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COST ANALYSIS OF INFORMATION AND COMMUNICATIONS INFRASTRUCTURE IN THE AREA OF EASTERN CROATIA

ANALIZA TROŠKOVA INFORMACIJSKO KOMUNIKACIJSKE INFRASTRUKTURE NA PODRUČJU ISTOČNE HRVATSKE

ABSTRACT

Information and Communication Technology is one of the most important components of modern enterprises. Information and Communication Technology can be defined as the coverage of computer hardware, software, networks and media for collection, storage and memory, processing and transmission of data and presentation of information in the form of voice, data, text and images. Information technology with fast communication and the possibility of using a distributed database and centralized data warehouse and locally distributed decision support tool supports non-hierarchical organization of work where the rapid changes in the business environment, individuals and workgroups in the realization of the task largely independent and can quickly adapt to change and respond to new challenges. Electronic business leads to optimization of operations and opportunities for faster and better decision-making. However, the growing need for new types of information and communication infrastructure increases the costs of doing business and is an important factor of competitiveness in the market.

The objective of this paper is to investigate and analyse the application of Information and Communication Technology in the enterprises in Eastern Croatia. The authors analyse the possibilities and costs of the introduction and use of the leased information and communications infrastructure in eight cities of Eastern Croatia. They thereby use a range of scientific research methods (methods of analysis, comparison, induction, deduction, description and classification, etc.) as well as individual mathematical-statistical methods used for the analysis and ranking of certain parameters. In the paper, the enterprises are

divided by size, and the analysis is done according to projected needs of companies based on the number of users and average requirements for services. The authors researched the costs establishment of enterprise and the cost of taxes, local taxes and other fees for each city separately. Based on the results the cost of infrastructure was calculated for each city. Based on these costs the cities were allocated ranks of feasibility of establishment and the possibility to increase the competitiveness of existing businesses in the market.

Key words: *Information and Communication Technology, infrastructure, costs, enterprise, Eastern Croatia*

SAŽETAK

Informacijsko komunikacijska tehnologija jedna je od bitnijih sastavnica modernih poduzeća. Informacijsko komunikacijsku tehnologiju moguće je definirati kao obuhvat računalnog sklopovlja, programske podrške, mreže i medija za prikupljanje, skladištenje i memoriranje, obradu i prijenos podataka te prezentiranje informacije u obliku glasa, podatka, teksta i slike. Informacijska tehnologija s brzom komunikacijom i mogućnošću distribuiranog korištenja centraliziranih baza i skladišta podataka te lokalno smještenih alata za potporu odlučivanju podržava i nehijerarhijsku organizaciju rada u kojoj su zbog brzih promjena u poslovnoj okolini pojedinci i radne skupine u realizaciji zadatka u velikoj mjeri nezavisni te se mogu brže prilagoditi promjenama i odgovoriti novim izazovima. Elektroničko poslovanje dovodi do optimalizacije poslovanja te mogućnosti bržeg i kvalitetnijeg odlučivanja. No, sve većom potrebom za novim vrstama informacijsko komunikacijske infrastrukture povećavaju se troškovi poslovanja i bitan su čimbenik konkurentnosti na tržištu.

Cilj ovoga rad je istražiti i analizirati primjenu informacijsko komunikacijske tehnologije u poduzećima na području istočne Hrvatske. Autori u radu analiziraju mogućnosti i troškove uvođenja i korištenja unajmljene informacijsko komunikacijske infrastrukture na području osam gradova istočne Hrvatske. Pri tome koriste niz znanstvenih metoda istraživanja (metode analize, komparacije, indukcije, dedukcije, deskripcije i klasifikacije itd.) kao i pojedine statističko-matematičke metode korištene za analizu i rangiranje određenih parametara. U radu su poduzeća podijeljena prema veličini, a analiza se vrši prema predviđenim potrebama poduzeća zasnovanim na broju korisnika i prosječnim zahtjevima za uslugama. Također, u radu su istraženi troškovi osnivanja poduzeća te troškovi poreza, prireza i ostalih davanja za svaki grad posebno. Na temelju dobivenih rezultata izračunati su troškovi infrastrukture poduzeća po gradovima. Temeljem tih troškova gradovima su dodijeljeni rangovi isplativosti osnivanja poduzeća i mogućnosti povećanja konkurentnosti postojećih poduzeća na tržištu.

