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Strengthening the Strategic Cooperation Between the EU and Western Balkan Region in the field of ICT Research

The ICT Research environment in the Former Yugoslav Republic of MACEDONIA

Information Society Technologies

Project funded by the European Commission under the "Information Society Technologies" Thematic Priority of the 6th Framework Programme for Research and Technological Development.

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ABSTRACT

The present report was firstly developed in March 2007 in the context of the EC funded project SCORE "*Strengthening the Strategic Cooperation between the EU and Western Balkan Region in the field of ICT research*", and has supported the SCORE Consultation Document that served for consulting expert ICT stakeholders about the relevant ICT research priorities in each WB country for the period 2007 – 2013. The document was finally updated and optimised in September 2007.

The report provides a brief overview of the ICT research environment in MACEDONIA.

The implementation of the ICT in Macedonia has been discussed and supported through three main documents: *e-Declaration,* The *National Strategy for Information Society* and *the National strategy for development of electronic communications with the information technologies* An additional relevant document is *the Program of the Government of Republic of Macedonia for 2006 -2010 period.*

The ICT research policy is mentioned as a separate part of the National strategy for development of electronic communications with the information technologies. In the National Strategy it is proposed that a special program for ICT research will be developed. There are no guides in which specific areas the research will be directed. The program will be supported by a special fund created only to support the research in the ICT area.

The Ministry of Education and Science, at its disposal has some financial instruments for the support of scientific research in which ICT research is also included.

It is worth mentioning that the NGOs are also involved in ICT research and are also financially supporting the ICT research.

Regarding the 6th and 7th Framework Programmes for Research and Technological Development, there has been reasonable progress in preparing and participating with project proposals of Macedonian research organisation. The level of applications submitted by Macedonian research organisations in FP6 calls for proposals is increased especially in the field of ICT.

The situation in the Macedonian ICT sector can shortly be described as progressive. Based on the analysis dated 2004, The ICT firms, constituting 1.3% of the total number of enterprises, contributed with 5.8% to the total country's businesses revenue and with estimated 11.0% to its overall value added. In the last 5 years, the percentage of ICT imports in total imports exceeds percentage ICT exports in total for an average of 1%. Employed in ICT industry accounted for the 2.4% of total businesses workforce. In 2004, the total ICT market reached $523.93 million in value. In 2007 the ICT market will exceed $700 million. ICT market grew by some 15% year-on-year.

Macedonia as country has a fragile economy and faces certain challenges. Some of the biggest challenges are: the high level of unemployment that is around 36 %, a brain drain, very large and slow public administration etc.

1 THE MACEDONIAN ICT POLICY FRAMEWORK

1.1 The overall ICT policy framework

Implementation of the ICT in Macedonia has been discussed and supported through three main documents: *e-Declaration*[1]. *The National Strategy for Information Society*[2] and *the National strategy for development of electronic communications with the information technologies*[3]. An additional relevant document is *the Program of the Government of Republic of Macedonia for 2006 -2010 period*[4].

The **e-Declaration** was brought in 2002 and its goal was to give recommendations for rapid development of an information society and digital economy in the Republic of Macedonia as a national priority. Recommendations are given to the following stakeholders: the Government of the Republic of Macedonia, all business entities, the IT companies, the Universities, the units of local self-government and the government.

As a result of this declaration in 2005 the **National strategy for Information Society and the National policy for Information society** were developed. The strategy was accepted by the Assembly of Republic of Macedonia on the 21st of September 2005. The mission of these documents is to create a supportive environment for the Information Society in Republic of Macedonia. The strategic objectives envisaged to be achieved by 2007 are:

1) Fully liberalized market of the electronic communication services;
2) Significantly increased number of Internet users;
3) Established electronic public services:
4) Implemented priorities for sustainability of the strategy and the action plans related to the Information Society.

These objectives will be achieved through seven pillars: infrastructure, e-business, e-government, e-education, e-health, e-citizens and legislation. For each pillar concrete objectives were proposed, as shown in the Table 1.

Pillar	Objectives
Infrastructure	Acceptable prices for usage of Internet and other electronic-communications services;
	Continuous and sustainable ICT-infrastructure support;
	Introduction of Protocol for electronic communications between business entities, citizens, public administration and non-Governmental sector.
E-business	Established mechanism for electronic connection, electronic payment and e-business implementation between the enterprises and other participants in the business processes.
	Established centres in Macedonia which will assist the enterprises during the ebusiness implementation.

