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The Global Innovation Index: Insight for Turkey with time series analysis

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Abstract

The aim of this study is to both to discuss the realized assets with the expected values and to decide for the needs of 2015 and foretell the precautions to be taken in necessary fields by using the data related with Turkey that are given in all indicators in "The Global Innovation Index" which is being published since 2007 and covers all the countries all over the world by The Business School for the World (INSEAD) that is related with innovation, the most important concept in the survival of enterprises. Innovation concept and being innovative have recently become an important concern in the fields of business and management as in every other. During the last 20 years innovation has found itself a significantly effective investigation area in various social sciences and have become the center of attraction by the executive committees. Our expectations to be derived from this study is to bring forward the innovation status of Turkey, predict for the 2015 and by informing the government, enterprises and individuals to create awareness among governors, business world, executives, information world, investors, academicians and universities and be a guide for their future plans, strategies and development of executive means and tools.

In this study we are examining to forecast a time series model based on Innovation Ranks for Turkey among 132 countries in 2010, 125 countries in 2011, 141 countries in 2012, 142 countries in 2013 and 144 countries in 2014 by using the ARIMA model statistical analysis. Rank values and expected rank values for each indicator between 2010-2014 and forecasting values for 2015 and their confidence intervals have been given. The statistics of the study were performed by using SPSS 20.0 package program. The expected and realized positions of Turkey over the world in terms of each indicator have been debated and parameters strengthened, weakened or did not show development have been tried to be established.

P values of the indicators in the forecasting ARIMA model and the direction of the graphics were taken into consideration and the status with respect to innovation basic indicators and sub indicators was given in a table. As a result of the study, it was determined that among the basic indicators, the human capital&research indicator (2) shows that policies are correct and it is necessary to keep the system the same way; market sophistication indicator (4) has a positive impact but needs to be supported with respect to the criteria in the sub indicators for 2015; the institutions indicator (1) and the creative outputs indicator (7) show that current policies have no use, there is no negative or positive progress and comprehensive new action plans need to be implemented; business sophistication indicator (5) shows that there may be negative progress due to wrong policies and that urgent action plans are required; infrastructure indicator (3) shows that there is negative progress due to wrong policies and urgent action plans are necessary.

Keywords: Innovation, Turkey Innovation Value, Global Innovation Index, Innovative, management

1. Introduction

The world is in a fast globalization. In today's world of global competition, innovation is very important for enterprises in order to be able to take place in global market, to move forward and to have a voice in the market. People in the past were inevitably benefited from goods and services produced locally however in today's world can reach to all kinds of products and services produced globally. That is why the enterprises should present variations in their supplies and services and individualize them according to the demands of persons and communities.

Innovation has been derived from the Latin word "innovatus". Innovation consists in the introduction of new products and production methods, the opening of new markets, the discovery of new raw materials and the implementation of new organizations (Schumpeter, 1934). There is a difference between invention and innovation and this difference results from its property of being able to be developed (Roberts, 1998:27).

We can evaluate innovation as follows according to its properties: Innovation is a means of competition, innovation is a system, innovation is institutional and national, innovations creates a changing and expanding effect and innovation is in interaction with all environment.

Figure 1. Innovation properties

Innovation is a means of competition. Innovation is a key driver to achieve sustainable competitive advantages and, more particularly, becomes one of the key challenges for small and medium enterprises (SMEs) (O'Regan et al., 2006) and competitive advantage and it comprises both new technologies and new methods (Porter, 1990).

Innovation is a system. Innovation is a system that produces and distributes knowledge, routes it into economy by innovation activities and turns it into a precious property (Gregersen & Johnson,1996:5) and its aim is to produce knowledge, distribute and use it for economical purposes (Graselli, 2009).

Innovation is both a process and a result. Innovation is a process that turns an idea into a merchantable product or service, new or improved production or distribution method or into a new public service procedure.

Innovation is institutional and national. Innovation system contains all sub segments and directions of institutional organization and financial structure that affects learning, investigation and discovery (Cooke at al., 2007:300). As to national innovation; it is the web formed by the public and private sector enterprises which start, import, and distribute activities, interactions and new technologies (Freeman, 1988, 7)

Innovation produces a spreading and changing effect. Its spreading is primarily the social and financial processes (Metcalfe, 1997, 24) and if the new products and processes cannot be successful in the market their influences will not spread and will not give way to variations (Ersöz, 2009:6).

Innovation is in interaction with all environments. Innovation as a change put forward in the outputs, structurer processes of an organization that facilitates its integration with the environment (Damanpour, 1996). Innovation has an important and positive relation with managerial performance (Vincent, Bharadwaj and Challagalla, 2004) and the innovative organizations grow more than those who are not innovative (Hoogstraaten, 2005).

Countries and enterprises that increase their product and service range take the lead in a competition with the others by creating a difference. They elevate their public wealth with their increased production, export, sales and personnel capacities. Moreover they create a solution to unemployment, which is one of the most important problems of the date, by creating accession. Innovation is a means of entrepreneurship and an action that provides resources to form a capacity so as to reach welfare (Drucker, 1985). Thus, countries and enterprises have to renew themselves in every aspect ceaselessly.

There are numerous manuscripts in the literature that investigated innovation. As Chang and Chen (2004) reported in their study; Freeman investigated national innovation system of Japan in 1987, Saxenian investigated regional innovation on information technologies in the silicon valley in 1991, Lundvall investigated national innovation systems in the Scandinavian countries, especially Belgian, in 1992, Nelson investigated national innovation systems of 15 developing and developed countries in 1993, Calsson investigated Sweden's technological innovation systems sin 1995, Breshi and Malerba investigated various innovation systems of the countries in OECD in 1997 and Cooke vd. have conducted a study regional innovations systems in Europe named Innovative Areas in Europe in 1997.

Moreover as Vega and Pujol (2009) stated in their studies; Freeman have worked on innovation in terms of continental point of view in 2002, Cooke vd. in terms of regional point of view in 2004, Malerba in terms of sector specific point of view in 2004, Lorenz and Lundvall in terms of knowledge and learning point of view in 2006, Assimakopoulos and Dodgeson in terms of innovations and webs point of view in 2007 and 2008 respectively, Bergek vd. in terms of technological point of view in 2008 and in terms of OECD innovation policy again in the same year.

In addition to these studies there are other studies including Tödling and Kaufmann's (1998) that studied innovation in terms of basic approaches, Koschatzky and Sternberg's (2000) in terms of Europe regional Innovation Scorbordunun (European Regional innovation Scoreboard-ERIS) basic results, Evangelista at all (2002) in terms of Italy's innovation, TUSIAD's (2003) in terms of financial development, national development, national competition and innovation, Becker and Dietz's (2004) in terms of collaboration of innovation and research and development, Buesa's (2006) at all. in terms of regional innovation systems in Madrid, Catalunya, Basque Country and Navarre regions of Spain, Fritsch and Slavtchev's (2007) in terms of innovation in NUTS-3 region of Germany and the effect of the investigations conducted by the regional universities, Cooke at all (2009) in terms of innovation, educational offers, institutional resources and demands for formation of knowledge, Li's (2009) in terms of differences of innovation performances in the regions taking place in China, Evangelista and Vezzani's (2010) in terms of the 4th innovation investigation conducted by the EU by using the statistical data derived from the enterprises actively working in Italy comparing technological and non-technological innovation and finally Zeng at all (2010) in terms of studying different collaboration webs and innovation activities of the Small and Medium Sized Enterprises in China.

It is a necessity to establish the place of Turkey in innovation, correct analysis of its deficiencies and then constitution of prompt and effective innovation politics and strategies to promote it from the developing countries league to the developed countries status. Innovative ideas, products and processes are increasingly thought to be important in strengthening the competitive powers of organizations (Tiwari, 2007).

In this study we aimed to put forward the position of Turkey between 2010-2014 in terms of innovation among the other countries of the world and predict outcomes for 2015 and be a guide by informing the government, enterprises and individuals to create awareness among governors, business world, executives, information world, investors, academicians and universities and be a guide for their future plans, strategies and development of executive means and tools. There are many studies conducted all over the world for Turkey in the literature but there is no study done before evaluating Turkey in terms of The Global Innovation Index values, all values of the index components and predicting its situation for the upcoming years. This study is the first study performed carrying the aforementioned features.

2. Materials and Methods

2.1. Materials: The Global Innovation Index (GII)

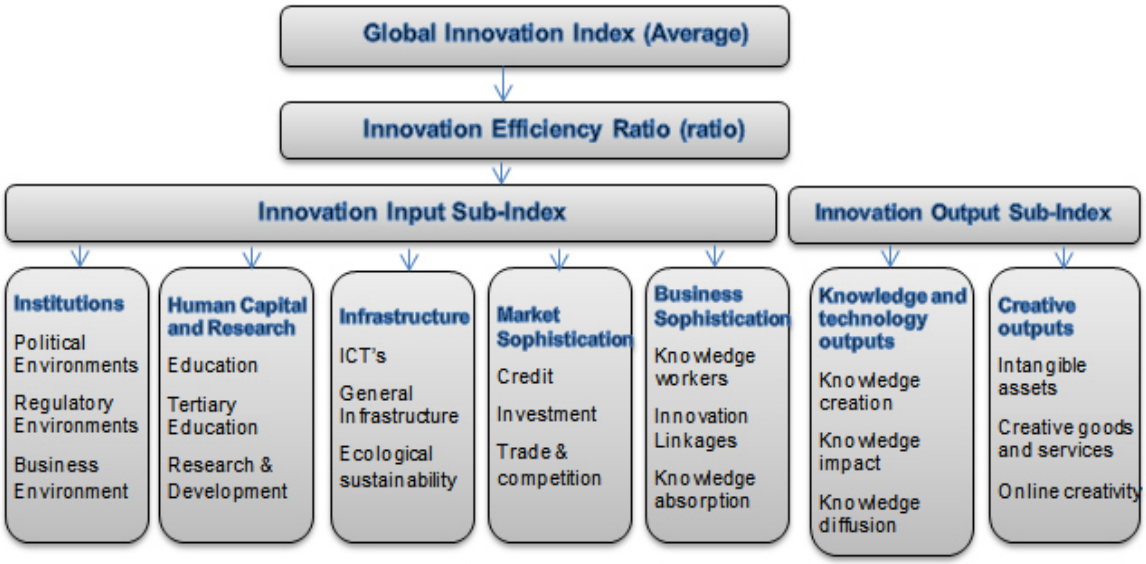
There are various studies about the global and regional innovation values and rankings of countries in many similar fields by global unions like World Economy Bank, European Union and European Economic Cooperation Organization. This study uses the reports of 2010-2014 including the "The Global Innovation Index (GII)" values issued in 2014 by the cooperation of Cornel University, The Business School for the World (INSEAD), Confederation of Indian Industry (CII) and World Intellectual Property Organization (WIPO, a specialized agency of the United Nations) where the same report has been issued since 2007. The study uses the ranks of Turkey for 2010 among 132 countries, for 2011 among 125 countries, for 2012 among 141 countries, for 2013 among 142 countries and for 2014 among 144 countries.

You can access to the details of the reports from https://www.globalinnovationindex.org/content.aspx?page=GII-Home.

The purpose of the GII report is to evaluate the innovation preparation processes of countries and to inform governments, businesses and individuals for full use of innovation. The report issues scores to many sub parameters of the organization, human capacity and business development of countries and rank countries according to these scores. The report also includes policies and recent related findings to encourage countries for innovation.

