

# Evaluation of ICT Investments toward an Increased Competitiveness

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## *Abstract*

*This paper focus on the analysis of the impact of investments in IT industry in the general frame of globalization and the drafting of a model for evaluation so that to address the subject of the theoretization of possible measures and efforts in strategic resource consumption for growing of IT competitiveness.*

*To reap the gains from globalization it is necessary to undergo a process of adjustment as factors of production – such as investment capital – towards the ITC applications. The extent by which e-Government will make a difference and add value is seen as dependent on three factors: strong leadership, management of the ‘digital divide’, and well managed innovation.*

**Keywords:** *ITC, e-government, investments, digital divide, Internet*

**JEL classification:** L86

## **Introduction**

Information and communication technologies (ICT) now penetrate all parts of society. They bring efficiency benefits to businesses and organisations, and new lifestyle options to individuals. Recent economic evidence confirms that ICT drive growth and improve competitiveness. However, the EU is not fully exploiting the opportunities offered by these technologies and is still behind its major competitors both in terms of investment and use. These technologies have the potential to move the EU to a higher growth path and thereby achieve the growth and jobs objectives of the revised Lisbon strategy.

Main developments that public authorities will have to take into account, by identifying “megatrends” in political, economic, social, and environmental areas which will constitute the environment of the future Information Society:

- *Political* - An enlarged Union

- *Economic* - The global economy/Employment
- *Social* - The ageing population
- *Environmental and Quality of life* - Health Protection / Energy efficiency.

Measuring E-Gov benefits is a growing priority in governments, although the state of the art appears to be in a fairly primitive stage.

As E-government has been spreading and improving fast in developed countries throughout the last few years, some governments have overestimated the benefits and disregarded the risks/problems associated with e-Government projects. As an effect, they often launched such projects based on non-economic reasons: visions of an all-web-based service delivery, pressure from IT departments, from constituency or from other states/countries, or a desire to experiment with new technologies.

Investments in E-Government, like other government investments, traditionally have not been driven solely, or even generally, by the prospects for financial return; rather, these programs have been created to deliver better services to citizen/business/interest group constituencies. Each case requires a tailored measurement approach that considers the quality, speed and comprehensiveness of services to citizens, economic efficiencies, alignment with government's strategic/political priorities, and the risks of changing technologies, potential cost overruns and changing needs.

Given the importance of creating an information society, the Lisbon European Council in 2000 stressed that businesses and citizens must have access to an inexpensive, world-class communications infrastructure and a wide range of services, facilitated by a regulatory framework allowing electronic commerce and the Internet to flourish. Governments were expected to make real efforts to exploit new technologies to make information as accessible as possible. In ICT, these first dimensiona are captured by variables such as the prioritization of ICT by the government, ICT penetration rates (Internet, PCs), Internet usage by business and the extent to which students have Internet access in schools.

Lisbon's eight distinct dimensions that capture the areas highlighted by Europe's leaders as critical for reaching the goal of becoming the world's most competitive economy are:

1. Creating an Information Society for All
2. Developing a European Area for Innovation, Research and Development
3. Liberalization: Completing the Single Market/State Aid and Competition Policy
4. Building Network Industries: in Telecommunications, Utilities and Transportation
5. Creating Efficient and Integrated Financial Services
6. Improving the Enterprise Environment: Business Start-ups/Regulatory Framework
7. Increasing Social Inclusion: Bringing People to the Workforce, Upgrading Skills and Modernizing Social Protection

## 8. Enhancing Sustainable Development.

This „Creating an Information Society for All” dimension measures the extent to which an economy has harnessed the new information and communication technologies (ICT) for sharing knowledge and enhancing the productivity of its industries. In particular, ICT has evolved into the „general purpose technology” of our time, given the critical spillovers to other economic sectors and their role as efficient infrastructure for commercial transactions. Countries with companies that aggressively integrate these new technologies into their production processes tend to see better productivity improvements than others. Further, countries with governments that strongly prioritize the adoption of ICTs have often leapfrogged in this direction. In other words, to create a true information society, all stakeholders in the economy (individuals, businesses and governments) must use these tools.

