Technology and Innovation Council"

For universalising the R&D, innovation, technology transfer and university-industry cooperation activities in our country at both regional and national scale, various platforms and formations were created by public institutions, private organisations and non-governmental organisations. The main purpose to these formations is to raise awareness of different societal segments on abovementioned topics and to have different partners/shareholders to contribute support on these issues.

R&D and innovation works vary depending on the structure of academic conditions, private sector status and funding supports in the region. Existing conditions of each region determine the direction, content and priorities of the R&D and innovation activities to be conducted in that region. Therefore, it is much more correct to determine the R&D and innovation works in line with regional demands and aims and in the light of professional studies.

Only one of the universities in İzmir stated that they have an industrial property rights policy. Also, 70% of all umbrella organisations do not have an R&D and innovation strategy towards their members. In addition to this, it has been observed that 60% of umbrella organisations support some clustering works, while 40% have been determined to be not supporting any such subjects. This information points out that innovation related issues should be tracked and directed on basis of different institutions. For this tracking, coordination and directing to be able to be done in a healthy manner, it is stipulated to be necessary to establish a Council.

Within the context of this aim, a "Science, Technology and Innovation Council" shall be established and this shall realise coordination between relevant institutions for the implementation of regional innovation strategy.

Aim 3 (SP2A3): Improvement of existing university-industry interface organisations and establishment of new ones shall be supported

In the Science and Technology Supreme Council meeting held on the 27th of December 2011, it was decided to create mechanisms that shall provide logistic support to academic studies and support the commercialisation of technology process by developing University-Industry cooperation.

In the universities in İzmir, number and utilisation frequency of interfaces are at a significantly low level.

In addition to first developing these existing interface structures, their capabilities should also be improved.

From the viewpoint of enterprises, only 11% of them describe the lack of an effective cooperation with universities as an obstacle against innovation. Enterprises also stated that services such as providing information on access to R&D and innovation supports and financial supports are not effectively active and that this situation is among the most important obstacles against innovation. In addition, only 5% of the enterprises are able to effectively benefit from public supports towards R&D and innovation. As was the case with private sector representatives, university academicians also pointed out lack of an effective mechanism as the most important (63%) problem against university-industry cooperation.

Because the importance of university-industry cooperation for the production of new technologies and high added value products is known, effectiveness shall be provided to the university-industry cooperation centres in İzmir within the context of this aim. In this framework, the infrastructures and superstructures of existing interface units shall be developed, gaining necessary functional specialisation; and they shall be supported to form strategic cooperation among themselves. In short and medium term, the existing structures shall be made possible to serve also other universities. In long term, establishment of similar structures in other universities shall be supported with the contributions of existing units. Interface organisations shall be included into similar international networks and technology-producing companies shall be encouraged to invest in İzmir by different activities to be arranged via the network.

In addition to the fundamental duties of these structures to be established, they shall also be directed towards providing services and/or trainings to academic society and private sector on issues such as project preparation-development, project designing-management and business plan preparation. Access of enterprises to information on R&D and innovation supports and intellectual and industrial property rights shall be facilitated. Also within the structures of the interface organisations to be established, support units shall be formed towards carrying out bureaucratic tasks of researchers on project preparation, management, patents and commercialisation, thus researchers shall be directed towards producing more knowledge and technology.

Although the number of patents received by enterprises in İzmir shows increase with each passing year, a large portion of these comprise of national patents. This result points out to the fact that our companies are not able to produce radical innovations but instead usually create incremental innovations. Also, technological competition at international market is not possible with nation patents.

Within the context of this aim, access of enterprises to information on R&D and innovation supports and industrial property rights shall be facilitated and the utilisation of the resulting knowledge in enterprises shall be encouraged. Interface units to be established within universities shall be had to provide assistance not only to universities but also to enterprises during patent application process. For such activities, interface organisations shall be additionally supported.

Monitoring mechanisms shall be created for tracking the performances of interface units to be established.

Aim 4 (SP2A4): Project design and entrepreneurship capacities of universities and enterprises shall be increased

Countries that desire to develop technology should primarily improve their knowledge generation capabilities and then turn the obtained knowledge into commercial assets.

Knowledge generation power of universities should also be increased, and afterwards, the knowledge should be protected and commercialised. Considering the number of papers written, it is observed that significant developments are noted each passing year in İzmir. However, the same development may not be mentioned with the same confidence about the number of projects produced or new goods and services obtained in result of the conducted projects. The ratio of approved projects within the total number of proposed projects is around 28% as of year 2010. There are 30 proposed and 8 supported projects per 100 researchers. Together with the number of created '*spin off*' companies, the number of entrepreneur

researchers establishing companies in Technology Development Zones is almost nonexistent compared to the total number of researchers.

With this aim, the project creation and entrepreneurship capacities of academicians shall be improved. Project preparation, development and management programmes aimed at researchers shall be developed. Having the project topics in line with the priorities of İzmir shall be encouraged. Thus, the researcher force of İzmir shall be had to produce projects in subjects specific to İzmir, contributing to the development of İzmir.

Universities shall be encouraged to form their industrial property rights policies. Also within the context of this aim, patenting of project results shall be supported and measures towards supporting the patent expenditures of researchers shall be taken. Enterprises to be formed by patent owner researchers for commercialising their patents shall also be included into relevant support efforts.

Abroad experience exchange programmes towards researchers and capacity development programmes covering trainings and seminars shall be supported. By enabling different partners to report their studies on a portal (i.e. "Innovation Portal") and having interface organisations realise project preparation and production trainings, a significant foundation shall be constituted for realisation of mutual studies. Within the process of commercialisation of academic results in universities, efforts shall be made towards shaping the studies in accordance to private sector demands and announcing received patents to companies. In addition to these, supports shall be provided also regarding investment co-funding for the academic results to be transformed into practice.

Aim 5 (SP2A5): Innovation capacities and cooperation skills of universities and enterprises shall be increased

The effect of cooperation is vital in the production of new goods and services with high added value.

Cooperation of universities means the cooperation of units inside the university, universities' cooperation with other universities and their cooperation with enterprises. The obtained data point out that qualitative and quantitative results on all these cooperation levels have not yet been achieved. The number of mutual programmes and projects created towards developing this cooperation is significantly low. Problems are experienced regarding taking courses from either different faculties or other departments. Inter-disciplinary study count is also low. Although successful examples seem to be increasing, there are significant steps to be taken considering the existing potential and demand.

Within the context of this aim, enterprises' technology production and management skills shall be increased, effective utilisation of research infrastructures shall be realised and mutual project production with such institutions shall be facilitated. Not only enterprise-university collaboration but also enterprise-enterprise collaboration based innovation projects shall be encouraged and supported.

To that end, supporting inter-disciplinary projects to be formed in accordance to prioritised fields and sectoral demands of İzmir shall be emphasised. Direct cooperation between enterprises with independent R&D units and universities shall be encouraged and activities towards this purpose shall be supported. This cooperation shall be realised not only at technical but also at personnel training and practical student education levels.

Mechanisms supporting project efforts to be made by universities towards and with industry shall be created. Sectors and partners that may bring projects shall be determined and mutual projects shall be created by holding synergy workshops between them. By directing research topics rather towards the fields where the demands of the industrialists lie, the effectiveness of project markets, which are exemplary applications in this field, shall be increased.

Researchers in universities should be effectively and continuously introduced to industry. To that end, summarised profiles of university researchers shall be created to be publicised on internet, and umbrella organisations shall be had to give links to this application. It is also important to prepare the profiles as

simple as the industrialists may understand.

Likewise, industry-industry, industry-university and university-university cooperations on pre-competition fields shall be encouraged.

Enterprises shall be had to form innovation policies to increase such skills of theirs. In result of the demand analyses to be conducted by experts, the existing statuses of enterprises on innovation shall be determined, their lacking aspects shall be revealed and short, medium and long term strategies shall be formed towards eliminating such deficiencies.

An interactive environment with pools where the needs and demands of industrialists would accumulate should be created. In this sense, question/answer desks and portals along with inter-institutional online communication platforms shall be established.

As of now, there are clusters and cluster formations at different stages of development in İzmir (İzmir Clustering Analysis – İZKA, 2011). Clustering attempts and cluster development activities in İzmir are underway in Organic Food, Aeration and Space, İAOSB Machine Metal Casting, Industrial HVAC, Petrochemicals, Biomedical (İNOVİZ), Furniture and Textile sectors. With clustering, enterprises get development opportunities in fields of R&D, innovation and university-industry cooperation such as information exchange, experience sharing, cooperation and benefitting from funds.