The GII consists of two main components: Innovation Input Sub index(IISI) and Innovation Output Sub Index(IOSI). IISI consists of 5 sections: institutions, human capital&research, infrastructure, market sophistication and business sophistication. This five input pillars capture elements of the national economy that enable innovative activities. IOSI is divided into two sections: knowledge technology output and creative output. Innovation outputs are the results of innovative activities within the economy. Each pillar is divided into three sub-pilars and each sub-pilar is composed of individual indicators, for a total of each years indicators. Index score value of each indicator is between 1-7 where 7 is the best and 1 is the worst. Countries are ranked where the country with the best score is ranked as the 1st. As the rank indicator index value decreases, the countries have a better indicator and vice versa.

Figure-2: Global Innovation Index



The overall GII score is the simple average of the input and output sub-indices. The innovation efficiency ratio is the ratio of the output sub-index over the input sub-index. It shows how much innovation output given country is getting for its inputs.

The Top 10 countries in the 2014 report with the best score and lowest rank are as follows: Switzerland, United Kingdom (UK), Sweden, Finland, Netherlands, United States of America (USA), Singapore, Denmark, Luxemburg, Hong Kong (China). These top countries in the 2014 report maintained their position since the publication of the report with slight changes in there rankings.

Table-1 includes the details of the main and sub topics in the Global Innovation Index (GII) in Figure-2. Each item in this table has a number. The time series analysis uses the numbers of these items.

Global Innovation Index	4.3.1.Applies tariff rate, weighted mean, %
Innovation Output Sub-Index	4.3.2.Non-agricultural mkt access weighted tariff, %
Innovation Input Sub-Index	4.3.3.Intensity of local competition[I]
Innovation Efficiency Ratio	**5.Business sophistication**
1. Institutions	5.1.Knowledge workers
1.1.Political Environment	5.1.1Knowledge-intensive employment, %
1.1.1.Political stability*	5.1.2.Firms offering format training, % firms
1.1.2.Government effectiveness*	5.1.3.GERD performed by business, %GDP
1.1.3.Press Freedom*	5.1.4.GERD financed by business, %
1.2.Regulatory environment	5.1.5.GMAT test takers/mn pop. 20-34
1.2.1.Regulatory quality*	5.2.Innovation linkages
1.2.2.Rule of law*	5.2.1.University/Industry research collaboration[I]
1.2.3.Cost of redundancy dismissal, salary weeks	5.2.2.State of cluster development[I]
1.3.Business environment	5.2.3.GERD financed by abroad, %
1.3.1.Ease of starting a business*	5.2.4.JV-strategic alliance deals/tr PPP$ GDP
1.3.2.Ease of resolving insolvency*	5.2.5.Patent families filed in 3+ offices/bn PPP$ GDP
1.3.3.Ease of paying taxes*	5.3.Knowledge absorption
2.Human capital & research	5.3.1.Royalty & license fees payments, % total trade
2.1.Education	5.3.2.High-tech imports less re-imports, %
2.1.1.Expenditure on education, %GDP	5.3.3.Comm.computer&info.services imp.,%total trade
2.1.2.Gov't expenditure/pupils,secondary,%GDP/cap	5.3.4.FDI net inflows, % GDP
2.1.3.School life expectancy, years	**6.Knowledge&technology outputs**
2.1.4.PISA scales in reading, maths, & science	6.1.Knowledge creation
2.1.5.Pupil-teacher ratio, secondary	6.1.1.Domestic resident patent app/tr PPP$ GDP
2.2.Tertiary education	6.1.2.PCT resident patent app./tr PPP
2.2.1.Tertiary enrolment, %gross	6.1.3.Domestic res utility model app./tr PPP$ GDP
2.2.2.Graduates in science&engineering, %	6.1.4.Scientific & technical articles/bn PPP$ GDP

2.2.3.Tertiary inbound mobility, %	6.1.5.Citable documents H index
2.3.Research&development(R&D)	6.2.Knowledge impact
2.3.1.Researchers, headcounts/mn pop	6.2.1.Growth rate of PPP$ GDP/worker, %
2.3.2.Gross expenditure on R&D, %GDP	6.2.2.New businesses/th pop. 15-64
2.3.3.QS university ranking, average scope top 3*	6.2.3.Computer software spending, %GDP
3.Infrastructure	6.2.4.ISO 9001 quality certificates/bn PPP$ GDP
3.1.Information&communication technologies (ICTs)	6.2.5.High-&medium-high-tech manufactures, %
3.1.1.ICT access*	6.3.Knowledge diffusion
3.1.2.ICT use*	6.3.1.Royalty & license-fees receipts, % total trade
3.1.3.Government's online service*	6.3.2.High-tech exports less re-exports, %
3.1.4.E-participation*	6.3.3.Comm.computer & info. Services exp., % total trade
3.2.General infrastructure	6.3.4.FDI net outflows, % GDP
3.2.1.Electricity output, kWh/cap	**7.Creative outputs**
3.2.2.Logistics performance*	7.1.Intangible assets
3.2.3.Gross capital formation, %GDP	7.1.1.Domestic res trademark app/bn PPP$ GDP
3.3.Ecological sustainability	7.1.2.Madrid trademark app. Holders/bn PPP$ GDP
3.3.1.GDP/unit of energy use, 2005 PPP$/kg oil eq	7.1.3.ICTs & business model creation[Ɨ]
3.3.2.Environmental performance*	7.1.4.ICTs & organizational model creation[Ɨ]
3.3.3.ISO 14001 environmental certificates/bn PPP$ GDP	7.2.Creative goods & services
4.Market sophistication	7.2.1.Cultural & creative services exports, % total trade
4.1.Credit	7.2.2.National feature films/mn pop. 15-69
4.1.1.Ease of getting credit*	7.2.3.Global ent. & media output/th pop. 15-69
4.1.2.Domestic credit to private sector, %GDP	7.2.4.Printing & publishing manufactures, %
4.1.3.Microfinance gross loans, %GDP	7.2.5.Creative goods exports, % total trade
4.2.Investment	7.3.Online creativity
4.2.1.Ease of protecting investors*	7.3.1.Generic top-level domains (TLDd)/th pop. 15-69
4.2.2.Market capitalization, %GDP	7.3.2.Country-code TLDs/th pop.15-69
4.2.3.Total value of stocks traded, %GDP	7.3.3.Wikipedia edits/pop. 15-69
4.2.4.Venture capital deals/tr PPP$ GDP	7.3.4.Video uploads on YouTube/pop. 15-69
4.3.Trade & competition	* an index Ɨ a survey question

Table-1: Global Innovation Index

The sign (*) in the relevant indicators is the index values obtained by various organizations. The sign (Ɨ) is the values obtained from the survey questions. Some of the indicator values are obtained from the data of national organizations.

2.2. Methods:

2.2.1. Time Series

Time series is a field of practice for statistics and sometime for the science of econometrics while practices can also be found in almost every branch of science. A time series is the sequence of measurements observed during the course of time (Akdi, 2003). Time series is a numeric quantity where the values of the variables are observed consecutively from one period to another. Consecutive realization of the observed values is not a condition but necessary to see the development of series in regular intervals (Granger and Newbold, 1977).

The objective of ARIMA models is to describe the movement of time series and it is used for both analytic purposes and for estimating the systematic part of the time series. The basic approach in ARIMA models is expressed that the present value of the examined variable is based on the combination of the weighted aggregate of past values and random shocks (Akgül, 2003).

$$\left(1-\sum_{i=1}^{p}\phi_i L^i\right)(1-L)^d X_t = \delta + \left(1+\sum_{i=1}^{q}\theta_i L^i\right)\varepsilon_t$$

Parameters p, d, and q are non-negative integers that refer to the order of the autoregressive, integrated, and moving average parts of the model respectively.

L is the lag operator, the α_i are the parameters of the autoregressive part of the model, the θ_i are the parameters of the moving average part and the ε_t are error terms.

In this study, a time series model was created based on the ranks of Turkey among 132 countries in 2010, 125 countries in 2011, 141 countries in 2012, 142 countries in 2013 and 144 countries in 2014 according to the "The Global Innovation Index" between 2010-2014 and statistical analyses were done by using forecasting-ARIMA

model. "The Global Innovation Index" rank values of Turkey between 2010-2015 were modelled through the time series analysis looking at the ranks between 2010-2014. Rank estimations for each quality for the years 2010-2014 and 2015 forecasting values were presented confidence intervals. In addition, P values of the indicators in the Forecasting ARIMA model were grouped as the best (1), positive progress (2), no change (3), negative progress (4) and the worst (5) with consideration of the direction of the graphics. The statistics of the study were done by using the SPSS 20.0 package program.

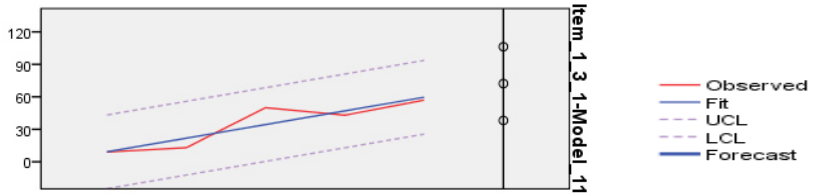
2.2.2. Limitations of the Study

The biggest limitation of the study is the fact that the year number is less. If it was done with more years, there could be differences only in the estimations of 2015. Although the report has been published since 2007, the data of the years 2010-2014 was used in the study. The year 2007 was not included in the study as the report of 2007 only includes GII values not the sub-indexes. GII covering 2008-2009 was done for 130 countries but it wasn't included in the study with respect to sub-indexes. The study included GII values of 2009-2010 and thereafter. Another limitation in the study was the fact that the number of countries for 2011 was less than the other years. There were 132 countries in 2010, 125 countries in 2011, 14 countries in 2012, 142 countries in 2013 and 143 countries in 2014.

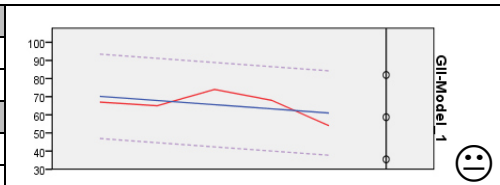
In the study, 18 countries added to the list in 2014 and their 2014 rank values were examined in order to determine how the rank of Turkey will be affected by the less number of countries in 2011. Angola (125), Barbados (41), Belarus (58), Bhutan (86), Brundi (138), Cape Verde (97), Fiji (95), Gambia (104), Guinea (139), Lesotho (117), Malta (25), Montenegro (59), Mozambique (107), Myanmar (140), Nepal (136), Seychelles (51), Togo (142) and Uzbekistan (128) were added to this list in 2014. The numbers in parenthesis next to the country names are the 2014 rank values of the countries. Given that Turkey was in rank 54 in 2014, only Malta (25) and Seychelles (51) affect the ranking among these 18 countries new in the list of 2014 and the remaining 16 countries were behind the rank of Turkey. Therefore, no limitation on the rank of Turkey was found with respect to the difference between 125 countries in 2011 and number of countries in 2012, 2013 and 2014. On the contrary, we expect higher rank for Turkey as the other countries were lower in the list.

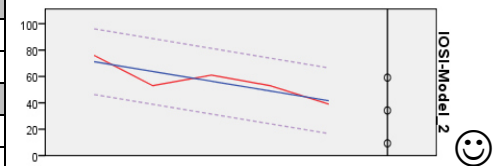
3. Results

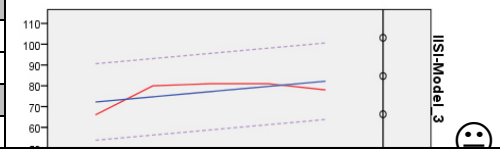
The results of this study were summarized and interpreted with tables and graphics as there were many indicators. The results were organized and interpreted part by part by considering the items of each sub index. The blue line in the graphics refers to the forecasts, red line refers to the observed indicating the value of the years, dotted line above and below the graphics curve refers to the UCL and LCL values. The example graphics and symbols in the graphics were given below.



