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ICT as catalyst for economic development: strengths and weaknesses

ICT sector has become a profitable business sphere, but much more important is strong impact of given sector on general economic growth, strengthening positive long-term economic feedback. Analysis shows that there is a strong correlation between deployment of ICT sector and economic development. The maximum benefit is achievable by following an innovative approach – modifying and modernizing processes and procedures by exploitation of capabilities offered by ICT. On the other hand growing vulnerability of society, its dependability on information processing systems becomes a critical risk.

Combined socio-technical information processing substantially affects number of processes in our society. Accumulation, sharing and usage of knowledge for creativity, innovation and production; global scale of economic and political transactions; networking as the central cooperation principle between countries, companies and individuals – all these factors are becoming extremely essential for further growth. But all of them are closely related with the development of information and communications technologies (ICT). Exactly potentialities of today's ICT have created a qualitative leap in evolution, ensuring previously inaccessible growth of knowledge level as well as the utilization of present knowledge and the generation of new knowledge.

ICT sector – a growth leader

Wide and ramified information flows are reliable indication of development of any country in today's networked and globalized world while advanced ICT, their convergence on digital platform provide necessary technical opportunities for information processing and transmission. Growing potential of information technologies and increasing demand for communications services materialize in pre-emptive growth of ICT sector in comparison with other sectors of the national economy and its increasing density in the gross domestic product (GDP).[1]

Global spread of advanced ICT is very dynamic and even accelerating process in comparison with other technologies.[2] There are different priorities and accents in various countries,[3] but in general an excellent ICT sector with healthy and competitive ICT companies is crucial for any

[1] E. g., ICT-producing sector has generated 5,9% of EU GDP in 1995-2000 (Ireland – 12,3%, Finland – 10,6%, Sweden – 7,3%); growth of its density continues, today it is near 8%. The same regularity one can see in Latvia – share of ICT commodities and services in Latvia's GDP has increased from 3,2% in 1997 to 6,0% in 2003 (hardware and software industry – 1,6% of GDP, electronic communications services – 4,4% of GDP). Taking into account GDP increase by 43% during this period, it means that ICT sector has grown 2,7 times as large.

[2] 38 years were necessary for radio broadcasting to attain 50 Mln users; TV attained the same number in 13 years, PCs – in 16 years, mobile cellular phones – in 6 years, WWW technologies – in 4 years.

[3] E.g., innovation and entrepreneurship in the ICT sector are US priorities. India accents development of software and IT services, Korea – hardware and bandwidth services, China – hardware and mobile services.

economy; it is a substantial component of national product and source for payments in the state budget.[4] Even small country can find its niche in today's globalized market.[5]

Short lifecycle of products is a specific particularity for ICT sector; sometimes annual changes of models and versions are taking place. There is very aggressive marketing of new products and non-stop advertising pressure on the customers. Although permanently and rapidly decreasing prices on technologies give chance also to less successful countries to use advanced communications for knowledge accumulation, sharing and usage, in total expenditures for hardware, software and services are growing. [6]

It means that huge investments in ICT sector are necessary;[7] sometimes they become even inadequate to the real demands.[8] It is quite typical that less developed countries invest more in electronic communications (in underdeveloped infrastructure), while more successful countries – in IT (in development of applications and services).[9]

But in total domestic financial resources of many countries are insufficient and foreign investments become substantial;[10] in addition investor brings new knowledge, advanced technologies and access to markets. And ICT in many countries really is the single knowledge-capacious sector where interest of investors is high and stable.

National economy and ICT sector: correlated growth

ICT sector is not only and even not primarily a profitable business sphere, a substantial component of GDP. Much more important is close relation of the sector with general

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[4] Electronic communications can be considered as a profitable business. E.g., Latvia's fixed incumbent *Lattelekom* as well both mobile operators *LMT* and *TELE2* have shown profitability correspondingly 25,5%, 36,6% and 32,3% in 2004.

[5] Latvia's company *SAF Tehnika* (microwave radio communications equipment) is a striking example; it covers 6-7% of corresponding global market segment. After careful and long-term R&D stage (really roots of competence are coming from late 80-ties) company was established in 1999, its market capitalization was 65 Mln EUR in the *Riga Stock Exchange* in 01.01.2005. The company has acquired Swedish company *Viking Microwave AB*.

[6] Global annual IT spending (hardware, software, services) has increased till 1000 billions USD in 2004, the forecast is 1200 billions USD in 2008.

[7] E.g., capital expenditures of Latvia's fixed incumbent *Lattelekom* and leading mobile phone company *LMT* (Swedish/Finnish company *TeliaSonera* owns majority of shares in both companies) in 1995–2004 exceed 10% of Latvia's GDP 2004.

[8] Successfully bubbled Y2K bug problem was an interesting example.

