Analyses of Information and Communication Technology Development in Baltic Sea Region States

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Abstract

The paper contains the characteristics and analysis of degree of acquisition of information and communication technology in Baltic Sea region states. Networked readiness index is applied in the purpose to compare ICT development in seven countries and to evaluate achievements and weaknesses. Regression analysis is applied to prove connection between degree of development ICT and growth of GDP per capita as well as the country's competitiveness rank. Particular attention is devoted to problem areas of ICT application in Latvia. The paper provides recommendations on behalf of improvement of situation in Latvia mostly in the government policy regarding promotion, prioritisation and vision of the future of ICT.

Key words: information technology, Networked readiness index, broadband, online public services, competitiveness.

Introduction

A Communication on the Commission's new *i*2010 strategy was adopted on June 1 2005. *i*2010 – European Information Society 2010 aims to exploit opportunities for economic growth and jobs in Europe by promoting an open and competitive digital economy. This document is a key element of the renewed Lisbon Strategy and offers a comprehensive strategy for the ICT and media sector. It proposes three priorities for Europe's information society policies ("i2010 – A European Information Society for growth..., 2005):

1. The completion of a Single European Information Space which promotes an open, competitive and content-rich internal market for electronic communications, media and content;
2. Strengthening Innovation and Investment in ICT research to promote growth and jobs through a wider adoption of ICT;
3. Achieving an Inclusive European Information Society that prioritises better public services and quality of life.

Benchmarking plays a central role in monitoring progress in achieving these *i*2010 priorities. In each case, a mix of indicators is needed to measure the different aspects of the objectives that are to be achieved. Policy emphasis now focuses more on complex issues of impact and usage of technologies in the wider economy and benchmarking must become more sophisticated (i2010 High Level Group, 2006).

The Commission continues to monitor progress through an annual European Information Society Progress Report. The reports assess developments and impact and indicate where additional measures may be needed.

In 2006 the i2010 High Level Group elaborated a document, which encompassed further benchmarking framework, namely: "i2010 Benchmarking Framework". In accordance with this document 9 themes were elaborated for benchmarking for the next 5 years: Developments of broadband; Advanced services; Security; Impact on ICT sector; Investment in ICT research; Adoption of ICT by Business; Impact of adoption of ICT by Business; Inclusion; Public services (i2010 High Level Group, 2006).

In 2006 EC issued its first annual i2010 Annual Information Society report, which revealed the progress achieved by 27 member states on implementing i2010 tasks. In parallel with mentioned report EC finances the studies "The User Challenge Benchmarking The Supply Of Online Public Services", which is devoted two core measurements of *sophistication* and *fully-online availability* of online services, measured across a basket of 20 services assessed from public agencies across 31 countries. Improvements of benchmarking methods still remain in agenda of i2010 High Level Group: a report on further development of methods provided by Capgemini was discussed in May 2009 (eGovernment Benchmark Method Paper, 2009).

Despite of these studies provide very comprehensive sight of ICT usage and adoption in member states none of them contains universal measure or index that allows to rank member states and to make comparisons among them and with the advanced world countries.

Nevertheless besides mentions studies a few of international and commercial organisations such as UNO (Department of Economic and Social Affairs United Nations, 2008), OECD (Guide for Measuring the Information Society", 2009), The Economist (The Economist Intelligence Unit, 2007), European Institute of Business Administration (INSEAD, 2005) and etc. issued reports on ICT and Information society issues. Methods and approaches used in INSEAD study were applied in Latvia with the purpose to calculate the eEurope index for regions of Latvia (Peteris Rivza and Evija Kopeika, 2005). Due to limit of article space authors confine themselves only with one such annual study namely "The Global Information Technology Report" (GITR).

Taking into account the centrality of innovation and technological readiness for national competitiveness, the World Economic Forum (the Forum) has undertaken, in cooperation with INSEAD since 2002, a research project aimed at identifying the factors enabling countries to fully leverage ICT in daily activities in order to effectively boost growth and prosperity.

The Networked Readiness Index (NRI), featured in the GITR series, establishes an international framework by which the performance in networked readiness of a large number of economies can be assessed and benchmarked against one another and over time. Thus the last GITR 2008–2009 extends its coverage to 134 developed and developing economies worldwide accounting more than 98 percent of the global GDP.