GII	**Real/Estimates Rank Values**									
	2010		**2011**		**2012**		**2013**		**2014**	
	67	70	65	68	74	66	68	63	54	61
	Forecasting ARIMA model (2015)									
	Value		**LCL**		**UCAL**		**P**			
	59		35		82		0,393			
IOSI	**Real/Estimates Rank Values**									
	2010		**2011**		**2012**		**2013**		**2014**	
	76	71	53	64	61	56	53	49	39	42
	Forecasting ARIMA model (2015)									
	Value		**LCL**		**UCAL**		**P**			
	34		9		59		0,058			
IISI	**Real/Estimates Rank Values**									
	2010		**2011**		**2012**		**2013**		**2014**	
	66	72	80	75	81	77	81	80	78	82
	Forecasting ARIMA model (2015)									
	Value		**LCL**		**UCAL**		**P**			







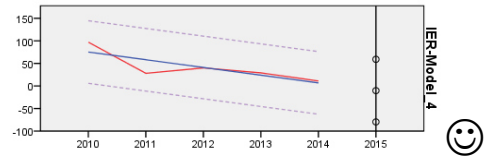
	85		66		103		0,265				
IER	**Real/Estimates Rank Values**										
	2010		**2011**		**2012**		**2013**		**2014**		
	97	75	28	58	40	41	29	24	11	7	
	Forecasting ARIMA model (2015)										
	Value		**LCL**		**UCAL**		**P**				
	1		1		59		0,089				

Table-2: Global Innovation Index (GII)

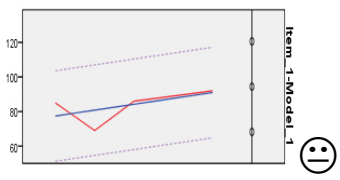
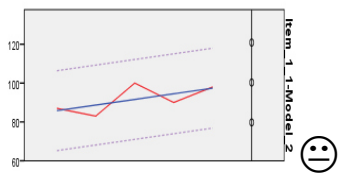
The rank value of Turkey in Global Innovation Index (GII) was 67 among 132 countries in 2010 while it remained nearly the same with 65 among 124 countries in 2011. In 2012, there was a tendency to go below the rank 70 which was expected for 2012 among 141 countries. After 2012, GII values got acceleration and went beyond the rank 59 in the end of 2014 which was the estimated value of 2015 and happened to be 54 among 144 countries. According to the statistical evaluation of the model, it cannot be said that there is a statistically significant acceleration for this change in the ranks of Turkey observed per years. P>0,10.

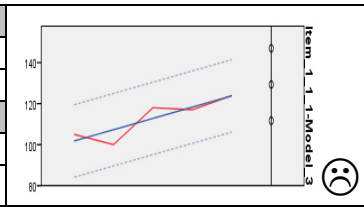
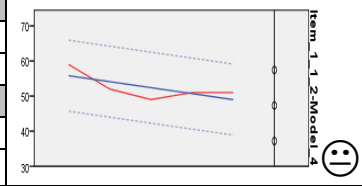
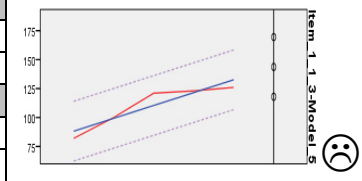
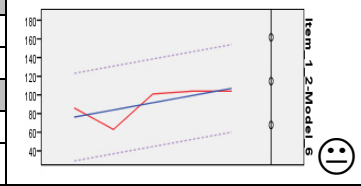
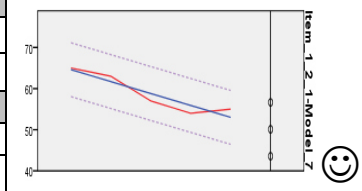
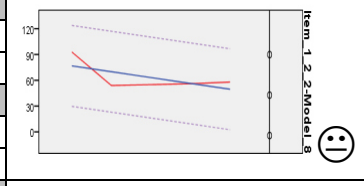
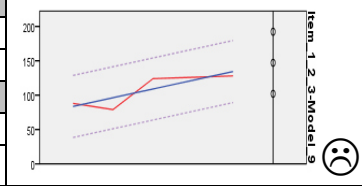
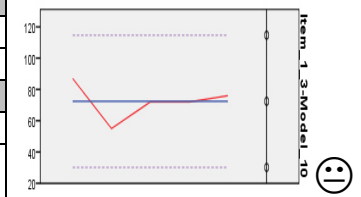
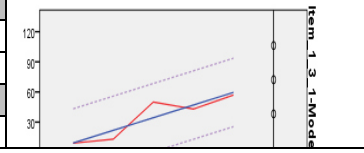
As to the Innovation Output Sub-Index (IOSI) rank value; the rank of Turkey was 76 in 2010 and significantly increased in 2011. There was a slight decrease in 2012 but it increased again in 2013 and 2014. Looking at the estimations, the rank of Turkey started with 71 in 2010 and increased slightly every year until 2015 with an estimated rank of 34 in 2015. The p value of the model shows that Turkey is an improvement trend if this acceleration remains the same in 2015 as well. P<0,10. There is an index value capable of fast improvement in 2015 and it should be supported.

As to the Innovation Input Sub-Index (IISI) rank value; the rank of Turkey was 66 in 2010 and slightly decreased in 2011. There was a 1 order decrease in 2012, no change in 2013 and increase in 2014. Looking at the estimations, the rank of Turkey started with 72 in 2010 and increased slightly every year until 2015 with an estimated rank of 85 in 2015. The p value of the model doesn't indicate any negative or positive progress. P>0,10.

As to the Innovation Efficiency Ratio (IER) rank value; the rank of Turkey was 97 in 2010 and significantly increased in 2011. There was a slight decrease in 2012 but it increased again in 2013 and 2014. Looking at the estimations, the rank of Turkey started with 75 in 2010 and increased slightly every year until 2015 with an estimated rank of 1 in 2015. If this improvement remains the same in 2015, it is estimated that the p value of the model will be reduced to p<0,05. In this sense, there will be focus on the components of this value and measures should be taken to support this acceleration.

The paper includes separate interpretations about Turkey's ranks of GII, IISI, IOSI and IER which are the basic indicators. As there are too many sub index indicators, there will not be any separate interpretations about the subsequent index values of five basic IISI and 2 basic IOSI sub indicators. Interpretations will be about the important sub-indexes of Turkey indicating negative progress, positive progress and stable positions. Table-10: Turkey's position according to P values of Global Innovation Index and sub-indexes includes the groups of innovation indicator ranks grouped per P values. These values will guide us on the areas that we should improve ourselves as a country.

1.Institutions	**1**		**Real/Estimates Rank Values**									
			2010		2011		2012		2013		2014	
			85	77	69	81	86	84	89	88	92	91
			Forecasting ARIMA model (2015)									
			Value		LCL		UCAL		P			
			94		68		121		0,283			
	1.1		**Real/Estimates Rank Values**									
			2010		2011		2012		2013		2014	
			87	86	83	89	100	92	90	94	98	97
			Forecasting ARIMA model (2015)									
			Value		LCL		UCAL		P			
			100		80		121		0,251			

		1.1.1	**Real/Estimates Rank Values** 2010 2011 2012 2013 2014 105 102 100 107 118 113 117 118 124 124 **Forecasting ARIMA model (2015)** Value LCL UCAL P 129 112 147 0,052	
		1.1.2	**Real/Estimates Rank Values** 2010 2011 2012 2013 2014 59 56 52 54 49 52 51 51 51 49 **Forecasting ARIMA model (2015)** Value LCL UCAL P 47 37 57 0,189	
		1.1.3	**Real/Estimates Rank Values** 2010 2011 2012 2013 2014 82 88 100 99 121 110 123 121 126 133 **Forecasting ARIMA model (2015)** Value LCL UCAL P 144 118 169 0,023	
	1.2		**Real/Estimates Rank Values** 2010 2011 2012 2013 2014 86 76 63 84 101 92 104 99 104 107 **Forecasting ARIMA model (2015)** Value LCL UCAL P 115 68 162 0,197	
		1.2.1	**Real/Estimates Rank Values** 2010 2011 2012 2013 2014 65 65 63 62 57 59 54 56 55 53 **Forecasting ARIMA model (2015)** Value LCL UCAL P 50 44 57 0,021	
		1.2.2	**Real/Estimates Rank Values** 2010 2011 2012 2013 2014 93 77 54 70 55 63 56 56 58 50 **Forecasting ARIMA model (2015)** Value LCL UCAL P 43 1 90 0,242	
		1.2.3	**Real/Estimates Rank Values** 2010 2011 2012 2013 2014 88 84 79 96 124 109 126 122 128 134 **Forecasting ARIMA model (2015)** Value LCL UCAL P 147 102 192 0,066	
	1.3		**Real/Estimates Rank Values** 2010 2011 2012 2013 2014 87 72 55 72 72 72 72 72 76 72 **Forecasting ARIMA model (2015)** Value LCL UCAL P 72 30 115 1,000	
		1.3.1	**Real/Estimates Rank Values** 2010 2011 2012 2013 2014 9 9 13 22 50 34 43 47 57 60 **Forecasting ARIMA model (2015)** Value LCL UCAL P	

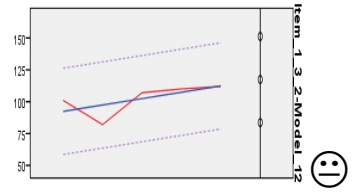
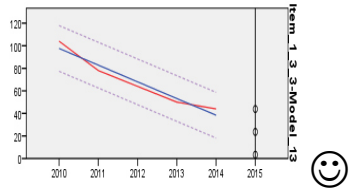
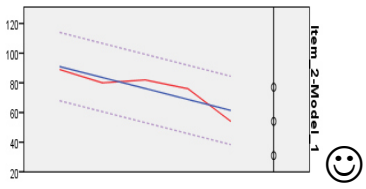
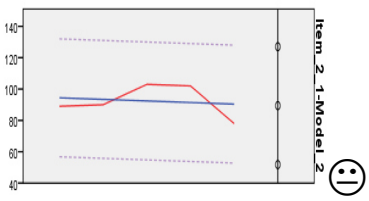
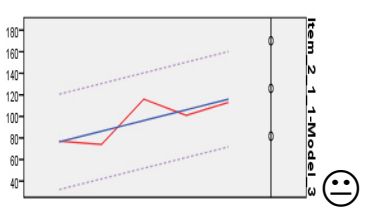
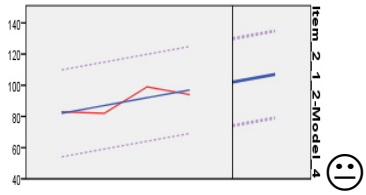
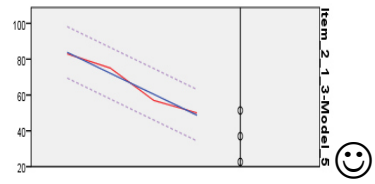
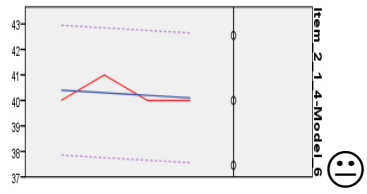
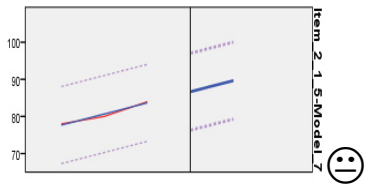
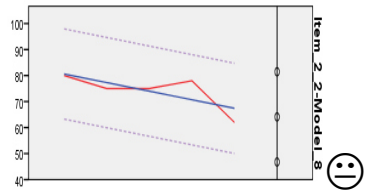
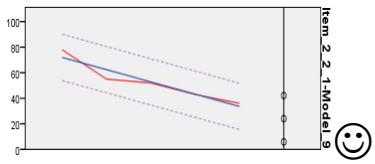
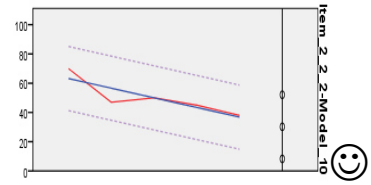
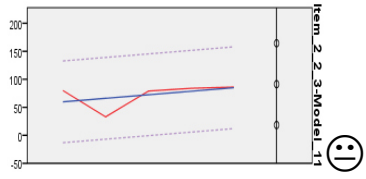
			72		38		106		0,034		
		1.3.2	Real/Estimates Rank Values								
			2010		2011		2012		2013		2014	
			101	92	82	97	107	102	110	107	112	112
			Forecasting ARIMA model (2015)									
			Value		LCL		UCAL		P			
			117		84		151		0,234			
		1.3.3	Real/Estimates Rank Values								
			2010		2011		2012		2013		2014	
			104	98	78	83	64	68	50	53	44	38
			Forecasting ARIMA model (2015)									
			Value		LCL		UCAL		P			
			24		3		44		0,005			