1 www.gtzpsp.com.mk/Uploads/e-DeclarationMacedoniaEng.pdf

2 http://kit.gov.mk/default-mk.asp?ItemID=7AD898E6B80F584EA90ACBD1CD702812

3 http://62.162.36.2/mtc/_webadmin/uploaded/NSEKIT_5.pdf

4 http://vlada.mk/assets/program%20of%20the%20government%202006-2010.pdf

Pillar	Objectives
	Established continuous information system for enterprises in Macedonia about the possibilities offered by the e-business.
	E-business implementation in several enterprises in Macedonia through reorganisation and digitalisation of the internal business-processes.
E-government	Participation of citizens in the information society building;
	Satisfactory infrastructure level;
	Legal and institutional framework for information society development;
	Logical infrastructure for advanced ICT-solutions and network connection of Governmental institutions;
	Electronic and online-transactions for e-Government services that encourage economic and social prosperity;
	Increased number of ICT-experts and increased level of ICT-literacy in the public administration.
E-education	*Objectives in the area of the educational infrastructure:* Better connection of the entities in the area of education, science and culture; Increase and standardisation of hardware and software equipment among the relevant entities in the area of education, science and culture; Fast and cost-effective access to Internet for all legal and natural entities participating in the educational process; Development of management information system for education; Creation and support of the existing research and innovation centres and technology transfer centres; Introduction of e-technologies certification centres.
	Objectives in the area of ICT staff: Overview of the ICT presence in the primary and secondary school education; Promotion of the ICT contents in the primary and secondary school education, curricula and profiling of the staff; Distance learning systems, e-learning, lifelong learning and flexible way of learning by using ICT; Coordination and promotion of the ICT education in the higher education institutions, specialised faculties and ICT curricula; Diminishing of the brain-drain of the newly educated staff;
	Objectives in the area of ICT literacy and contents: Adjustment of the civil education with the aim of educating the citizens to use the e-services; Provision of acquiring continuous digital literacy (ICT literacy) for all, by adapting to certain professional needs; Introduction of national and foreign certificates for acquired ICT knowledge; Publishing ICT literature in standard and multimedia format; Creation and use of information in electronic form - library stocks also in the areas related to the education: research institutions, museums and cultural institutions and provision of virtual working environments.
E-Health	Quick access for the patients to the health care services;
	Quick access to the medical history (anamnesis) of the patient from any location, i.e. health care institution;
	Up-dated overview of the health-financial data for the purpose of improvement of the liquidity and the control over the expenses, with ultimate objective – improvement of the financial performances of the HIF;
	Electronic exercising of rights regarding health insurance;

Pillar	Objectives
	Increasing of the quality of services through electronic following of the medical records and the treatment (evidence based decision-making);
	Improvement of quality of medical statistics and efficiency in the implementation of health care policies;
	Securing of high quality information for the needs of education, researches and development of medical professionals;
	Harmonising of the quality and the standards of the health care system and of the he health care services with those of the European Union.
e-Citizens	Support of the local communities in the creation of local sustainable policies for ICT;
	Building coherent policies in order for all sectors to be able to offer e-services that shall be unified, standardised, accessible, secure, of high quality, user-friendly and aware of the needs of the citizens, irrespective of their location and social status. It is necessary to formalize the obligations, the interoperability, the deadlines, and the quality of the service or any eservice that involves mutual communication at several levels of authority;
	Enabling accessible e-services irrespective of the software platform, which shall use open standardised formats14 of documentation and exchange of information;
	Creation of favourable environment and practice of good governance in order for the citizens to be able to participate in the overall social process, as well as in the process of decision-making at the local and at the national level with the assistance of the ICT tools;
	Overcoming of the digital divide through solutions, continual training for increasing of public awareness, as well as the knowledge of ICT and e-citizens' education;
	Support of the development of the local contents, as one of the agents for increase in the number of Internet users.
Legislation	Legislation that should provide for institutional framework; Legislation that addresses the substantive law in specific areas; and Legislation that refers to the proceedings

Table 1 – List of pillars and objectives

After finishing the process of public debate the **National Strategy for development of electronic communications with the information technologies was brought.** The vision of this strategy is Macedonia to be an advanced information society. The mission is to enable rapid introduction and massive efficient use of electronic communications and information technologies that will contribute for including Macedonia in global networked economy and achieving significant leap frog. The specific goals of the strategy are to achieve according to most important ICT indicators:

1) 80% of the average of the new EU member states by 2010 and
2) 90% of the average of the new EU member states by 2012

The activities that will result from this strategy will be implemented in the period of 2007-2010 but the complete impact will be achieved by 2012. To achieve these goals a list of concrete suggestions are presented in the area of: legislation and regulation of electronic communications; universal service, radiofrequency spectre, media digitalization, functional separation, broadband internet, local municipalities, small and medium sized enterprises, academic research, information security, interoperability and research in the ICT as shown in the Table 2.

