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**ICT – A LEVER OF ECONOMIC DEVELOPMENT
OF THE SLAVONIA AND BARANJA REGION**

ICT - POLUGA RAZVOJA GOSPODARSTVA SLAVONIJE I BARANJE

ABSTRACT

Information and communication technology (ICT) is the technology area with the fastest knowledge doubling and this sector is the most propulsive of all human activities. At the same time ICT is an infrastructure support for all business, scientific and other public and social activities, thus it influences the technical progress and business development of all of these human activities. This paper compares data on ICT literacy in Croatia with those in EU countries. The focuses is on thorough exposition of the ICT sector in the region of Slavonia and Baranja compared with Zagreb and overall ICT sector in the Republic of Croatia that is growing over 7% in the long-term period. The measures are proposed for improvement of operations and better development of ICT sector in the Slavonia and Baranja region. The model is feasible for other Croatian regions.

Keywords: High tech, Human resource, Efficiency, Industrial development

SAŽETAK

Informacijske i komunikacijske tehnologije (ICT) su područje u kojem se znanja najbrže udvostručavaju te je ovaj sektor najpropulzivniji u sveukupnoj ljudskoj djelatnosti. U isto vrijeme ICT je i infrastrukturna djelatnost koja se koristi u svim poslovnim, znanstvenim i drugim javnim te društvenim djelatnostima te tako ona utječe i na tehnički napredak te na poslovni razvoj u svim tim ljudskim djelatnostima. U ovom radu se uvodno uspoređuje ICT pismenost hrvatske populacije sa zemljama EU. Fokus rada je detaljno razmatranje struktura ICT sektora na području regije Slavonije i Baranje što se uspoređuje s gradom Zagrebom i ukupnim ICT sektorom u Republici

Hrvatskoj koji ima predviđen dugoročni rast veći od 7%. Predlažu se mjere za unaprijeđenje poslovanja i kvalitetniji razvoj ICT sektora u slavonsko-baranjskoj regiji, kao model izvediv i za druge hrvatske regije.

Ključne riječi: *Efikasnost, industrijski razvoj, ljudski resursi, visoke tehnologije*

1. Introduction

Information and communication technology (ICT) is the area in which knowledge doubles most quickly and the most propulsive sector in overall human activity.[5] [7] [8] At the same time, ICT is forms an infrastructure that is used in all business, scientific and other public and social activities, and so it affects the technical progress and business development in all of these human activities. ICT supports the development of other industries and society; it has an inherent trait of rapid development and fierce market competition, as well as the rapid abandonment of previous technical solutions. ICT is certainly one of the most innovative industries and the expansion of new technologies from highly urban centres to virtually every home is another feature of this industry. We are witnessing a relatively good initial development of ICT in Croatia.

The aim of this analysis is to point out the development trends of ICT in Eastern Croatia, specifically comparing this high-tech area with the situation in Zagreb, which through various indicators shows significant business ties with ICT stakeholders in the Eastern Croatia. The concluding section will seek to make a positive and developmental trend and propose models for business improvement and rapid development of this sector in the region of Slavonia.

Data for this paper were obtained from Statistics [1] by activities:

- J61 - Communications,
- J62 - Computer programming and related activities,
- J582 - Software publishing,
- C262 - Production of computers and IT peripherals,
- J631 - Information service activities.

2. Croatian ICT economy

The Croatian ICT economy is inseparable from Europe and the world; every day and operational reasons for the increased efficiency of the whole society, when using ICT, led to practically equalizing the habits of its users in most countries of Europe. Therefore, these considerations should start by comparing the situation of the ICT sector in the Republic of Croatia with the EU countries.

2.1. Comparisons of the major factors of ICT - Croatian and EU

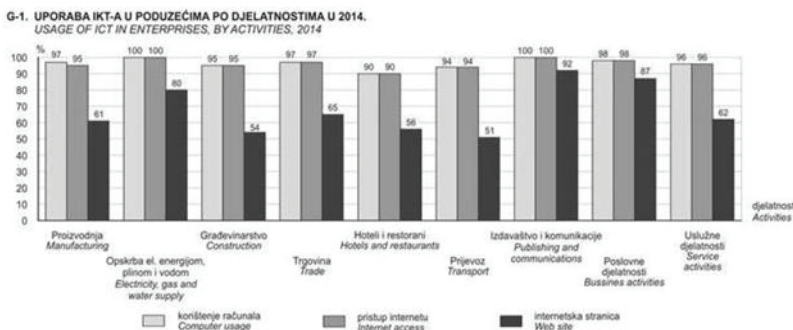
According to Eurostat data for 2013 and 2014 [3] more business and social characteristics of behaviour in Croatia the show same level of adopted ICT as in EU countries.

