MANAGING IT INFRASTRUCTURE FOR INFORMATION SOCIETY DEVELOPMENT. THE ALBANIAN CASE

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Abstract

Information has become an important element without which society cannot achieve its objectives. The term "information society" is increasingly used nowadays, instead of the terms "production" or "consumption society", because of the importance and necessity of information in today's dynamic environment. Since IT became commercial in the early 1990s, it has diffused rapidly in developed countries but generally slowly in developing ones. The ICT development requires preparation, largely in the form of investment in network infrastructure, skills and regulatory frameworks. So the physical infrastructure of information systems is one of the important components of the information society.

The aim of this paper is to identify ICT infrastructure indicator and to find what factors Albania need to take in consideration for managing ICT infrastructure to compare with other countries for building an information society. Many technological changes have brought new developments in IT infrastructure, such as data and digitalization, packet switching and broadband networks, as well as increased role of wireless and Internet. Albania, as a developing country have tried do benefit in maximum from these developments, focusing in the IT infrastructure management as one of the elements for building information society.

Keywords: ICT, physical infrastructure, e-readiness, IT services.

JEL Classification: O33, L86

In many industries nowadays, the existence of an organization depends largely on the effective application of information and communication technology (ICT). Organizations are increasingly seeking to apply information and communication technology to support existing business, and to create a competitive advantage. IT also significantly changes corporate behaviour and organisation structure, which should increase productivity (Brynjolfsson and Hitt, 2000).

Since these trends happen to bring visible benefits, ICT are more and more used by individuals and companies. Every month, a lot more people become mobile-phone users, for example, and the phones themselves are increasingly powerful data devices. The Internet—now a ubiquitous platform for commerce, entertainment and

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communication—has generated a thriving industry. Global monthly Internet traffic in 2010 is two-thirds higher than one year ago, according to Cisco, a network equipment provider. The capacity of the world's international optical fiber cables—which carry all this traffic—doubles every 18 months, based on estimates by Telegraphy, a telecommunications research firm. This demand is being driven by increasingly sophisticated usage of Internet-enabled services: video accounts for more than 50% of global Internet traffic today, and the data generated by Facebook, a social networking site, is estimated to surpass that of all the world's e-mail.

These figures show how the today society has realized the benefits of using ICT and their importance, and for that reason, begins to use them more and more, becoming so an information society. Information society refers to a society in which the creation, dissemination and manipulation of information has become the most significant economic and cultural activity. Along with the information society is born the information economy. It is the economy in which knowledge is the main source of value.

Republic of Albania, in its efforts to build a sustainable economic growth, evaluates the impact of information society, considering ICT as an essential tool for its construction. Despite the challenges that are facing Albania and other developing countries, computer technologies and other ICT have a tremendous potential to help overcome them. For the purposeof building an information society, ICT infrastructure is one of the important factors to be considered. So, this paper would try to identify the ICT infrastructure state of the art in Albania, as an important indicator of Information society. To do so, the research questions raised and tried to be ansewered in each paragraph below, are:

1. What is the meaning of ICT infrastructure and its importance for the information society?
2. How links the concept of ICT infrastructure with ICT services?
3. What are the developments in ICT infrastructure which help the emergence of new services and the developing of existing ones?
4. What is the state of the art of ICT infrastructure indicators in Albania, using the service data?
5. How does ICT infrastructure in Albania compare with othe countries similar in economic and development conditions?

1 Information society and information technology infrastructure

Information has become an important element without which society cannot achieve its objectives. The term "information society" is increasingly used nowadays, instead of the terms "production" or "consumption society", because of the importance and necessity of information in today's dynamic environment. Western countries are convinced that the information society will result in economic and social benefits (Audenhove 2000). Organisation for Economic Cooperation and Development, notes that information infrastructures are expected to stimulate economic growth, increase productivity, create jobs, and improve on the quality of

life(Gichoya 2005) . National economies are increasingly tightly tied together globally by ultra high–speed information networks (Jun-Hwan Kim 2000). Heeks (2002) observes that there is a big difference between ICT implementation and use between developed and developing countries. However, Westrup (2002) observes that similarities can also be expected. The difference is how problems are addressed in different countries.

It can be argued that, with their adequate resources and advanced technology, the Western countries have an easier way of implementing ICT projects than DCs. Most developing countries are characterised by limited computer applications in the public sector, inadequate infrastructure and shortage of skilled manpower (Odedra 1993).