The aim and tasks of the research

The authors of the article have chosen seven Baltic Sea region countries (BSR) with the purpose to analyse the extent of acquisition of ICT and to make certain recommendation on behalf of further adoption ICT in Latvia. Despite of different size of the countries and diverging history's background ones are allocated in the neighbourhood one to another and last five years belong to the same political and economical organization, thus they have to have the same targets and similar priorities of development.

The following tasks were set:

- To analyse the extent of acquisition of ICT by seven Baltic Sea region countries using NRI;
- To analyse Latvia place referring to application of ICT among Baltic Sea region countries;
- To prove connection between degree of acquisition of ICT and competitiveness of a country;
- To make recommendation on behalf of further adoption ICT in Latvia and improvement of competitiveness.

Materials and Methods: monographic method, statistical analysis of data and expert method.

The Networked Readiness Index 2008–2009: the framework and the methodology

The NRI 2008–2009 builds on a mix of hard and survey data. In particular, 27 variables out of 68 are hard, quantitative data, collected from respected international organizations such as the International

Telecommunication Union (ITU), the World Bank, and UNO. The remaining 41 variables capture dimensions that are more qualitative in nature and come from the Executive Opinion Survey, conducted annually by the Forum in all the economies covered by GITR.

The NRI is composed of three subindexes, assessing respectively ICT environment, readiness, and usage, for a total of 9 pillars and 68 variables, as is presented at Figure 1.

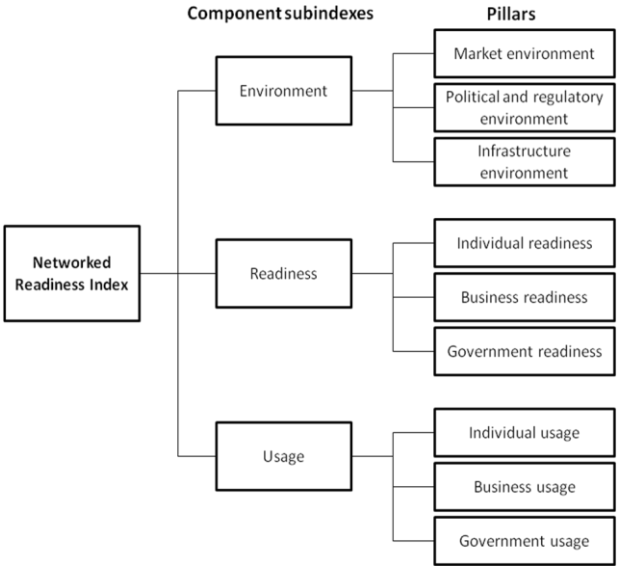

Figure 1. **Networked readiness index composition (drawn by authors using data of The Global Information Technology Report 2008–2009", INSEAD)**

All pillars are given the same weight in the calculation of the three subindexes, while the overall NRI is a simple average of the three subindexes. The underlying assumption is that all the Index components provide a similar contribution to the overall networked readiness of a country.

The different subindexes, pillars, and variables' scores offer important insights on the relative strengths and weakness of each economy in leveraging ICT, and can help governments to prioritize the areas in need of improvement in their national agendas.

Below is a brief description of each subindex and pillar composing the NRI.

Environment subindex

As stated earlier, governments, business communities, and individuals can fully leverage the competitive and development potential of ICT only if an appropriate environment is in place. The environment subindex aims at capturing the ICT conduciveness of the environment in a country by assessing a total of 30 variables related to the market environment, the regulatory framework, and infrastructure for ICT development.

The *market environment pillar* (14 variables) gauges the friendliness of the business environment for ICT development, including aspects such as the presence of appropriate capital sources, the degree of business sophistication, and the innovation potential, together with the ease of doing business, the freedom of exchanging information in the net and, the extent of convergence of ITC industries and the related accessibility of digital content.

The *regulatory and political environment pillar* (9 variables, looks at the efficiency and transparency of the legal framework, taking into account such general aspects as the independence of the judiciary, the effectiveness of the law-making process, the protection of the property rights, the existence and development of appropriate legislation concerning the protection of intellectual property.

Last, the *infrastructure environment pillar* (7 variables) measures the degree of development of ICT-conducive soft as well as hard infrastructure.

Readiness subindex

The readiness subindex (23 variables) examines whether the appropriate human skills for using ICT are in place, the degree of access and affordability of ICT for businesses and citizens, and the extent to which the government prioritizes ICT and uses it in its daily activities and organization.

Accordingly, the *individual readiness pillar* (9 variables) measures the disposition and preparedness of citizens to use ICT through a range of variables, including the quality of the educational system, the availability of Internet access in schools, residential telephone connection charges, broadband and telephone subscription charges, and the cost of mobile telephone calls.