Ključne riječi: *Informacijsko komunikacijska tehnologija, infrastruktura, troškovi, poduzeće, istočna Hrvatska*

1. Introduction

Information and communication technology is an essential part of everyday life in both personal and in business terms. It is almost unthinkable to start the day without using a computer. Computers are used for a whole range of activities, from simple ones such as a morning wake up call, to complex such as the processing of complex data and information and decision-making at management. Systems supported by information and communication technologies are extremely important for successful operation of institutions and companies.

In the following chapters the application of information and communication technology at the companies in the Eastern Croatia will be explored and analyzed. The paper analyzes the

opportunities and costs of introduction and use of information and communication infrastructure leased in the area of eight cities in Eastern Croatia.

2. Information and Communication Technology in Business

A piece of information defined as data that is linked to some meaning has become one of the key resources in the business. Upon the development of communication networks information have become more accessible. However, not all of the available information is also useful information. "Knowing that decisions and their implementation makes up the future of the successful performance of each company, leads to special attention in the research of the decision-making process, where we try to discover the laws that govern this process in order to limit irrational behaviour and steer decision-makers to use rational methods to achieve rational objectives." (Pilepić & Šimunović, 2010, 411) It is necessary to know how to manage the available information, and to make a valid decision based on useful data. Information technology in business process automation accelerates the course of collecting and processing information. Support systems in the decision-making process are assisting in faster problem-solving and achieving positive results.

"Information technology has not exhausted its potential in allowing business automation and acceleration of the operation execution, but it is used as a key resource that can ensure long-term growth, increase revenue and market competitiveness for organization." (Čerić & Varga, 2004, 10) In the business environment that has recently been characterized by uncertainty, decision support and information management is increasingly attracting the attention of the management and it is becoming more important in the execution of business processes. The ever more rapid development of Information and Communication Technology has enabled the emergence of new ways and techniques of decision-making and data management which have not been used before. Various information systems that enhance business processes of production and management are developed.

3. Companies in Croatia

According to the Small Business Encouragement Law, the definitions and criteria for differentiation of small business entities with respect to their size was determined. According to this Law, there are micro, small and medium-sized operators of small businesses and large enterprises in the Republic of Croatia. The following table shows the structure of enterprises in the Republic of Croatia.

Table 1 The number of enterpreneurs in Croatia within the period under observation

Commercial enterprises	Large (L)		Medium (M)		Small (S)		Total		Small businesses (S+M)	
	Number	%	Number	%	Number	%	Number	%	Number	%
2003	889	1,3	2.597	3,8	64.698	94,9	68.184	100,0	67.295	98,7
2004	962	1,4	2.692	3,9	65.327	94,7	68.981	100,0	68.019	98,6
2005	1.074	1,5	2.969	4,1	67.760	94,4	71.803	100,0	70.729	98,5
2006	441	0,6	1.480	1,9	76.588	97,6	78.509	100,0	78.068	99,4
2007	475	0,6	1.590	1,9	81.467	97,5	83.532	100,0	83.057	99,4
2008	453	0,5	1.396	1,6	87.807	97,9	89.656	100,0	89.203	99,5
2009	436	0,5	1.446	1,6	89.438	97,9	91.320	100,0	90.884	99,5
2010	375	0,4	1.379	1,4	95.004	98,2	96.758	100,0	96.383	99,6
2011	359	0,4	1.292	1,4	89.539	98,2	91.190	100,0	90.831	99,6
2012	348	0,4	1.309	1,3	95.597	98,3	97.254	100,0	96.906	99,6
2013	459	0,4	1.426	1,2	114.797	98,4	116.682	100,0	116.223	99,6

Source: Croatian Chamber of Economy, Central Bureau of Statistics, Financial Agency, www.cepor.hr, author

According to the data in Table 1 it is possible to notice a trend of constant growth of small enterprises in Croatia within the study period, especially after the year 2006. The reasons for this increase are the changes of the criteria for determining the size of the company according to the new Accounting Law, which made these criteria similar to those of the European Union. The application of new criteria in 2006, brought to a significant decrease in the number of large and medium enterprises, while it lead to the increased number of small entrepreneurs and in 2013 it amounted to 98.4% compared to the total number of enterprises in the Republic of Croatia. Given that the number of small firms has been increasing over the years, the question of ensuring quality of information and communication technology required in business arises. In this paper, the companies in the Eastern Croatian region in particular will be analyzed.

4. Eastern Croatian Region

Thanks to its geographical area, the Eastern Croatia has many prerequisites for a number of economic activities. Apart from agriculture, forestry, waterpower engineering, extracting oil and gas that has been used in these areas for many years, because of its characteristics the Eastern Croatia has space for further development. Modern development of the population in Eastern Croatia is substantially burdened by the expressive spatial population polarization between urban (city) and rural (village) settlements/areas in almost all parts of the population development, making it difficult, or even preventing stable and prosperous socio - economic and regional development of that region. (Živić, 2003, 70, a).