In the view of Lisbon Review Index, the Romanian ranking is 25 and the score in the 2008 and 2006, are 3.84 - see figure 1.



**Figure 1 Score Dispersion among EU Countries**

Note: EL is Albania, SE is Sweden

ICT is a driver for productivity. The gains from ICT stem directly from investment in ICT, a fast growing and innovative ICT sector, and indirectly from improvements in business processes through wider use of these technologies across the economy. According to recent studies, the overall contribution to labour productivity growth from ICT investments and from technical progress in the production of ICT goods and services, accounted for about 40% of EU labour productivity growth over the second half of the 1990s, compared with 60% in the US.

The ICT sector, as a whole, performs fairly well in comparison with the US in terms of size (10% of GDP in the US against 8% in the EU, and also in productivity and employment creation), but less so in terms of contribution to R&D (in the US, ICT account for 30% of R&D). However, in these developments the EU has suffered from lower and delayed investments in ICT and, possibly, a less efficient use of ICT.

There is a growing consensus that e-government is now becoming a key factor for increasing competitiveness. The multiplier and leveraging effect of the public sector on overall productivity and competitiveness is even increased by the use of ICT, which has become the main driver of productivity growth. In a recent study on the link between ICT and productivity growth the Economist Intelligence

Unit (EIU) shown that the best thing governments can do to promote effective and efficient use of ICT and to boost productivity across the economy is probably to practice what they preach and “lead by example”.

Understanding the relative performance of IT industries across different countries is a complex task. The success of an industry rests on the aggregate performance of the firms within it. And an individual company’s performance is dictated by a diverse set of factors, ranging from firm-specific strategies and behaviours through to the broader competitive environment in which firms operate.

The purpose of the IT industry competitiveness index is to compare countries in different regions of the world on the extent to which they possess the conditions necessary to support a strong IT industry. To achieve this, the Economist Intelligence Unit has built a benchmarking model which scores individual countries on the key attributes of a competitive IT sector.

The **IT industry competitiveness index** is organised into six distinct categories of quantitative and qualitative indicators, numbering 25 in all. The category and indicator weights were formulated by the Economist Intelligence Unit’s modelling team, using individual correlation coefficients of each indicator against a measure of IT labour productivity to determine the indicators’ relative importance. The result is an overall index score and category scores for each country.

### IT industry competitiveness index

**Table 1**

United States (First ranked country)	1 rank	77.4 Overall score
Romania	40 rank	32.1
Iran (Last ranked country)	64 rank	15.7

There are six categories of indicator used in the index; these are set out on the next page, along with their weights in the index, and that of each indicator in the category. The main data sources for each indicator are also provided, along with an indication of whether the score is based on quantitative data (for example, US\$ spend, number of students) or on a qualitative assessment made by Economist Intelligence Unit analysts.

Qualitative indicators are scored on a 1-5 basis. Quantitative indicators are normalised through the population set so that each country is measured from 0 to 1

by applying a formula  $Y_{ij} = \frac{x_{ij} - \min_{ij}}{\max_{ij} - \min_{ij}}$  (where  $Y_{ij}$  contry evaluation, max and

min are the maximun and the minimum values related to one specific indicator) is the to each data point. Each indicator is then converted into a score of 0-100 by applying the appropriate multiplier (20 for the qualitative indicators, 100 for the quantitative indicators). As the weights sum to 1, the composite score for each

country is also based on an index range of 0 to 100 (with 100 representing the highest and best possible score).