In this sense, studies towards determining the sectors with cluster potential, finding out the demands of existing clusters and developing capacity shall be encouraged. In line with the demands of clusters and the actions to be taken on the roadmaps, efforts towards realising cooperation with institutions generating knowledge shall be supported. The knowledge generating segment shall be made a natural and strong part of clusters by obtaining effective cooperation between clusters and these institutions.

The aim is to bring a more professional structure to clusters and to have the cluster administration mechanisms institutionalised. To that end, field trips to foreign clusters shall be arranged, sectors with cluster potential shall be prioritised, cluster governance training models and clustering strategies shall be determined, cluster executive training programmes shall be formed and clusters shall be assisted for benefitting from national and international funds.

Aim 6 (SP2A6): Innovation-related capacities and supports of umbrella organisations shall be increased

Services of umbrella organisations have a large impact on the universalization of innovation activities. When effectiveness and efficiency are realised in the activities –towards their members- of these structures, which are bound together directly and/or indirectly via membership systems, it is definite to make a positive impact on the performances of their members.

The infrastructures (technical infrastructure and human resources) of the umbrella organisations in İzmir are not adequate to be able to provide services to their members about R&D and innovation. In addition to this, 70% of the umbrella organisations do not have any policies or strategies on this subject, and 90% do not have any system for tracking the performances of their members. These organisations at most provide their members with information and direction supports and trainings. However, almost no support is given on other subjects important for R&D and innovation such as industrial property rights, project preparation and management, technology transfer and product development. Furthermore, not enough benefit may be provided to the members at all with the trainings given. 35% of all umbrella organisations provide services towards formation of mutual R&D and innovation projects between their members.

In an environment where umbrella organisations prove inadequate regarding innovation, it is difficult for enterprises to produce a high performance. Therefore, capacities and supports of umbrella organisations are aimed to be increased within the context of this aim.

Umbrella organisations shall be supported towards determining their R&D and innovation strategies, shaping their services towards this strategy and developing a system for keeping track of their members' innovation performances. Especially in OIZs, capacities of the existing offices shall be developed for them

to provide their information and direction services better, more effectively and continuously. Also, these offices shall make it possible for the cooperation and communication between member enterprises and umbrella organisations to be continuous and effective, and encourage development of new mechanisms towards purposes. Offices shall be had to arrange trainings towards enterprises on the subjects of R&D and innovation, industrial property rights and access to financial resources.

Strategic Priority 3 (SP3): Developing human resources in science and technology fields

The most important factor in developing human resources towards R&D and innovation issues is constituted by universities. Researchers in universities along with students at different levels constitute the most effective researcher force and human resource in the region. The content, methodology and periods of the education given in universities define the quality of human resource.

For the region to accelerate and become successful in technology production, it is necessary to not only develop and diversify the existing human resources but also to design training programmes on new areas of specialisation in line with the region's demands.

Within the context of this strategic priority, it is aimed to train the human resource capable of producing technology for İzmir to make advances in science and technology and to achieve the level required to produce and export its own technology.

5 aims have been defined under this strategic priority.

SP3A1: Creation of sectoral human resources policies and programmes shall be supported

SP3A2: Qualified R&D personnel employment in enterprises shall be supported

SP3A3: Restructuring of undergraduate and graduate programmes in line with sectoral demands shall be supported

SP3A4: New programmes shall be opened in Vocational High Schools and Vocational Schools of Higher Education such as innovation and design towards the actual intermediary employee demands of enterprises

SP3A5: Training programmes shall be created and implemented on the subjects of R&D, innovation, entrepreneurship and industrial property rights

In the table below, upper scale plans, documents and strategies relevant to this strategic priority are shown.

Relevant Upper Scale Plans / Documents / Strategies	Development Axis / Strategic Purpose	Priority
2011-2016 Science and Technology Human Resource Strategy and Action Plan	Increasing Science/ Technology HR and Improving Sectoral Distribution	Developing career opportunities and improving incomes
		Programmes towards growing Science/Technology HR in line with the R&D demands of private sector
		Increasing technician and equivalent personnel employment
		Science/Technology HR personnel aimed at the priorities and field demands of the country
	Improving the work environments of Science/Technology HR personnel	Improving the work environments at universities
	Increasing the Circulation of Researchers	Developing national, inter-sectoral and international circulation mechanisms
		Providing opportunities required for qualified researchers abroad to be employed in the country especially in prioritised fields
	Developing R&D Personnel Employment Capacity	Employment of qualified R&D personnel at universities
		Developing R&D personnel employment capacity in private sector
		Developing R&D personnel employment capacity in Public Research Centres
2011-2013 SME Strategy and Action Plan	Developing the Administrative Skills and Institutional Qualifications of SMEs	Supporting qualified labour force employment and developing enterprise personnel qualifications
2023 Turkey Export Strategy	Technological Development and Infrastructure	Transition from low qualification human capital to high efficiency/qualification human capital shall be realised.
2011-2016 National Science, Technology and Innovation Strategy	Accelerating R&D and Innovation Capacity in Demand–Based Fields	Developing Science/Technology human resources and providing interaction through inter-disciplinary approaches
	Adding More SMEs to the List of Those Dealing in R&D and Innovation	Developing mechanisms towards increasing the R&D and innovation oriented human resource employment in SMEs
Turkey Higher Education Strategy	Re-Associating the Education Programmes of High Schools and Vocational High Schools	Having these higher education institutions embedded into local business and employment markets
2010-2013 İzmir Regional Plan	Increasing Employment and Workforce Efficiency	Vocational education shall be developed by considering the intermediate staff needs especially in key sectors.
		Qualified human resources shall be developed especially in key sectors

Aim 1 (SP3A1): Creation of sectoral human resources policies and programmes shall be supported

In this aim, the issues of raising awareness in applications towards the development of innovation culture in enterprises, developing the innovation skills of the personnel, universalising practical training applications and making İzmir attractive for the qualified personnel are covered.

Awareness shall be raised and informing efforts shall be carried out regarding systems and mechanisms such as rewarding, performance management, internal innovation etc. that will enable the development of innovation characteristic of human resources employed in enterprises.

Qualified personnel shall be attracted to the region by advertising the living and research opportunities in İzmir and by creating new opportunities through technoparks and universities.

Aim 2 (SP3A2): Qualified R&D personnel employment in enterprises shall be supported

Existence of R&D units and number of R&D personnel in enterprises has an important place among innovation indicators. Even the enterprises realising their R&D studies through external partners should bear R&D units within their bodies and employ qualified engineers in such departments for the purpose of institutionalising the knowledge received from outside. Therefore, independent of the company's size, all enterprises hoping to produce and export technology for increasing their competitiveness should have independent internal R&D units where relevant engineers are employed.

In İzmir, one of the most industrialised regions of Turkey, only 15% of enterprises have R&D departments. The ratio of R&D personnel within total number of personnel has constantly increased during 2007-2010 period, rising from 2.7% to 4.5%. Compared to overall number of existing enterprises, the number of doctorate degree personnel is considerably low. Although it is felt to seem positive that the number of R&D personnel is relatively high and following an increasing trend, production and implementation of new ideas are interrupted because these personnel, in practice, also work in fields other than R&D activities.

Within the context of this aim, employment of R&D personnel in enterprises shall be supported, enterprises shall be assisted in finding R&D personnel expert in their fields, and thus, sustainable R&D studies shall be realised in both large and small scale companies.

With the sectoral demand analyses to be conducted, employee demands of prioritised and high technology sectors shall be determined. Afterwards, development of tools such as programmes, courses and seminars by universities in line with meeting this demand shall be supported. For the sectors to be revealed at the end of this analysis study, opening new industry-oriented doctorate programmes shall be supported and active participation of industrialists in this process shall be emphasised for obtaining healthy results.

Employment of doctorate degree R&D personnel shall be encouraged, cooperation with universities shall be established towards that end, and industry doctorate programmes shall be supported in this context. Furthermore, sectors in need of programmes shall be determined when establishing industry-oriented doctorate programmes by cooperating with industrialists, and suitable mechanisms shall be established for programme's funding. In addition to these activities, actions towards raising awareness among industrialists shall be realised for the purpose of universalization.