- Purchases over the Internet during three-month intervals in Croatia comprises 22%, in Italy 15% and in France 47% for persons 17-74 years of age;
- Employment in high-tech fields, which entails the use of ICT in Croatia, covers 3.3% and, for example, in Lombardy 3.4% of the workforce;
- Higher education in the population of Croatia has reached 34.5%, just as in Italy: 34.5%;
- The share of new products in companies in Croatia is 10.5% - in Italy 14.9%;
- Fast growing companies (with an increase of more than 10% per year with more than 10 employees) - Croatia has 42,954 (approximately 2.78%), and Italy 768,320 (approximately 3.65%);
- Mastery of basic computer skills in Croatia is 20%; in Italy it is 12% of people aged 16-74 years.
- Mastery of Internet usage in Croatia is 29%; in Italy 19% of the population.

2.2. Global data on Croatian ICT industry

The Croatian ICT sector employs more than 25,000 workers - with a gross turnover of nearly 3 billion Euros, or 4.1% of Croatian GDP. Much more than that number of ICT employees is in the same or similar jobs in other industries where ICT is a necessity. The entrenchment of this technology is shown in Figure 1 - stating the percentage of ICT use in economic activity in 2014.

Figure 1 *The use of ICT in the main economic sectors [2]*



It should be noted that employees in the Croatian ICT sector are highly educated, qualified for the tasks they perform and are productive and motivated, which are important preconditions for more rapid entry into the technology and business trends of the world.

3. ICT economy of Slavonia and Baranja

ICT in Eastern Croatia was developed in large companies and state institutions. Most experts are educated beyond. Since the opening of study at the University of Osijek, primarily the Faculty of Electrical Engineering, in 1991, over 1000 engineers and graduate engineers have completed their studies of electrical engineering, mechanical engineering, computing and telecommunications, offering strong support to employment in eastern Croatia.

3.1. The share in the Croatian economy

Gross domestic product (GDP) for the five counties of eastern Croatian and the city of Zagreb. is given in graph 2. Share of gross value added of industry of Croatia in 2011 and 2012 g. (%) is given on graph 3.

Figure 2 GDP per capita in Zagreb and five counties of Slavonia and Baranja (€) [1]

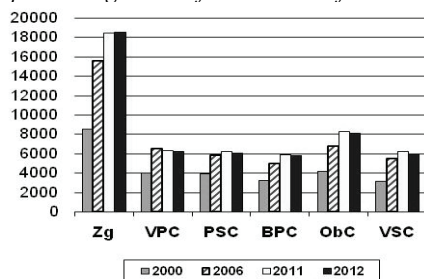
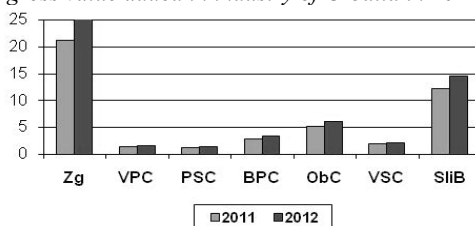


Figure 3 Share of gross value added in industry of Croatia in 2011 and 2012 (%) [1]



3.2. The growth of ICT in the region of Slavonia and Baranja

Example of activity J62 – computer programming - is characteristic for growth of ICT in Slavonia in the period from 2008 to 2013. The number of companies has increased from 56 to 83, the number of employees from 227 to 311. Total income has increased from 63 to 83 million USD and export from 4 to 26 million USD. Net wages have risen from 4013 to 4988 HRK. The added value has increased from 29 to 44 million EUR, and the share of value increased from 46% to 53% (the average of the group is 20%). The consolidated financial results have increased from 2.49 to 8.31 million EUR (334%).

3.3. The situation in the telecommunications sector

Total revenues in the telecommunications (J61) for 2010 and 2013 are shown in Table 1.

Table 1 Total revenues in the telecommunications area for 2010 and 2013 (HRK)

County	2010	2013
Vukovar	961 942	2 396 978
Osijek	555 683	867 385
Sl. Brod	1 298 106	133 885
Virovitica
Požega	10 000 262	1 438 114
Zg. county	25 929 108	49 243 538
City of Zagreb	15 051 845 069	12 787 380 156
Croatia	15 295 240 075	13 142 541 889

Source: [1]

3.4. Number of ICT companies in the Slavonia and Baranja

The number of ICT companies in Slavonia and Baranja by counties shown in Graph 4. The number of companies in the communications sector J61 in 2010 and 2013 is shown in Table 2.