[9] Total ICT expenditures in EU countries really do not depend on welfare level (they are between 5–9% of GDP). At the same time IT expenditures gradually increase from 1,5–2% for countries with lower GDP per capita till 3,5–4,5% for countries with higher GDP per capita, but electronic communications expenditures decrease from 4,5–6% till 2,5–4%.

[10] E. g., 7,8% of accumulated foreign direct investments in Latvia has been put into electronic communications sector.

economic growth.[11] The economy becomes more and more based on information and knowledge. The value chains are changing. 21st century real-time economy, 24x7 stock exchanges and banking, *just in time* supply and delivery, minimizing stocks, individual products instead of mass production are based on intensive use of communications, Internet-based principles and technologies.[12]

Public and private investments in education and research are the financial source for knowledge accumulation and development. Further realisation of ideas, creative usage of knowledge, innovation, development and delivery of products to the market result in the growth of income. If the income exceeds investments in knowledge and products' development, positive feedback exists and process reproduces.[13] Development of ICT provides technical opportunities for mentioned knowledge circulation in any sphere.

There is also another strengthening positive long-term economic feedback: economic growth means increasing public and private investments in advanced ICT technologies and usage of services, that in one's turn strongly supports rapid development of all sectors, increase of capacity of businesses and administration, growing competitiveness of enterprises and regions of the country.[14] It promotes more dynamic development of the country, creation of new enterprises and well-paid jobs, increasing public budget and social expenditures. Implementation of ICT increases quality of jobs, raises productivity, motivates employees to obtain new skills, to grow their welfare level. National economy takes advantage of the development of the ICT sector.

Electronic communications has transformed into a component of the strategic infrastructure (*critical infrastructure*) of any country equally with energetic and transport networks. Electronic communications services really become a substantial component of *services of general interest* that is very important for improvement of living standards.[15] They are an extremely substantial factor for development of any country since ICT companies provide advanced services to citizens and businesses, meeting the growing needs of the whole society

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[11] E. g., EU Lisbon strategy means ICT as one of key drivers for the growth of competitiveness of the whole EU economy. 28,5% of EU Seventh R&D Framework Programme (2007 – 2013) thematic budget will be expended for development of various ICT products.

[12] Alan Greespan, the chairman of the *Federal Reserve*, said in June 2000: "Information technologies are reducing the degree of uncertainty and hence risk by improving our real-time understanding of production processes and of the vagaries of consumer demand".

[13] Empiric data of various countries show that increase of investments in R&D by 1% results in GDP growth even by 0,15%. There is considered that investments amount to 3% of GDP are in line with today's demands, these investments can provide quintuple payback.

[14] 25% of the recent EU GDP growth and 40% of EU productivity growth (in US – even 60%) are due to ICT. There is a strong correlation between intensity of ICT-producing sector and productivity growth. Therefore investment in ICT R&D budget is an increasing share of total research expenditures.

[15] Continuing Latvia's regional differences illustrate a significance of advanced electronic communications for development of country. There are 2–3 times higher level of GDP and non-financial investments in Latvian regions where all advanced communications services are fully available in comparison with regions that are underdeveloped in this sense.

and each individual for elimination of his social exclusion that today often results in a lower knowledge level and a lower welfare level.

Internet usage substantially affects different spheres of life of society; it is widely used for economic and political transactions, procedures and decision-making on all levels; especially it relates to the most advanced tool – broadband Internet access.[16] All Internet related problems are interlinked, all the set of informative, technological, normative, security problems should be covered; in addition many issues relate not only to Internet, Internet only escalate them, analogous decisions should relate to another media too.[17] Therefore integrated decisions are necessary, regulatory strategy must be elaborated and functions for regulatory institutions should be distributed and determined. And activities have to be directed mainly to causes instead of fight against effects.

And what is more. General access to and free flow of information is not only principal prerequisite for development. It is one of the basic principles of the democracy; sometimes the term *currency of democracy* is used. And Internet governance issue has to be analyzed in much more wide context than ICANN and root servers' problems only.

Increasing risk: technological dependability and vulnerability of the society

Exactly thanks to development of ICT our level of knowledge, our ability to exploit our knowledge and to create new knowledge has never been greater. This new environment facilitates our daily life and minimizes problems of space and time, at the same time human being becomes more and more dependant on this environment (*the vulnerable society)*. The growing scale, complexity and coupled increasing threat of faults (damage or non-damage) of information processing systems requires stronger demands and co-operation to eliminate number of risks.

