Global Economic Crisis and Future Perspective of Information Society Innovation and Development

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Abstract - Accepting the fact that information technology and the Internet are major drivers of economic growth, social change, research and innovation, this paper analyses the impact of current economic crisis on future perspective for further technological innovation and development of information society, as well as the potentials offered by information-communication technologies in overcoming the stagnant economic trends.

I. INTRODUCTION

The last decade has seen information and communication technologies (ICT) dramatically transforming the world, enabling innovation and productivity increases, connecting people and communities, and improving standards of living and opportunities across the globe [1].

II. GLOBAL ECONOMIC CRISIS

The world is experiencing the severe financial and economic crisis, the worst since the Great Depression of the 1930s. The crisis that originated in the US sub-prime mortgage market led to a widespread credit crunch, with spillover effects throughout the global financial and banking sector. Virtually no economy was spared from the economic downturn, with many countries officially entering into recession during 2009. While the most immediate and pressing impact of the financial crisis has been the lack of readily available credit, it is expected that its mid and long-term effects will still be felt in the timing of economic recovery and in persistently high unemployment rates in many countries [2].

According to International Monetary Fund (IMF) global activity has weakened and become more uneven, confidence has fallen sharply recently, and downside risks are growing. Besides unresolved structural fragilities in many countries, a barrage of shocks hit the international economy in 2011, including the devastating Japanese earthquake and tsunami, unrest in some oil-producing countries, and the major financial turbulence in the euro area. Two of the forces now shaping the global economy are high and rising commodity prices and the need for many economies to address large budget deficits [3].

Overall, activity in the advanced economies is now projected to expand by 1½ percent on average during 2012–13 (Figure 1). Given the depth of the 2009 recession, these growth rates are too sluggish to make a major dent in very high unemployment. This is largely because the euro area economy is now expected to go into a mild recession in 2012 as a result of the rise in sovereign yields, the effects of bank deleveraging on the real economy, and the impact of additional fiscal consolidation [3].

<table>
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<tr>
<th>Table 1. Overview of the World Economic Outlook Projections</th>
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<tr>
<td>September 2011 WEO Projections</td>
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<tr>
<td>World Output  5.2  3.8  3.3  3.9</td>
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<tr>
<td>Advanced Economies  3.2  1.6  1.2  1.9</td>
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<tr>
<td>Emerging and Developing economy  7.3  6.2  5.4  5.9</td>
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<tr>
<td>World Trade Volume  12.7  6.9  3.8  5.4</td>
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<tr>
<td>Imports</td>
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<tr>
<td>Advanced Economies  11.5  4.8  2.0  3.9</td>
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<tr>
<td>Emerging and Developing economy  15.0  11.3  7.1  7.7</td>
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<td>Exports</td>
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<td>Advanced Economies  12.2  5.5  2.4  4.7</td>
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<tr>
<td>Emerging and Developing economy  13.8  9.0  6.1  7.0</td>
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With only limited policy room, growth in most other advanced economies is also lower, mainly due to adverse spillovers from the euro area via trade and financial channels. Growth in emerging and developing economies is also expected to slow to average 5¾ percent during 2012–13 — a significant slowdown from the 6¾ percent

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growth registered during 2010–11 and about \(\frac{1}{2}\) percentage point lower than projected by IMF in the September 2011 (Table 1) [3]. The reasons are connected with the worsening external environment and a weakening of internal demand. The most immediate policy challenge is to restore confidence and put an end to the crisis in the euro area by supporting growth, while sustaining adjustment, containing deleveraging, and providing more liquidity and monetary accommodation.

The economic downturn has posed significant challenges to governments regarding the most appropriate policies to tackle the crisis. In major advanced economies, the key policy requirements are to address medium-term fiscal imbalances and to repair and reform financial systems, while sustaining the recovery. In emerging and developing economies, near-term policy should focus on responding to moderating domestic growth and to slowing external demand from advanced economies [2].