Table-3: Global Innovation Index Institutions index

1. Institutions: Looking from the basic input indicator point of view, Turkey's rank had negative progress except 2011 and is expected to be 94 in 2015 with 2-step decrease compared to 2014. Although Turkey had progress in 2011 with respect to this indicator, it couldn't maintain its position thereafter and negative progress continued. The statistical model with respect to institutions show that there is no positive progress in Turkey and urgent measures should be taken, p=0.248. The sub index values of the institutions basic indicator show that there are fast negative acceleration in the indicators of 1.1 political environments and 1.2 regulatory environments. However, there was rapid progress in 1.3 Business environment indicators from rank 87 in 2010 to rank 55 in 2011. I couldn't be maintained thereafter and it was decreased to rank 72 in 2012 and 2013 and to 76 in 2014. It is estimated to be at rank 72 again in 2015. It is easily seen that the most remarkable points in the institutions indicators are 1.2.2, 1.3.1 and 1.3.3. The rank for 1.3.1 Ease of starting a business decreased rapidly from 9 in 2010 to ranks 13, 50, 43 and 57 respectively with an estimation of further decrease to rank 72 in 2015. On the contrary, the indicator for 1.3.3 Ease of paying taxes had a rapid improvement and happened to be 107, 78, 64, 50 and 44 in years with an estimation of rank 24 in 2015 with further improvement.

2.Human capital & research	2		Real/Estimates Rank Values								
			2010		2011		2012		2013		2014	
			89	91	80	84	82	76	76	69	54	61
			Forecasting ARIMA model (2015)									
			Value		LCL		UCAL		P			
			54		31		77		0,048			
	2.1		Real/Estimates Rank Values								
			2010		2011		2012		2013		2014	
			89	94	90	93	103	92	102	91	78	90
			Forecasting ARIMA model (2015)									
			Value		LCL		UCAL		P			
			89		52		127		0,806			
		2.1.1	Real/Estimates Rank Values								
			2010		2011		2012		2013		2014	
			77	76	74	86	116	96	101	106	113	116
			Forecasting ARIMA model (2015)									
			Value		LCL		UCAL		P			
			126		82		170		0,110			

		2.1.2	**Real/Estimates Rank Values** 2010: 83, 82 — 2011: 82, 87 — 2012: 99, 92 — 2013: 94, 97 — 2014: , 102 **Forecasting ARIMA model (2015)** Value: 107 — LCL: 79 — UCAL: 135 — P: 0,227	
		2.1.3	**Real/Estimates Rank Values** 2010: , — 2011: 83, 84 — 2012: 75, 72 — 2013: 57, 60 — 2014: 50, 49 **Forecasting ARIMA model (2015)** Value: 37 — LCL: 23 — UCAL: 51 — P: 0,016	
		2.1.4	**Real/Estimates Rank Values** 2010: , — 2011: 40, 40 — 2012: 41, 40 — 2013: 40, 40 — 2014: 40, 40 **Forecasting ARIMA model (2015)** Value: 40 — LCL: 37 — UCAL: 43 — P: 0,742	
		2.1.5	**Real/Estimates Rank Values** 2010: 80, — 2011: 78, 78 — 2012: 80, 81 — 2013: 84, 84 — 2014: , 87 **Forecasting ARIMA model (2015)** Value: 90 — LCL: 79 — UCAL: 100 — P: 0,121	
	2.2	**2.2**	**Real/Estimates Rank Values** 2010: 78, 81 — 2011: 75, 77 — 2012: 75, 74 — 2013: 78, 71 — 2014: 62, 67 **Forecasting ARIMA model (2015)** Value: 64 — LCL: 47 — UCAL: 81 — P: 0,151	
		2.2.1	**Real/Estimates Rank Values** 2010: 70, 72 — 2011: 55, 62 — 2012: 52, 53 — 2013: 43, 43 — 2014: 36, 34 **Forecasting ARIMA model (2015)** Value: 24 — LCL: 6 — UCAL: 42 — P: 0,013	
		2.2.2	**Real/Estimates Rank Values** 2010: , 63 — 2011: 47, 57 — 2012: 50, 50 — 2013: 45, 43 — 2014: 38, 37 **Forecasting ARIMA model (2015)** Value: 30 — LCL: 8 — UCAL: 52 — P: 0,056	
		2.2.3	**Real/Estimates Rank Values** 2010: 80, 60 — 2011: 33, 66 — 2012: 79, 72 — 2013: 84, 79 — 2014: 86, 85 **Forecasting ARIMA model (2015)** Value: 91 — LCL: 18 — UCAL: 164 — P: 0,449	

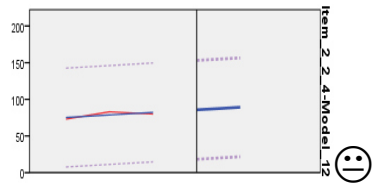
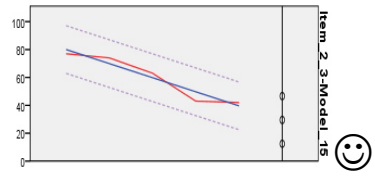
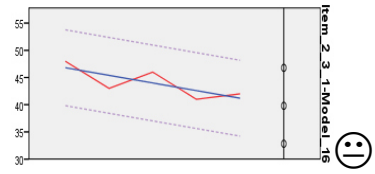
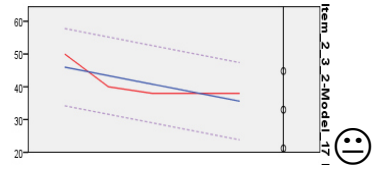
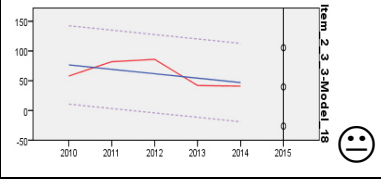
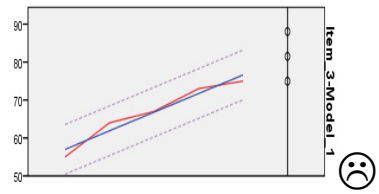
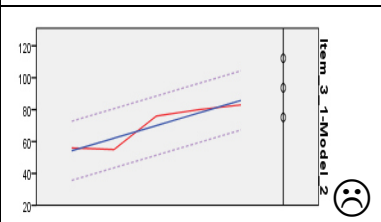
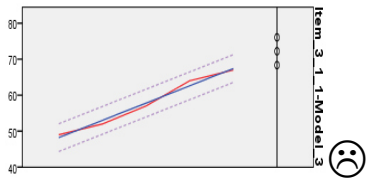
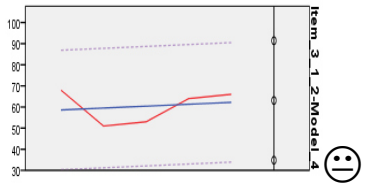
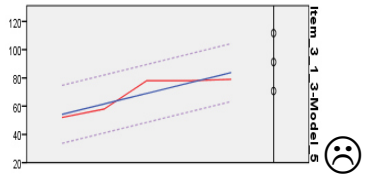
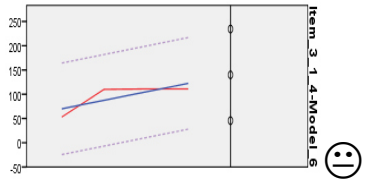
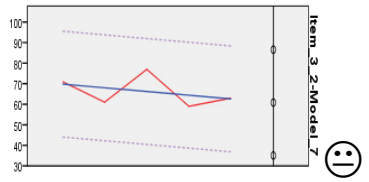
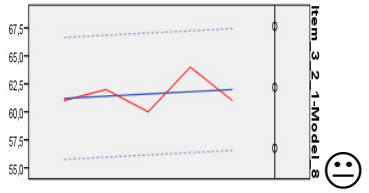
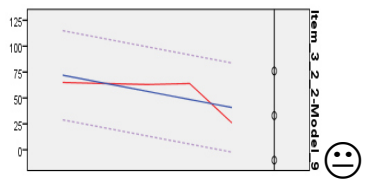
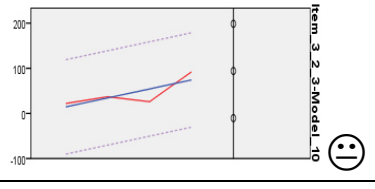
		2.2.4	**Real/Estimates Rank Values** 2010: ,	2011: 73, 75	2012: 83, 79	2013: 80, 82	2014: , 86 **Forecasting ARIMA model (2015)** Value: 89 | LCL: 22 | UCAL: 157 | P: 0,522	
	2.3		**Real/Estimates Rank Values** 2010: 77, 80 | 2011: 74, 70 | 2012: 63, 60 | 2013: 43, 50 | 2014: 42, 40 **Forecasting ARIMA model (2015)** Value: 30 | LCL: 12 | UCAL: 47 | P: 0,010	
		2.3.1	**Real/Estimates Rank Values** 2010: 48, 47 | 2011: 43, 45 | 2012: 46, 44 | 2013: 41, 43 | 2014: 42, 41 **Forecasting ARIMA model (2015)** Value: 40 | LCL: 33 | UCAL: 47 | P: 0,137	
		2.3.2	**Real/Estimates Rank Values** 2010: 50, 46 | 2011: 40, 43 | 2012: 38, 41 | 2013: 38, 38 | 2014: 38, 36 **Forecasting ARIMA model (2015)** Value: 33 | LCL: 21 | UCAL: 45 | P: 0,113	
		2.3.3	**Real/Estimates Rank Values** 2010: 58, 77 | 2011: 82, 69 | 2012: 86, 62 | 2013: 42, 54 | 2014: 41, 47 **Forecasting ARIMA model (2015)** Value: 40 | LCL: 1 | UCAL: 105 | P: 0,340	

Table-4: Global Innovation Index Human Capital & research

2. Human capital and research: With respect to this basic input indicator, it is seen that the rank of Turkey had some progress though not fast while it had rapid progress in 2014 to rank 54. In 2015, it is expected to maintain its position at rank 54. The statistical model for human capital and research show that Turkey is within a significant improvement. Looking at the sub index values of this basic indicator; a progress was seen in 2014 despite negative improvement in 2012 and 2013 in particular in the field of 2.1 Education with an estimate to be at rank 89 in 2015 with 11-step negative progress compared to 2014. This negative look of the item 2.1 is because of rapid negative progress of item 2.1.1 expenditure on education and its sub index of %GDP. The rank for the item 2.3 Research and development (R&D) was 77 in 2010 and had rapid improvement to rank 42 in 2014 with an estimate of rank 30 in 2015. Regarding human capital&research, it is seen that item 2 and 2.2.1 in Table 10 has p<0,05 and included in the group with successful policies.