In rural areas, the potential of utilization is lower than in urban areas, and higher distance between locations is resulting in higher costs of implementation. The reduced density of population leads to reduced demand for services, which results in reduced infrastructure development in these areas.
The age structure of the population in rural areas is much less favourable. There is less chance that the elderly population will use the Internet, often because of their ignorance of technology and fear that they can make mistakes. It is not uncommon that the level of education in rural environment is somewhat lower, resulting in lower IT literacy, and it is a barrier to the use of the Internet. The smaller income, which prevents most of the people to afford a computer and the Internet connection, is also a hindrance. The indicators that affect regional competitiveness most are: employment levels and productivity of employees, the share of employment by industry, demographic trends, investments, investment in knowledge, infrastructure, the level and type of education, innovation and research and development. (Tijanić, 2010, 422, a).

Since the declaration of its independence, Croatia has inherited uneven regional development, and the Homeland War has only increased the disproportion of certain areas. (Blagojević, 2008, 1177). Despite of the more and more significant concentration of population in urban areas, the Eastern Croatia has, according to the number and proportion of the rural population, still retained more rural characteristics in relation to Croatia as a whole, as well as in relation to other macro-regional areas of Croatia. (Živić, 2003, 79, b). The average working engagement of the rural population in Eastern Croatia is in decline, which points to its diminishing economic activity, and thus the development of its area.

Croatia needs to continue to invest in programs that encourage the development of broadband Internet access in developing regions, being aware of the fact that the fluctuations of capital will be in the direction where there is a direct revenue. Human resources (human capital base)

are becoming more important determinant of competitiveness, both at national level, and at lower levels. (Tijanić 2010, 426, b).

5. Infrastructure Opportunities

The demand for high speed data transmission is becoming more pronounced in today's business, as well as on the communications market. In order to achieve competitiveness in the market today and set aside from the rest of the competition it is necessary for companies to invest in Information and Communication Technology infrastructure. Companies that are based on business Information and Communication Technology generated economic growth. The largest contribution is reflected in the services segment, where it creates the biggest share of the total income. The growth of this industry is expected to have a significant impact on Croatian economic growth and thus increasing the productivity of the economy.

The demands of end-users for telecommunications services, IT systems and computing solutions with the option of mobility and/or higher speed are on the increase. For this reason there is an increased use of wireless and optical networks, in order to be able to fulfil the increasing number of requests. Most of the infrastructure that is currently on the market has reached its maximum physical capabilities and cannot meet all the requirements of users in a satisfactory manner. Most of the solutions that exist on the market have been developed based on the growing need for doing business over the Internet. Thus the number of services on the market has increased. A modern business undertaking involves the provision of voice services over the Internet and leasing space for the Web pages and email addresses. The desire for access to all business data from any location and using all available devices led to the development of cloud computing and enabled the creation of one's own virtual data centre.

Competitive business is unthinkable without business information systems that require network devices, storage systems and servers. Cloud Computing's development gives enterprises the opportunity to rent the necessary Information and Communication Technology infrastructure from the operators, and thus reduce the costs of accommodation, power, cooling, upgrades and maintenance of the infrastructure itself. They choose which programs they want to use themselves, and pay them after use. In this way the investment in the purchase of software, necessary licensing or installing them is reduced. Investments in telecommunications infrastructure per capita amounted to HRK 357,75 in 2011 (Mastelić, 2013, 419, a). The fact is that the demand for an increasing number of telecommunication services is growing rapidly. The desire of end-users for the increasing availability of multimedia content via telecommunications networks and simultaneous data storage in the cloud represent demanding technology that is becoming more popular for both private and business users.

Electronic communications market in Croatia is currently on the slight increase, but the adoption of new technologies in the mobile and telecommunications networks has major opportunities for rapid progress and development. The development of broadband Internet access has become an important political issue in the European Union. (Mastelić, 2013, 420, b). The number of requests for stable and high speed Internet access via symmetrical speeds through optical infrastructure is increasing. In this area Croatia is lagging behind in the number of connections to an average Member States of the European Union. (Mastelić, 2013, 420, c). The development of broadband access is in direct correlation with economic growth and quality of life in the area. It is up to the state and local government and regulatory bodies to encourage and support the rapid development of the density of broadband, especially in rural areas.