In order to increase personnel efficiency in enterprises, implementation of an incentive system especially towards creative ideas (new suggestion, invention, innovation etc.) shall be supported. Realisation of these aims shall also be contributing to attracting qualified personnel to İzmir.

New and effective programmes shall be formed for enterprises to provide practical training and part-time work opportunities to university students.

Aim 3 (SP3A3): Restructuring of undergraduate and graduate programmes in line with sectoral demands shall be supported

It is necessary to open new generation engineering departments, especially engineering branches based on high technology and high-tech industries, and vocational high schools in İzmir.

Actions shall be taken towards determining and meeting the industry's R&D human resource demand and qualities at sectoral scale. Establishment of new programmes in line with the result of these actions shall be supported. These departments and programmes to be established shall contribute to the scientific development of innovative sectors, while also supporting the specialist demand to emerge in that sector. Continuity of interaction with trained specialists shall be realised and thus feedback shall be obtained on the programmes from people who recognise the education programmes of the universities they graduated from and are employed within industry.

In long term, relevant subjects should also be integrated into the system of Ministry of National Education, beginning from elementary education. That way, it is aimed to provide a complete integrity for establishment of new programmes demanded at, high school, associate degree and undergraduate degree levels.

Aim 4 (SP3A4): New programmes shall be opened in Vocational High Schools and Vocational Schools of Higher Education such as innovation and design towards the actual intermediary employee demands of enterprises

In addition to producing technology, utilising the technologies to be produced in an effective and purpose-oriented manner is also of importance. Presence of technical personnel capable of learning the usage of technologies obtained through production or import facilitates technological development, production increase and flow of foreign capital into the region and country.

Within the context of this aim, student based cooperation between vocational high schools and private sector shall be developed, and in result, intermediary employees shall be trained in line with regional demands. According to the sectoral demand analyses to be done, additional courses and –if necessary– programmes shall be opened in vocational high schools, and students shall be educated in line with the needs and demands of the sector. Also, in addition to creativity, innovation and entrepreneurship, existing programmes on design and industrial design shall be supported and new programme modules shall be designed.

Aim 5 (SP3A5): Training programmes shall be created and implemented on the subjects of R&D, innovation, entrepreneurship and industrial property rights

Existence of a high knowledge and awareness level on topics such as R&D, innovation, industrial property rights and commercialisation is vital for successful implementation of processes. Qualifications of the people to be employed in this process should be improved for R&D projects to be designed in line with purpose, problems to be foreseen and necessary changes to be done and project results to be turned into public benefit.

The number of R&D and innovation projects carried out in İzmir is below the desired level. Although a certain increase is observed in the number of patent applications made each year, it is well below the region's potential. Among the reasons of why researchers do not get patents, excessive amount of bureaucracy, lack of any industrial and intellectual property rights policy in universities and lack of information on the process play an active role. From the viewpoint of industry, lack of information on industrial property rights ranks at the seventh place among obstacles against innovation. This situation points out that enterprises do not experience problem in this process. However, the fact that total number of new products developed during 2007-2010 period was 2,339 while the total number of patent application was 307 may be taken as an indicator of the existence of some problems in this process.

Within the context of this aim and due to the reasons explained above, information seminars about R&D, innovation, innovative marketing, technology management, industrial property rights and access to funding sources shall be provided and certificate programmes shall be arranged especially towards the R&D personnel of enterprises. Furthermore, new incentives and supports on these subjects shall be actively announced to companies. Programmes shall be formed towards supporting services such as patent research, competitor analysis and patent assessing provided for development of enterprises' relevant skills and knowledge on the process.

Through these trainings, the awareness of companies on technology and innovation shall be raised and an innovation culture shall be formed inside the company. Different segments shall be brought together in these trainings by realising also the participation of experts employed in the technology transfer offices of universities and university researchers. In long term, these trainings shall aid in training experts who will work at private sector but will speak the same language of universities.

In addition to enterprises, trainings and seminars shall be held on issues such as R&D and innovation management, industrial property rights and technology especially for engineering departments of universities, graduate programmes on these topics shall be opened and/or courses on such subjects shall be integrated into the programmes. Opening graduate programmes in universities focusing on R&D and innovation management shall be encouraged. Interface organisations shall be supported for their activities towards meeting the demands of private sector in this field.

Strategic Priority 4 (SP4): Patenting research results and supporting commercialisation

For the production of high added value goods and services, the knowledge generated in universities should be transferred to industry, patented and commercialised. These projects may sometimes carry out only by universities, while sometimes they are conducted together with private sector organisations. The most important obstacle faced within this process is comprised of problems experienced within patenting research results and commercialisation of these patents.

The regions and countries outstanding in R&D and innovation place necessary importance on R&D and innovation, while also facilitating the processes required for commercialisation of innovation obtained through research results and transforming the knowledge into products as much as possible. Focusing the attention of research centres, institutes and universities on entrepreneurial studies, supporting such studies, converting into patents and commercial products and bringing university and industry segments closer are all examples of aspects to be supported in this context.

Strengthening the commercialisation of research results shall encourage more researchers into conducting research, increasing the research potential. Therefore, more effective utilisation of the physical research infrastructure shall be made possible. The increase to be observed in the number of research studies shall make direct contribution to regional development by increasing the number of new goods and services.

Within the context of this strategic priority, activities that will facilitate and accelerate the commercialisation process of research studies obtained from universities in İzmir shall be executed.

There are 3 aims defined under this strategic priority.

SP4A1: Patenting and commercialisation of research results in universities shall be encouraged

SP4A2: Entrepreneur researchers shall be supported in the process of commercialising their innovative ideas

SP4A3: Converting patents belonging to enterprises into commercial products shall be realised

Relevant High Scale Plans / Documents / Strategies	Development Axis / Strategic Purpose	Priority
2011-2013 SME Strategy and Action Plan	Developing the Administrative Skills and Institutional Qualifications of SMEs	Facilitating and supporting information access of SMEs regarding administration, institutionalisation, marketing, efficiency, quality, standardisation, industrial property rights, information communication use etc. fields
	Developing the R&D and Innovation Capacity of SMEs	Creating support mechanisms towards commercialisation of R&D and innovation projects
2023 Turkey Export Strategy	Technological Development and Infrastructure	Exporters' global competitiveness shall be increased via Sectoral Leadership, Science-Technology and Innovation.
2011-2016 National Science, Technology and Innovation Strategy	Increasing R&D and Innovation Based Economic Gains in Fields with High R&D and Innovation Capacity	Enabling platforms where partners (university-public-industry) come together, increasing inter-disciplinary researches and encouraging sharing of research results in order to increase spreading and commercialisation of information
	Creating Economical Added Value from New Products, Processes and Services Obtained Through Research Results	Providing the researchers with more effective benefit from Intellectual and Industrial Property Rights
		Encouraging company start-up supports based on R&D and innovation to increase the commercialisation capacity of knowledge and technologies
	Adding More SMEs to the List of Those Dealing in R&D and Innovation	Facilitating access to information regarding intellectual and industrial property rights, and universalising and diversifying information distribution activities through SME R&D and innovation supports
Ninth Development Plan (2007-2013)	Increasing Competitiveness	Realising transition to high added-value production structure in industry and services
2010-2013 İzmir Regional Plan	Increasing Institutionalization, Production and Marketing Capacity in Enterprises	Branding shall be supported and the number of geographical indication employing products and brand registrations within Turkey total share shall be increased.

Aim 1 (SP4A1): Patenting and commercialisation of research results in universities shall be encouraged

Regarding research potential, İzmir is the third most important region of Turkey. With 9 universities, 7,240 researchers, technology development zone, TEKMER, Development Agency, TPI information and documentation offices and interface centres, it has a strong new technology production potential. Despite all this capacity, the desired level in commercialisation of project outputs has not yet been achieved. The number of patents/utility models proposed by universities for 2007-2010 period was 51, and the number of registered applications was 11. This means 7 patents/utility models per 1000 researchers. Among the main reasons of why researchers do not apply for patents, registered patents not being able to be commercialised takes an important place (31%).

