ICT DETERMINING FACTORS IN INCREASING THE INNOVATION IN ROMANIA

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Abstract

In order to develop competitiveness, to strengthen the economic position in front of the social challenges of the 21st century (which include: climate changes, energy resources, health and aging), large and sustained efforts are made at the European Union level regarding the innovation. This paper investigates how the frequency of computer use by individuals can be linked to the innovation level, in order to establish an ICT determining factor for growing the innovation. The results show that the encouragement of ICT absorption by the individuals can yield to a growth in the innovation level, thus minimizing the gap between Romania and the European Union developed countries.

Keywords*:* innovation, ICT, correlation, UE 2020 initiative

1. Innovation and SII indicator

According to the "European Union's Green Paper on Innovation", the innovation refers to: product, process and organization, and includes: the renewal and enlargement of the range of products, services and related markets, the establishment of new methods of production, supply and distribution and the introduction of changes in management, work organization, and staff training.

The "PRO INNO Europe" initiative, launched by the Directorate General Enterprise and Industry, has the aim to „contribute to the improvement of the design, implementation and delivery of innovation policies and support measures at Member State and European level„ [1]. In this framework, an European Innovation Scoreboard[5] has been published annually, starting in 2001. The report offers an indicator of national performances in innovation: SII (Summary Innovation Index), computed according to a certain methodology from a variety of sub-indicators, grouped in three main types – Enablers, Firm Activities and Outputs – and eight innovation dimensions (fig. 1).

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[5] European Innovation Scoreboard (2001-2009), Innovation Union Scoreboard (2010)

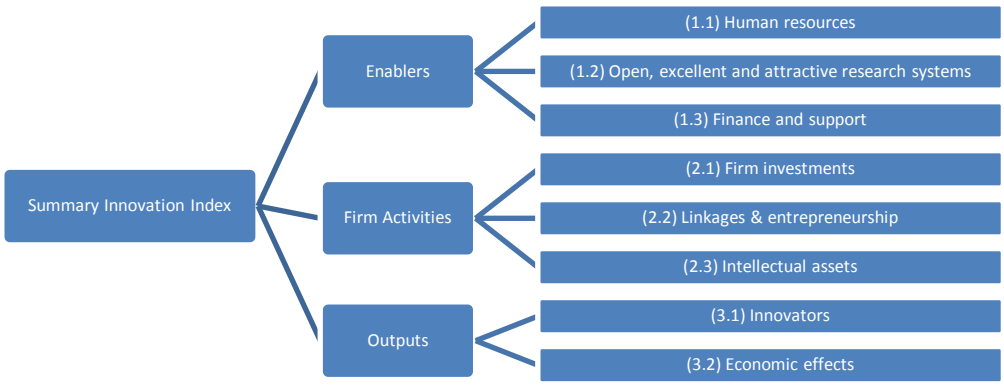


Fig. 1. The three main types of sub-indicators and the eight dimensions of Summary Innovation Index

The form and structure of the dimensions of SII have been modified over the time. The 2010 Innovation Union Scoreboard published on 1st February 2011 proposes a 25-indicators structure. The methodology for calculating the composite indicator SII has been updated every year so that its final value is comparable from one year to another. Most of the data are taken from the European Statistics Database (EUROSTAT).

Depending on the value in 2010 of the SII indicator, the UE states members can be divided into four groups, corresponding to the level of performance in innovation:

- the Innovation leaders: Denmark, Finland, Germany, Sweden;
- the Innovation followers: Austria, Belgium, Cyprus, Estonia, France, Ireland, Luxembourg, Netherlands, Slovenia and the UK;
- the Moderate innovators: Czech Republic, Greece, Hungary, Italy, Malta, Poland, Portugal, Slovakia and Spain;
- the Modest innovators: Bulgaria, Latvia, Lithuania and Romania.