6. Cost analysis of Information and Communication Technology infrastructure

Taking into account the extensiveness of the business, the need for constant connectivity between all company locations and stable and fast access to the Internet for each of these divisions the service proposal for a complete Information and Communication Technology solution that one modern enterprise should have was made. So for all sizes of businesses Voice Over Internet Protocol service is foreseen, including devices, Web hosting with 500MB of space so they can receive e-mail and symmetrical internet speed depending on the size of the company. For small enterprises the Internet speed access of 10/10 Mbps, for medium access speed of 20/20 Mbps, while for larger companies the speed access of 30/30 Mbps is planned.

Table 2 Monthly costs of Information and Communication Technology infrastructure of the region towns according to the company size

TOWN	Monthly costs of Information and Communication Technology infrastructure in the companies		
	Small	Medium	Large
Đakovo	HRK 2.620,00	HRK 4.790,00	HRK 7.975,00
Našice	HRK 2.620,00	HRK 4.790,00	HRK 7.875,00
Osijek	HRK 2.270,00	HRK 4.290,00	HRK 7.175,00
Požega	HRK 2.620,00	HRK 4.690,00	HRK 7.875,00
Slavonski Brod	HRK 2.390,00	HRK 4.390,00	HRK 7.475,00
Vinkovci	HRK 2.370,00	HRK 4.290,00	HRK 7.475,00
Virovitica	HRK 2.390,00	HRK 4.390,00	HRK 7.475,00
Vukovar	HRK 2.620,00	HRK 4.790,00	HRK 7.875,00

Source: authors

Based on the data, the fixed monthly expenses of complete Information and Communication Technology solutions small companies are the lowest in Osijek and amount to HRK 2.270,00. In Vinkovci, Virovitica and Slavonski Brod the situation is almost the same. In Vukovar, Đakovo, Požega and Našice due to isolated location, smaller needs and reduced availability of optical infrastructure fixed monthly costs have increased and amounted to HRK 2.620,00. As for medium-sized enterprises the situation is changing, depending on the geographical location. The fixed costs range from HRK 4.290,00, as stated in Osijek and Vinkovci, to HRK 4.790,00 in Vukovar and Đakovo. For large companies, the lowest fixed monthly cost of the complete solution is again in the biggest place in the region - Osijek and amounts to HRK 7.175,00. Because of the lower availability of infrastructure in the remaining cities the costs themselves increase. Thus Vinkovci, Virovitica and Slavonski Brod are immediately behind Osijek by the amounts of the monthly costs for Information and Communication Technology solutions with the amount of HRK 7.475,00. Again the biggest expenses are in Vukovar, Đakovo, Požega and Našice, and are ranging from HRK 7.875,00 to HRK 7.975,00.

7. Company establishment and the analysis of taxes, local taxes and other contributions

Costs of founding companies can be divided into several levels. For the establishment of a Limited liability company a minimum share capital of HRK 20.000,00 is required. The fees which are additionally paid are the court fee for the application in the amount of HRK 400,00 the entry of the company in National Gazette in the amount of HRK 900,00 and the fee of the Central Bureau of Statistics in the amount of HRK 55,00 and a notary public service. Upon the founding of the company, the name of the enterprise must be specified and an application for entry in the register, which shall be certified by a notary public, must be made. After this,

the company stamp is formed and company trading account is opened in a bank upon which the start-up capital should be paid in the amount of HRK 20.000,00. In continuation of this study the city taxes and the tax burden on businesses in the towns in the region will be analyzed.

City and municipal taxes vary according to the rates and monthly or yearly amounts of the tax burden. The city taxes include surtax on income tax, consumption tax, houses for rent tax, taxes on company or the name and the tax on the use of public surfaces. Table 3 shows the most frequent tax burden on businesses in the towns of the region. Taxpayers of the company or the name are legal entities or physical persons who are liable to profits or income tax and are registered for the activity performance. A tax on use of public surface is paid by legal and physical persons for the use of public land. Public areas particularly include sidewalks, streets, squares, parks, green areas and other surfaces.