3.Infrastructure	**3**		**Real/Estimates Rank Values** 2010: 55, 57 | 2011: 64, 62 | 2012: 67, 67 | 2013: 73, 72 | 2014: 75, 77 **Forecasting ARIMA model (2015)** Value: 81 | LCL: 75 | UCAL: 88 | P: 0,005	
	3.1		**Real/Estimates Rank Values** 2010: 56, 54 | 2011: 55, 62 | 2012: 76, 70 | 2013: 80, 78 | 2014: 83, 86 **Forecasting ARIMA model (2015)** Value: 94 | LCL: 75 | UCAL: 112 | P: 0,023	

		3.1.1	**Real/Estimates Rank Values**				
			2010	2011	2012	2013	2014
			49 48	52 53	57 58	64 63	67 67
			Forecasting ARIMA model (2015)				
			Value	LCL	UCAL	P	
			72	68	76	0,001	
		3.1.2	**Real/Estimates Rank Values**				
			2010	2011	2012	2013	2014
			68 59	51 60	53 60	64 61	66 62
			Forecasting ARIMA model (2015)				
			Value	LCL	UCAL	P	
			63	35	91	0,770	
		3.1.3	**Real/Estimates Rank Values**				
			2010	2011	2012	2013	2014
			52 54	58 62	78 69	78 76	79 84
			Forecasting ARIMA model (2015)				
			Value	LCL	UCAL	P	
			91	71	112	0,036	
		3.1.4	**Real/Estimates Rank Values**				
			2010	2011	2012	2013	2014
				53 70	110 88	111 105	111 122
			Forecasting ARIMA model (2015)				
			Value	LCL	UCAL	P	
			140	46	234	0,217	
	3.2		**Real/Estimates Rank Values**				
			2010	2011	2012	2013	2014
			71 70	61 68	77 66	59 64	63 63
			Forecasting ARIMA model (2015)				
			Value	LCL	UCAL	P	
			61	35	87	0,532	
		3.2.1	**Real/Estimates Rank Values**				
			2010	2011	2012	2013	2014
			61 61	62 61	60 62	64 62	61 62
			Forecasting ARIMA model (2015)				
			Value	LCL	UCAL	P	
			62	57	68	0,736	
		3.2.2	**Real/Estimates Rank Values**				
			2010	2011	2012	2013	2014
			65 72	64 64	63 56	64 49	26 41
			Forecasting ARIMA model (2015)				
			Value	LCL	UCAL	P	
			33	1	76	0,166	
		3.2.3	**Real/Estimates Rank Values**				
			2010	2011	2012	2013	2014
				22 14	37 34	26 54	92 74
			Forecasting ARIMA model (2015)				
			Value	LCL	UCAL	P	
			94	1	199	0,209	

		3.2.4	Real/Estimates Rank Values								
			2010		2011		2012	2013		2014	
					60	65	93	83	95	100		118
			Forecasting ARIMA model (2015)								
			Value		LCL		UCAL		P		
			135		1		296		0,301		
	3.3		Real/Estimates Rank Values								
			2010		2011		2012	2013		2014	
			53	69	91	66	58	64	64	62	56	60
			Forecasting ARIMA model (2015)								
			Value		LCL		UCAL		P		
			58		3		113		0,728		
		3.3.1	Real/Estimates Rank Values								
			2010		2011		2012	2013		2014	
			52	46	37	40	28	34	25	27	26	21
			Forecasting ARIMA model (2015)								
			Value		LCL		UCAL		P		
			14		1		33		0,041		
		3.3.2	Real/Estimates Rank Values								
			2010		2011		2012	2013		2014	
			72	96	111	93	104	90	104	88	61	85
			Forecasting ARIMA model (2015)								
			Value		LCL		UCAL		P		
			82		1		162		0,741		
		3.3.3	Real/Estimates Rank Values								
			2010		2011		2012	2013		2014	
			39	55	81	55	48	55	55	55	52	55
			Forecasting ARIMA model (2015)								
			Value		LCL		UCAL		P		
			55		1		113		1,000		

Table-5: Global Innovation Index Infrastructure Indexes

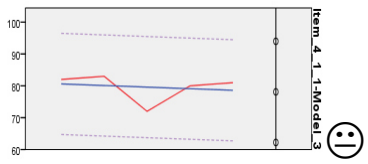
3. Infrastructure: Looking from the point of view of this basic input indicator, the rank values of infrastructure had constant decrease from 2010 to 2014 with rank values of 55, 64, 67, 73 and 75 with an estimate of rank 81 in 2015. The statistical model support the idea that Turkey is in negative progress through wrong policies in this indicator; p=0.005. When we look at the sub index values of this basic indicator; 3.1.4 e-participation indicator is one of the worst indicators with values of -, 53, 110, 111 and 111. It is estimated to be at rank 140 in 2015. Nevertheless, indicators 3.2.2 Logistic Performance and 3.3.1 GDP/Unit of energy use have good positions with rank 26 in values of 2005 PPP$/kg oil eq. In 2015, it is expected to have progress to rank 14. Regarding human capital and research, Table 10 show negative progress in items 3, 3.1, 3.1.1 and 3.1.3 requiring urgent action plans.

4.Market sophistication	4		Real/Estimates Rank Values								
			2010		2011		2012	2013		2014	
			70	71	72	68	64	66	60	63	63	61
			Forecasting ARIMA model (2015)								
			Value		LCL		UCAL		P		
			58		47		69		0,090		
	4.1		Real/Estimates Rank Values								
			2010		2011		2012	2013		2014	
			56	69	95	82	100	94	108	106	111	119
			Forecasting ARIMA model (2015)								
			Value		LCL		UCAL		P		
			131		92		170		0,051		

4.1.1

Real/Estimates Rank Values									
2010		2011		2012		2013		2014	
82	81	83	80	72	80	80	79	81	79

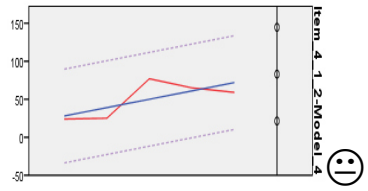
Forecasting ARIMA model (2015)			
Value	LCL	UCAL	P
78	62	94	0,772



4.1.2

Real/Estimates Rank Values									
2010		2011		2012		2013		2014	
24	28	25	39	77	50	65	61	59	72

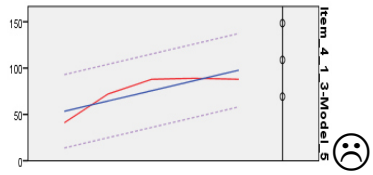
Forecasting ARIMA model (2015)			
Value	LCL	UCAL	P
83	21	145	0,170



4.1.3

Real/Estimates Rank Values									
2010		2011		2012		2013		2014	
41	53	72	65	88	76	89	87	88	98

Forecasting ARIMA model (2015)			
Value	LCL	UCAL	P
109	69	149	0,067

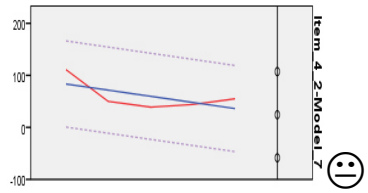


4.2

4.2.1

Real/Estimates Rank Values									
2010		2011		2012		2013		2014	
111	83	50	72	39	60	44	48	55	36

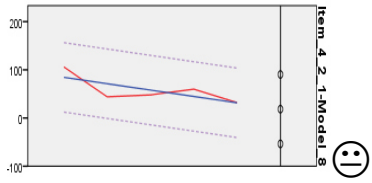
Forecasting ARIMA model (2015)			
Value	LCL	UCAL	P
24	1	107	0,247



4.2.1

Real/Estimates Rank Values									
2010		2011		2012		2013		2014	
106	84	44	71	48	58	60	45	32	32

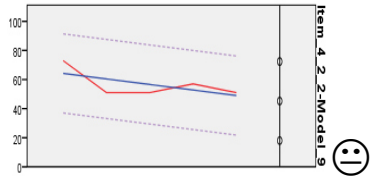
Forecasting ARIMA model (2015)			
Value	LCL	UCAL	P
18	1	90	0,162



4.2.2

Real/Estimates Rank Values									
2010		2011		2012		2013		2014	
73	64	51	60	51	57	57	53	51	49

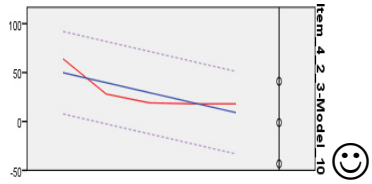
Forecasting ARIMA model (2015)			
Value	LCL	UCAL	P
45	18	72	0,254



4.2.3

Real/Estimates Rank Values									
2010		2011		2012		2013		2014	
64	50	28	40	19	29	18	19	18	9

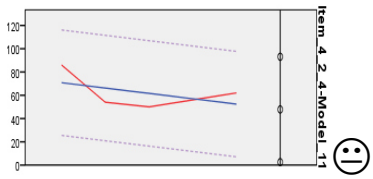
Forecasting ARIMA model (2015)			
Value	LCL	UCAL	P
1	1	41	0,093



4.2.4

Real/Estimates Rank Values									
2010		2011		2012		2013		2014	
86	71	54	66	50	62	56	57	62	52

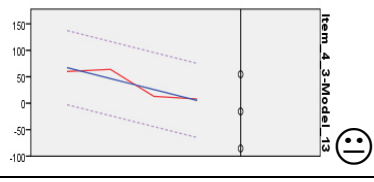
Forecasting ARIMA model (2015)			
Value	LCL	UCAL	P
48	3	93	0,382



4.3

Real/Estimates Rank Values									
2010		2011		2012		2013		2014	
		60	67	64	47	13	26	8	5

Forecasting ARIMA model (2015)			
Value	LCL	UCAL	P
1	1	55	0,105



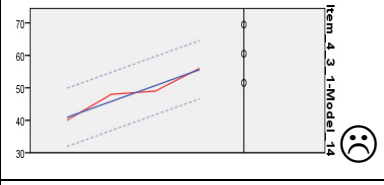
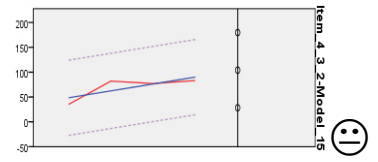
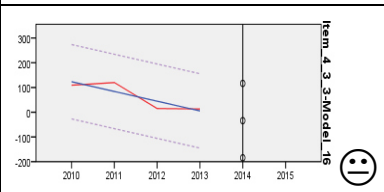
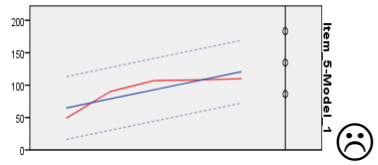
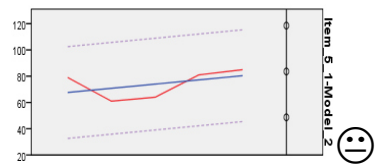
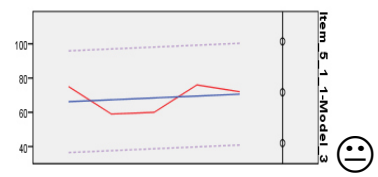
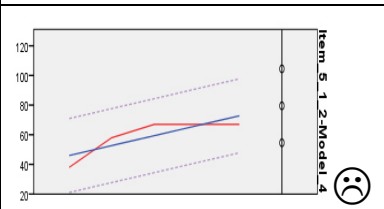
		4.3.1	**Real/Estimates Rank Values**									
			2010		2011		2012		2013		2014	
					40	41	48	46	49	51	56	56
			Forecasting ARIMA model (2015)									
			Value		LCL		UCAL		P			
			60		52		69		0,034			
		4.3.2	**Real/Estimates Rank Values**									
			2010		2011		2012		2013		2014	
					35	48	82	62	77	76	83	90
			Forecasting ARIMA model (2015)									
			Value		LCL		UCAL		P			
			104		28		180		0,219			
		4.3.3	**Real/Estimates Rank Values**									
			2010		2011		2012		2013		2014	
					109	123	120	84	15	45	13	5
			Forecasting ARIMA model (2015)									
			Value		LCL		UCAL		P			
			1		1		116		0,128			

Table-6: Global Innovation Index Market Sophistication Indexes

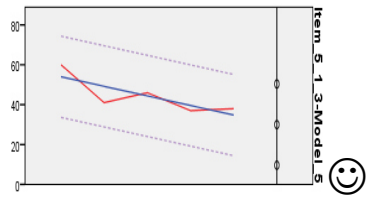
4. Market Sophistication: With respect to this basic input indicator, a progress was noticed from 2010 to 2014 with rank values of 70, 72, 64, 60 and 63 where further progress is expected with rank 58 in 2015. The statistical model regarding market sophistication shows that Turkey has positive impact with existing policies. P value is between 0,05-0,10. Regarding the sub index values of this basic indicator, the indicator 4.1 Credit is one of the worst indicators with values 56, 95, 100, 108 and 111. Further negative progress is expected in 2015 to rank 131. Despite that, rapid progress was seen in items 4.3 trade&competition with rank values -, 60, 64, 13 and 8; and 4.3.3 Intensity of local competition with 109, 120, 15 and 13 with further rapid progress in 2015.