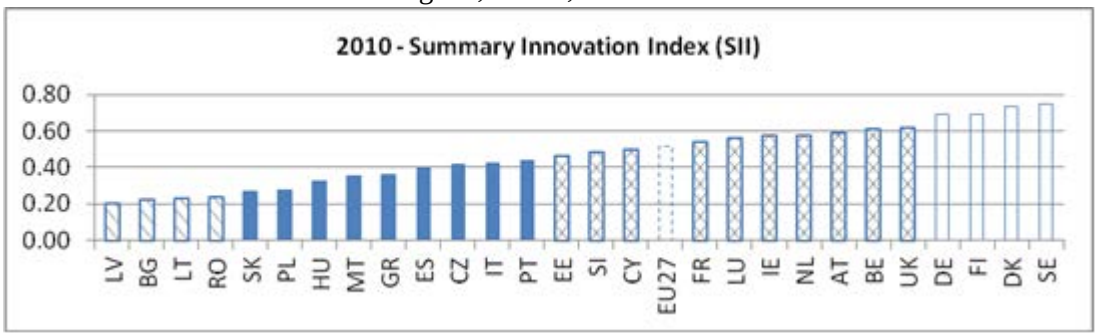


Fig. 2. The four groups of performance in innovation for EU-27 in 2010

2. Correlations between the frequency of computer use by individuals and the innovation level for 24 EU countries

A strong relationship between the SII indicator and the "frequency of computer use by individuals" indicator, as a measure of ICT development, will be proved in this section.

The correlation between the two measures at the national level, for the last year (2010), has been tested through a cross-sectional analysis including 24 countries[6] of EU-27. The significant value of the correlation coefficient (R=0.86) proves that there is a strong relationship between the two variables. The ANOVA analysis is presented in Annex, Table 1.

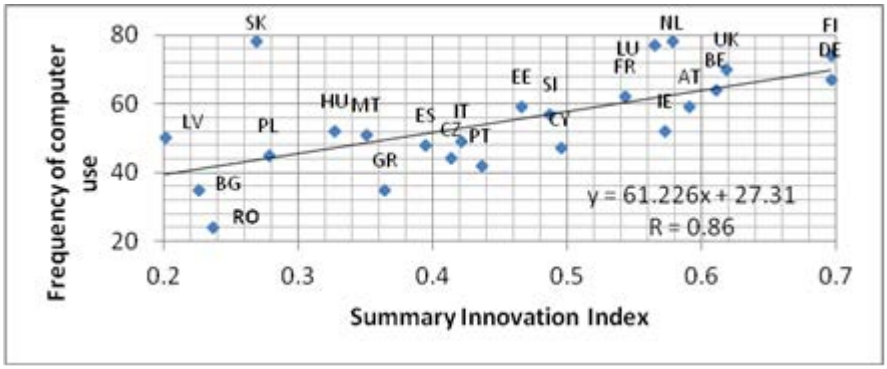
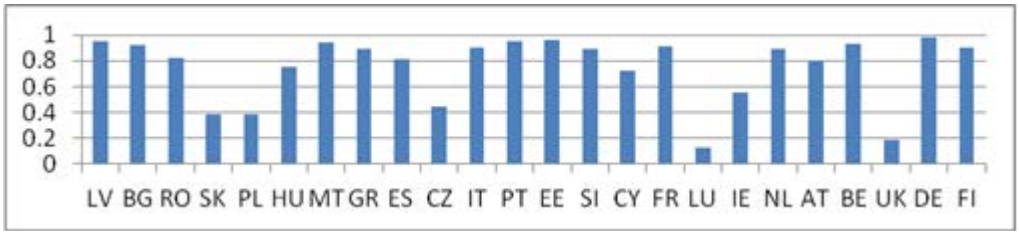


Fig. 3. Cross-sectional analysis for 24 EU countries in 2010

To be noticed in fig.3 the position of Romania: it is a leader regarding the innovation in its Modest innovation group, despite the fact that in ICT terms there is a significant negative gap between Romania and all the other countries. In 2010, the "frequency of computer use by individuals" indicator for Romania is 24, for Bulgaria is 35 and more than double for Latvia.

In the second analysis, the coefficients of correlation between the two measures were computed for the same 24 EU-countries, considering the last five years (2006-2010). The results are listed in Annex, Table 2 and graphically presented in fig. 4.



[6] The 24 EU states analyzed are: Austria (AT), Belgium (BE), Bulgaria (BG), Cyprus (CY), Czech Republic (CZ), Estonia (EE), Finland (FI), France (FR), Germany (DE), Greece (GR), Hungary (HU), Ireland (IE), Italy (IT), Latvia (LV), Luxembourg (LU), Malta (MT), Netherlands (NL), Poland (PL), Portugal (PT), Romania (RO), Slovakia (SK), Slovenia (SI), Spain (ES) and United Kingdom (UK).