The *business readiness pillar* (10 variables) gauges companies' preparedness to fully incorporate ICT in their operations and processes, including the extent of training of the labour force, companies' spending on research and development (R&D), the degree of collaboration between academia and the industry.

Last, the *government readiness pillar* (4 variables) measures the degree to which ICT is prioritized in the government's agenda and to which there is a clear vision on how to promote its use and penetration.

Usage subindex

The usage subindex (15 variables) assesses the actual ICT usage by the three main stakeholders of the NRI.

The *individual usage pillar* (5 variables) gauges ICT penetration at the individual levels, notably for personal computer (PC) and the Internet.

The *business usage pillar* (5 variables) examines the extent to which businesses generate and absorb technology, using such variables as the prevalence of foreign licensing and the capacity for innovation, the availability and usage of fixed telephone lines for business and internet usage by businesses.

The *government usage pillar* (5 variables) assess the extent, to which the government's vision for ICT has been implemented successfully, as well as the government's own ICT usage.

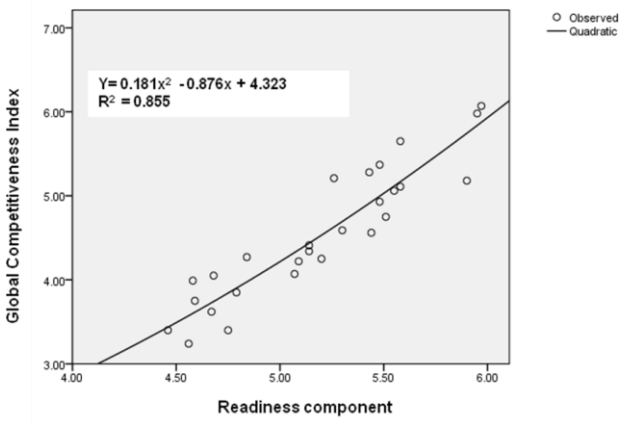

Figure 2. **Global Competitiveness Index dependence of Networked readiness index for 27 EU countries (drawn by authors using data of The GITR 2008–2009", INSEAD and Global Competitiveness Report 2009–2010", World Economic Forum)**

Over the years the GITR series has evolved into one of the world's most respected international assessments of countries' capacity to leverage technology for increased competitiveness. The regression in Figure 2 demonstrates a very high value for *R*2 and shows that Global Competitiveness Index increases significantly, if grows the readiness to use ICT means.

There is an evidence that ICT readiness fosters ICT usage, because a strong correlation exists between the degree of preparedness and propensity to use ICT of the three main social actors mentioned above (government, businesses, and individuals) and their actual ICT usage, as displayed in Figure 3.The regression in Figure 3 not only demonstrates a very high value for *R*2, but also shows that usage of ICT increases significantly as the readiness or preparedness to use ICT advances.

Hence, a society that is well prepared and well disposed to use ICT will be more likely to successfully leverage the competitive and development potential of ICT.

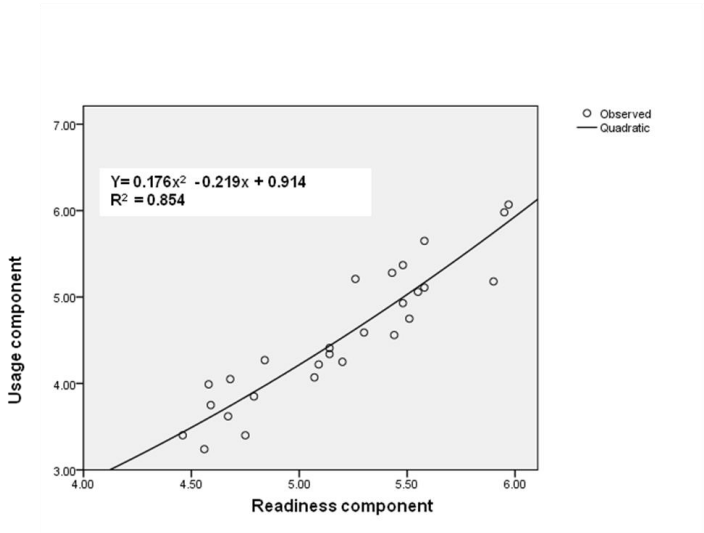

Figure 3. **Readiness component fosters ICT usage (drawn by authors using data of The Global Information Technology Report 2008–2009", INSEAD)**

While the ICT industry is not immune to the crisis, the GITR (Irene Mia, Soumitra Dutta, 2009) has predicted that global technology spending will grow by 2.9 percent year-on-year in 2009 that is lower than the previously forecasted 4.9 percent.