Since IT became commercial in the early 1990s, it has diffused rapidly in developed countries but generally slowly in developing ones. This led to a widening IT gap, the so–called *digital divide* between the two groups. The IT gap among developing countries is also increasing.

To overcome these problems, governments of developing countries are focusing their efforts in planning and implementing national ICT strategies to build the information society, in order to benefit from using ICT effectively in sectors of strategic importance to the economy. The ICT development, on the other hand requires preparation, largely in the form of investment in network infrastructure, skills and regulatory frameworks. The notion of preparation lent itself to the term "e-readiness". It shows the extent to which, a given society, social group or organization, is aware, customized and prepared to use new information and communication technologies. E-readiness was generally defined as the extent of readiness in access to network infrastructures and technologies. It can also be seen as the degree to which a society is prepared to participate in the digital economy with the underlying concept that the digital economy can help to build a better society.

However, e-Readiness can be a relative concept and it could be defined differently depending on each country's priorities and perspective. In most countries including developing countries, it goes beyond this generic definition to include various other factors. This evolves from the importance given to basic infrastructures in the eighties and nineties to more emphasis on the socio-economic dimensions of technologies today (Avegrou and Walsha 2000).

ICT implementation success affects ICT facilities quality and information system quality (Westrup 2002). In turn ICT facilities quality and information systems quality affect the perceived benefits. An ICT project implementation can only be perceived to have succeeded if the perceived benefits are realised. ICT facilities quality can be assessed after careful evaluation of the infrastructure to determine technical functionality.

From this perspective, the basic infrastructure as well as the related services, are object of the first assessments of the e-readiness in different countries. Another reason is that Receiving information requires information producers (e.g. data services and consulting), information disseminators, physical infrastructures to

convey information, equipment (e.g. PCs and monitors) to display it, literacy of recipients to read/understand it and ultimate application of the information to productive activities (Lihtenberg F.R. 1995). So the physical infrastructure of information systems is one of the important components of the information society. Over the last five years, the DC governments have implemented some capital investment towards set up and installation of ICT infrastructure.The revolution in IT has itself been brought forth by a company of innovations in telecommunications and informatics, made possible by cheaper new lightweight materials (e.g. optical fibres) transmitting information faster. Information flows faster and less expensively throughout the globe, but it will take substantial time to reach full digitalisation given the youth of IT.

1.1 Information technology Infrastructure meaning and components

Information technology infrastructure underpins the distributed operational and administrative computing environment. Hidden from the application-based world of end-users, technology infrastructure encompasses the unseen realm of *protocols*, *networks, and middleware* that bind the computing enterprise together and facilitate efficient data flows. Yet information technology infrastructure involves more than just the mechanics of data systems; it also includes people providing support and services. Information technology infrastructure is a distributed technical framework in support of user and enterprise computing.

Information technology infrastructure should be seen in both public and firm level.

A firm's information technology portfolio is its total investment in computing and communications technology. The IT portfolio thus includes hardware, software, telecommunications, electronically stored data, devices to collect and represent that data, and the people who provide IT services.

The foundation of the information technology portfolio is the firm's longer term information technology infrastructure, which in turn is linked to external industry-based infrastructures such as bank payments systems, airline reservations systems, and automotive industry supply chain networks, and to public infrastructures such as the Internet and telecommunications networks. The combination of the internal and external information technology infrastructures make up the firm's information technology infrastructure (Brancheau et al, 1996). The technology components are converted into useful *shared services* by a human information technology infrastructure composed of knowledge, skills, standards, and experience. The services notion of information technology infrastructure is very powerful. It also provides more certainty to the provider as to their responsibilities, and allows for more precise planning. The infrastructure services often include telecommunication network services, management and provision of large-scale computing (such as servers or mainframes), management of shared customer databases, research and development expertise aimed at identifying the usefulness of emerging technologies to the business, and a firm-wide intranet. These emerging

technologies are the bases for bettering ICT infrastructure and developing new services which in turn will help in building better information systems and networks in an information society. But let us take e deeper look in these new developments.

2 Technological changes as incentives for new ICT services and Infrastructure development

ICT technology is continuing to develop rapidly. Five key areas of technological change are having a significant effect on the structure of ICT markets, and will continue to do so for the foreseeable future. They are:

2.1 The shift from analogue to digital

Human beings use analog techniques for listening to and viewing content. Historically, technologies for communication have also used analog signals (for example, conventional telephony, music cassettes and records). Substantial operating efficiencies accrue when a network can aggregate traffic going in the same direction, and transport it all over a single "pipe". Modern digital networks can simultaneously transport bit streams representing many different types of communication (such as data, text, audio, video, and voice).