Figure 4 Number of ICT companies in Slavonia and Baranja - by county [1]

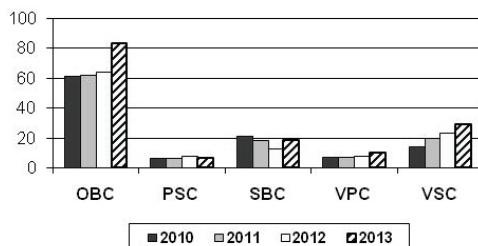


Table 2 Number of companies in the communications sector J61 in 2010 and 2013

County	2010	2013
Vukovar	3	5
Osijek	2	4
Sl. Brod	3	2
Virovitica	0	0
Požega	12	8
Zg. county	10	15
City of Zagreb	126	133
Croatia	219	246

Source [1]

3.5. Number of employees in the ICT industry

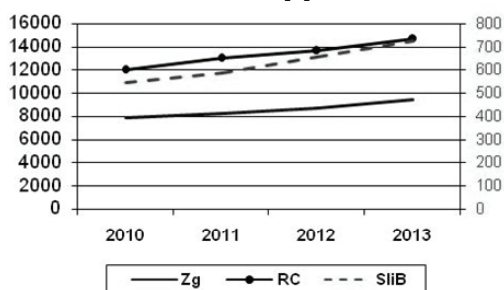
The number of employees in communication companies (J61) is given in Table 3 and the number of IT companies in Slavonia and Baranja, the City of Zagreb and Croatia for 2010 and 2013 is shown in Figure 5.

Table 3 Number of employees in communications sector J61

County	2010	2013
Vukovar	4	13
Osijek	4	7
Sl. Brod	6	2
Virovitica	0	0
Požega	112	5
Zg. county	32	43
City of Zagreb	9 190	8 266
Croatia	9 705	8 786

Source: [1]

Figure 5 Number of employees at ICT companies in Slavonia and Baranja, City of Zagreb and Croatia [1]



3.6. Trends and comparisons of income

Consider the data on net wages and salaries for the sectors of information and communication for the 2010 and 2013 year in Tables 4 and 5, and the activity J61 (communication) in Table 6.

Table 4 Net wages and salaries in the IT in 2010 (HRK)

County	J62	J631	J582	C262	Uk.sektor
Vukovar	822 868	156 967	799 271	506 323	2 285 429
Osijek	10 773 522	1 698 630	118 485	145 336	12 735 973
Sl. Brod	2 760 851	2 882 568	185. 264	372.937	6 201.620
Virovitica	211 305	0	0	56.109	267 414
Požega	1 524 831	98 404	0	0	1 623 235
SliB	16 093 377	4 836 569	1103 020	1 080 705	23 113 671
Zg. county	11 185 195	1 517 862	2.769 108	3 487 140	18 959 305
City of Zagreb	460 774 399	49 464 559	41320 475	108 897 923	660 457 356
Croatia	614 525 328	87 867 567	48 824 112	130 047 274	881 264 281

Source: [1]

Table 5 Net wages and salaries in the IT in 2013 (HRK)

County	J62	J631	J582	C262	Uk sektor
Vukovar	2 387 330	0	796 531	220 612	3 404 473
Osijek	18 613 804	1 772 201	59 137	101 524	20 546 666
Sl. Brod	4 247 778	6 043 458	294 445	382 190	10 967 871
Virovitica	543. 101	443	0	59 692	603 236
Požega	1 456 961	54 618	0	63 560	1 575 139
SliB region	27 248 974	7 870 720	1 150 113	827 578	37 097 385
Zg. county	17 246 094	1 783 735	1 617 226	3 386 955	24 034 010
City of Zagreb	606 433 738	70 936 939	40 517	89 431 652	807 319 758
Croatia	819 972 463	140 580 904	52 837 210	107 156 856	1 120 547433

Source: [1]

Table 6 Salaries and wages for communication sector J61 for the 2010 and 2013 year (HRK)

County	2010	2013
Vukovar	159 954	374 714
Osijek	119 873	140 146
Sl. Brod	180 075	42 161
Virovitica	0	0
Požega	2 841 440	167 861
Zg. county	1 624 854	1 785 665
City of Zagreb	882 846 130	828 572 227
Croatia	909 362 417	853 947 154

Source: [1]

4. Main achievements

4.1. Solutions at the national level in practice

The Croatian ICT sector is very successfully involved in the development of e-government; they have created and implemented information systems in the sectors of health care (with IT support in the entire chain of health care from prevention to emergency services); real estate registration and cadastre and in educational system of primary, secondary and higher education [1].