Despite slowdowns in sales in many technology products, the sales of global mobile phones are expected to grow by 6 percent in 2009, according to forecasts by Gartner Inc. and the popularity of social networking sites is growing steadily.

There are two underlying reasons why the technology sector, while suffering because of the overall economic challenges, is showing such signs of resilience.

One is that technology is evolving continuously and, despite economic uncertainty over the coming years, progress in most areas of ICT capabilities continues at a reasonable pace. For example, the price of personal computers is falling rapidly and the emergence of a whole new class of laptops, priced as low as US$100 to US$300 is enabling large segments of the population now to get access to affordable computing (Irene Mia, Soumitra Dutta, 2009). This fact could explain the growth in popularity of social networking platforms

The second reason is related to the fact that both public and private sector leaders now accept the important role of ICT in stimulating growth and enabling the development of economies by significantly increasing productivity across sectors and industries.

Assessing of ICT development in Baltic Sea region countries using Networked readiness index

Table 1 provides some insight into the seven economies in leveraging ICT in year 2008, by looking at the countries performance in each of the nine pillars composing the NRI. Due to the lack of article space the tables, which comprise all 68 variables of the Network Readiness Index 2008-09 measured for seven countries are not attached here.

Table 1

Baltic Sea region countries performance in each pillar of the Network Readiness Index 2008-09 (drawn by authors using data of The Global Information Technology Report 2008–2009", INSEAD)

Country	Overall ranking	Number of times ranked in top 3	Market environment	Regulatory environment	Infrastructure environment	Individual readiness	Business readiness	Government readiness	Individual usage	Business usage	Government usage
Denmark	**1**	5	9	2	6	4	6	2	3	2	1
Sweden	**2**	5	10	5	2	8	2	3	2	1	6
Finland	**6**	2	6	3	7	1	5	8	16	7	19
Estonia	**18**	-	21	21	26	19	32	7	14	24	3
Lithuania	**35**	-	48	41	39	36	51	49	32	47	30
Latvia	**48**	-	49	46	47	55	60	76	39	62	74
Poland	**69**	-	87	100	41	43	52	103	46	69	127

Three Nordic countries Denmark, Sweden and Finland are surely the networked readiness champions in the region as well as globally, having consistently ranked in the top 10 for the past eight years, as indicated in Table 1. These countries seem to be fully benefiting from ICT advances, as shown by their high penetration and diffusion rates and their sophisticated business sectors, successfully exporting high-tech products to international markets. The Nordic recipe for networked success owes much to a transparent and business-friendly legal framework, well functioning markets, effective educational and research systems, and a widespread culture of innovation both in the public and private sectors. Also, Nordic policymakers have early understood the importance of ICT as a competitiveness enabler and have constantly promoted its use and diffusion in their countries.

Denmark, Sweden are the countries appearing in the top three positions most frequently (i.e., in five pillars out of nine), followed by Finland and Estonia.

The rankings of 2008–09 confirm Denmark's superior capacity to leverage ICT for overall national competitiveness: the country has ranked consistently in first place since 2006. The country demonstrates an outstanding result, ranking 4th, 2nd, and 1st in the environment, readiness, and usage components, respectively. In particular, the government's clear and consistent vision on the importance of ICT diffusion (2nd and 1st, respectively, in government readiness and usage) reflects in an extremely ICT friendly regulatory environment (2nd), with the world's most-developed ICT legislation; it has also helped in achieving among the highest penetration rates worldwide (Irene Mia, Soumitra Dutta, 2009).

An important element of the government's ICT prioritization in Denmark was the liberalization of the telecommunications sector in 1996, well ahead of most fellow members of the European Union.

Finland, Denmark and Sweden each is ranked at the 1st place in one pillar. Finland benefits of the highest individual readiness, respectively Denmark leads in government usage, but Sweden, in turn, top the league for the usage, respectively, of their business sectors.

Swedish businesses appear among the most innovative in the world (4th for capacity of innovation and firm level technology absorption) and are using the Internet extensively in their transactions (2nd) (Irene Mia, Soumitra Dutta, 2009).