Within the context of this aim, the tasks of concluding the research studies in universities with patents and commercialisation of these results shall be empowered. In this context, initially the universities' research projects that have the potential to be applicable with an aim towards producing high added value goods and services shall be financially supported. For encouraging projects to be concluded with patents as much as possible, along with raising awareness in this field, covering the expenses of international patent applications shall also be taken into consideration within the context of relevant supports. Patents proposed by researchers shall be announced on the internet pages of interface centres, thus publicising them to entrepreneurs. Capacities of interface organisations shall be developed up to the required degree, and employment of experts in patenting and commercialising shall be encouraged. Activities where the patents coming from universities and research centres (İzmir Project Market, İzmir Patents Exposition etc.) shall be held, and thus the patents shall be regularly publicised to national and international entrepreneurs and risk capital organisations. Efforts shall be made towards having the legal regulations made for including patents and commercialised patents within the academic performance evaluation process.

Aim 2 (SP4A2): Entrepreneur researchers shall be supported in the process of commercialising their innovative ideas

Because R&D and innovation projects include high risk factors, the status of success –i.e. being demanded by end users- is significantly rare. The studies conducted show that generally only 1 out of 3,000 raw project ideas obtain considerable successes in the market. Others are withdrawn during this process, either at project stage or before they enter the market as products. Also, the average R&D period of a successful product covers around 5 years depending on sectoral differences (Schiling, 2010). All these aspects come up as obstacles against techno-enterprises to be made by researchers.

Within the framework of this aim, researchers shall be encouraged towards entrepreneurism and their technology production performances shall be improved. Relevant trainings shall be held towards researchers on the topics of project preparation, techno-entrepreneurism and industrial property rights, and good application examples shall be explained. Meetings shall be organised with academicians who have been successful in their enterprises, and especially young researchers shall be encouraged towards entrepreneurism.

Patent values of researchers with international patents shall be calculated and professional business plans shall be formed for researchers with authentic projects. For the commercialisation of patents and projects found successful at the end of this evaluation process, spin-off companies shall be created, and researchers with projects and patents shall be supported in this period both financially and in terms of management processes. Applications shall be developed for monitoring the entrepreneurs who received Techno-Enterprise Supports from the Ministry of Science, Industry and Technology, also after they get the Ministry support.

Aim 3 (SP4A3): Converting patents belonging to enterprises into commercial products shall be realised

Enterprises get patents for their new products and aim to convert their patents to commercial products for reasons such as defending and protecting their studies, increasing their marketing power and obtaining prestige and income.

As may be observed in many different segments in our country, it is also not very common among enterprises to protect their new products and services with patents or utility models. There are various reasons to this situation. However, because the products and services launched without protection may be copied by other companies in a short time, new competitors arise in the same market and many resources spent for R&D and innovation activities towards producing that product are not able to be recovered. Also the registered patents may not be commercialised due to different reasons.

Within the context of this aim, enterprises shall be encouraged to register patents for their ideas and the process of commercialising the patents shall be supported. Informative studies shall be arranged for enterprises on the importance of innovation, and they shall be encouraged to steer towards innovation-

based competition rather than price-based competition. Innovation shall be constantly encouraged, and by determining "innovative companies" each year depending on different indicators, these companies shall be publicised. Umbrella organisations shall be actively included in this process. In addition to these, patents belonging to enterprises not yet commercialised shall be included in the patents pool via interface organisations, supporting their commercialisation.

Strategic Priority 5 (SP5): Facilitating access to funding

For the R&D and innovation activities to succeed and their results finding a place for themselves as a product in the market, an effective funding mechanism is required along with appropriate physical infrastructure and human resources. With the new regulation and incentive system USA brought into force in year 1980 for accelerating the commercialisation of patents produced in universities within the framework of Bayh-Dole Law, a significant increase occurred in the number of commercialised patents and spin-off companies. This positive increase has provided a billion dollar added value and considerable employment opportunities in USA economy. These findings show the importance of a correct and effective funding model for R&D, innovation and entrepreneurism.

In our country, there are various R&D and innovation supports in place, coming foremost the supports provided by institutions and organisations such as TÜBİTAK, Ministry of Science Industry and Technology, TTGV and KOSGEB. These support mechanisms constantly diversify and increase.

For R&D and Innovation activities to be developed, it is of vital importance to provide funding along with attracting funds to the region by benefitting from existing supports provided. Furthermore, it is necessary to raise the awareness levels of enterprises to be born out of enterprising ideas on the topic of funds and to form models in issues such as supporting the co-funding demands of projects.

Within the context of this strategic priority, new support mechanisms shall be designed for the funding of R&D, innovation and entrepreneurship specific to İzmir.

There are 3 aims defined under this priority.

SP5A1: Funding sources shall be developed and their utilisation shall be encouraged

SP5A2: Technologic entrepreneurship shall be encouraged

SP5A3: R&D and innovation opportunities shall be publicised for the purpose of attracting foreign investments to the region

In the table below, High Level Plans, documents and strategies relevant to this strategic priority are shown.

Relevant Upper Scale Plan / Document/Strategy	Development Axis / Strategic Purpose	Priority
2011-2016 National Science, Technology and Innovation Strategy	Increasing R&D and Innovation Based Economic Gains in Fields with High R&D and Innovation Capacity	Developing programmes that will support directed and result-oriented projects capable of serving the country's economical and technological development
	Drawing System Interactions to Inter-Sectoral and Inter-Disciplinary Direction	Supporting researches that will produce global added value from local resources and qualities
	Having Existing and New Research Infrastructures Constitute Basis for UBTYS 2011-2016 Strategic Approach	Allocating funding to research infrastructures from EU pre-accession financial aid programmes
2010-2013 İzmir Regional Plan	Developing Regional R&D and Innovation Capacity	Innovation centred enterprises shall be developed.
	Increasing Institutionalization, Production and Marketing Capacity in Enterprises	Finance capabilities of SMEs and their capacity to benefit from current financial grants shall be increased. .

Aim 1 (SP5A1): Funding sources shall be developed and their utilisation shall be encouraged

For the purpose of accelerating R&D and innovation efforts, along with the existing supports it is necessary to provide new funding supports, to decrease the impact of excess bureaucracy on access to these supports and to sufficiently announce and publicise these supports. It is stipulated to prepare the portal that will publicise and announce the international/national/regional incentive mechanisms for innovation activities, to create loan packages in banking system relevant to innovation, and to establish technology valuation and innovation accreditation centres for risk capital and loan guarantee purposes.

In short term, support mechanisms towards consortium projects for SME and large scale industry-university mutual projects shall be designed, regional large scale industry-SME mutual projects shall be tracked, and SMEs shall be had to undertake significant R&D packages in these projects.

Also, issues where difficulties are experienced within the process of applying to support programmes shall be determined towards the purpose of reducing bureaucratic load, relevant institutions shall be notified of such issues and improvement suggestions.

A catalyser effect shall be created by having the public to be included as a partner to enterprise capital funds, and the regional universities' technology transfer offices shall be restructured towards directing the potential entrepreneur academicians to enterprising capital funds.

An internet page, where the national and international (technical and financial) support mechanisms are announced and continuously updated, that is publicised via various channels at national scale shall increase the use of supports by enterprises. By bringing enterprises and bank representatives together for the amendment on including relevant R&D and innovation packages regarding the innovations to be realised in banking system, enterprise demands shall be determined. A healthy process shall be created by establishing technology valuation/innovation accreditation centres to be utilised for risk capital procurement and loan guarantee purposes. Creating a regional enterprise capital fund shall bring important results for the region.

Attracting international capital to İzmir for R&D purposes, announcing and raising awareness on the subject of Derivatives Exchange (DE) and the benefits to be provided with it, diversifying the financial supports towards entrepreneur researchers, creating enterprise capital funds, providing the utilisation of

such funds by the industrialists, establishing a risk capital mechanism along with a mechanism providing commercialisation supports shall be among main purposes.

In addition to these, a plan towards establishing risk capital and seed funding shall be formed and brought into effect.

Aim 2 (SP5A2): Technologic entrepreneurship shall be encouraged

A major part of enterprises in İzmir do not deal in innovation. Only a 25% of the enterprises produce new goods and services, while 75% produce and market their existing, low added value goods and services that already have numerous substitutes and competitors in the market. Researcher entrepreneurs are virtually nonexistent compared to the total number of researchers.