### III. IT SECTOR IN CURRENT CRISIS

Given the central nature of ICTs in the economy the impact of the economic crisis on ICTs is twofold, i.e. direct and indirect impacts on the ICT sector itself, but also on the productive and innovative use of ICTs across the economy and society. The two impacts are mutually reinforcing. A slowing ICT sector will generate lower productivity increases and potentially fewer ICT innovations. Slower uptake of ICTs slows the productivity and innovation - enhancing features of ICTs from diffusing throughout the economy. Network effects induced by a broadly installed ICT infrastructure do not materialize [4]. The “third” or so called societal impacts, result from the ways in which ICTs are facilitating longterm changes in patterns of social and economic behaviour, is also affected by the crisis slowing down the transition to an Information Society.

The fact that the ICT sector is not immune to the current crisis and is suffering can be seen at both "ends" of the market [5]:

- The supply side of the ICT sector is seeing a downturn in investment, as there is less confidence in the economy and less readily-available cash to invest in longer-term infrastructure projects. ICT growth in OECD countries was down by over 6% in 2009;
- The demand side of the ICT sector is also suffering, as consumers postpone plans to upgrade their mobile phone or broadband connection and become more cost conscious. World ICT spending fell by 4% in 2009 but is expected to grow by some 6% in 2010.

In terms of ICT sub-sectors, the revenues of global ICT hardware firms have been more affected early in the economic crisis than ICT services firms (IT services, software, Internet-related and telecommunications), as was the case in 2001-2002. Semiconductors, electronics, communications and IT equipment were hit by slumping business and consumer demand and growth dropped sharply. The semiconductor industry is a bellwether for developments in the ICT industry. Semiconductor production fell particularly rapidly at the end of 2008 and in the first quarter of 2009, with world capacity use dropping towards 50% and semiconductor equipment manufacturers seeing very rapid falls in orders. ICT services have also slowed, and year-on-year growth of IT services and software both turned negative in the first quarter of 2009, with Internet business growth around zero. [4].

The economic crisis is having a major impact on the ICT sector in Europe as well. In Western Europe, total end-user spending on ICT fell 8% in 2009 and remain flat in 2010 before increasing to 3 percent in 2011. In Eastern Europe, the situation is expected to be worse, with a 10% decline in 2009 and a 2% decline in 2010. In 2011, spending is projected to increase by 4%. While the downturn is expected to have a significant impact on all segments of European ICT industry, some sectors (manufacturing) will be more strongly hit than others (software) [6]. The telecom equipment industry, which is Europe’s traditional strength, and semiconductors are being hit by the crisis more than other ICT segments. The service segment (telecoms and software) is tempering the crisis thanks to sustained demand for traditional services.

Global restructuring of world ICT production continues during the crises. Eastern Europe, Mexico and non-member developing economies are increasingly important as producers and growth markets. In 2009 OECD countries’ share of the ICT world market declined to 76% (from 84% in 2003), as growth in non-OECD economies decoupled from growth in OECD countries. The OECD-area ICT sector has shifted to computer and related services and other ICT services. These services account for more than two-thirds of total ICT sector value added in most countries.

Multinational enterprises, international sourcing, and intra-firm and intra-industry trade have had huge impacts on global ICT goods value chains, and the reorganisation of the international supply of ICT services has been an increasing source of growth. China is by far the largest exporter of ICT goods, very largely driven by foreign investment and sourcing arrangements. India is by far the largest exporter of computer and information services, fuelled by the growth of domestic firms. Asia plays an increasing role in goods production networks that import high-value electronic components for assembly and re-export, and China’s role as a production and sourcing location has intensified. In 2008 China’s ICT exports were only slightly behind the combined exports of the United States, the EU27 (excluding intra-European trade) and Japan. New supply locations are emerging as the search for low-cost provision and the reorganisation of global innovation and supply chains continue [5].

ICT and ICT-related employment account for a significant share of total employment. The ICT sector had close to 6% of total OECD business sector employment in 2008 (almost 16 million people), and long-term growth
has been somewhat faster than for total business. ICT employment has trended downwards, but not as rapidly as in automobiles, for example. Employment has dropped in ICT goods sectors, and has remained quit flat in ICT services. However, despite year-on-year falls of 6-7%, ICT manufacturing employment has not suffered the large declines of 2002-03. [5].