The major risk is a growing gap between societies rich and those poor in knowledge, growing disparity in their opportunities, which to a great degree is determined by the technological and financial availability of ICT (*digital divide*). The labour market requires increasing knowledge, but the notion of ICT skills has not yet gained the ground.[18] Although IT users' interface become more unsophisticated and level of necessary skills decrease, many employees are not confident in their future. And it is true that without good education (including IT skills) many people are pushed out of the labour market. Access to ICT more and more directly correlates with welfare level: access means knowledge and inclusion, as the result – upswing. Lack of access – outlaw, uninformed and poor as a result. It is a strong

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[16] Various studies and statistics show that there is a strong correlation between penetration of broadband lines and growth in EU countries.

[17] As the source of information Internet has become comparable with press, radio, TV; the content regulation principles also should become equal and independent of media type, they should be directed to the content. The optimum balance between availability of information and restrictions to access have to be found.

[18] ICT skills become one of the key issues for employment in Latvia, they are mandatory or desirable for 68% of jobs in private sector; 54% of total workforce has obtained these skills today, but 65% of unemployed are unfamiliar with ICT. 35% men and 48% women in EU confess that they cannot use PC. Only 27% of EU workforce has obtained IT skills, which are necessary for their job; for low income jobs this figure is only 4%.

additional factor for growing polarization of society on global and national levels. By reduction the level of abilities and skills necessary for participation, simplifying user interfaces, minimizing the cost of services it is possible to minimize the digital divide.[19]

This factor is closely related with necessary revolutionary changes also in human psychology, mentality, even identity that is much more long-term and problematic item. Increasingly human beings learn and work individually (unforeseen and emergency cases, e-work, e-learning). In these circumstances a human's abilities to act and to take decisions individually become crucial. The traditional forms of human communications (family, friends, colleagues) have become weaker and humans face the challenges of the world alone. Unfortunately, we witness the increase in psychological troubles (malfunction, stress) that are caused by higher quality standards, information overflow, autonomy and even loneliness.

In addition new generations in the developed world can live only by using the achievements of technological progress (Internet, 3G mobile communications). They lose the ability to communicate directly and humanly.

But this advanced technological environment is comparatively delicate as any sophisticated system, its reliability never can achieve the desirable goal – 100%; but destruction of communications networks fully paralyses modern society. It could be for natural reasons (depreciated equipment, technical problems, overflow) as well because of damages with criminal intent. Technological revolution and Internet determined the first achievements of knowledge based economy and they made easier disruption of the open economy too, this is a paradox.

The question of technological security in its broadest sense becomes of critical importance in the largely automated real-time economy. If information flows will become a target for terrorist attacks, it will result as destroyed supply chains, collapsed *just in time* delivery, grounded cargo planes, stopped trucks on borders, interrupted financial transactions.

Free movement of people, goods and services in addition to logistics should be supplemented by a new dimension – security. Growing vulnerability of information processing systems asks for strengthening security demands, for global interconnection and interoperation of information systems, smart global integrated information system that will allow control of goods and people during border crossing. Only integrated system can provide both necessary factors: qualitative information processing and global cooperation.

Security relates also to content, there are number of contradictional issues. The reason is integrated processing of information from number of sources in real time.

Usually under the term *data protection* we understand protection of confidential data. Today's problem is legally available public sector information. Real time processing information from business and real estate registers, tax and customs information systems etc. is an excellent tool to disclose *grey* and *black* business, but the same information can be used for economic espionage and criminal purposes too. Organised crime and global terrorist network use public

[19] E-inclusion issues are a substantial part of WSIS final documents as well EU strategic programmes (Lisbon Strategy, Sixth and Seventh Framework R&D programmes, etc.).

information sources and communications networks for they activities.[20] There was found after September 11 that it was too easy to locate a lot of sensitive information and it can be appraised as the threat to the national and personal security.[21]

An explosion in the number of spam E-mails is a hot topic. This really represents a waste of time for those who receive them, as well as delays or even blocking of real messages because of E-mail overloads. The consequences can involve failure to pay bills on time, violation of contractual agreements, etc. At the same time Internet is an excellent global marketing tool for businesses. It is particularly useful for small companies and for beginners. No more do firms have to pay loads of money for the distribution of advertising, the organising of presentations or participation in international exhibitions. The Internet can be used instead, but spam blockage means that lots of valid messages with *.tif*, *.jpg* and *.zip* files are being lost. Businesses have been complaining about this, because it keeps them from sending out audio and video products, project documentation, illustrations, etc. This global problem cannot be resolved by single country.

And not only economy, our everyday life also is step by step filled with artificial intellect of various home electronics. Sometimes the question is: what will be the next steps and do we really want some of opportunities offered by *intelligent home*?

Further development: necessity of integrated strategic vision

In total one can conclude that there are specific national interests in the development of the ICT sector.

ICT really are the main reason and catalyst for radical changes, they have become an extremely strong tool for development of information society, they are everywhere in the era of information and knowledge. Nevertheless, the final goal is not and should not be the development of other technologies for technology's sake. Technologies as such do not have much substantial value. Their substantive existence does not have a meaning. Their advantages appear only when these technologies are properly applied.