5.Business sophistication	**5**		**Real/Estimates Rank Values**									
			2010		2011		2012		2013		2014	
			49	65	90	79	107	93	108	107	110	121
			Forecasting ARIMA model (2015)									
			Value		LCL		UCAL		P			
			135		86		183		0,062			
	5.1		**Real/Estimates Rank Values**									
			2010		2011		2012		2013		2014	
			79	68	61	71	64	74	81	77	85	80
			Forecasting ARIMA model (2015)									
			Value		LCL		UCAL		P			
			84		49		119		0,425			
		5.1.1	**Real/Estimates Rank Values**									
			2010		2011		2012		2013		2014	
			75	66	59	67	60	68	76	69	72	71
			Forecasting ARIMA model (2015)									
			Value		LCL		UCAL		P			
			72		42		101		0,734			
		5.1.2	**Real/Estimates Rank Values**									
			2010		2011		2012		2013		2014	
			38	46	58	53	67	59	67	66	67	73
			Forecasting ARIMA model (2015)									
			Value		LCL		UCAL		P			
			79		55		104		0,074			

5.1.3

Real/Estimates Rank Values									
2010		2011		2012		2013		2014	
60	54	41	49	46	44	37	40	38	35

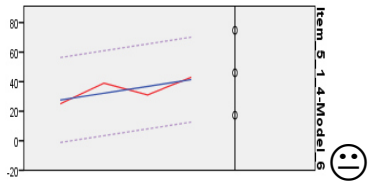
Forecasting ARIMA model (2015)			
Value	LCL	UCAL	P
30	10	50	0,098



5.1.4

Real/Estimates Rank Values									
2010		2011		2012		2013		2014	
		25	28	39	32	31	37	43	41

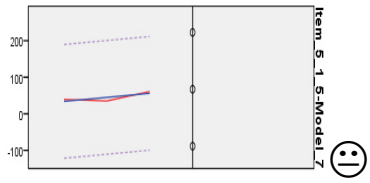
Forecasting ARIMA model (2015)			
Value	LCL	UCAL	P
46	17	75	0,263



5.1.5

Real/Estimates Rank Values									
2010		2011		2012		2013		2014	
				39	34	35	45	61	56

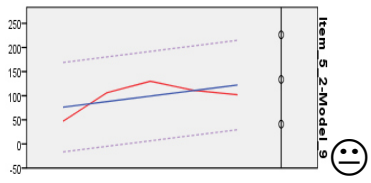
Forecasting ARIMA model (2015)			
Value	LCL	UCAL	P
67	1	223	0,425



5.2

Real/Estimates Rank Values									
2010		2011		2012		2013		2014	
47	76	106	88	130	99	111	111	102	122

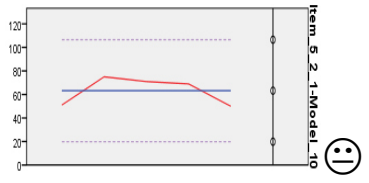
Forecasting ARIMA model (2015)			
Value	LCL	UCAL	P
134	41	226	0,300



5.2.1

Real/Estimates Rank Values									
2010		2011		2012		2013		2014	
51	63	75	63	71	63	69	63	50	63

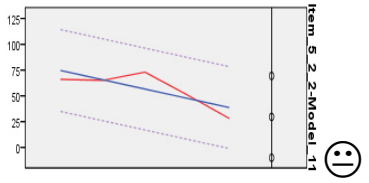
Forecasting ARIMA model (2015)			
Value	LCL	UCAL	P
63	20	107	1,000



5.2.2

Real/Estimates Rank Values									
2010		2011		2012		2013		2014	
66	75	65	66	73	57	51	48	28	39

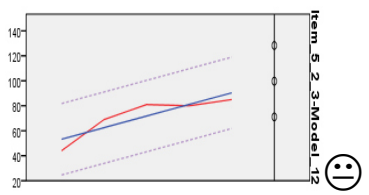
Forecasting ARIMA model (2015)			
Value	LCL	UCAL	P
30	1	69	0,107



5.2.3

Real/Estimates Rank Values									
2010		2011		2012		2013		2014	
44	53	69	63	81	72	80	81	85	90

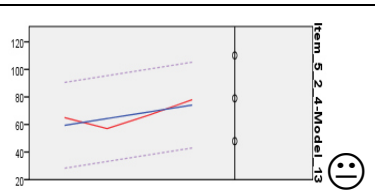
Forecasting ARIMA model (2015)			
Value	LCL	UCAL	P
100	71	128	0,047



5.2.4

Real/Estimates Rank Values									
2010		2011		2012		2013		2014	
		65	59	57	64	67	69	78	74

Forecasting ARIMA model (2015)			
Value	LCL	UCAL	P
79	48	110	0,269

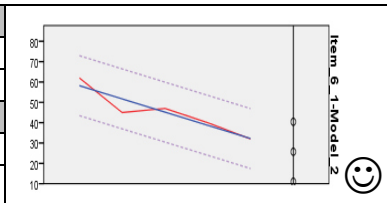
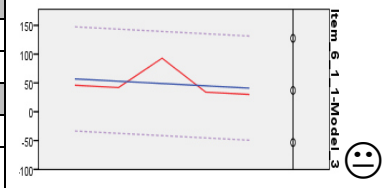
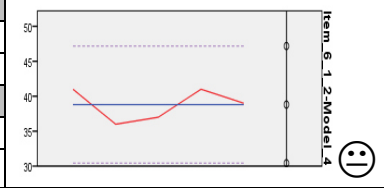
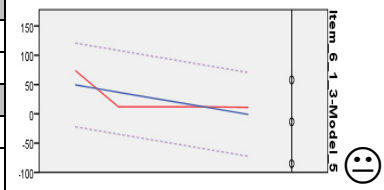
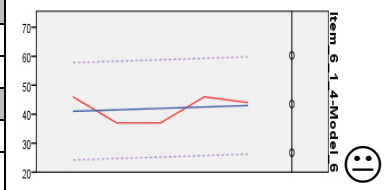
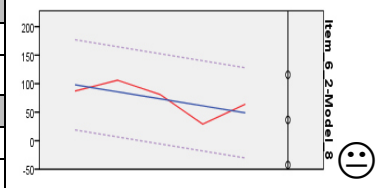
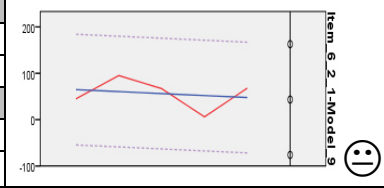
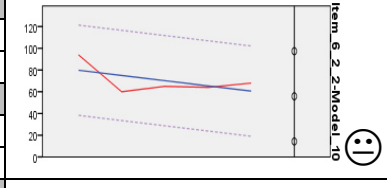
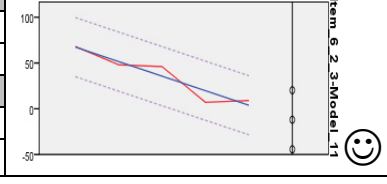


		5.2.5	Real/Estimates Rank Values								
			2010		2011		2012		2013		2014
					72	82	100	76	52	70	67	63
			Forecasting ARIMA model (2015)								
			Value		LCL		UCAL		P		
			57		1		154		0,594		
	5.3		Real/Estimates Rank Values								
			2010		2011		2012		2013		2014
			36	61	103	78	108	96	115	114	118	131
			Forecasting ARIMA model (2015)								
			Value		LCL		UCAL		P		
			149		77		221		0,091		
		5.3.1	Real/Estimates Rank Values								
			2010		2011		2012		2013		2014
			45	53	65	56	69	58	46	61	67	63
			Forecasting ARIMA model (2015)								
			Value		LCL		UCAL		P		
			66		25		107		0,584		
		5.3.2	Real/Estimates Rank Values								
			2010		2011		2012		2013		2014
			31	39	51	45	53	51	67	57	52	62
			Forecasting ARIMA model (2015)								
			Value		LCL		UCAL		P		
			68		35		101		0,176		
		5.3.3	Real/Estimates Rank Values								
			2010		2011		2012		2013		2014
					96	94	105	105	109	116	131	127
			Forecasting ARIMA model (2015)								
			Value		LCL		UCAL		P		
			137		112		163		0,053		
		5.3.4	Real/Estimates Rank Values								
			2010		2011		2012		2013		2014
					87	92	104	94	90	95	97	97
			Forecasting ARIMA model (2015)								
			Value		LCL		UCAL		P		
			98		60		137		0,728		

Table-7: Global Innovation Index Business Sophistication Indexes

5. Business Sophistication: With regard to this basic input indicator, rapid negative progress was seen from 2010 to 2014 with rank values of 49, 90, 107, 108 and 110 with further negative progress to 135 in 2015. Statistical model regarding business sophistication shows that Turkey has a negative tendency with wrong policies and urgent action plans are required. P value is between 0,05-0,10 with upward curve direction. The sub index values of this basic indicator show that almost all indicators other than 5.2.2 state of cluster development are negative and it is expected to be negative in 2015 as well.