Within the framework of this aim, the number of techno-entrepreneurs shall be increased by conducting studies that will clear the path of techno-enterprising in İzmir and facilitate the process. In this sense, an awareness raising study shall be conducted on existing enterprises, capital owners, entrepreneurs and researchers on techno-entrepreneurism, and good application examples shall be described. Projects where small and large scale enterprises mutually conduct shall be supported. Bureaucratic obstacles faced during supporting process shall be notified to relevant authorities, reducing excess bureaucracy.

In order to provide commercialisation of university and industry patents and project results, a new "commercialisation fund–entrepreneur fund" like risk capital/seed funding shall be established. For the management of such funds, cooperation shall be made with university interface organisations, and projects that pass economical valuation with success shall be supported with this fund. Interface offices shall utilise these programmes along with other technical and human resources features towards attracting foreign R&D companies to İzmir. In order to have enterprises and researchers benefit from these funds, services supports shall be provided for making necessary preparations and studies to that end. Efforts shall be made for the banking system in İzmir to provide project-funding supports towards R&D and innovation.

Existing funds shall be publicised, new funds shall be established, efforts shall be made for necessary banking regulations to be realised towards facilitating access to enterprising funds, and supports provided to entrepreneurs shall be publicised for universalising these applications in order to increase the effectiveness of entrepreneur researchers.

Platforms bringing together industry and university shall be established, prized competitions regarding entrepreneurship shall be arranged and awareness on successful enterprising stories shall be raised.

Aim3 (SP5A3): R&D and innovation opportunities shall be publicised for the purpose of attracting foreign investments to the region

Region's R&D and innovation force along with the incentives and supports towards innovation shall also be publicised to international enterprises for the purpose of attracting them to the region and cooperating with local enterprises. Financial support shall be granted to the R&D projects of international companies that cooperate with local companies for R&D studies in İzmir. Enterprises that became successful in result of their innovation efforts and received world patent (PCT and AB) shall be rewarded and publicised. Also, international large scale organisations shall be encouraged towards establishing their R&D Centres in İzmir and relevant publicity and support mechanisms shall be developed.

Strategic Priority 6 (SP6): Improving the entrepreneurship and innovation ecosystem

For the R&D and innovation works to be universalised and turned into economical assets in a region and/or country, existence of the main relevant aspects that are technical knowledge, financial resources and application spaces is not sufficient by itself. There should be an "innovation climate ecosystem" that bears dynamic characteristics within itself and constantly updates and develops itself by sensing the present and future changes in advance. Innovation is evaluated as not merely an activity for the industry to conduct within its own body but rather as a result obtained through the meeting of universities, industry and other relevant local-national organisations. Under this strategic priority, it is aimed to encourage the enterprises and all other organisations within the ecosystem on the subject of innovation, raise their awareness, have them handle the issue strategically, and, as a result, strengthen the innovation ecosystem in İzmir.

There are 5 aims defined within the context of this strategic priority.

SP6A1: R&D and innovation culture shall be developed

SP6A2: Infrastructure of umbrella organisations shall be developed

SP6A3: R&D, innovation, project preparation and design capacities of consultancy companies shall be increased and the accreditation system shall be developed

SP6A4: Authentic programmes aimed towards increasing the innovation and creativity skills of public and local administration personnel shall be developed

SP6A5: İzmir shall be made a centre of attraction for qualified labour force

In the table below, High Level Plans, documents and strategies relevant to this strategic priority are shown.

Relevan High Scale Plan / Document/Strategy	Development Axis / Strategic Purpose	Priority
2011-2016 Science and Technology Human Resource Strategy and Action Plan	Increasing Science/Technology HR and Improving Sectoral Distribution	Directing the youth towards R&D fields
		Universalising the Science/Technology culture in the society
2011-2013 SME Strategy and Action Plan	Developing the R&D and Innovation Capacity of SMEs	Raising the awareness of SMEs' R&D, innovation and design fields, and supporting their activities
2011-2016 National Science, Technology and Innovation Strategy	Increasing R&D and Innovation Based Economic Gains in Fields with High R&D and Innovation Capacity	By encouraging open innovation –acknowledged as paradigm change in our day–, strengthening the R&D and innovation based roles of the actors comprising the production chain of sectors
	Drawing System Interactions to Inter-Sectoral and Inter-Disciplinary Direction	Increasing the technology generation capacity via encouraging R&D based vertical cooperations
	Adding More SMEs to the List of Those Dealing in R&D and Innovation	Developing SMEs' skills of technology orientation and management
Ninth Development Plan (2007-2013)	Increasing Competitiveness	Developing R&D and innovativeness
		Universalizing information and communication technologies
2010-2013 İzmir Regional Plan	Developing Regional R&D and Innovation Capacity	Innovation, R&D and technology awareness shall be raised

Aim 1 (SP6A1): R&D and innovation culture shall be developed

One of the highest priority conditions for R&D and innovation is the development of differential thinking, creativity, project designing and foresight skills. Societies devoid of such values may not obtain a success at desired level in technological product and services production.

İzmir is one of Turkey's pioneer regions where mechanisms towards technology production are present. One of the first technoparks founded in Turkey has been established in İzmir. One of the oldest university-industry cooperation centres and one of the first TPI Information and Documentation units has been established again in İzmir. An institution in İzmir has been awarded as the most successful centre of Europe regarding Technology Transfer. The first Development Agency has been established in İzmir. However, despite all these firsts, İzmir still benefits from government supports less than some regions, produces fewer projects and owns fewer patents. One of the most important reasons of this is that innovation culture has not yet developed sufficiently in İzmir.

Under this aim, conditions necessary for the development of R&D and innovation culture in İzmir shall be realised. Innovation and entrepreneurism trainings shall be arranged especially at elementary education, secondary education and higher education levels. Innovative training applications not in curriculum shall be brought into effect via projects. These trainings shall have practical contents and bring together the industry segment that is in need of project and academy segment that has project production capability. Project preparation and management trainings shall be held also for academicians, both the number and quality of projects shall be improved. Training modules aimed towards increasing EU funds shall be arranged, and successful companies and academicians shall be supported. Furthermore, innovative companies to be selected depending on innovation indicators shall be rewarded and displayed as role models. "Free Meeting Days" shall be held between academia and industry in different subjects, triggering the emergence of innovative ideas.

Short term “educative and entertaining” programmes shall be organised for elementary and secondary education towards the purpose of development of R&D and innovation culture. Project contests shall be organised for encouraging the students towards research studies and for popularising the concept of research.

By establishing programmes covering trainings, pilot applications and consultancy and creating a qualified expert pool to support the process, an institutionalisation of product management shall be realised as to form a technology-product-market relation.

Aim2 (SP6A2): Infrastructure of umbrella organisations shall be developed

Umbrella organisations are structures to which enterprises dealing in R&D and innovation issues are connected via direct or indirect membership relations. Due to this characteristic, there is a continuous and bilateral communication between umbrella organisations and their members. One of the main purposes of umbrella organisations is to facilitate their members’ efforts towards effective and efficient activities, thus producing solutions and providing services to increase their national and international competitiveness. Therefore, there is an interaction between the characteristics of umbrella organisations and the competitiveness of their members.

The infrastructures (technical infrastructure and human resource) of umbrella organisations in İzmir are not sufficient for providing services to their members about R&D and innovation. In addition to that, 70% of these organisations do not have any defined policy or strategy determining their actions on innovation. The ratio of umbrella organisations producing projects towards increasing their members’ national and international skills is 30%. Only 35% of umbrella organisations provide services towards forming mutual R&D and innovation projects. The supports they provided most commonly to their members have been about “contact information of relevant organisations” and “general information on supports”. As may be seen here, the efforts of umbrella organisations aimed towards improving their members’ R&D and innovation capabilities are at a limited level. One of the reasons to this is the insufficiency of physical and human resource infrastructures of such organisations.

Within the context of this aim, R&D and innovation related physical and human resource infrastructures of umbrella organisations shall be supported. Establishment of offices that will establish communications and provide support and direction to members on topics such as R&D and innovation, industrial property rights and financial supports via umbrella organisations, and personnel employment towards that end shall be encouraged. Personnel shall be trained in such topics and shall be directed towards working in cooperation with interface organisations. The trainings provided by umbrella organisations shall be planned in coordination to increase effectiveness.