4.2. Solutions in the real sector

Complex solutions have been implemented in the banking and insurance sectors, telecommunications, wholesale trade and agriculture. Especially prominent solutions include professional services in key infrastructure maintenance, information management and documentation, systems management, geographic information systems, security management and human resource management. Specialized application areas include: tourism, intelligent cities, smart energy, flexible payment, entertainment and innovative personal solutions. [1].

4.3. Croatian ICT solutions abroad

It should be noted that there are Croatian ICT companies in a number of EU countries and the OECD and other countries implementing their ICT solutions and so securing a place on foreign (European and global) markets. An example is the development of information systems in education for Turkey. [1]

4.4. The project "Slavonian network"

Broadband access is to be an integral part of ICT and at the same time is an effective technological and communication link between all actors in the business, scientific, and social sector and public services. Because of its importance the European Commission set an ambitious plan in 2010 for the development of broadband access in all EU countries through the Digital Agenda for Europe.[4]. The Faculty of Electrical Engineering has launched the "SLAVONIAN NETWORK project – the development of broadband access in the five counties of Slavonia and Baranja", in the framework of the strategy of broadband development in the Republic of Croatia from 2012 to 2015. The number and density of connections of broadband Internet users in Croatia is significantly below the average in EU member states, and in the five counties in the Slavonia region, except for the city of Osijek, it is below Croatia's average. This state of affairs in prevents social and economic development, effective functioning of the public administration and the inclusion of the region in modern communication and faster development of modern telecommunication services within the

country and the EU [13]. Project team members from the Faculty of Electrical Engineering in Osijek and Panon think tank for strategic studies in Osijek are preparing this project and have analysed conditions in which the project will be realized and have set up special models of implementation; Figures 6, 7 and 8. Here they cite as an illustration a good approach to development as well as a model that could be adapted for ICT development in Croatia and the region [9] [10].

Figure 6 Preparatory stages of the project "Slavonian network".[9]

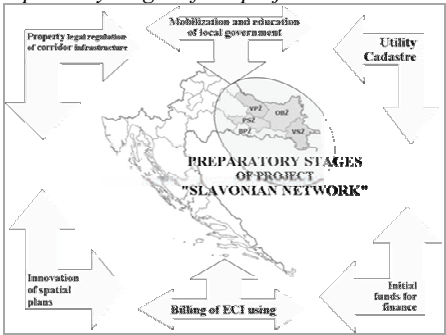
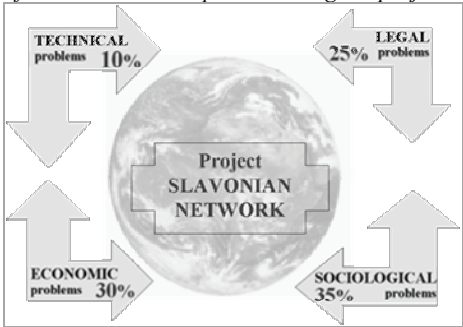


Figure 7 Implementation of the project "Slavonian network" [9]



Figure 8 The structure of business issues expected during the project "Slavonian network" [9]



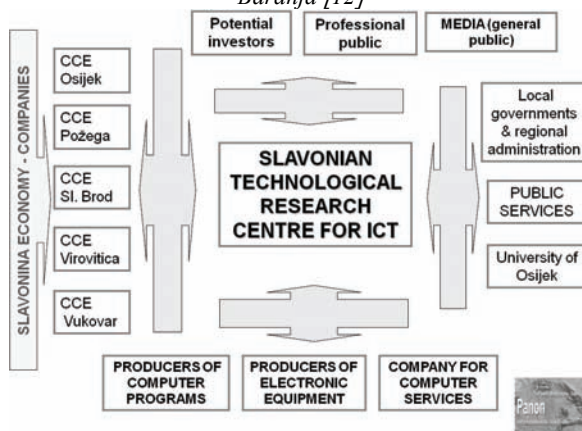
5. Discussion

The ICT industry produces sophisticated services and products for which tools the software license holders are regularly burdened with relatively high costs. The market for this industry is mostly state-owned companies or external contracting for computer and the local populace and the public sector for communications services. The main feature, which is very rapid adaptation to new techniques, seeks exceptional commitment and the reaction rate of this industry. The conclusion on the basis of accounting data does not reveal specific items such as investment in development - that level of this industry is at the basis of development activities itself. The main levers of the economy, however, created a synergy of the ICT industry and other business activities of producers. For Slavonia and Baranja it is agriculture, storage and the processing of food, energy and ecology. Bringing fast Internet service is therefore of paramount importance for the harmonic development of the economy of Slavonia and Baranja, but also the ICT industry as an export-oriented economic activity.