6.Knowledge &	6		Real/Estimates Rank Values								
			2010		2011		2012		2013		2014
			88	92	90	80	63	68	49	56	48	43
			Forecasting ARIMA model (2015)								
			Value		LCL		UCAL		P		
			31		5		58		0,019		

	6.1	6.1	Real/Estimates Rank Values 2010 2011 2012 2013 2014 62 58 45 52 47 45 40 39 32 32 Forecasting ARIMA model (2015) Value LCL UCAL P 26 11 40 0,021	
		6.1.1	Real/Estimates Rank Values 2010 2011 2012 2013 2014 46 57 42 53 93 49 34 45 30 41 Forecasting ARIMA model (2015) Value LCL UCAL P 37 1 127 0,686	
		6.1.2	Real/Estimates Rank Values 2010 2011 2012 2013 2014 41 39 36 39 37 39 41 39 39 39 Forecasting ARIMA model (2015) Value LCL UCAL P 39 30 47 1,000	
		6.1.3	Real/Estimates Rank Values 2010 2011 2012 2013 2014 74 49 12 37 12 24 12 12 11 1 Forecasting ARIMA model (2015) Value LCL UCAL P 1 1 58 0,174	
		6.1.4	Real/Estimates Rank Values 2010 2011 2012 2013 2014 46 41 37 42 37 42 46 42 44 43 Forecasting ARIMA model (2015) Value LCL UCAL P 43 27 60 0,784	
	6.2		Real/Estimates Rank Values 2010 2011 2012 2013 2014 87 98 106 86 81 73 29 61 64 49 Forecasting ARIMA model (2015) Value LCL UCAL P 37 1 116 0,215	
		6.2.1	Real/Estimates Rank Values 2010 2011 2012 2013 2014 45 65 95 60 67 56 6 52 68 48 Forecasting ARIMA model (2015) Value LCL UCAL P 43 1 163 0,741	
		6.2.2	Real/Estimates Rank Values 2010 2011 2012 2013 2014 94 80 60 75 65 70 64 65 68 61 Forecasting ARIMA model (2015) Value LCL UCAL P 56 14 97 0,329	
		6.2.3	Real/Estimates Rank Values 2010 2011 2012 2013 2014 68 67 48 51 46 36 7 20 9 4 Forecasting ARIMA model (2015) Value LCL UCAL P 1 1 20 0,016	

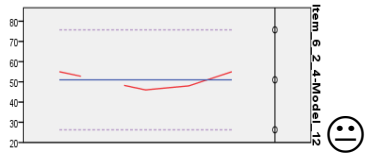
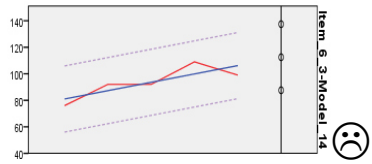
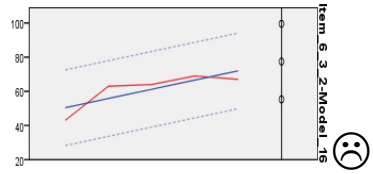
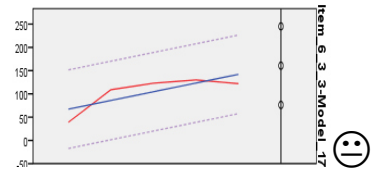
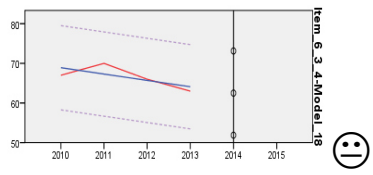
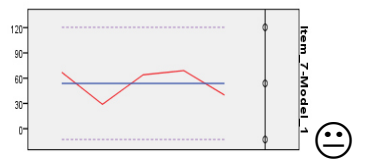
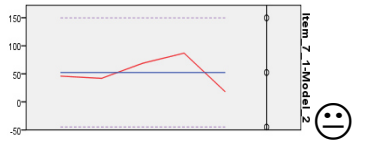
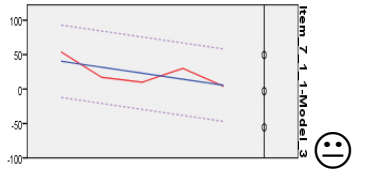
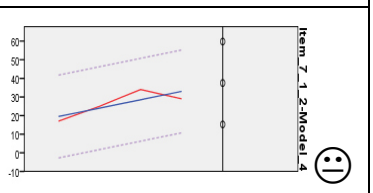
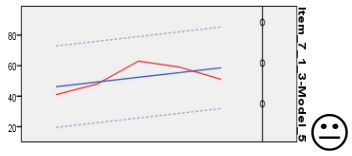
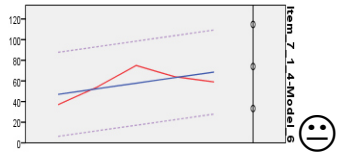
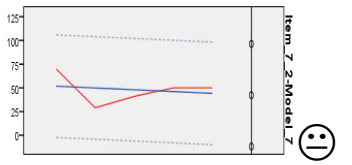
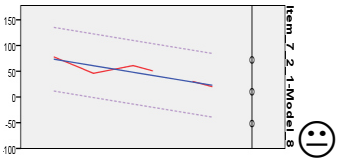
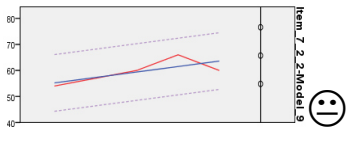
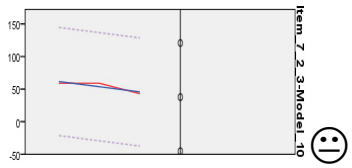
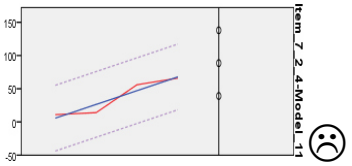
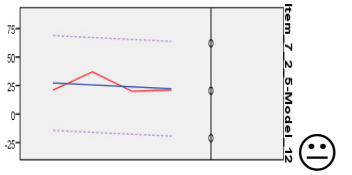
		6.2.4	**Real/Estimates Rank Values**	
			2010 2011 2012 2013 2014	
			55 51 51 46 51 48 51 55 51	
			Forecasting ARIMA model (2015)	
			Value LCL UCAL P	
			51 26 76 1,000	
	6.3		**Real/Estimates Rank Values**	
			2010 2011 2012 2013 2014	
			76 81 92 87 92 94 109 100 99 106	
			Forecasting ARIMA model (2015)	
			Value LCL UCAL P	
			112 88 137 0,085	
		6.3.2	**Real/Estimates Rank Values**	
			2010 2011 2012 2013 2014	
			43 50 63 56 64 61 69 67 67 72	
			Forecasting ARIMA model (2015)	
			Value LCL UCAL P	
			77 55 100 0,091	
		6.3.3	**Real/Estimates Rank Values**	
			2010 2011 2012 2013 2014	
			39 67 109 86 123 105 130 123 122 142	
			Forecasting ARIMA model (2015)	
			Value LCL UCAL P	
			161 76 245 0,112	
		6.3.4	**Real/Estimates Rank Values**	
			2010 2011 2012 2013 2014	
			67 69 70 67 66 66 63 64	
			Forecasting ARIMA model (2015)	
			Value LCL UCAL P	
			63 52 73 0,284	

Table-8: Global Innovation Index Knowledge & Technology Outputs Indexes

6. Knowledge & Technology Outputs: Regarding this basic output indicator, there was progress from 2010 to 2014 with rank values of 88, 90, 63, 49 and 48 with expectation of improvement in 2015 with a rank value of 31. The statistical model regarding knowledge&technology outputs show that Turkey has right policies and has to maintain the current system; p=0.062. Looking at the sub index values of this basic indicator, 6.1.Knowledge creation and 6.2.3.Computer software spending, %GDP indicators have the best rank values. Table 10 regarding this output indicator shows that item 6, 6.1 and 6.2.3 are in the group with successful policies with p<0,05.

7.Creative outputs	**7**		**Real/Estimates Rank Values**	
			2010 2011 2012 2013 2014	
			67 54 29 54 64 54 69 54 40 54	
			Forecasting ARIMA model (2015)	
			Value LCL UCAL P	
			54 1 120 1,000	
	7.1		**Real/Estimates Rank Values**	
			2010 2011 2012 2013 2014	
			46 52 42 52 69 52 87 52 18 52	
			Forecasting ARIMA model (2015)	
			Value LCL UCAL P	
			52 1 150 1,000	
		7.1.1	**Real/Estimates Rank Values**	
			2010 2011 2012 2013 2014	
			54 40 17 32 10 23 30 14 4 6	
			Forecasting ARIMA model (2015)	
			Value LCL UCAL P	
			1 1 49 0,195	

		7.1.2	**Real/Estimates Rank Values**				
			2010	2011	2012	2013	2014
				17 20	25 24	34 28	29 33
			Forecasting ARIMA model (2015)				
			Value	LCL	UCAL	P	
			37	15	60	0,191	
		7.1.3	**Real/Estimates Rank Values**				
			2010	2011	2012	2013	2014
			41 46	48 49	63 52	59 55	51 59
			Forecasting ARIMA model (2015)				
			Value	LCL	UCAL	P	
			62	35	88	0,327	
		7.1.4	**Real/Estimates Rank Values**				
			2010	2011	2012	2013	2014
			37 47	54 52	75 58	64 63	59 69
			Forecasting ARIMA model (2015)				
			Value	LCL	UCAL	P	
			74	33	115	0,274	
	7.2		**Real/Estimates Rank Values**				
			2010	2011	2012	2013	2014
			70 52	29 50	41 48	50 46	50 44
			Forecasting ARIMA model (2015)				
			Value	LCL	UCAL	P	
			42	1	96	0,747	
		7.2.1	**Real/Estimates Rank Values**				
			2010	2011	2012	2013	2014
			78 73	46 61	61 48	35	20 23
			Forecasting ARIMA model (2015)				
			Value	LCL	UCAL	P	
			10	1	72	0,121	
		7.2.2	**Real/Estimates Rank Values**				
			2010	2011	2012	2013	2014
			54 55	57 57	60 59	66 61	60 64
			Forecasting ARIMA model (2015)				
			Value	LCL	UCAL	P	
			66	55	77	0,148	
		7.2.3	**Real/Estimates Rank Values**				
			2010	2011	2012	2013	2014
					59 62	59 54	43 46
			Forecasting ARIMA model (2015)				
			Value	LCL	UCAL	P	
			38	1	121	0,333	
		7.2.4	**Real/Estimates Rank Values**				
			2010	2011	2012	2013	2014
				11 6	14 26	56 47	66 68
			Forecasting ARIMA model (2015)				
			Value	LCL	UCAL	P	
			88	39	138	0,057	
		7.2.5	**Real/Estimates Rank Values**				
			2010	2011	2012	2013	2014
				21 27	37 26	20 24	21 22
			Forecasting ARIMA model (2015)				
			Value	LCL	UCAL	P	
			21	1	62	0,732	

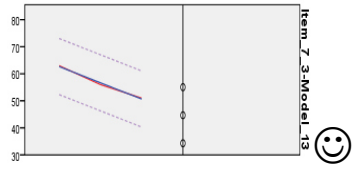
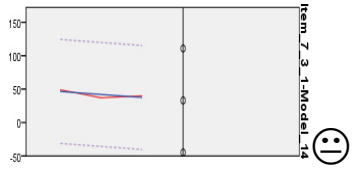
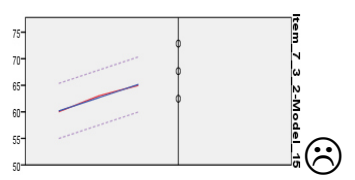
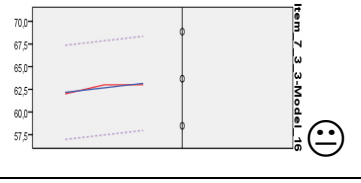
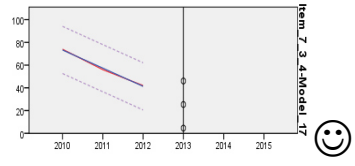
	7.3	7.3	Real/Estimates Rank Values								
			2010		2011		2012		2013		2014	
							63	63	56	57	51	51
			Forecasting ARIMA model (2015)									
			Value		LCL		UCAL		P			
			45		34		55		0,061			
		7.3.1	Real/Estimates Rank Values								
			2010		2011		2012		2013		2014	
							49	46	37	42	40	38
			Forecasting ARIMA model (2015)									
			Value		LCL		UCAL		P			
			33		1		111		0,488			
		7.3.2	Real/Estimates Rank Values								
			2010		2011		2012		2013		2014	
							60	60	63	63	65	65
			Forecasting ARIMA model (2015)									
			Value		LCL		UCAL		P			
			68		62		73		0,073			
		7.3.3	Real/Estimates Rank Values								
			2010		2011		2012		2013		2014	
							62	62	63	63	63	63
			Forecasting ARIMA model (2015)									
			Value		LCL		UCAL		P			
			64		58		69		0,333			
		7.3.4	Real/Estimates Rank Values								
			2010		2011		2012		2013		2014	
							74	73	56	57	42	41
			Forecasting ARIMA model (2015)									
			Value		LCL		UCAL		P			
			25		5		46		0,046			

Table-9: Global Innovation Index Creative Outputs Indexes

7. Creative Outputs: Regarding this basic output indicator; there were increases and decreases in years with rank values of 67, 29, 64, 69 and 40. It is expected that the rank will have negative progress with 54 in 2015 with reverse acceleration. Values from 2012 for almost half of this output indicator show that there may be different results for 2015 estimates. Statistical model regarding creative outputs show that the current policies in Turkey is not useful and there is no negative or positive progress; p=1.000. The sub index values of this basic indicator show that the worst indicators are 7.2.4.Printing & Publishing manufactures % and 7.3.2. Country-code TLDs/th pop. 15-69.