### **Investments in e-government and cutting off the digital divide**

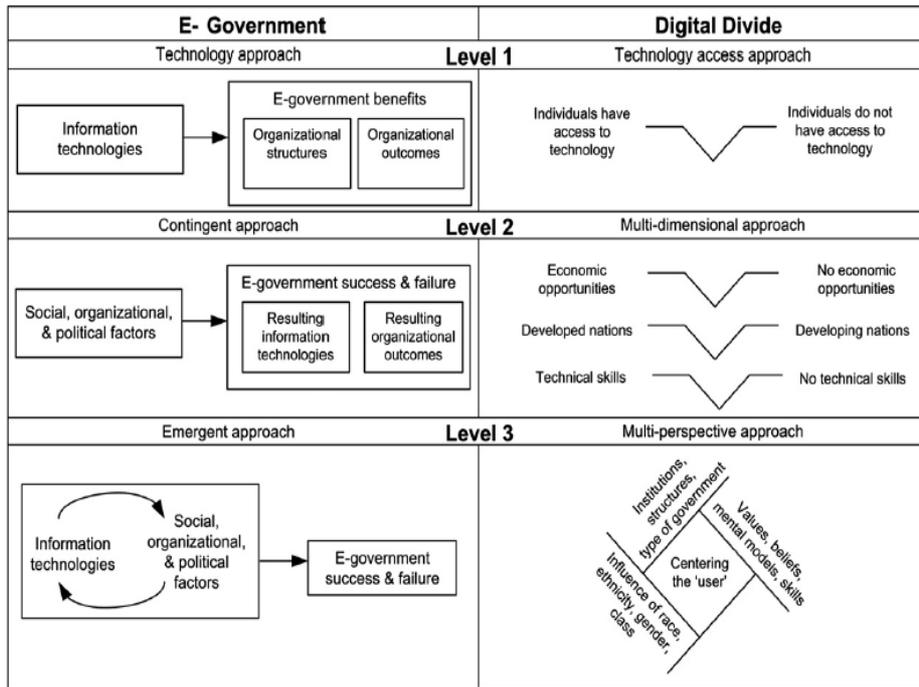
A special consideration is given to E-government as it utilizes technology to accomplish reform by fostering transparency, eliminating distance and other divides, and empowering people to participate in the political processes that affect their lives. E-Government supposes the use by public bodies of Information and Communication Technologies (ICTs) to deliver information and/or services to citizens, external organizations, elected representatives and other stakeholders in such a way as to complement, replace or improve existing delivery systems.

Electronic government (E-Gov) is the use of technology, particularly Web-based Internet applications, to enhance the access to and delivery of government information and services to citizens, business partners, employees, agencies, and other entities. E-Gov promises its government sponsors a powerful tool for improving processes and communicating with the rest of the world.

E-Government and digital divide are strong connected social phenomena. For the economic climate, E-government and ICT provide a great opportunity to innovate the business of government by fostering efficiency and, as a consequence, by reforming public management. Using high IT in government activities has little social value if citizens are not able to use services or interact in political processes in meaningful ways. Similarly, using IT in government without incorporating a demand perspective would potentially lead to partial explanation of a complex social reality. Ideally, by designing and developing of properly implemented e-government applications and services, by developing effective and less costly infrastructure will increase the potential to provide innovative mechanisms for the reshaping of government services, policy making and implementation.

As almost all definitions of e-Gov go beyond services to the citizen to include organizational change and the role of government, one should regard the aspects of different dives – as the digital divide or regional disparity.

In the literature, it was suggested that the digital divide, or research investigating the digital divide, can be metaphorically seen as a proxy for an E-Government demand-side perspective. As mentioned in the literature, using information and communication technologies (ICTs) to foster administrative reform is one expression of E-Government. However, we have tried to make mention of the conceptual and social literatures related to E-Government such as e-democracy and the larger body of technology, politics, and the information society.



**Figure 2 Parallel between E-Government literature and Digital Divide literature (Helbig, 2009)**

### The case of Romania

Concerning the PC penetration, Romania is still at a low level even if the annual average sales rate grow was more than 50%. Many of the underdeveloped areas do not have the basic infrastructure to ensure Internet access and, in some cases, they do not even have access to fixed telephony. Romania has a policy for establishing telecentres for community's access to telephony and Internet services as an interim solution before fixed telephony can be generally available to households. The fixed telephony penetration rate (20.3%) is lower than the overall European penetration rate (41%) and much lower than the EU 25 average (approximately 51%), due to the significant increases in mobile penetration and a tendency for people to abandon their fixed lines in favour of mobile telephony.