And already today one can appraise a positive influence. ICT nowadays has a similar effect on the development of humanity as the spread of writing and printing have had for centuries. The constantly-growing transmissible data flow in the global network characterizes the increasing importance of the information. Due to total networking everybody becomes connected to everybody on a global scale. It replaces the traditional horizontal and vertical communication principles, consequently bringing along principal changes in action as well as in development.

Internet and mobile communications completely globalize economic processes, including cooperation and competition. The active inclusion of knowledge into the economic model is changing the basic postulates and ideas of the model. One of the major mechanisms of

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[20] E.g., usage of anonymous prepaid cards for mobile phones.

[21] E.g., information on chemicals, detailed oil and gas pipeline mapping, drinking water resources and supply, location and technologies of nuclear power plants, etc.

globalisation is the international division of labour; definite regions become progressively specialized in definite sectors of economy, in which they have comparative advantages. In turn, local specialization gives rise to the necessity to exchange intensively goods and services on an interregional and international scale.

The development of ICT opens a real possibility to radically change the manner of a state's governance. Social dimension is becoming extremely important for growth – a person as a creator, holder and sole proprietor of knowledge becomes the main driving force for the development.

And yet more. Advanced ICT provide opportunities to perfect algorithms for knowledge-based activities in every area and level. Socio-technical information processing integrates people, processes and technologies in harmonized knowledge space providing creative exploitation of information and knowledge. Key function of this space – transformation of information into knowledge and knowledge into well-founded decisions and successful actions.

The optimal result is not achieved by quantitative actions only, by simply automating, "informatizing" or digitizing already existing processes and procedures, by changing a form and maintaining their essence or leaving the old content. Only an innovative approach, a modernization and transformation of traditional procedures and actions will increase their effectiveness. Only an exploitation of capabilities offered by ICT, that were not achievable before, will bring forth a new way of thinking and acting.

The results are qualitative changes: more efficient production and services, state administration and social policy. This is the only way to obtain maximum benefits and a higher standard of living. It is only when such benefits are reaped that we shall be able to start talking about new and better model for social organization. The winners will be those who succeed in connecting traditionally stable values with new possibilities.[22]

Therefore governmental policy, related to the ICT sector (*e-strategy*), have to be in a strong accordance with national development strategy and, at the same time, national economy must take advantage of the development of the ICT sector.[23] Strong collaboration between government, businesses and civil society is extremely important for the whole country's development process, in order to strengthen strategic approach for right long-term integrated decisions and to ensure synergy effect.

Very positive changes in perception of role of ICT for society do exist today. And the merit of the WSIS is a simple fact. Even several globe parts had a trivial technological approach before the first phase of the WSIS in 1993. And all of them have significantly modernized

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[22] See final documents of the WSIS. – http://www.itu.int/wsis

[23] An example is well known EU Lisbon Strategy, which really is knowledge-based development policy for EU, and programmes *eEurope 2005* and *i2010*, which provide necessary technological and content support.

their position today.[24] However not always primacy of the technological viewpoint is in the past.

The characteristic example is accent on broadband Internet access that is very popular issue today. Broadband connection really is necessary to use advanced services, exactly development of public services for business and citizens, favourable environment for evolution of e-business transactions, general skills and motivation to use these services is a primary issue. Underdeveloped services mean that many users have not a stimulus for broadband connections and broadband penetration rate also is quite low.[25]

If lot of services will be ensured, broadband will be demanded by consumers and offered by network operators and positive developmental process will be supported. To achieve it we need to shift focus from an infrastructure dominated approach to services in both the public and private sector. Development of content industry and reliable services are key tasks for successful fulfilment of the programmes like *eEurope* and *i2010*.

Conclusion: ICT for ever?

The knowledge-based development has to be considered more as a long-term process than a specific final result. Changes in the economy are not taking place starting from a particular day; it is a gradual result. Handicraft and physical strength are step by step being replaced by mind and knowledge. In the future there will continue to be an increase in penetration of computers, embedded processors and mobile phones with even greater their functionality.

According to the theory of wavy technological evolution ICT is on wave's peak nowadays. It means that utilization of ICT has to ensure incomes and reserves as well investments for development of future's technologies. Forecasts show that such situation will continue next 10 – 15 years. But without any doubt ICT already become a basis for the next wave – development of nanotechnologies, genetics and biotechnologies is impossible without advanced ICT. And as the tool ICT will never lose its significance.

[24] See documents of African and Latin America Regional Conferences for the WSIS in 2003 and 2005. – http://www.itu.int/wsis

[25] There is strong correlation between penetration of hosts and broadband connections in EU countries.