Aim 3 (SP6A3): R&D, innovation, project preparation and design capacities of consultancy companies shall be increased and the accreditation system shall be developed

A major part of enterprises prefer obtaining the supports required for issues not directly related to production and channelling their existing personnel to works directly affecting production. In this sense, SMEs generally procure services required for issues such as, R&D, innovation, project design, application to public supports and patents from private consultancy companies. Therefore, the knowledge level, experience and specialisation degree affect the project success of enterprises and this situation directly impact the economical activities of enterprises.

As is the case with many other regions of our country, consultancy services are provided by many different individuals and companies in İzmir too. The knowledge and experience levels of consultancy companies play a definitive role on the success of such services provided to enterprises. It is observed that many enterprises prefer postponing their projects due to being unable to find qualified organisation to receive consultancy services.

Within the context of this aim, accrediting consultants via consultancy trainings and training more qualified

consultants in İzmir shall be supported. Initially, the accreditation system towards consultants shall be developed and enterprises' cooperation with trained consultants shall be encouraged through providing necessary informative efforts. Furthermore, new programmes towards consultants shall be established, increasing opportunities for developing themselves.

Aim 4 (SP6A4): Authentic programmes aimed towards increasing the innovation and creativity skills of public and local administration personnel shall be developed

Public institutions and local administrations are among the main structures creating environment and encouragement for innovation efforts. One of the most significant obstacles against efforts made towards R&D, innovation, industrial property rights, project preparation and benefitting from public supports is the excess presence of bureaucracy. Such processes of public institutions and organisations should be accelerated, their effectiveness and knowledge accumulation should be increased and their structures should be restructured to constitute a role model to other organisations.

Within the framework of defined aim, programmes developing the innovation capabilities of relevant public institutions and organisations, and structures such as municipalities, public provincial directorates and district governorships that contribute to social benefits shall be supported. Training programmes especially towards employees in public institutions providing services to private sector shall be organized for improving their creativity and problem solving skills.

Aim 5 (SP6A5): İzmir shall be made a centre of attraction for qualified labour force

Time and significant financial resources are required for qualified human resources. Activities made towards human are among the most important investments. Educated and qualified youth should be employed in the region and they should be encouraged towards utilising their knowledge accumulation and skills for the development of the region's enterprises and institutions to have this investment return to the region and/or country.

İzmir is among the three most preferred regions for university education. The increase in the number of universities increases also the number of such young people. Despite this positive appearance, successful and skilful young people graduated from universities prefer either İstanbul or abroad because of better or more employment opportunities. This brain drain is one of the key factors obstructing the development of İzmir.

While the brain drain in İzmir continues, on the other hand the enterprises in İzmir indicate that they are unable to find qualified personnel. Despite the existence of 7 computer engineering and 3 software engineering departments in İzmir, 59% of enterprises in this field experience qualified labour force problem. Although there are 4 mechanical engineering departments, 68% of enterprises in industrial HVAC sector experience problems for finding qualified personnel. Despite the fact that the first biomedical department was established and that 211 people got graduated from the department until this day, the biomedical sector in İzmir also experience problems for finding experts in their fields. These examples –and many more- point out that employment of the human resources trained in İzmir may not be realised at desired level and this potential may not be utilised sufficiently. A major portion of graduated people prefer İstanbul or foreign countries due to better opportunities. For İzmir to develop not only in R&D and innovation but also in all fields, first the human assets trained locally should be embraced and then the young people successful within the country or abroad should be attracted to the region.

Within the context of this aim, İzmir shall be made an attraction centre for qualified labour force. The initial purpose is to have successful young people remain in the enterprises of İzmir. To that end, financial supports shall be established for realising the young people graduated with honours from engineering departments to be employed within İzmir borders.

Towards the purpose of attracting qualified labour force to the region, R&D and innovation features of İzmir, relevant supports and incentives, and its research force shall be publicised to international R&D organisations and companies, encouraging them to invest in İzmir. For these investments will create a certain qualified engineer and export demand, it shall encourage the brain drain back to İzmir.

Efforts shall be made for realising free of charge space allocation and special incentive mechanisms to international companies, and national support mechanisms towards R&D and innovation shall be publicised to such foreign companies.

The Strategic Priorities and Aims in this section are listed at the table below.

SP1	**Strengthening the research and innovation infra**
SP1A1	Physical infrastructure in universities towards research and technology development shall be established and existing infrastructure shall be improved
SP1A2	Infrastructure of İzmir Technology Development Zone shall be improved, establishment of specialised Technology Development Zones and Business Incubation Centres in İzmir shall be supported
SP1A3	Increasing the number of R&D units in enterprises and R&D centres shall be encouraged
SP1A4	Region's capacity towards creativity and design shall be increased
SP1A5	Communication infrastructure of the region shall be developed in order to strengthen the local, national and international information exchange and communication with networks
SP2	**Developing institutional structure and capacity in science and technology fields**
SP2A1	A monitoring mechanism shall be created for the purpose of real time tracking of innovation indicators in İzmir
SP2A2	Implementation of innovation-based strategy and providing direction at regional scale shall be realised by establishing an "İzmir Science, Technology and Innovation Council"
SP2A3	Improvement of existing university-industry interface organisations and establishment of new ones shall be supported
SP2A4	Project design and entrepreneurship capacities of universities and enterprises shall be increased
SP2A5	Innovation capacities and cooperation skills of universities and enterprises shall be increased
SP2H6	Innovation-related capacities and supports of umbrella organisations shall be increased
SP3	**Developing human resources in science and technology fields**
SP3A1	Creation of sectoral human resources policies and programmes shall be supported
SP3A2	Qualified R&D personnel employment in enterprises shall be supported
SP3A3	Restructuring of undergraduate and graduate programmes in line with sectoral demands shall be supported
SP3A4	New programmes shall be opened in Vocational High Schools and Vocational Schools of Higher Education such as innovation and design towards the actual intermediary employee demands of enterprises
SP3A5	Training programmes shall be created and implemented on the subjects of R&D, innovation, entrepreneurship and industrial property rights
SP4	**Patenting research results and supporting commercialisation**
SP4A1	Patenting and commercialisation of research results in universities shall be encouraged
SP4A2	Entrepreneur researchers shall be supported in the process of commercialising their innovative ideas
SP4A3	Converting patents belonging to enterprises into commercial products shall be realised
SP5	**Facilitating access to funding**
SP5A1	Funding sources shall be developed and their utilisation shall be encouraged
SP5A2	Technologic entrepreneurship shall be encouraged
SP5A3	R&D and innovation opportunities shall be publicised for the purpose of attracting foreign investments to the region
SP6	**Improving the entrepreneurship and innovation ecosystem**
SP6A1	R&D and innovation culture shall be developed
SP6A2	Infrastructure of umbrella organisations shall be developed
SP6A3	R&D, innovation, project preparation and design capacities of consultancy companies shall be increased and the accreditation system shall be developed
SP6A4	Authentic programmes aimed towards increasing the innovation and creativity skills of public and local administration personnel shall be developed
SP6A5	İzmir shall be made a centre of attraction for qualified labour force

3. GENERAL EVALUATION

İzmir Regional Innovation Strategy study has been realised for bringing İzmir to the future and bringing the future to İzmir, with the aim of an "innovative İzmir generating knowledge, producing and exporting technology".

Considering the general framework, İZKA, Ege University (EBİLTEM) and TurkStat worked as the core technical staff for the project. "İzmir Technical Committee of Innovation" and "İzmir Innovation Committee" that contributed with their technical opinions, suggestions and evaluations in the studies have also functioned as knowledge-experience sharing platform. This platform creates a synergy that enables the public, private and non-society segments within the innovation ecosystem to notify their institutions regarding studies relevant to the subject and prepare mutuality projects. In İzmir Technical Committee of Innovation, -aside from the universities of İzmir- Sabancı University, Çukurova University, Anadolu University, Middle East Technical University, TTGV, ÜSİMP and private sector representatives took place and made significant contributions to the project. Within the Innovation Committee, İzmir Metropolitan Municipality, İzmir Special Provincial Directorate, universities, chambers, stock markets, unions, free zone and OIZ administration representatives made contributions to the project, undertaking the mission of raising awareness on innovation within their own institutions and organisations.

In the study of İzmir Regional Innovation Strategy, 35 different indicators related to the R&D and innovation level of İzmir during 2007-2010 period has been examined to determine the current R&D and innovation capacity of the province. Various indicators related to academic society, private sector and cooperation between university-industry have pointed out that technology generation potential exists in many institutions and organisations of İzmir but that this may not be utilised at desired level. The study also points out the actions required to be taken for activating this potential.