Area	Activities
Legislation and regulation of electronic communications	The independent regulatory body responsible for regulating the electronic communications should develop strategy and action plan
	The state institutions responsible for developing of the information society and mediums should take active participation in the European institutions for development of ICT and information society
Universal service	The regulatory body responsible for electronic communications after the acceptance of the strategy should make in-depth research and analysis to determine the optimal strategy for universal service in the country
Radiofrequency spectre	The responsible regulators for electronic communications will prepare analysis for future digital dividend that will be created after the process of media digitalization
	The responsible regulators for electronic communications will revise all the regulations for management and assigning radiofrequencies in the direction of development of wireless economy
Media digitalization	The strategy for the media should be complementary with the this strategy and the civil society and the private sector should be included
Functional separation	Creation of detail study for the need of introducing a functional/structural separation of the electronic communications in Macedonia.
Broadband internet	Creation of strategy for broadband internet, elimination of all legal issues and administrative barriers revising the technical standards in the area of construction of telecommunications infrastructure, speeding up the promotion of selling wide broadband, initiating the dialog for creation of Internet exchange, the business and NGO communities to organize one day training for all interested parties, analysis of the administration of the .mk domain and giving proposals, preparing a plan for introducing the IPv6 internet protocol, and respecting the principle of e-inclusion.
Local municipalities	In one and half year period all municipalities to have ICT strategy, campaigns for the benefits of development of municipalities electronic communications networks, organization of seminars and public debates for building wireless network, organizing cross-border cooperation, establishing the necessary ICT infrastructure for e-spots, connection of all the primary and high school
Small and medium enterprises (SMEs)	Encourage SMEs to use ICT and to build mechanism for participation of the SMEs in the global market by lower VAT for ICT products and services, to improve e-security and e-confidence, enabling e-work and distance learning, creating standards for Service Learning Agreement, to eliminate the obstacles for Certificate Authority and to enable usage of e-documents and e-signatures, to create a study for implementation of ICT solutions in SMEs.
Academic networks	Proposal for transformation of the Macedonian Academic Research Network
Information security	Building social and public consciousness for existing of the information non-security and the need for building capacities and knowledge for protection
	Securing fundamental human rights and protection of national “Intellectual capital”, knowledge, information and ICT infrastructure
	Implementation and improving systems for risk management
	Promotion, readiness and participation for international cooperation for information security on national and international level
Interoperability	Analysis and recommendations for the interoperability of the services, in technical, semantically and organizational aspect by taking in account the international standards.

Table 2 – Areas and activities

The Program of the Government of Macedonia is for the period of 2006 till 2010. In the part for the Information technology and e-business the government plan the following actions:

1) setting up IT Ministry,
2) computerization of Macedonia & wide-encompassing training in computer literacy
3) wireless network installations throughout the country,
4) internet usage and office administration programs,
5) introduction of a mandatory IT subject in primary schools & full computerization of schools,
6) connection of all border crossings in Macedonia into a centralized information system compatible with the EU system,
7) implementation of an integrated medical information system and introduction of e-health card,
8) computer system for court files management;
9) computerization of the procedure for issuing personal ID documents at the Ministry of Interior,
10) digitalization of the Cadastre and application of geographic-information system (GIS),
11) promotion of non-cash payment, e-trade, e-banking and e-government.

An implementation and realization of some of the above listed actions is started.

1.2 The elements of ICT research policy making

The ICT research policy is mentioned as a separate part of the National strategy for development of electronic communications with the information technologies. In the National Strategy it is proposed that a special program for ICT research will be developed. The program will include projects proposed by the business community, academic institutions, independent development centre, consultants, civil sector, research projects proposed by the EU and other international institutions and foundations. There are no guides in which specific areas the research will be directed.

The program will be supported by a special fund created only to support the research in the ICT area.

The previous Government for 2006 has adopted the programme for scientific research, development of technology and development of a culture of technology. The activities are aimed at promoting scientific research, innovative projects and a culture of technology. The programme contains no substantial change compared with previous years, and the amount allocated was at the 2005 level of € 4.3 million (less than 1% of GDP).

Moreover, the Ministry of Education and Science, at its disposal has the following financial instruments for the support of scientific research[5], in which ICT research is also included:

1) financing the national research and technology development projects;
2) awarding scholarships for post-graduate and doctoral studies at local and foreign universities;

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5 www.gtzpsp.com.mk/Uploads/e-DeclarationMacedoniaEng.pdf

3) financial support for research workers participating at international conferences;
4) financial support in organising international scientific conferences;
5) contribution for publishing scientific and research publications;
6) development of the research and technology development infrastructure.