The digitalization of the fixed networks is crucial for the provision of value-added services and for the increase of the service quality. Although positive evolution registered, the digitalization rate reached 89.1% in 2005, compared to 54.8% in 2000, the rate is still low, especially in rural areas.

Concerning Internet access, the situation is critical, both for households and for enterprises. In 2004, only 10% of the population used Internet weekly, almost four times less than EU 25 average (38%). Only 39% of the Internet users accessed it from home, compared to 75% in EU 25. A similar situation can be found in

enterprises, where 52% have Internet access, compared to 89% in EU 25. A major difference is noticed between SMEs and large enterprises where 90% of large enterprises have access to Internet, while only 50% of SMEs use this mean of communication.

The main reason for the low level of Internet penetration is the high prices for fixed telephony and Internet, both for citizens, compared to the average income of population, and for the some companies compared with the prices in large urban areas. Another reason is the low rate of investments in infrastructure.

From the total Internet access connections the percentage of **broadband connections** represented almost 41% in 2005. Considering the entire population, broadband connection penetration rate was approximately 3.5 % at the end of 2005, lower than EU 15 average (14.5%) and EU 25 (12.8%)<sup>5</sup>. Regarding the percentage of enterprises with broadband connections, there is a major gap between Romania (7%) and EU 25 average (52%) – more than seven times.

Those significant infrastructure gaps are remediable only through major investments, both from private companies and from public institutions.

In developing and increasing the efficiency of public electronic services, the indicative operations of this key area of intervention will pursue the implementation of electronic public services (**E-Government, E-Learning and E-Health**) solutions. Use of modern, innovative and efficient e-government services contribute to increased productivity by better internal performance and by multiplier effects that enable companies to lower their administrative costs and raise their competitiveness. They reinforce innovation across the economy by being pro-active in delivering high quality and new services and producing leverage effect.

By adopting **E-Learning** applications, also by ensuring the services' availability, the citizens' access to the Internet educational resources will be promoted. For businesses to be competitive in the knowledge-based society, it is essential that employees have access to continuing education. Supporting the development of e-learning will generate a better trained work force, more flexible and more adapted to the market requirements.

**E-Health** plays an important role in European competitiveness as recognized in the Lisbon Strategy since 2000. It impacts the life of all citizens by improving access to healthcare and the quality and effectiveness of the services offered. When combined with organizational changes and the development of new skills, e-Health can help to deliver better care for less money within citizen-centered delivery systems. The E-Health services' implementation will bring benefits both in terms of savings in the medical system and in improving the medical services offered to citizens, and ultimately will contribute to a healthier workforce.

## **The analysis of the quantified impact of investments in IT industry in the general frame of globalization**

Gartner recommends the following types of metrics for determining e-government success:

- Administer stakeholder satisfaction and value surveys before and after service delivery. Survey external constituents, political leaders, and employees and contractors that deliver support services (e.g., contact centers). Measure stakeholder perception of privacy and security.
- Quantify Web channel usage relative to other channels (e.g., walk-in, phone or mail).
- Web channels being utilized, Analysis of costs and improved service for delivering services over each channel.
- Itemize the extent that processes have been improved by delivering them via new channels.
- Identify how government has been transformed.
- Is e-government marketing used on Web sites, in the press and in public places?

Government officials use **many metrics** in measuring the value of e-government programs, as:

- Financial measures: return-on-investment, cost-benefit analysis, net-present-value, internal-rate-of-return
- Indicators of public approval and acceptance: customer satisfaction measures and E-Gov take-up, or adoption rates
- Benchmarking.

Romania lags behind in terms of computer penetration and electronic communications infrastructure access, not only compared to EU 25, but also to the New Member States average. This has a negative impact on national competitiveness, as computer usage and Internet access are important factors for the economic development.

The general objective of SOP is the increase of Romanian companies' productivity by reducing the disparities compared to the average productivity of EU. The target is an average annual growth of GDP per employed person by about 5.5%. This will allow Romania to reach approx. 55% of the EU average productivity by 2015.