With its 9 universities, İzmir continues to bear the title of Turkey's third province regarding number of universities. Regarding population density, İzmir is the region with the highest population per university throughout the country. Considering its young population structure, industrialisation status and potential, being the most developed province of its region in socioeconomical terms and other attraction factors, it is observed that İzmir is actually a centre of attraction for new universities to be established.

In line with the number of universities, the number of faculties is also high. However, faculty types do not display significant variety. These faculties should also focus on knowledge generation and technology production in line with the region's strategic priorities along with their standard training activities. Presence of many but similar engineering departments delays the formation and development of new technological fields in İzmir. It is of vital importance to create diversity especially between engineering departments and to realise inter-disciplinary cooperation at different levels.

On the other hand, technical infrastructure such as laboratories and research centres that were established within different units of the universities should be made effectively accessible to other departments and universities, the industry and also foreign investors. Also, accrediting a certain portion of the existing laboratories by heeding sectoral demands shall make it possible for the resources paid to outside institutions and organisations by the industry of İzmir to remain inside the province.

In order to accelerate the technological development, the currently weak cooperation between university and private sector should be developed. To that end, the research infrastructure, academic capabilities and human resources of universities should be effectively publicised to private sector. Establishing the mechanisms to realise such cooperation within both universities and umbrella organisations should be encouraged.

Efforts should be made for solving "finding qualified labour force" issue that has been determined to be among the main problems of industry in the region. Demands of private sector should be defined and new programmes should be opened in universities in relevant fields towards meeting such demands.

Furthermore, “Industry Oriented Doctorate Programmes” and similar programmes should be universalised. Supports of umbrella organisations towards their members are of significance regarding the enterprises’ development in R&D and innovation. Within this framework, it is necessary to develop the quality and quantity of services provided by umbrella organisations in İzmir, and these services should be coordinated.

Enterprises’ value of benefitting from R&D and innovation based regional, national and international funds is at a low level. In order to increase benefits from such supports, more effective and purpose-based support programmes towards enterprises should be arranged.

Innovation centres are below the necessary level in both quantitative and qualitative terms. Improving the technical and physical features of existing centres along with establishing new ones shall contribute to the strengthening of innovation activities process. Furthermore, it has been deemed necessary to initialise efforts to open new interface organisations and to establish new units, in addition to activities towards increasing the service quality of existing ones.

The number of enterprises dealing in innovation activities in İzmir is not yet at the level sufficient to make the province a centre of technology production and export. In line with developing enterprises’ skills towards R&D and innovation project preparation, project design and management via financial supports, an increase on the number of enterprises dealing in innovation and managing projects including radical innovations shall be realised.

It is necessary for enterprises to develop the innovation atmosphere within their own bodies, encourage employees towards generating new ideas, and for other, non-enterprise sources such as universities to also be included into R&D and innovation process.

Within the abovementioned context, the actions required to be undertaken for activating the R&D and innovation potential of İzmir have been determined within 27 Aims under 6 different Strategic Priorities.

İzmir Regional Innovation Strategy, which has been realised through the participation of all relevant actors under the leadership of İzmir Development Agency, shall constitute a model and methodology suggestion to other provinces and regions of our country. İzmir strives towards utilising innovation as an important means to economical and social development. In this sense, realising the development of innovation culture within the public, private and civil society segments of İzmir, increasing innovation activities of the private sector, structuring the research and technology development activities towards the demands of business world, developing university-private sector cooperation and networks for enabling the flow of information on innovation, increasing the quantity and quality of public resources spent towards innovation and more effective utilisation of limited public and private sector resources allocated for that purpose are the main purposes in this field.

The expected outcome of this study is the realisation of all partners/shareholders embracing the aims and action defined within the study, reflecting these into their own strategies and work programmes, and providing the institutional and individual contribution towards realising these aims. The contribution support and cooperation of all partners is a vital requirement for the stipulated strategies to succeed.

4. REFERENCES

European Commission Internet Page (http://ec.europa.eu/research/innovation-union/index_en.cfm?pg=key)

Chesbrough, H. (2003) Open Innovation, Harvard Business School Press, Boston, Massachusetts.

İktisadi Kalkınma Vakfı/Economical Development Foundation (2010). Geçmişten Günümüze Lizbon Stratejisi ve 2020 için Yeni Bir Vizyon Işığında "AB 2020" Stratejisi Değerlendirme Notu, Prepared By: Sema Gencay CAPANOĞLU.

İZKA (2009). Strategic and Rising Sectors for İzmir.

İZKA (2010). 2010-2013 İzmir Regional Plan.

İZKA (2010). İzmir Clustering Analysis.

İzmir Regional R&D and Innovation Capacity Analysis, İzmir Development Agency-Ege University Science and Technology Centre (EBİLTEM) 2010, İzmir.

Situational Analysis on R&D and Innovation Ecosystem in İzmir, İzmir Development Agency-Ege University Science and Technology Centre (EBİLTEM) 2011, İzmir.

İzmir Regional Innovation Strategy Field Survey, İzmir Development Agency-Turkish Statistical Institute (TURKSTAT), 2011.

Kırım, A. (2007). Türkiye Nasıl Zenginleşir? Remzi Publishing House, İstanbul.

Small and Medium Enterprises Development Organization (2011). 2011-2013 SME Strategy and Action Plan, Ankara.

Lin, YY. C., Edvinsson, L. (2010). National Intellectual Capital: A comparison of 40 countries, Springer, New York.

OECD, (2010). Innovation Strategy, Access Address: http://www.oecd.org/pages/0,3417,en_41462537_41454856_1_1_1_1_1,00.html Access Date: 6th of May 2012.

Schiling, M. (2010). Strategic Management of Technological Innovation, McGraw-Hill Irwin.

T.R. State Planning Organisation (2006). Ninth Development Plan (2007-2013), Ankara

T.R. Ministry of Industry and Commerce (2010). Turkey Industry Strategy Document 2011-2014 (Towards EU Membership), Ankara.

T.R. Council of Higher Education (2007). Higher Education Strategy of Turkey, Ankara.

The Scientific and Technological Research Council of Turkey (2010). 2011-2016 National Science, Technology and Innovation Strategy of Turkey, Ankara.

The Scientific and Technological Research Council of Turkey (2010). 2011-2016 Science and Technology Human Resource Strategy and Action Plan, Ankara.

TÜSİAD-Sabancı University Competition Forum (2005). Lisbon Strategy. Access Address: http://www.uig.gen.tr/dokumanlar/lizbon.PDF. Access Date: 6th of May 2012.

Turkish Exporters Assembly (2011). Turkey Export Strategy 2023, Ankara

ANNEX 1: Indicators Received from Institutions within Study Context

Table 8: Innovation indicators gathered from institutions within the context of the study

Ministry of Science, Industry and Technology	Total Number of Applications to SAN-TEZ Programme
	Number of Applications to SAN-TEZ Programme and Approvals in İzmir
	Number of Applications to SAN-TEZ Programme from İzmir Universities
	Distribution of Supported SANTEZ Projects per Year and Region
	Sectoral Distribution of İzmir SAN-TEZ Projects (First 5 Sectors)
	Number of Technology Development Zones per Province
	Status of SAN-TEZ Projects per Region
	Sectoral Distribution and Number of Employees of R&D Centres in İzmir
	Provincial Distribution of R&D Centres
	Average Budgets of SAN-TEZ Projects
Ege University Science and Technology Centre (EBİLTEM)	Sectoral Distribution of Technology Transfers Realised by IRC-Ege
	Number of Technology Transfers Realised by IRC-Ege
	Cooperation Types Realised by EBIC-Ege
	Contributions of PUM Programme
Global Competitiveness Index	Top 10 Countries and Turkey in Competitiveness Index
Relevant Institutions	Institutes and Research Centres in İzmir Functioning Under Ministries
Small and Medium Enterprises Development Organisation (KOSGEB)	R&D, Innovation and Industrial Application Support Application and Approval Counts Throughout Turkey
	KOSGEB units in İzmir
İzmir KOSGEB Southern Service Centre Directorate	Total Number of Enterprises Applied per Years
	Sectoral Distribution of Applications
İzmir KOSGEB Northern Service Centre Directorate	Total Number of Enterprises Applied per Years
	Sectoral Distribution of Applications
İzmir Technology Development Zone (İZTEKGEB)	Number of Companies per Year
	Sectoral Distribution of Companies
	Number of Employees
	Export Amounts of Companies
Ministry of Finance	Number of Taxpayers Benefitting from R&D Discounts in İzmir
The Global Innovation Index 2011	Turkey Innovation Index 2011
TÜBİTAK Directorate of Technology and Innovation Support Programmes (TEYDEB)	Average TEYDEB R&D Project Budgets per Region
	Number of Companies with Proposed and Approved Projects for TÜBİTAK-TEYDEB Supports per Region
	TEYDEB Project Applications Percentage of Companies per Year in İzmir
	Sectors from Which Most Applications are Made to TEYDEB Supports in İzmir (Top 5)
	Number of Proposed and Approved Projects for TÜBİTAK-TEYDEB Supports per Region
	Approval Rates of TEYDEB Project Applications per Region
	TEYDEB Average Grant Amounts per Project in Different Regions
	TEYDEB Project Average Period