Table 3 Tax burden of the companies in the towns of the region

TOWN	TAX BURDEN OF THE COMPANIES		
	Surtax	Tax on company or the name	Tax on the use of public surfaces.
Đakovo	10%	Individuals (HRK 500,00 – 1.000,00) Legal entities (HRK 800,00 – 1.000,00)	10% of the amount paid for the use of public surfaces
Našice	8%	Individuals (HRK 50,00 – 2.000,00) Legal entities (HRK 50,00 – 2.000,00)	-
Osijek	13%	Individuals (HRK 200,00 – 500,00) Legal entities (HRK 500,00 – 1.000,00) Independent caterers (HRK 600,00)	10% of the amount paid for the use of public surfaces
Požega	10%	Individuals (HRK 400,00 – 700,00) Legal entities (HRK 750,00 – 2.000,00)	-
Slavonski Brod	12%	Individuals (HRK 400,00 – 1.000,00) Legal entities (HRK 600,00 – 2.000,00)	-
Vinkovci	13%	Individuals (HRK 200,00 – 2.000,00) Legal entities (HRK 600,00 – 2.100,00)	10% of the fee amount paid for the use of public surfaces
Virovitica	10%	Individuals (HRK 200,00 – 400,00) Legal entities (HRK 500,00 – 1.800,00)	-
Vukovar	0%	Individuals (HRK 200,00 – 2.000,00) Legal entities (HRK 500,00 – 2.000,00) Independent caterers (HRK 400,00 – 1.200,00)	5% of the rent amount

Source: Ministry of finances, available on www.porezna-uprava.hr/ (March 30, 2014)

Based on the data in the table it is possible to observe different rates of local taxes in the cities, as well as various annual payments of company tax and tax on use of public land in the region. More developed areas of the region as well as those with more residents have a higher tax burden, compared to smaller cities. Surtax rates amounts are ranging from 8 % to 13 %, and the city of Vukovar is the exception with 0 % surtax.

The amount of tax on the company name is different in every city for physical and legal persons, and it is the lowest in Našice (for physical as well as for legal entities). Taxes on use of public surfaces is mostly equal in all towns, except in Vukovar, where the rate of this tax is lower than in the other cities of the region, while Virovitica, Slavonski Brod, Požega and Našice do not have this type of tax.

8. Analysis of the company's expenses in relation to Information and Communication Technology infrastructure and tax load

The following table shows the ranks of cities in relation to the costs of Information and Communication Technology infrastructure and the tax burden. Monthly costs of Information

and Communication Technology infrastructure are ranked for each city separately as well as the size of the company. In the same way, the tax burden for each city in particular is ranked, and the sum of these ranks gave the final ranking of the feasibility of establishing companies within the region.

Table 4 Town ranking with relation to costs of Information and Communication Technology infrastructure and tax burdens

TOWN	Monthly costs of Information and Communication Technology infrastructure			Tax burdens of the companies			Sum	Rank
	Small	Medium	Large	Surtax	Company tax	Tax on the use of public surfaces		
Đakovo	4	4	4	3	3	3	21	6
Našice	4	4	3	2	6	1	20	5
Osijek	1	1	1	5	2	3	13	2
Požega	4	3	3	3	4	1	18	4
Slavonski Brod	3	2	2	4	5	1	17	3
Vinkovci	2	1	2	5	8	3	21	6
Virovitica	3	2	2	3	1	1	12	1
Vukovar	4	4	3	1	7	2	21	6

Source: authors

Based on the data in Table 4 it is possible to notice, corresponding to the rank obtained, that the lowest costs of the Information and Communication Technology infrastructure, as well as tax burdens are in Virovitica. The rank two of feasibility of establishing companies in the region has Osijek, despite the high rate of surtax and other tax burdens, and then Slavonski Brod and Požega follow. The biggest cost of Information and Communication Technology infrastructure and tax burdens are in Đakovo, Vinkovci and Vukovar and these are also towns of the region in which the feasibility of establishing a company is minimum.

9. Conclusion

The paper presents data on the structure of companies in the Republic of Croatia and the costs of Information and Communication Technology infrastructure in the cities of the Eastern region. For the analyzed cities tax burden on businesses are also investigated. In the paper companies are divided according to the size of the undertaking, and the analysis is carried out according to the foreseen needs of companies based on the number of users and the average requests for services. Also, the paper examines the costs of company founding and tax expenses, local taxes and other fees for each city separately. Based on the results gained, the costs of infrastructure for enterprises in the cities were calculated. Based on these costs cities were assigned ranks of feasibility of establishing enterprises and the possibilities of increasing the competitiveness of the existing companies on the market.

The costs of Information and Communication Technology and the tax burden on businesses in Eastern Croatia depend on a number of factors that also affect the feasibility of the establishment of enterprises within the region. The rates of local taxes and other tax burdens are particularly high in the bigger cities of the region, however, despite that fact, the feasibility of establishing companies in them is greater than in the smaller towns. Based on the above mentioned, it can be concluded that the application of Information and

Communication Technology in these cities (especially towns with a rank 1-3) is higher, as well as the profitability of its introduction.

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