Fig. 4. Correlation between the frequency of computer use by individuals and the innovation level for 24 EU countries in 2006-2010

It can be noticed that for almost all countries, the correlation coefficient is above the statistical significance threshold of 0.80. The countries are represented in accordance to their innovative level: at the right side are the Innovation leaders and at the left side are the Modest innovators: Romania (coefficient 0.82), Bulgaria (coefficient 0.92), Latvia (coefficient 0.95).

The last correlation tested refers to Romania, in the last five years. The strong link, proved by a significant 0.82 correlation coefficient, suggests the fact that encouraging the use of computers by individuals may yield, in the near future, to an increase of innovation performances. In figure 5, we notice the lower value for the SII indicator in 2010, as a direct effect of the economic crisis in our country and despite the continued growth of the frequency of computer use by individuals. The ANOVA analysis is presented in Annex, Table 3.

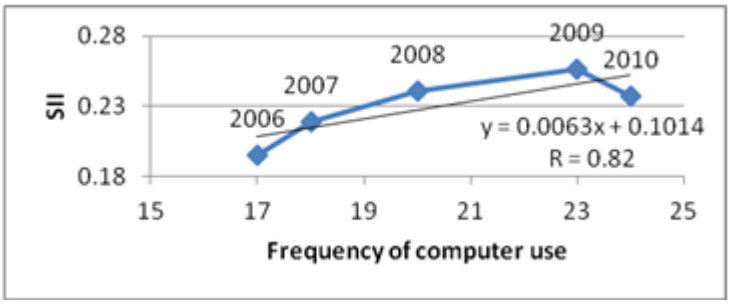


Fig. 5. Correlation between the frequency of computer use by individuals and the innovation level in Romania during the period 2006-2010

3. Conclusions

The three statistical analyses presented in this paper showed that there is a significant link between the innovation level and the frequency of computer use by individuals indicator in most of EU countries in the last five years. This link is very strong for the three countries analyzed from the Modest innovation group: Romania, Bulgaria and Latvia. Inside this group, Romania is a leader regarding the innovation performances, despite the fact that it is far behind the other countries in ICT terms. This suggests that, if Romania will implement new strategies in order to increase the ICT absorption by the individuals, this will yield to a significant growth in the innovation level, providing a more accelerated convergence of Romania towards the European Union developed countries.

4. References

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Annex

Table 1. Statistical analysis of the correlation between the frequency of computer use by individuals and the innovation performance (SII) for 24 EU countries in 2010

Regression Statistics	
Multiple R	0.86
R Square	0.73
Adjusted R Square	0.37
Standard Error	11.45
Observations	24.00

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1.00	1910.36	1910.36	14.56	0.0009
Residual	22.00	2886.60	131.21		
Total	23.00	4796.96			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	27.31	7.61	3.59	0.001643
SII	61.23	16.05	3.82	0.000944

Table 2. The correlation coefficient between the frequency of computer use by individuals and the innovation performance (SII) for ~~the~~ 24 EU countries in the last five years 2006-2010 (by cluster of innovation)

Modest innovators		Moderate innovators		Innovation followers		Innovation leaders	
State	Correlation coef.	State	Correlation coef.	State	Correlation coef.	State	Correlation coef.
LV	0.948	SK	0.390	EE	0.964	DE	0.984
BG	0.921	PL	0.389	SI	0.888	FI	0.900

RO	0.819	HU	0.751	CY	0.723
		MT	0.943	FR	0.915
		GR	0.892	LU	0.130
		ES	0.813	IE	0.553
		CZ	0.449	NL	0.891
		IT	0.903	AT	0.801
		PT	0.954	BE	0.935
				UK	0.186

Table 3. Statistical analysis of the correlation between the frequency of computer use by individuals and the innovation performance (SII) for Romania in the last five years (2006-2010)

Regression Statistics	
Multiple R	0.82
R Square	0.67
Adjusted R Square	0.56
Standard Error	0.02
Observations	5.00

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.0015	0.0015	6.1075	0.0900
Residual	3	0.0007	0.0002		
Total	4	0.0022			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	0.101	0.052	1.937	0.148
Computer use	0.006	0.003	2.471	0.090