The funds for this research are allocated from the Budget of the Republic of Macedonia. Within the framework of the Ministry of Education and Science a Science and Technological Development Sector has been established, which comprises the following units: the Unit of Financing the Research and Technological Development, Unit of Normative and Legal Procedures in the Research and Technological Development, Unit of Technological Development and Technical Culture, Projects Unit, and the Unit of International Scientific and Technical Cooperation. Also a Scientific Research Council exists that is the strategic body for the promotion and development of science and research.
Additionally, the Program of the new Government of Republic of Macedonia for 2006 – 2010 envisages to:

1) Increase investments in scientific-research infrastructure to create basis for application of modern research methods;
2) Budgetary funds for scientific-research work in function of the private sector, following the example of more developed European countries;
3) Encourage and support science through fiscal policy;
4) Granting favourable and stimulating loans with payment deadlines up to 30 years for newly-weds with university education;
5) Promotion of cooperation with scientific-research institutions abroad for better knowledge transfer;
6) Establishment of strict and fair criteria for personnel selection in scientific research institutions;
7) Support of the cooperation between scientific-research institutions and economic institutions.

NGOs are also involved in ICT research and are also financially supporting the ICT research. Major NGO that supports the research in the field of ICT is Metamorphosis. They have researched topics more in the area of open software and local government. Metamorphosis is independent foundation since 2004.
A new non-profit organization Information Technology Service Management Forum Macedonia was formed. It is established as a forum for Information Technology (IT) service/product providers, IT service/product users, and related parties to explore all means available to maximize IT business value.

Regarding the 6th and 7th Framework Programmes for Research and Technological Development, there has been reasonable progress in preparing and participating with project proposals of Macedonian research organisation. The level of applications submitted by Macedonian research organisations in FP6 calls for proposals is increased especially in the field of ICT.

2 OVERVIEW OF ICT ACTIVITIES

2.1 Overview of ICT research projects

In order to provide an overview of the projects carried out in the last 5 years in Macedonia, a detailed list of ongoing or completed international projects are listed in the Table 3. The aim of such presentation is to have an overview of the key research areas supported so far in the country. This will help to know the state of art and better identify the ICT research priorities in the country as the base of the Strategic Research Agenda for Macedonia.

ICT Research Area	Name of International-funded Projects	Approximate level of funding in given area (for Macedonian partners)
eProcurement	ELLECTRA-WeB	133,000 eur
eGovernment	We-Go	15.750,00 eur
	SWEB	//
ICT research awareness and training	IS2WEB	63,300,00 eur
	SEE-Innovation	58.700,00 eur
	ERA WESTBALKAN	49.974,00 eur
	IDEALIST7FP	17.940,00 eur
	SEEGRID	100.000,00 eur
e-Customs	RACWeB	118.820,00 eur
eMobility	WEB-MOB - Development of Researchers Mobility Policy Guidelines for the Region of Western Balkans	25.000,00 eur

Table 3 – Categorisation of international funded ICT research projects

IS2WeB[6] is an EU funded project from FP6 representing a Specific Support Action. The main goal of the project was to identify suitable research organisations in the Western Balkan countries and assist them to get informed about and actively participate in EU-funded research in the field of Information Society Technologies. As a result of the project activities an online directory was developed comprising the most promising research organizations in the Western Balkan countries. The number of Macedonian research organisations in the IS2WEB online directory is over 20. The project has supported and strenghtened the co-operation between EU and Western Balkan Countries in the field of IST research by facilitating independent and self-sustaining IST research activities and promoting the European R&D culture in the region. The ultimate goal of the project was extending Information Society activities to the Western Balkan countries.

[6] www.is2web.org. The list of Macedonian academic & NGO research organisation in the directory is provided in this link http://www.is2web.org/frontoffice/portal.asp?cpage=NODE&cnode=22

SEE-Innovation[7] (a sister project of IS2WEB) developed a similar directory, targeting SME ICT companies that have research activity. The number of Macedonian SME companies with research activity included in the SEE INNOVATION directory is 15. As a part of the project a survey on research competencies of research organizations was conducted.

2.2 Key competencies in ICT research fields

Below is the classification of ICT research competencies, based on the integration of the survey outcomes, presented in a prioritised way. The table presents the most competent research fields in Macedonia. The data on this table are based on the results of two EC funded FP6 projects IS2WeB and SEE- Innovation.

Classification of ICT research capacities	Number of Academic & NGO research organisations (based on a total of 20)	Number SME research organisations (based on a total of 15)
ICT Technology Pillars		
Software, grids, security and dependability	14	12
Knowledge, cognitive and learning systems	12	6
Embedded systems, computing and control	8	6
New perspectives in ICT drawing on other science and technology disciplines	9	2
Ubiquitous and unlimited capacity communication networks	4	6
Simulation, visualisation, interaction and mixed realities	4	2
Integration of Technologies		
Personal environments	10	5
Intelligent infrastructure	6	6
Home environments	7	3
Robotic systems	7	0
ICT meeting societal challenges for mobility	8	5
ICT meeting societal challenges for health	6	5
ICT meeting societal challenges in support of the environment	7	3
ICT for content, creativity and personal development: new media	6	2
ICT for content, creativity and personal development: cultural resources	6	2
ICT meeting societal challenges to improve inclusion	2	2
ICT for trust and confidence	1	0
Future and Emerging Technologies	5	2