The study revealed 5 different statuses of P values obtained according to the statistical results with the GII ranks of Turkey between 2010-2014. These 5 different status are shown between 1-5 where 1 is the best, 2 is positive progress, 3 is no change, 4 is negative progress and 5 is the worst. Table 10 includes the number showing the status of Turkey with respect to GII according to the value range of P and the direction of the graphics curve.

Status 1: P value is less than 0,05 with downward curve direction. For indicators with this value of P, it can be said that there are correct policies and the current system should be maintained the same way.

Status 2: P value is between 0,05-0,10 with downward curve direction. For indicators with this value of P, the current policies had positive effect, indicators in these criteria for 2015 should be definitely addressed and supported and short term additional action plans should be made.

Status 3: P value is p>0,10. For indicators with this value of P, the current policies have no use, there is no negative or positive progress, new policies should be developed, and new comprehensive action plans should be prepared and implemented.

Status 4: P value is between 0,05 – 0,10 with upward curve direction. For the indicators with this value of P, it can be said that we are in a negative tendency and urgent action plans are required.

Status 5: P value is smaller than 0,05 with upward curve direction. For indicators with this value of P, we can say that we are in negative progress due to wrong policies and that urgent action plans are required.

	Basic	1.Institutions	2. Human Capital&Research	3.Infrast-ructure	4. Market Sophistication	5. Business Sophistication	6. Knowledge & Technology Out.	7. Creative Outputs
1		1.2.1 1.3.3	2 2.1.3 2.2.1	3.3.1			6 6.1 6.2.3	7.3.4
2	IOSI IER		2.2.2 2.3		4 4.2.3	5.1.3		7.3
3	GII IISI	1 1.1 1.1.2 1.2 1.2.2 1.3 1.3.2	2.1 2.1.1 2.1.2 2.1.4 2.1.5 2.2 2.2.3 2.2.4 2.3.1 2.3.2 2.3.3	3.1.2 3.1.4 3.2 3.2.1 3.2.2 3.2.3 3.2.4 3.3 3.3.2 3.3.3	4.1.1 4.1.2 4.2 4.2.1 4.2.2 4.2.4 4.3 4.3.2 4.3.3	5.1 5.1.1 5.1.4 5.1.5 5.2 5.2.1 5.2.2 5.2.4 5.2.5 5.3.1 5.3.2 5.3.4	6.1.1 6.1.2 6.1.3 6.1.4 6.2 6.2.1 6.2.2 6.2.4 6.3.3 6.3.4	7 7.1 7.1.1 7.1.2 7.1.3 7.1.4 7.2 7.2.1 7.2.2 7.2.3 7.2.5 7.3.1 7.3.3
4		1.1.1 1.2.3			4.1 4.1.3	5 5.1.2 5.3 5.3.3	6.3 6.3.2	7.2.4 7.3.2
5		1.1.3 1.3.1		3 3.1 3.1.1 3.1.3	4.3.1	5.2.3		

Table 10: Status of Turkey according to P values of Global Innovation Index and sub-indexes (1 the best, 2 positive progress, 3 no change, 4 negative progress, 5 the worst).

4. Discussion

For innovation, which is one of the most important concept for the countries to increase their national income and welfare and for the business to compete and survive in global area, what is the position of Turkey in the world between 2010-2014 with respect to the ranks of Global Innovation Index covering the world countries, what are the strengthening, weakening and neutral areas, what measures should be taken in which areas as a solution?

First of all, the place of Turkey in innovation should be correctly analysed and determined for Turkey to move from the group of developing countries to the group of developed countries. This is the goal of our study. After findings, correct and effective innovation policies and strategies should be established timely and impartially. We intended the results of our study to be a guide to this.

In this study, first the values of GII, IISI, IOSI and IER values of the Innovation Index indicators were first examined. According to the statistical evaluation of the model, it cannot be said that there is no statistically significant positive acceleration for this change in GII and IISI observed per years, or there is positive or negative development. For this change in IOSI and IER observed per years, there is a positive improvement and a statistically significant positive acceleration was gained, this should be supported and measures to support this acceleration should be taken in the second half of the year by focusing on the components of this value.

After that, five basic IISI and 2 basic IOSI sub indicators were examined group by group. Each group was handled with all sub indicators. As there are too many indicators, there are important sub-indexes indicating the position of Turkey either positive progress, negative progress and stable.

After that, 5 different statuses were different according to the graphics and P values obtained according to the statistical results with the all GII indicator ranks of Turkey between 2010-2014. These are accepted as best (1), positive progress (2), no changes (3), negative progress (4) and the worst (5). Table 10 includes the number showing the status of Turkey with respect to GII according to the value range of P and the direction of the graphics curve.

When we examine rank tables of the seven group innovation indicators and their sub indicators for Turkey between 2010-2014:

1. Institutions: Regarding basic input indicator, it is the only input indicator of Turkey without a change. It is seen that Turkey has no negative or positive progress, current policies have no use, new policies should be developed and new comprehensive action plans should be taken. According to the P values of the sub indicators of institutions, the best ones are 1.2.1 and 1.3.3, the worst ones are 1.1.3 and 1.3.1 but there is no one with positive progress.

2. Human capital & research: This is the only input indicator where Turkey is the best with respect to basic input indicator. It is seen that Turkey has good policies and it should continue the current system in the same manner. According to the P values of the human capital and research sub indicators, the best ones are 2, 2.1.3 and 2.2.1, there is not worst and negative progress for this indicator.

3. Infrastructure: This is the only indicator where Turkey is the worst with respect to basic input indicator. Unfortunately, it is seen that Turkey has negative progress due to wrong policies and urgent action plans should be taken. Only item 3.3.1 was the best according to the P values of the infrastructure sub indicators, items 3, 3.1, 3.1.1, 3.1.3 are the worst and there are no negative and positive indicators.

4. Market Sophistication: This is the only indicator of Turkey with positive progress with respect to basic input indicator. It was seen that the existing policies of Turkey had a positive impact but there should be focus and further support to the indicators for the year 2015 and short term additional action plans should be made. There was no best indicator according to the P values of the sub indicators of Market Sophistication and item 4.3.1 was the worst.

5. Business Sophistication: It is the only indicator of Turkey with negative progress regarding basic input indicator. It is seen that Turkey is a negative tendency due to wrong policies and urgent action plans should be taken. There is no best indicator according to the P values of the sub indicators of Business Sophistication and the item 5.2.3 is the worst.

6. Knowledge & Technology Outputs: It is the only out indicator of Turkey with respect to basic output indicator. It is seen that Turkey has correct policies and the current system should be maintained in the same way. Items 6, 6.1 and 6.2.3 were found to be best according to the P values of the sub indicators of human capital & research and the worst ones are not valid for this indicator.

7. Creative Outputs: It is the only output indicator of Turkey with no change with respect to basic output indicators. It is seen that there is no negative or positive progress of Turkey, current policies have no use, new policies should be developed and new comprehensive action plans should be taken. It was found that item 7.3.4 was the best according to the P values of the sub indicators of Creative Outputs and the worst didn't exist.

Innovation is very important for Turkey as well as all countries. The relevant researches reveal that the organizations which use the innovation process effectively are able to improve their processes, differentiate their products and services, and enlarge their market shares and grow more than do their competitors (Tidd et al, 2005: Geroski, Machin and Van Reenen, 1993: Geroski and Machin, 1993)

The status of Turkey with respect to innovation indicators can be easily seen in Table 10. Table 10 shows that Turkey is the best in the indicators of 1.2.1.Regulatory quality, 1.3.3.Ease of paying taxes, 2.Human capital & research, 2.1.3. School life expectancy, years, 2.2.1.Tertiary enrolment, %gross, 3.3.1.GDP/unit of energy use, 2005, PPP$/kg oil eq, 6.Knowledge&technology outputs, 6.1.Knowledge creation, 6.2.3.Computer software spending, %GDP and 7.3.4. Video uploads on youTube/pop. 15-69.

5. Conclusions

Our expectations from the results of this study are to reveal the innovation status of Turkey, to make estimation for 2015, to inform governments, businesses and individuals and create awareness for governments, business world, administrators, informatics specialists, investors, educators and universities, to guide them in developing future plannings, strategies and administrative tools. For each indicator, the expected and realized position of Turkey was found; solution proposals were given for the strengthening, weakening and no progress indicators of the country. Accordingly, among total 110 basic and sub indicators, Turkey was the best in 10 indicators, had positive progress in 8 indicators, no change in 72 indicators, and negative progress in 12 indicators and was the worst in 8 indicators. As there were many indicators in the Innovation Index, results were not separately interpreted for each indicator. For the results of the study, Table 10 should be examined and interpreted very

well.

Turkey needs the miracle of innovation to move from the group of developing countries to the group of developed one, to step forward and to have its voices in global competition. Benefitting from innovations by developing countries will be faster and more effective compared to developed countries. Turkey has not reached to the point of satisfaction with respect to innovation. It has advantages regarding population considering the fact that the population would have an excessive impact (Alakoç Burma, Z., 2015, 80).

Given the fact that the rank of Turkey for GII was 54 among 144 countries in 2014, it is clearly seen that Turkey has long way to go. Our expectation for 2015 is 59 because of worse GII values in previous years (67, 65, 74, 68).

As it can be seen clearly from Table 10, Turkey is the best in the outputs 2.Human Capital&Research and 6.Knowledge$Technology. These indicators clearly show the importance of research and education. Priority should be given to education and R&D to increase the innovation rank of Turkey, and urgent measures should be taken in sub indicators of the indicators 2 and 6 with no negative or positive progress. For example, Germany found three indicators with difficulties of innovational education policy as number of persons graduated from the science and technology departments (university), lack of lifelong learning activities and reduction in the number of people starting secondary education (http://trendchart.cordis.lu, 2006). The role of education and related innovations is one of the most important four elements in the national innovation system of Japan which is among the leader countries in innovation (Freeman, 1987:4).

Table 10 in the study also clearly indicates that Turkey had no progress in the fields of Institutions (1) and Creative Outputs (7). The number of these indicators is 72 out of 110 indicators. Action is required for these indicators which are many in number. Similarly, there is a negative progress in the field of Business sophistication (5) and the worst position is in the field of Infrastructure (3). Urgent solution ways and strategies should be developed for this case.

The findings from our study have significant meanings for governments, decision makers, public organizations, private sector businesses, managers, educators, social scientists, universities and researchers. The ruling administration in every field of Turkey should give priority to innovation. The findings obtained from this study should be examined and interpreted by governments, economists, managers, educators and sociologists considering the qualities of the relevant year. When the values of 2015 were published, a study is planned to find the extent of match between the expected values and real values.

When Turkey becomes innovative, it will increase its variety of product and service and be distinguished among other countries which will increase its production, export, national income, social welfare and employment. Turkey needs to determine its own innovation strategies according to its priorities and it should determine in its development plans the methods and results to follow in achieving these goals. In this difficult and compulsory process, governments, public institutions, universities, managers, industry, technology and individuals should adopt and support innovation and participate in the process.

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