In Estonia, in particular, ICT diffusion eased and facilitated the transition from a planned economy to an extremely competitive market economy in less than 20 years, thanks to a visionary leadership and the government's continuous prioritization of innovation and universal ICT access as a tool for improved growth and competitiveness.

Estonia continues in year 2008 to keep the top of the rankings, gaining two positions from 2007, showing that a small country can succeed, when coupled with the right ICT and competitiveness-friendly policies and with a vision of a fully networked society.

On the other side of the spectrum Poland (69th) continue to trail behind. Poland has not overcome perennial weaknesses in its networked readiness landscape, such as the poor market and regulatory environment (ranked 87th and 100th, respectively) and the marginal importance given by the government to ICT in its national agenda (103rd and 127th for government readiness and usage, respectively).

In their turn Latvia and Lithuania keep the bottom of ranking respectively at 48th and 35th position.

Latvia notable competitive advantages and disadvantages

As long as during last years two post soviet countries Estonia and Lithuania improved their rank, meanwhile Latvia and Poland continued to lose their positions (see Figure 4). One of the reasons is that broadband coverage in rural areas remains an issue and broadband penetration is still lower than average, as is the connectivity of households. With only 62% of enterprises having broadband internet access, Latvia is placed at the bottom of the European ranking as well (23rd) (Irene Mia, Soumitra Dutta, 2009). No significant progress can be observed in the area of broadband over the last years.

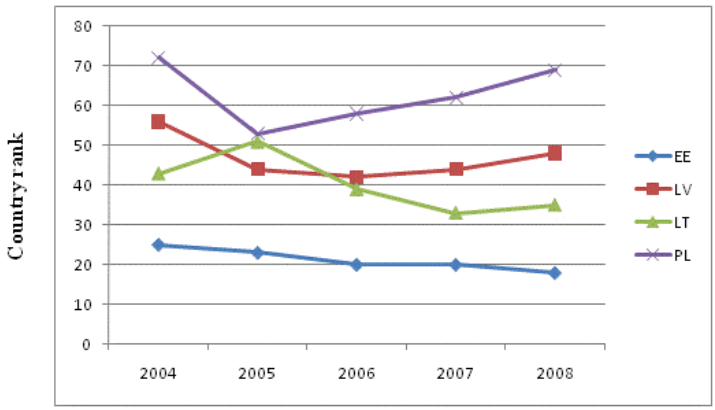

Figure 4. **Estonia, Latvia, Lithuania and Poland NRI ranks 2004- 08 ((drawn by authors using data of GITR 2005, 2006, 2007, 2008, 2009, INSEAD)**

The Table 2 shows areas that need for improvement and first of all relating to government institutions responsible for policy making and regulation environment, moreover *Effectiveness of law-making bodies* is ranked as 86, but *Efficiency of legal framework* as 79. It is much worse in comparison with Estonia (39 and 31) and almost similar with Lithuania: 88 and 73. An experience in exploiting ICT means for improvement effectiveness of the government institutions is assessed as 96 for "*ICT use and government efficiency*" and as 109 for "*Government success in ICT promotion*" correspondingly. In opposite the Estonian government institutions efforts are assessed by rank 2 and 5, but Lithuanian results by moderate ranks: 43 and 50. Thus it seems that it is difficult to expect notable improvements in near future, because "*Importance of ICT to government vision of the future*" is far behind at 110th

place, but "*Government prioritisation of ICT*" is ranked on 94th position also far behind Estonia and Lithuania.

Latvia notable competitive advantages and disadvantages (drawn by authors using data of The Global Information Technology Report 2008–2009", INSEAD)