[7] www.see-innovation.org. The list of Macedonian SMEs in the directory is provided in this link http://www.see-innovation.org/frontoffice/portal.asp?cpage=NODE&cnode=26

Other		
Mitigation of natural risks	1	0
Curriculum development	1	0

Table 4 - Competent research fields of key research organisations in Macedonia

3 KEY DRIVERS OF ICT RESEARCH

3.1 Main ICT sector trends in MACEDONIA

Based on the analysis dated 2004, the situation in the Macedonian ICT sector can shortly be described as following:

The ICT firms, constituting 1.3% of the total number of enterprises, contributed with 5.8% to the total country's businesses revenue and with estimated 11.0% to its overall value added. In the last 5 years, the percentage of ICT imports in total imports exceeds percentage ICT exports in total for an average of 1%. Employed in ICT industry accounted for the 2.4% of total businesses workforce. [8] In 2004, the total ICT market reached $523.93 million in value. According the same source in 2007 the ICT market will exceed $700 million. ICT market grew by some 15% year-on-year.[9].

During 2004, a Macedonian spent an average of $254 on ICT products and services. Some estimates are that in 2006 the average spending is $280.

There were 526 enterprises and 5,936 jobs in the ICT industry in 2004 and the estimates for 2006 are 620 firms and more than 6500 employees.

In the same year (2004), ICT workforce rose by 3.0% (comparable rise for the country, as a whole was 5.9%). However, the 2004 dynamics of these indicators for the IT and telecom sectors largely differ. The IT sector workforce increased by 16.8% (within it, especially high rates were recorded for IT hardware and software categories with their revenues exploding by 68.5% and 66.4%, respectively) but at the same time, the telecom sector witnessed the revenue growth rate of 4.5%,and 0.1% decline in workforce.

Within the highly dispersed IT segment the bulk of companies (366) have been sales (channels) and services oriented.[10] Within this the IT and telecom component witnessed different patterns.

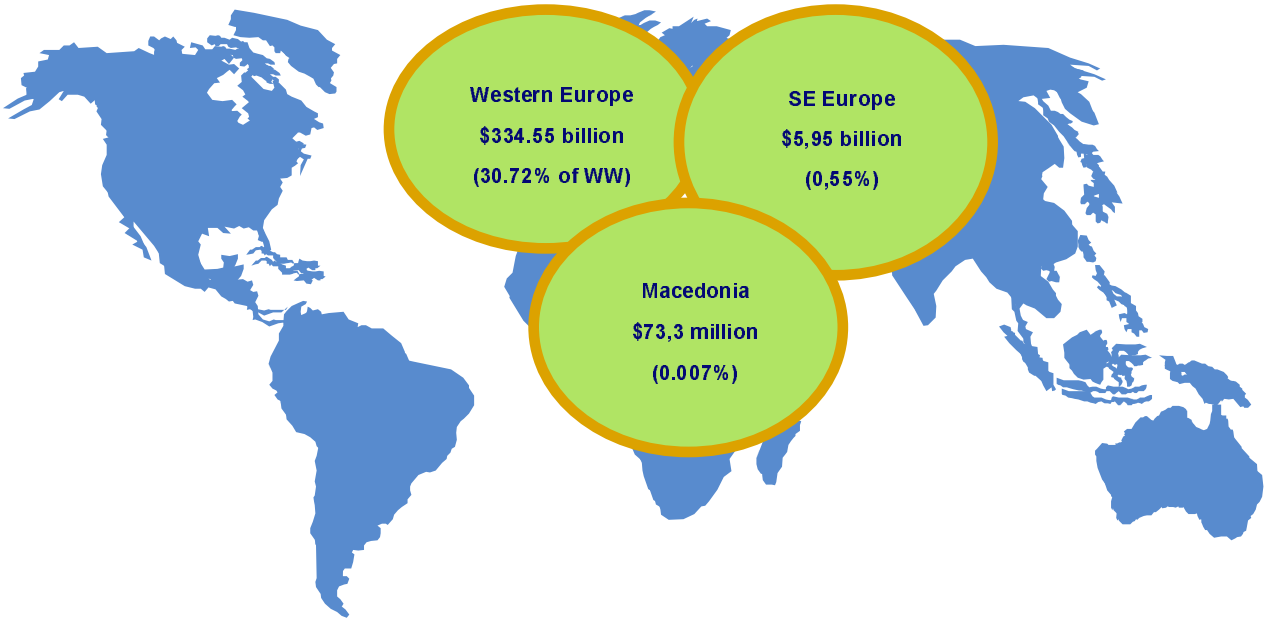
The average gross monthly salary in the ICT industry in Macedonia in 2004 grossed around 570 euros. Within the ICT industry, the highest gross salary was recorded in the software category, amounting to 900 euros. The remaining categories of the ICT industry reported below-average industry salaries. However, in the last five years the average rate of growth is 3%.