The 2008-2009 economic crisis had a profound impact on the revenues of ICT companies and on ICT research and development (R&D) expenditures worldwide [5]. The effect for the ICT sector worldwide was a steep downward trend in R&D expenditure growth from a 25% growth in the first quarter of 2008 to a 22% decline in the first quarter of 2009. Growth in both revenues and R&D expenditures remained negative in 2009, but started to show signs of recovery. The first quarter of 2010 was marked by positive growth rates in both revenues (25%) and ICT R&D expenditure (approaching 10%).

Nevertheless, the scarcity of credit had an immediate and direct impact on the ability of telecom operators and ICT companies to fund expansion and innovation. During the crisis, new investments were postponed or scaled back, as investors became more cautious. Moreover, ICT companies and telecom operators came under further price pressure for their services as consumers’ purchasing power diminished and unemployment rates increased dramatically [2].

Concerning the situation in Europe, the ICT sector is the largest R&D investor in this region and research activities are largely concentrated in its manufacturing segments. The economic slowdown, its uncertain outlook and the expected brake on earnings suggest a slowdown in the growth of R&D expenditure. There is a risk that the current financial crisis may undermine the recent positive development in R&D investment rate by European businesses. As the private sector will tend to limit its R&D spending, it would become all the more important to ensure that the public sector sustains, and even increases, its support to R&D [6].

It is also evident that like foreign direct investment (FDI) in general, ICT-related FDI slumped during the crisis. ICT-related merger and acquisitions (M&As) declined faster than total M&As from 2007. In 2009, acquisitions of ICT firms accounted for only 11% of the total value of deals, down from the historic high of over 30% in 2000 when telecommunication firms overextended themselves in a buyout frenzy. Non-OECD economies are increasingly active: the share of ICT-sector cross-border M&As targeting and originating in them increased steadily to 33% and 24%, respectively, in 2009.

There is a major shortfall in the investment needed to modernize the global information infrastructure, a shortfall that the financial crisis can only exacerbate. A recent study by Nemertes concludes that demand will exceed total broadband capacity at the access layer of the Internet by 2012, with the situation worse than originally projected in the US. Nemertes estimates the global cost of upgrading the Internet to keep pace with demand at US $137 billion over the next five years, with network operators in North America spending 60-70% less than they should be [7].

There are high hopes that the ICT sector will emerge from the crisis as strong as ever. Experience of previous crises in the ICT sector also suggests that there is reason to remain optimistic. The ICT industry has already been severely tested during the dot.com crisis in 2001/2002, from which it emerged stronger and more resilient. Crises can often overturn the established order and generate openings for new opportunities: Google was born in 1998, in the midst of the Asian financial crisis and Skype was born in 2003, during the dot.com slump [2].

VI. ICT’S ROLE IN OVERCOMING ECONOMIC DOWNTURN

ICTs and the Internet are a fundamental economic infrastructure. The benefits of ICTs are amplified by their use throughout the economy and society, and the innovations that they drive. ICT investments spur competitiveness and productivity at the firm and aggregate level, in particular when combined with investment in skills, organisational change (and industry restructuring), innovation and new firm creation [5].

Investment in ICT contributes to overall capital deepening helping to raise labour productivity. Technological progress in the production of ICTs may contribute to more rapid multifactor productivity growth in the ICT-producing sector. Finally and most importantly, greater use of ICT outside the ICT sector throughout the economy helps firms, public and social institutions to increase efficiency and enhance innovation, develop new products and services and raise multifactor productivity growth.

Due to fact that ICT industry and ICT-enabled innovation in non-ICT industries and services make an increasingly important contribution to the economic growth, the ICT sector was highlighted in the EU Lisbon Objectives, and has retained its prominence in the Europe 2020 Strategy. The Digital Agenda for Europe, one of seven ‘flagship initiatives’ under the Europe 2020 strategy, aims to “contribute significantly to the EU’s economic growth and to spread the benefits of the digital era to all sections of society” [6].