Turkish Patent Institute (TPI)	Total Number of Patent and Utility Model Applications of Universities in İzmir
	Provincial Distribution of Patent and Utility Model Applications Generated in Universities
	Number of Patent, Utility Model and Industrial Design Registration in İzmir per Year
	Share within Patent Applications per Year
	Regional Distribution of Patent Applications
	TPI Information and Documentation Units in İzmir
	Distribution of Patent Applications in Turkey Based on Origin
The Scientific and Technological Research Council of Turkey (TÜBİTAK)	Innovation Indicators of Turkey per Year
	Approval Rates of Projects Proposed to TÜBİTAK
	Number of Proposed and Approved Projects per Researcher
	Average Project Budgets of TÜBİTAK Projects
	Number of Projects Displayed in Project Markets in İzmir
	Number of Researchers Registered in ARBİS
	Regional Distribution of Total Researchers Registered in ARBİS
	Number of Projects Proposed to TÜBİTAK in İzmir
Technology Development Foundation of Turkey (TTGV)	Number of Projects Supported by TTGV
	Number of Companies Supported by TTGV
	Distribution of Projects Supported in Aegean Region, İzmir, İstanbul and Ankara Based on Their Respective Fields of Technology
	TTGV Grant Amounts per Project
9 Universities in İzmir	Faculties Actively Functioning in Healthcare Field as of Year 2010
	Vocational High Schools and High Schools Actively Functioning in Healthcare Field
	Vocational High Schools and High Schools
	Sectoral Distribution of Vocational High School Programmes
	Industry Oriented Research Centres
	Number of Faculties, Academic Personnel and Students
	Distribution of Engineering Departments
	Faculty of Agriculture Departments and Number of Researchers
	Number of Academic Personnel in Engineering Departments
	Institutes Providing Services to Industry and Their Numbers
	Aquaculture Faculty Departments and Number of Academic Personnel
	Industry Oriented R&D Units
	Share Allocated to Scientific Research Projects
Higher Education Council of Turkey (YÖK)	Number of Universities
	Structures and Establishment Years of İzmir Universities
	Number of Scientific (SCI) Papers from İzmir and Turkey
	Number of Lecturers

ANNEX 2: Main Indicators of R&D and Innovation

Table 9: R&D and Innovation Main Indicators

Indicators	Source	İzmir	Ankara	İstanbul
Institutional Indicators				
Number of Universities (2010)	YÖK	9	14	37
Population per University (2010)	TURKSTAT, YÖK		340,836	358,261
Number of Researchers Registered in ARBİS (2010)	TÜBİTAK	7240	24584	18354
Number of technology Development Zones (2010)	Ministry of Science, Industry and Technology	1	6	5
Number of R&D Centres (Law no. 5746) (2010)	Ministry of Science, Industry and Technology	8	16	26
Academic Indicators				
Number of Scientific (SCI) Papers (2010)	YÖK	2,064	5,579	4,787
Approval Rate of Projects Proposed to TÜBİTAK (%) (Academic) (2007-2010 Average)	TÜBİTAK	25	31	29
Number of Projects per 100 Researchers (Academic) (2010)	TÜBİTAK	30	12	16
Number of Approved Projects per Researcher (Academic) (2010)	TÜBİTAK	8	4	5
Average Project Budget in TÜBİTAK Projects (Academic) (Bin TL) (2010)	TÜBİTAK	152	196	180
Number of Applications to SANTEZ Programme (2007-2010 Total)	Ministry of Science, Industry and Technology	84	165	115
Number of Approvals in SANTEZ Programme (2007-2010 Total)	Ministry of Science, Industry and Technology	39	84	60
Total Number of Patents and Utility Models of Universities (2007-2010 Total)	TPI	51	117	69
Number of Patents and Utility Models per 1000 Researchers (2007-2010 Total)	TPI	7.0	4.8	3.8
Number of Projects Proposed to TÜBİTAK (Academic) (2010)	TÜBİTAK	1,838		
Number of Projects Approved by TÜBİTAK (Academic) (2010)	TÜBİTAK	453		

Industry Indicators				
Number of Companies Applying to TÜBİTAK-TEYDEB Supports (2007-2010)	TÜBİTAK	416	932	2,016
Number of Companies Supported by TÜBİTAK-TEYDEB Supports (2007-2010)	TÜBİTAK	259	593	1,212
Approval Rates of TEYDEB Project Applications (%) (2007-2010)	TÜBİTAK	58	57	57
TEYDEB Grant Amounts per Project (Thousand TL) (2007-2010)	TÜBİTAK	160	215	336
Average TEYDEB Project Period (Month) (2007-2010)	TÜBİTAK	16	19	16
Number of Companies Supported by TTGV (2007-2010)	TTGV	23	81	53
Number of Patent Applications (2007-2010)	TPI	594	1,163	4,333
Number of Patent Registrations (2007-2010)	TPI	92	190	965
Number of Utility Model Applications (2007-2010)	TPI	868	1,019	5,313
Number of Utility Model Registrations (2007-2010)	TPI	638	620	3,757
Number of Companies in Technology Development Zone (2010)	İZTEKGEB	67		
TDZ Companies Export Amounts (USD) (2010)	İZTEKGEB			
Number of Engineers Working in Technology Development Zone (2010)	İZTEKGEB	339		
Size of R&D Discounts (Thousand Euro) (2007-2010 Total)	Ministry of Finance	18,910		
Number of Projects Supported by TTGV (2007-2010)	TTGV	26		
Total Number of Enterprises Applying to KOSGEB (2007-2010)	KOSGEB	57		
Number of Enterprises Supported by KOSGEB (2007-2010)	KOSGEB	49		
Number of University-Industry Cooperation Centres (2011)	Universities	4		
Number of Spin-Off Companies (2010)	Universities	2		

ANNEX 3: 2010-2013 İzmir Regional Plan Relevant Performance Indicators

Table 10: Performance Indicators Related to R&D and Innovation Described in 2010-2013 İzmir Regional Plan *

INDICATOR	CURRENT STATUS	SOURCE	AIM (2013)
Ratio of Brand Registrations throughout Turkey (%)	5.6 (2008)	Turkish Patent Institute (TPI), Branding Data, 2009	9
Ratio of Industrial Design Registrations throughout Turkey (%)	5.7 (2008)	TPI, Industrial Design Data, 2009	9
Ratio of Patent Registrations throughout Turkey (%)	7.4 (2008)	TPI, Patent Data, 2009	10
R&D Benefitting Ratio of İzmir within Overall Turkey Values (%)	4.5 (2009)	TÜBİTAK, 2009	6
Ratio of Companies with TSE Quality Certificate in İzmir within Overall Turkey Values (%)	6 (2009)	TSE, 2009	8
Number of Products with Geographic Indication	8 (2009)	TPI, 2009	10
Number of Companies in Technology Development Zone	65 (2009)	Calculated based on data provided on İZTEKGEB internet page, 2009	80
Number of Companies in OIZs	735 (2008)	İZKA OIZ Survey, 2008	800

* These indicators are indicators stipulated within 2010-2013 İzmir Regional Plan. Innovation indicators shall be updated as per studies to be conducted in line with the main indicators formed within the context of İzmir Innovation Strategy. Updated indicators shall provide input to 2014-2023 İzmir Regional Plan.