[8] Analysis of the Macedonian ICT Sector 2004, The ICT industry role within the Macedonian economy and benchmarking with selected countries, IDC Adriatics, 2006

[9] Analysis of the Macedonian ICT Sector 2004, Macedonian ICT market, IDC Adriatics, 2005

[10] Analysis of the Macedonian ICT Sector 2004, Macedonia ICT industry structural features and swot analysis, IDC Adriatics, 2006

The position of South East European Countries and Macedonia in Global IT Market for year 2005 is:



The ICT sector in Macedonia for year 2005 is as follows (see Figure 1 and Table 5).[11]

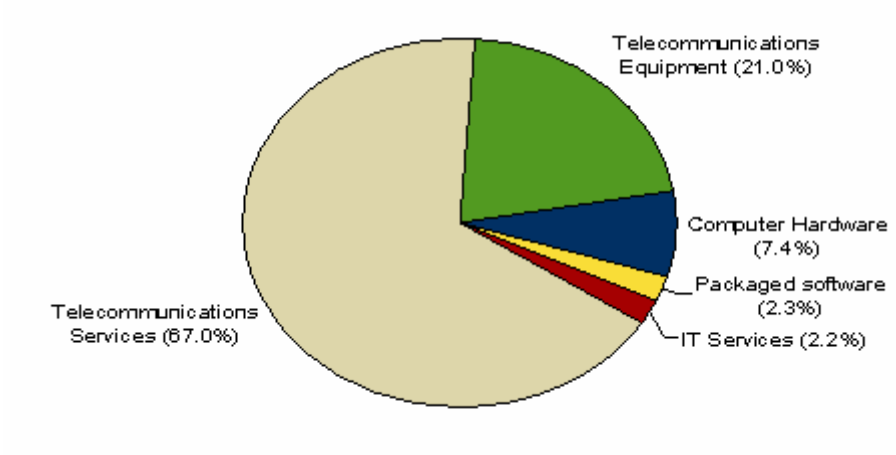


Figure 1 – Segmentation of ICT Sector in Macedonia

ICT sector segments (Year 2005)	Size (in %)	Size (in million $)
Telecommunications Services	67%	351,29
Telecommunications Equipment	21%	109.96
Computer Hardware	7.4%	45.46

11 http://www.idc-adriatics.com; http://www.masit.org.mk

Packaged Software	2.3%	12.25
IT Services	2.2%	15.58

Table 5 – Segmentation of ICT sector (including size in million $)

In the future the following incentives are required in order to achieve further growth of the ICT sector:

1) IT Channel & Hardware Companies: incentives for local vendors or purchase locally assembled machines on a larger scale;
2) Software Companies: incentives and support in development and marketing of local software products. Support for development of products using the tools and under the umbrella of global software vendors;
3) Services Companies: further liberalization & deregulation of the telecom market, introduction of community broadband networks based on existing optical infrastructure;
4) Telecommunications Services & Telecommunications Equipment: sponsored research (Vardar Silicone Valley), support for undertaking large IT projects comprising services components – pilot value-added solutions/products development (managed services, outsourcing) to be exported later on.

A key achievement of the ICT sector in Macedonia was that for the first time, the country took part in the worldwide competition WSA (World Summit Awards) held in Austin, Texas, in May 2006. There were awards in three different sectors: Public Sector, Private Sector and Digital Opportunities. For the worldwide competition concerning Digital Opportunities - company On.Net, was awarded for the project "Macedonia First Wireless Nation", on WITSA Annual Awards Meeting, held in May, 2006. Working with the Government of Macedonia and the private sector, the least developed of the Yugoslav republics went into the world's first 'wireless country' of its size or larger. The local Internet service provider was connecting every one of the country's 460 primary and secondary schools to a wireless network. Two years ago most of these schools did not even have working telephones. Now each is outfitted with a computer lab, and the students are connected to the world.

Considering key (technological) in progress activities of the ICT sector, below are described some of them:

Center of Excellence (CoE) An initiation of MASIT, guided and started according to recommendations to an Israeli Consultant Dr. Shmuel Yerushalmi, who was present in Macedonia on a 7day Fact Finding Mission. In the moment a Business Plan of the idea is in a phase of construction and where over 20 ICT companies are involved, 2 MNCs, over 4stakeholders, Academia and Financial Institutions. The CoE is foreseen to function as a tool for promoting and implementing the transfer of knowledge and technologies generated by individuals, Universities and also by existing enterprises to the business sector, by establishing innovative and high-tech Small and Medium Enterprises (SMEs); this, in *order to create business opportunities* for skilled professionals and also graduated students to personally advance and succeed in Macedonia, and an environment for attempting to revert the ongoing brain-drain situation.