NOTABLE COMPETITIVE DISADVANTAGES		NOTABLE COMPETITIVE ADVANTAGES	
Network Readiness Index 2008	**Rank /48**	**Network Readiness Index 2008**	**Rank /48**
Environment component	**47**	**Environment component**	**47**
Market environment	**49**	**Market environment**	**49**
Availability of latest technologies	66	Total tax rate, 2007	33
State of cluster development	112	No. of procedures required to start a business, 2008*	16
Burden of government regulation	76		
Political and regulatory environment	**46**	**Political and regulatory environment**	**46**
Effectiveness of law-making bodies	86	Number of procedures to enforce a contract, 2008*	9
Judicial independence	71	Time to enforce a contract, 2008*	11
Efficiency of legal framework	79		
Infrastructure environment	**47**	**Infrastructure environment**	**47**
Availability of scientists and engineers	112	Secure Internet servers, 2007*	38
Quality of scientific research institutions	88	Education expenditure, 2006*	25
Readiness component	**59**	**Readiness component**	**59**
Individual readiness	**55**	**Individual readiness**	**55**
High-speed monthly broadband subscription, 2006*.	80	Internet access in schools	32
Lowest cost of broadband, 2006*	69		
Cost of mobile telephone call, 2006*.	88		
Business readiness	**60**	**Business readiness**	**60**
Local availability of research and training services	75		
Company spending on R&D	72		
University-industry research collaboration	83		
Business telephone connection charge, 2006*	72		
Local supplier quality	67		
Local supplier quantity	107		
Government readiness	**76**	**Government readiness**	**76**
Government prioritization of ICT	94		
Government procurement of advanced tech products	100		
Importance of ICT to government vision of the future	110		
Usage component	**46**	**Usage component**	**46**
Individual usage	**39**	**Individual usage**	**39**
Business usage	**62**	Personal computers, 2006*	30
Firm-level technology absorption	81	Internet users, 2007*	27
Capacity for innovation	71	Internet bandwidth, 2007*	22
Government usage	**74**	**Business usage**	**62**
Government success in ICT promotion	109	**Government usage**	**74**
Availability of government online services	86	Presence of ICT in government offices	44
ICT use and government efficiency	96		

The Table 2 also provides the evidence of weaknesses of some environment components such as "*State of cluster development* ", "*Availability of scientists and engineers*", which are common for all three republics, nevertheless the state of "*Quality of scientific research institution*" is much better in neighbouring countries (Estonia 25, Lithuania 46 but only Latvia 88).

Nevertheless the number of variables, which characterize environment for business in Latvia, appears to be better than in neighbouring countries, so "*Number of procedures required to start a business"* (LV- 16, EE – 15, LT – 46) and "*Number of procedures to enforce a contract*" (LV – 9, EE - 55, LT – 14). If to compare variables characterizing individual usage of ICT, it appears that Latvia takes position in the middle of three Baltic countries, but concerning tax burden Latvian environment is more preferable for business, because a variable "*Total tax rate, 2007"* is for Latvia – 33, Estonia - 86 and for Lithuania – 81.

Analysis of the variables at the Table 2 reveals considerably low priority of ICT in the Latvian government agenda, e.g. most of the variables that expose political and regulatory environment, government readiness and usage of ICT by government is much worse than in Estonia and Lithuania.

The authors of the article made a presumption concerning 9 variables that characterise government attitude to ICT and do not require additional investment into infrastructure, for example", *"Government prioritization of ICT", "Importance of ICT to government vision of the future", Government success in ICT promotion"* and etc. In case if Latvia has values of mentioned variables at least at Lithuanian level it would be raised from the 48th position to the 43rd and such European countries as Italy and Slovak Republic would be left behind and Latvia, but at the whole ranking list Latvia would be at the position in front of Thailand, Chine and Jordan.

Making the above described presumption the authors calculated possible changes of Latvia's ability to compete. In the year 2008 Latvia took the 68th position among 134 countries and the 25th place among European Union countries in the Global Competitiveness Index list (Claus Schwab, Xavier Sala-i-Martin, 2009). In case if Latvia has values of the mentioned above variables at least at Lithuanian level, the Global competitiveness index would be raised from 4.06 to 4.12 and Latvia would improve its position from 68th to 64th place and would take the position in front of Kazakhstan, Botswana, Uruguay and Romania.

Conclusions

Seven CBR countries appear diverging results in acquisition of ICT means. While Nordic countries Denmark, Sweden and Finland demonstrate high sustainable results not only among European countries, but also among 134 most developed economies, the countries of former soviet bloc except Estonia still lag behind. Estonian example shows that right ICT and competitiveness friendly policies coupled with a vision of a fully networked society ensure successful results.

Latvia, which takes the 6th position among seven countries leaving behind only Poland, provides the evidence of weaknesses of some environment and readiness components, whilst the country demonstrates advantages in the areas such as market environment and individual usage. Analysis of the variables of NRI reveals considerably low priority of ICT in the Latvian government agenda in comparison with other CBR countries.

The acquisition of ICT by business, individuals and government institutions provides a positive impact on competitiveness of a country. Analysis provided by article authors shows that Latvia has a real opportunity to improve its competitiveness by acquisition of ICT means. So that comes true, it is necessary that government institutions such the Ministry of Regional Development and Local Municipalities, the Ministry of Communications and other institutions would assign higher priority to ICT in their agenda.

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