2.2 Data replaces voice

While voice services are still dominant in revenue terms (in many cases voice accounts for more than 80 percent of company revenues), the importance of voice compared to other information services appears to be declining. The need to replace voice revenue is behind the drive for innovation in data services (Brown 2010). Demand for information services and data transmission is continuing to grow steadily. In addition to digital services, much voice traffic is now digitized, for at least part of the transmission circuit. The shift from voice to data has important consequences for network design.

2.3 Packet switching replaces circuit switching and new waves in networking

In response to growing demand for data and digital voice, ICT networks are shifting from circuit switching to packet switching. Circuit switching does not work well for data communications such as Internet traffic, because it cannot handle bursts of high throughput, and cannot provide switching and routing for other users when the initial parties have a temporary pause in communications. Configuring a voice line for Internet access ties up a line for the duration of the call even though the data communications requirements may make up only a small portion of the total time.

Packet switching is a superior, more efficient, way to manage data traffic (Gitchoya 2004). The network breaks traffic down into small packets that can be routed over any available network link. The digital nature of packet switching means that a single network can handle a variety of different packet-based services including voice, data, text, images, sound, and video. Optical circuit switching ... offers significant advantages in the core of the network (Dan et al 2009). A further consequence of the shift from voice to data services is a shift from narrowband

networks to broadband networks. Data services typically require broadband networks. Broadband networks are able to transmit more information, faster.

2.4 Intelligence Migrates from the Core to the Edge

In conventional circuit-switched telephone networks the "intelligence" is located centrally on telephone company premises. User devices are generally quite simple (for example telephone handsets). The hierarchy of switches in the telephone network provides the intelligence to route calls, generate billing information, and provide additional services (such as caller identification, voice mail, and so on).

Stoica and Zhang (Stoica 1999) provide an investigation of provision of grades of service using edge routers and core routers. Centralized intelligence is efficient where most users have similar requirements, as in a telephone network. However, this approach offers limited opportunities to customize services, and optimize the network, for individual user requirements. The architecture of the Internet moves intelligence from the core network to users operating at the edges of the network.

2.5 The Increasing Role of Wireless and Internet

Consumers have readily and quickly embraced wireless telecommunications. Wireless service removes the need to be "tethered" to the network, and provides greater mobility for users. Wireless connections are often easier to install and can involve lower capital expenditure than wired ones. Wireless networking is a particularly interesting development because it provides

community groups, municipalities and individuals with a relatively simple and affordable

mechanism for internet service delivery (Middleton et al. 2006). Wireless local area networks (WLANs) can be established using unlicensed spectrum to share internet connectivity (Galperin, 2005; Lehr & McKnight, 2003; Mackenzie, 2005; Sawhney, 2003). In many rural and remote areas, wireless provides a cost-effective alternative for achieving universal service. Some of the traffic growth in wireless networks is due to customer migration from wireline networks, (rather than from new telecommunications customers), as wireless and mobile services become increasingly effective substitutes for wireless services.

The Internet provides a platform for new information services, and an alternative delivery mechanism for existing services. Initially a medium for traffic associated with research and education, the Internet now delivers a wide range of information services.

These new technological developments have changed the way ICT infrastructure services are offered, contributing so in a significant development in overall ICT infrastructure. So, new uses of telecommunication services are strongly associated with the introduction and diffusion of these new technologies (Antonelli 1996) on the other hand new innovative uses of telecommunication services based on an array of innovations introduced since the mid-eighties, have made an important step in the evlution of ICT toward a technological system (Antonelli 1996).

So we can use the ICT services as a good indicator to show what technological change have brought and will bring in regard of ICT infrastructure, which in turn will help in building Information society.

3 ICT infrastructure in Albania, problems and opportunities compared with the region

Actually, some of the countries in South East Europe (SEE), a group of countries where Albania is part, are not subject to a consistent and systematic evaluation of e-readiness, which is one of the most important indicators for the existence of inforation society in a country. There is no government institution actually committed to this process. Some external evaluations such as the Global Report on Information Technology, which covers 1000 states, covers only Croatia, Macedonia and Serbia from the group of SEE, but there are still no data for Albania. Also, the Report of e-Readiness rankings of 2008 of " The Economist" does not include any of the SEE countries, even Albania.