Taking into account both the identified possibilities for improvement of the competitive position of Romanian enterprises to cope with the challenge and to be able to use the opportunities arising from operating on the European Single Market and the areas eligible for the ERDF support, the following Priority axes have been identified in the SOP IEC:

Axis 1: An innovative productive system

Axis 2: Research, Technological Development, and Innovation for Competitiveness

Axis 3: IT&C for private and public sectors

Axis 4: Increased energy efficiency and sustainable development of the energy system

Axis 5: Romania, an attractive destination for tourism and businesses

Axis 6: Technical Assistance.

The priority axes of Romania's competitiveness strategy are in full compliance with the lines of action of the Commission's proposal regarding the framework for Competitiveness and Innovation 2007-2013, and take into account the guidelines put forward by the European Commission for the cohesion policy for 2007-2013.

**In the Operational Programme „Increase of Economic Competitiveness”,** Priority axis 3: „ICT for private and public sectors”, the objective is to support the economic competitiveness through increasing the interactions between the public sector, enterprises and citizens by fully exploiting the ICT potential.

The Romanian progress in information society and its future opportunities are far from being satisfactory. The lagging behind especially regards Internet access, Information Society services and up-take of IT applications in economy. As a proof for the current Information Society situation, after obtaining the data for each indicator, both at Romania and EU level, the EU-25 average was calculated. Then, the same scale used for the soft indicators was applied to the hard indicators in order to compare them.

The following formula was used for scaling:

$$\text{Scaled indicator} = 6 * (\text{original value} - \text{minimum}) / (\text{maximum} - \text{minimum}) + 1$$

The minimum and maximum values included the data on Romania.

The next step consisted of calculating the gap between the values characteristic to Romania and the EU-25 average. Finally, the indicators were arranged in accordance to the determined gaps. The prioritisation is then resulting from the calculation of indicator-based gaps. As all indicators are financeable, the starting premise will be that the largest amount of funds will be allocated to measures covered by indicators with largest gaps. Moreover, as all indicators are equally weighted within each priority, a top of priorities may be established according to the weight of the aggregated priority gap in the total SOP gap.

For the **micro level**, the main contribution of the ICT sector to economic growth is mainly sustained through the companies' uptake. The ICT usage stimulates extensive and intensive growth for goods and services production. Concerning the extensive growth, ICT provides, for the Romanian companies, the opportunity to access new regional and global markets and to promote and commercialize goods and services inland by electronic means. An intensive development is also due to the decrease of production, administration and marketing costs, deriving from ICT use, which can determine a significant increase of productivity.

## ITC Indicators

**Table 3**

Composite Indicator <sup>1</sup>	Gap compared to UE
ITC usage in the private sector	-3.1
Citizens' access and Internet use	-1.9
e-Government	-2.5
e-Education	-1.0
e-Health	-0.3
Electronic commerce	-0.7
Informatics security	-0.5

**At macro level,** E-readiness is a measure of the quality of a country's information and communications technology (ICT) infrastructure and the ability of its consumers, businesses and governments to use ICT to their benefit. When a country uses ICT to conduct more of their activities, its economy can become more transparent and efficient. The e-readiness rankings also allow governments to gauge the success of their ICT strategies against those of other countries, and provide companies wishing to invest overseas with an overview of the world's most promising investment locations from the perspective of e-readiness.

The rankings illuminate the factors that are driving, or inhibiting, countries' progress in using ICT to advance economic and social development.

### Economist Intelligence Unit e-readiness rankings, 2008

Table 4

United States (first ranked)	1	8.95	2	8.85
Romania	45	5.46	45	5.32
Iran (last ranked)	70	3.18	69	3.08

### Conclusions

The further the progress of the Information Society, the scope of issues to be handled by the public authorities is steadily increasing. For instance, the main focus of eEurope is economic and social. Although not currently within the scope of eEurope, ICT also has the capacity to contribute to sustainable development.

<sup>1</sup> These composite indicators have been calculated by aggregating a number of 29 sub-indicators taken up from EU statistics (Eurostat). Dates for Romania and for EU 25 cannot be presented in the table because of the composite character of indicators

Therefore, an overall picture is more and more difficult to elaborate. This document does not aim to be totally comprehensive but aims to identify the main challenges and improvements or adaptations to be made for the next five years.

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