The Digital Agenda for Europe frames key actions to tackle following seven problems – fragmented digital markets, lack of interoperability, rising sybercrime and risk of low trust in networks, lack of investment in networks, insufficient R&D efforts, lack od digital literacy and skills, and missed opportunities in addressing societal challenges. Actions in this areas are projected as a set of positive agendas to boost Europe’s social and economic performance.

V. ECONOMIC FUTURE WITH ICT

Current technological progress like WEB 2.0 services, virtualization and cloud computing, dynamic
rise of mobile technology and broadband connections create new opportunities for developing models and strategies, organization change and higher education levels in order to overcome economic crisis. Priorities are now on getting the economy moving, focusing on ICT skills and employment, broadband diffusion, ICT R&D and venture finance, and a major new emphasis on using ICTs to tackle environmental problems and climate change.

a) Mobile telephony and broadband networks—Connectivity and access are fundamental. Without them, there can be no use of the ICTs that they enable. What matters is the extent to which ICTs are used and the range of people that make use of them. These depend on other factors in addition to connectivity and access—for example, the affordability of access and services, the relevance and value to end-users of the content and resources that can be accessed through them, and the capabilities of end-users to make use of access (such as their literacy and research skills [8]).

Mobile telephony has become the predominant mode of voice communications worldwide, leading not just to growth in the number of mobile phones but to a reduction in the number of fixed line subscriptions in all world regions. It represents a major transformation in social behaviour, in which the opportunity for personal interactive communications at the point of need or choice has, for the first time, become available to the majority of people in low-income countries (about 85 per cent of Africa’s population is now covered by mobile networks, and the figure should approach 100 per cent by 2015).

At the end of 2010, global mobile penetration was estimated at 79 subscriptions per 100 inhabitants, up from 69 the year before. According to International Telecommunication Union (ITU), there were some 5.4 billion subscriptions worldwide. Developed and transition economies now boast more than one mobile subscription per inhabitant, while penetration in developing economies in 2010 was about 77 per 100 inhabitants, close to the global average [9].

The transition to a mobile-led communications requires significant rethinking of the ways in which individuals and communities make use of networks and devices, of Government strategies for the delivery of online public services and citizen communication, and of ways in which communications networks can be used to achieve development objectives.

Broadband is gaining increasing attention by Governments worldwide as a general-purpose technology with important impacts on the economy, employment, education and health. At the end of 2010, there were an estimated 527 million fixed broadband subscriptions around the world. Global penetration rose less than one point between 2009 and 2010 from 7.0 to 7.7 fixed broadband subscriptions per 100 inhabitants. The gap between developed and developing countries remains massive (26 versus 4) and in LDCs there were less than 1 million fixed broadband subscriptions in 2010 [9].

In addition, with the improvement in the speed and quality of broadband and with Web 2.0 technologies and applications, economic and social dynamics across the world will change dramatically, with massive implications in terms of productivity gains and new opportunities for individuals. This inflection point presents an opportunity for economies—and cities—all over the globe to take decisive steps to gain the competitive advantage that can be derived from widespread use of broadband networks.

Some studies have analyzed the effects of broadband deployment. For example, in 2010 the World Bank published research demonstrating that every 10 percent increase in broadband penetration produces a 1.4 and 1.2 percent rise in GDP growth in middle-income and developed countries, respectively (figure 2). Another study showed that increased broadband penetration significantly increases productivity growth in countries with high and medium ICT intensity—potentially by as much as 15 percent.

b) Cloud computing - One widely-used definition, from the United States National Institute of Standards and Technology, describes cloud computing as “a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources (e.g. networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction.” [8].