In this analysis data on investment in ICT in Croatia are not presented. These investments in Zagreb are more significant than in other regions, with the area of the five county Slavonia region in recent years having not seen an investment of even one (HRK) kuna [12].

Slavonian ICT companies have achieved notable successes in the market - but the overall ICT development and application of ICT in the economy and the public sector in the region is not designed nor directed on the basis of scientific and technical analysis. It is therefore necessary to unite potentials and resources available, and initiate a serious design development of ICT in the region in the coming period. This suggests establishing a specialized professional body SLAVONIAN TECHNOLOGY-RESEARCH CENTRE FOR ICT - which would be organized by the Chamber and connect business, higher education, local ICT companies and potential investors [12], Figure 9.

Figure 9 Proposed model for to guide the development of ICT in the region of Slavonia and Baranja [12]



6. Conclusion

Slavonia and Baranja have very good growth potential for ICT with the expectation of growth above 7%, and connections with other parts of Croatia, especially with Zagreb, provide additional opportunities for fast placement.

Education level, cultural and economic traditions and relatively long IT traditions give preference to local ICT resources in developing new and high quality IT solutions.

Implementation of ICT in the region on specific products is a key lever of development in Eastern Croatia. The infrastructure of this development, however, is the development of fast communication infrastructure with the help of EU funds.

An important assumption of the rapid expansion of ICT in the region is consistent implementation of the project "Slavonian Network - development of broadband access in the five counties of Slavonia and Baranja", with the support of EU funds.

The manufacturing and service sectors of ICT in the region should help science, business and local and state administration in answering the challenges. In this sense, we propose discussion within the CCE and the University of Osijek on the proposed model to guide the development of ICT in the region of Slavonia and Baranja and its urgent application in practice.

REFERENCES

- [1] Croatian Chamber of Economy
- [2] Državni zavod za statistiku
- [3] EC: Digital Agenda for Europe (<http://ec.europa.eu/digital-agenda/>)
- [4] Eurostat (<http://ec.europa.eu/eurostat>)
- [5] Ivanović, M.: Tri eseja o znanosti - drugo dopunjeno i prošireno izdanje, ISBN 978-953-6032-55-6226, Elektrotehnički fakultet Osijek, Osijek, 2008.
- [6] Ivanović, M.; Jović F.: The Triple Helix Model for Innovation Processes in Transition Countries 7th International Conference VIPSI, Opatija, April 6 - 9, 2008; VIPSI Beograd, Proceedings, pp 6.1.– 6.6
- [7] Ivanović, M.; Širić, M.: The Knowledge Economy and Development of New Technologies for Knowledge Society; XXVII Int. Conference „Science in Practice“, Osijek, May 5 -7, 2008. Faculty of Electrical Engineering Osijek; Proceedings, pp 31 – 36
- [8] Ivanović, M.: Millennium Scientific Paradigm; XXIX International Conference „Science in Practice“, Subotica, 5.-7.6.2010. Polytechnic Engineering College Subotica, ISBN; Proceedings pp 77 – 82
- [9] Ivanović, M.; Ambroš, L.; Mesarić, V.: Establishing a Consortium - Way for Successful Implementation of Investment Projects - an Example of the Infrastructural Project Slavonian network"; 3rd International scientific conference „Economy of Easter Croatia“, Osijek, May, 23-24, 2014; Proceedings, pp 16 – 22
- [10] Ivanović, M.; Ambroš, F.; Mesarić, D.: Models of investment in fiber optic networks and implementation of the "Slavonia network" project; 3rd International scientific conference „Economy of Easter Croatia“, Osijek, May, 23 - 24, 2014; Proceedings, pp 4 – 16
- [11] Jović, F.: Analogy, temporality and information in a dynamic system, The IPSI BgD Transaction of Advanced Research, Volume 3 (2007), Number 2, 19-21.
- [12] Jović, F.: ICT – A Lever of Economic Development of the Slavonia and Baranja Region; public lecture on ICT summit at Faculty of Electrical Engineering Osijek, Osijek, March 27, 2015. (PPP)
- [13] Mesarić, D.; Ambroš, F.; Ivanović, M.: Development of broadband network in Slavonia and Baranja; 2nd International scientific conference „Economy of Easter Croatia“, Osijek, May, 23 - 25, 2013; Proceedings, pp 54 – 64