The ICT sector is actually considered to be one of the most viable candidates to participate in this endeavour, due to the potential expansion possibilities and high added value it offers, the expertise and quality of the people already involved and the increasing consensus which is being achieved. According to an OECD study presented in The Economist, July 27, 2005, Macedonia was, already in 2003, one of the five markets with fastest growth of IT in a global scale.

Vardar Silicone Valley is an initiation of the Macedonian Government for creation of place where incentives for investments will be raised, all connected and devoted to ICT development. One of the first initiations, that can become part of, is the CoE, which will certainly need the incentives provided by the Vardar Silicone Valley, such as free trade zone, VAT free zone etc… The new Government has already created similar free trade zones for other industries, which implies that soon the Vardar Silicone Valley will be created as well. Center of Excellence, focus is on PRIVATE investments in ICT, by partnering with leading Macedonian ICT companies & international financial institutions who already voiced their readiness to participate in the initiative.

The following are the objectives of the Silicone valley:

1. Assisted by foreign consulting offices Government will offer the biggest companies in the field of software development, digital techniques, and research (Microsoft, Oracle, Cisco) to establish, free of charge, their own laboratories in Vardar Silicone Valley or to outsource part of their operations.
2. The Government will provide the infrastructure and significant tax privileges for the companies located in the Vardar Silicone Valley.
3. Vardar Silicone Valley is a Governmental Action plan (2006 – 2010) activity. However the Centre of Excellence is planned to become one of the first initiatives in the Vardar Silicone Valley. Additionally, it should be clear that this valley will contain special conditions attractive for investments, conditions such as free economic zone, tax – free, etc.
4. Assisted by foreign consulting offices it will be offered to the biggest companies in the field of software development, digital techniques, and research (Microsoft, Oracle, Cisco) to establish, free of charge, their own laboratories in Vardar Silicone Valley or to outsource part of their operations. The Government will provide the infrastructure and significant tax privileges for the companies located in the Vardar Silicone Valley. "Vardar Silicone Valley" remains definitely an important project for the whole ICT Business Community.[12]

Moreover, in order to enhance the skills of IT professionals, a new project for the re-qualification of IT resources is being implemented by the Agency for Employment and MASIT. This project is in the interest of development of the IT sector and was performed based on the results of IT Workforce Demand Survey, where it has been confirmed, that there is lack of IT professionals and that there is necessity the professionals with technical skills to be educated in order to become IT professionals. During the next year (2008), the project will organise the re-qualification of 120 individuals. It is planned that this project is one of the first projects within the ICT Centre of Excellence.

Finally, the trends of ICT usage have improved considerable in the recent years. The following table reveals the key ICT usage trends:[13]

Number of PC users in % (2006)	**Number of Internet users in %** (2006)	**Number of mobile users in %** (2005)	**Number of fixed lines in %** (2005)
37.00%	13.00%	37.80%	25.60%

12 http://www.vlada.org.mk

13 http://www.e-schools.com.mk

Table 6 – Key ICT usage statistics in Macedonia

While 37% of the households in Macedonia own a computer, close to half (48%) of all homes in the capital city area have personal computers (PCs).

13% of the households are connected to the Internet. This number is considerably higher in capital city at 21%. In the capital city, the largest number of users accesses the Internet at home and at work whereas users in other parts of Macedonia access the Internet most frequently in Internet cafes. Users in areas outside of capital city use the Internet at work considerably less frequently than their counterparts in capital city. Overall, the survey shows a larger percentage of people using technology in urban areas. Youth are the fastest growing population of users. Overall, 26% of Internet users began using the Internet in the past year; whereas 37% of all youth users began using the Internet within the last year.

The figures indicate significant Internet penetration growth, especially over the last 12 months.

The total number of mobile telephony users is 776,000 (37.80%), which is more than the number of fixed telephony users which is about 525,000 (25.60%)

3.2 Main socio-economic challenges in MACEDONIA

Macedonia as country has a fragile economy and faces certain challenges. The biggest challenge is the high level of **unemployment** that is around 36 %, while the majority of unemployed are women[14]. There is indication that the existence of a substantial informal sector may lead to a significant over-estimation of real unemployment. [15]

The structure of unemployment concerning the level of **education** and professional orientation is unfavourable. The authorities have adopted a series of reforms in education in 2005 in order to modernize curricula in all educational levels, to improve the training of teaching staff, to promote vocational education and training and to support life long learning. However, as a result of decades of under spending on education the infrastructure is inadequate and outdated[16]. Some of the obstacles in this segment/area can be overcome with the usage and implementation of ICT by introducing distance learning courses and programs.