This new architecture of ICT use is expected to have significant benefits for end-users, who can access services as and when they require them rather than having to invest in hardware and software assets that they rarely need—cloud computing has reduced costs, enabled greater capacity and range of activity, and generated efficiencies in business practice and the use of ICT resources. It will also improve people’s ability to use computers when they are on the move.

c) Social networking - The recent explosion in social networking and the related evolution of new forms of business, operational, scientific, and other relationships point in even more promising directions. Social networking and other forms of user-generated content are the most dynamic area of Internet development today, at least as far as end-users are concerned. The changes in the relationship between the production and consumption of content which are associated with them have already had profound implications. Web 2.0 has enabled a widespread and continuing shift in the balance of

![Figure 2](image-url)
communications and content consumption away from a more traditional pattern (such as newspapers, broadcasting and mainstream websites), in which content was delivered to consumers, towards a new pattern in which a high proportion of content is exchanged among consumers.

The increasing availability of Internet, and so of Web 2.0 interaction, on mobile phones is adding a new dynamic to the growth of social networks. “User-generated content” takes many forms, such as: online chat and instant messaging (IM) services, voice over Internet services (VoI), audio and video sharing websites, blogs, wiki-based sites and wiki software, other important areas of user-and network-generated content include personal sales and auction sites, online gaming and peer-to-peer filesharing [8].

Broadband also facilitates the use of social media and many of its applications, which present economic and marketing opportunities for enterprises. The potential of social networks, such as Facebook and Twitter, lies particularly in relation to customer interaction, such as marketing and brand monitoring. Their nature encourages customer feedback, which can serve to guide business decisions and strategy.

Young people are particularly adept at social media use and are an emerging consumer group that can be targeted. Social media may offer a cost-effective way for informal enterprises and small and medium enterprises (SMEs) to establish a Web presence. Furthermore, as mobile versions of social networking do not require much bandwidth, they can be attractive options for users in countries with slow Internet connections. It may also provide better information on demand and user preferences.

A 2010 study found that 20 per cent of companies in the United States and Europe already use blogs, forums or wikis for internal or external purposes. But while Facebook is the most popular social networking site worldwide, others lead in specific national markets such as Orkut in Brazil, Qzone in China and VKontakte in the Russian Federation [9].

d) Keeping the privacy and security of information systems on the high level is the great challenge in Information Society development The increased role of ICTs within economy and society has led to a great increase in the volume and range of data on individuals which are held within computer systems, and a concomitant risk that such data will be used for purposes other than those for which it was provided. Citizens and consumers are concerned that their data may leak or be misused, but Governments and many citizens are also concerned about the risks posed by international terrorism and organised crime.

e) Green ICT - In the past few years, a new aspect of ICT use has emerged and become a focal point of attention: the "green" potential of ICT, in particular the use of ICT to become more energy-efficient and, as a result, reduce greenhouse gas emissions. There is much hope that ICT can be a major part of the solution in tackling climate change and related environmental challenges [10]. Some advocates of ICTs see them as major potential contributors to environmentally sustainable economic growth, while others have warned that the growing use of ICTs and society’s growing dependence on them have challenging implications for resource management and waste disposal.

VI ICT SECTOR IN SERBIA

ICT is among the most vibrant and fastest growing sectors in Serbia, with a two-digit annual growth in the years prior to the crisis. In the period 2005-2008, the IT sector in Serbia grew from €280 million to €545 million [11]. In 2007 alone the market grew by 36.61%, followed by 18.74% in 2008. This growth based on the growth of other sectors, introduced structural reforms and privatization as well as an inflow of FDI. However, the economic crisis hit Serbia heavily, creating significant negative consequences to the ICT industry as well. In 2009 alone, the IT market in Serbia fell by 22.20% to €424 million.

IT sector in Serbia has software and hardware segments. About 67% accounts for the hardware segment which includes PC sales, locally assembled computers, notebooks, printers etc, the remaining 33% for the software segment which includes software development and services. According to the data provided by the Serbian Chamber of Commerce, there has been a significant export growth of the IT services (computer and information services), in the year 2008 to 160 mil $ comparing with previous years, after which its value slightly went down (140 mil$). The Statistical Office data showed a great market potential in providing services in introducing IT solutions such as ERP and CRM. Website development also has market potential. Demand for delivery of hardware solutions continues to remain high [11].