There is also a **brain drain** as an issue that has big influence on the country but this problem is not treated enough. There are estimations that from the start of the transition between 12.000 and 15.000 young, educated and highly skilled persons left the country[17]. It is worth mentioning that Macedonia is in the top ten highest ranking countries regarding the share of the youngest age groups (0-14 years) in the total population (20%) and in the top ten lowest percentages of population at age 65 years and over in Europe (12%)[18].

Another problematic factor for the business climate in Macedonia is the **public administration** perceived as large and slow[19]. In order to improve management and increase transparency, reforms in the organization of the public administration are taking place

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14 http://www.coebank.org/pdf/gb/socialchallenges_en.pdf

15 http://sep.gov.mk/documents/eip/jordan-radC27E2-2.PDF

16 http://sep.gov.mk/documents/eip/jordan-radC27E2-2.PDF

17 Horvat, V. (2004), Brain Drain. Threat to Successful Transition in South East Europe?, Southeast European Politics Vol. V, No. 1, June 2004 pp. 76-93

18 http://www.coebank.org/pdf/gb/socialchallenges_en.pdf

19 http://nspk.org.mk/pdf/NACIONALEN_IZVESTAJ_ZA_KONKURENTNOST_2006_En.pdf

progressively. There is also a need of significant changes in terms of staffing, IT and other equipment. Further development of IT systems (e-customs, e-procurement, e-administration, e-governments, e-citizens etc.) is also recommended in order to allow interconnection and operation with the centralised and decentralized Community IT systems. However, implementing reforms in the public administration and the Governmental sector in general remain serious challenge. Further efforts are necessary, in particular regarding the management of human resources and the fight against corruption[20]. Corruption is perceived as widespread. Macedonia ranks 103rd out of 158 countries in Transparency International's Corruption Perceptions Index for 2005[21]. The corruption is also influencing the competitiveness and is one of the reasons for low level of competitiveness of Macedonia. Macedonia is taking 80 place out of 120 economies regarding the level of corruption.

Some of the recommendations where ICT can assist are given in the Table 7[22]:

Pillar	Recommendations
Institutions	Reform of the public administration designed to transform it into a service for citizens and businesses. Standardization of the procedures and shorter response time in providing services by public administration; Resolve the issues with the Cadastre as a first step towards property rights protection; Accelerated implementation of the other stages of the decentralization process with parallel institutional capacity building of the local government; Full implementation of international accounting standards and external auditors' increased accountability;
Infrastructure	Liberalization of the landline telephony and steps to open the market and allow entry of a third mobile phone operator on the market; Investments in new production capacities in power engineering facilities, and networking with the electrical power suppliers in the neighbouring countries; Restructure the Macedonian Railroads Public Company and investments in road and railroad networks, which might also attract foreign investors;
Health and Primary Education	Improvement of efficacy of health care sector financial management; Introduction of IT in primary education;
Higher Education and Training	Higher investments in education, science and research; Introduction of curriculum's adapted to the needs of the private sector; Support to special training programs in the private sector; Public awareness campaign aimed at promoting life-long learning; Introduction of compulsory secondary education;
Technological Readiness	Liberalization of new mobile phones operators' entry in the country, which could induce price reduction; Continuation of the process of adapting and implementation of international quality standards in production and services; Several important issues remain to be addressed to meet the preconditions for the liberalization of the IT market, such as retail tariff regulation, cost accounting and accounting separation, number of providers (portability) and regulation of leased lines provision. The Government is also running late in negotiating the revision of the concession agreements, in particular with the incumbent operator and with the two mobile operators; Improvements in the regulatory authorities' internal organization and competences,

20 http://sep.gov.mk/documents/eip/jordan-radC27E2-2.PDF

21 http://www.heritage.org/research/features/index/country.cfm?id=Macedonia

22 http://nspk.org.mk/pdf/NACIONALEN_IZVESTAJ_ZA_KONKURENTNOST_2006_En.pdf

	with allocation of adequate human resources to enable them to adequately perform their regulatory functions;
Innovation	Better intellectual property protection with big penalties for the offenders; Inspectors and prosecutors still lack the necessary equipment and expertise to detect and prosecute infringements; Tax relieves for companies financing R&D and using innovation in their operation; Establishment of business incubators where entrepreneurs can realize their ideas that usually result in interesting applicable innovations; The Government should organize activities to promote scientific research, innovative projects and a culture of technology. Given the discrepancy between the needs and the available budget, cooperation with the private sector is imperative. Part of the funding could be allocated for a special fund for technology development;

Table 7 - Recommendations for increasing competitiveness