The usage of IT in Serbia is still in a developing phase. High penetration of IT into Serbian households and companies has been slowed down in the last two years, mostly due to the economic crisis. However, the main question is how much the ICT sector would be able to grow in the years of, and directly following, the recession.

In their analysis, MINECO argues on the necessity of IT sector growth at 19% per year for the period 2010-2014 (5 years), otherwise the Serbian economy will fall into a deeper crisis. In that regard, the role of the Government is very important [11].

Besides the political dimension of the approach to the development of ICT sector and of information society generally, exceptional importance in Serbian national economy has awareness that development supported by the application of ICT is not a purely technical question connected with the construction of a telecommunications network, the Internet infrastructure and installation of
computers. Such development calls for altering the country’s economic system to make it capable of supporting new business models based on knowledge-intensive technologies. Besides a new and altered role of the Government, the principal role in the construction of such an economic system is played by private companies, which create new models of doing business and invest in them [12].

The task of the state is therefore creating an environment conducive to this kind of entrepreneurship. The following factors may considerably influence the capacity of an Serbian economy to support domestic ICT sector growth and accept new ICT technological solutions as the basement for higher growth rates and better living standards: 1) adequate interaction between macroeconomic and structural policies and development of entrepreneurial attitude; 2) a financial system acting to mobilize and rally individual resources to fund investments and allocation of funds in ICT sector and other sectors with the highest rates of growth; 3) the existence of an open and competitive market which will facilitate the diffusion of innovations; 4) key role of human capital, because higher levels of knowledge are required where it is necessary to apply or adapt modern technological solutions; 5) policy changes in many areas caused by the increasingly important role of IT; 6) an efficient government, because it is becoming clear that a successful developmental strategy in contemporary conditions becomes impossible without cooperation between companies, and between companies and the state, at various levels.

VII CONCLUSION

Much of the world has yet to tap to a significant extent the Internet’s and ICT’s huge potential for generating economic and social benefits. As more people get connected, it will trigger massive implications for productivity and will open all kinds of new opportunities for countries and individuals. The developmental impacts that result from proper ICT implementation are not the product of changes in technology, connectivity or access alone, but of the conjuncture of those changes with human development activity—the choices people, businesses and Governments make, the ways in which they connect with new opportunities, the extent to which they seek to change their prospects in the longer term.

The challenge is even more relevant now because many countries are rethinking their growth and development models due to global economic crisis. This is an area in which technology—and particularly ICT—can play a crucial role, even if there are no solutions that guarantee success.

Determining factors for future ICT role in supporting economic upturn are the following [9]:

Firstly, the quality of the ICT infrastructure is an increasingly vital determinant of the overall economic and social development. Governments and their development partners need to ensure that the ICT infrastructure meets the needs of different kinds of enterprises, and all other information economy stakeholders.

Secondly, enterprises must be able to make the best use possible of ICTs, as they positively affect productivity. Different kinds of ICTs help enterprises to manage their resources more efficiently, access the information needed for better business decision-making, reduce transaction costs, and enhance their ability to bring products and services to customers. Governments should play a key role in enhancing business use of ICTs by—for example—ensuring that relevant ICT tools and services are available and affordable, and providing a legal and regulatory framework that supports the uptake and productive use of ICTs.

Thirdly, supporting the ICT sector itself is important. The production of ICT goods and services is providing new opportunities for private firms to start up and grow, create jobs, and spur innovation, thereby contributing to overall economic growth. Governments can create an enabling framework for the ICT sector to expand by liberalizing the sector, enhancing competition in all segments, providing adequate regulations, increasing trust in the use of ICT services, providing training in ICT skills, nurturing ICT enterprises through incubation and by establishing technology parks, and using public procurement to create demand among local ICT enterprises.

Serbia, being at the beginning of information society development, has to define proper infrastructure-organization-human framework to tap all the advantages offered by new technologies in order to overcome economic crises and to enable more competitive work of domestic enterprises and higher growth rates of national economy.

REFERENCES