The status report of ICT sector performed by eSEE initiative, established by the Special Coordinator of the Stability Pact for Southeast Europe, supported by UNDP, also generates data and analyses about the existing policies and strategies that affect among other things the ICT infrastrucutre services, while ICT infrastructure is one of the core elements of this evaluation.

3.1 ICT infrastructure and services

Basic infrastructure that must be evaluated includes:

- Fixed telephony
- Mobile telephony and networks
- Internet access

A comparison with the same indicators in the region is shown in the table 1

Indicator	Albania	The lowest value	Country	The highest value	Country
Fix telephony penetration	39%	26,90%	Kosova	>95%	BhZ, Serb, KRO,
Number of operators in mobile networks	3	2	te tjeret	3	BhZ,
Number of national ISPs	25	2	M ZI	70	Moldavia

Tab. 1 ICT infrastructure indicators in Albania, in comparison with SEE countries

It is seen that the general state of Albania's fixed telephony is not good compared with other countries. Thus the level of penetration is slightly greater than the country ranked last in the area of SEE, Kosovo, and is far from the countries with a very good penetration level of over 95% of the population with access to fixed telephony (Serbia, Croatia, Macedonia, BHZ). Main lines penetration is around 9% which is the lowest in the region.

While the indicator of the spread of mobile telephony has more or less the same development, with 2-3 operators who display almost the same degree of competition and, therefore, will have the same spread of infrastructure between countries.

Albania has a considerable number of ISPs taking into account the small area of the country, compared with Moldova, which has the greatest number. On the other hand there are countries which are worse than Albania, as Montenegro about competition in this subsector, which will promote a better distribution of ICT infrastructure.

Even though, data do not show anything about the quality of services. Fixed phone operator is in a monopolistic situation and quality of services varies. Mobile phone networks and Internet service providers are in expansion throughout the area.

A typical situation is that the telephone operators mainly state-owned, control also the largest ISPs, which often means that these ISPs have better position on the use of infrastructure. This market is still not well developed; the prices are relatively high, so very often the situation represents a major obstacle to Internet penetration.

In relation to Internet access and use, some data are found according to SouthEastern Europe Telecommunications & Informatics Research Institute (INA). Internet hosts in the country are 856. Number of domain names is 830. Dial up subscribers are 25 000, while DSL are only 2100, reflecting so not a good status of quality in access to networks and Internet. The Internet subscribers in the data of 2007 are 27 780 (There are no data that can show the growth of this indicator), while the Internet Users can be compared through Global Information Technology Report (2007), tab 2.

Country	Internet users /1000 persons	Mbps / 1000 persons
Albania	6010	0
BHZ	20640	0.240
Croatia	31880	3.190
FYrom	7860	0
Moldavia	9520	0.42
Serbia/Mzi	18610	0.87
Danimark	52550	348.210
USA	63000	33.060

Tab 2 Comparison of countries according to Internet users

Source:http://www.weforum.org/en/initiatives/gcp/Global%20Information%20Technology%20Report/index.htm

The analyses continues with some figures that show the growth of ICT indicators in time. Even though some data are missing, and it is a problem with the statistics in almost all SEE countries, the table 3 shows this trend.

Years	2002	2003	2004	2005	2006	2007	2008
Total investments in Infrastructure by companies in telecommunications					337.666	1.622.203	1.322.202
Number of telephone subscribers (fixed lines)	197.496	228.858	256.000	231.264	238.141	259.637	295.146
Number of mobile phone subscribers	370.000	800.000	1.150.000	1.259.200	1.530.000	1.769.100	2.095.000
Number of leased lines					515	811	946
Number of Internet users	2500	30000	37500	46900	58600	75000	471000

Tab. 3 The growth of ICT infrastructure indicators in years

Conclusions and further research opportunities

Different authors show the importance of ICT infrastructure in building information societies. But the ICT infrastructure depends on technological changes which in the last decades have been numerous and significant. They have helped in emerging of new services and developing existing ones, which in turn can help in bettering ICT infrastructure. The paper gathered secondary data from different sources to show the ICT infrastructure indicator for information society in Albania, a developing country. The comparative analyses with other SEE countries showd that Albania stayes behind other countries, in most of the indicators, such as Internet users and Internet use (Mbps/1000), fixed telephony penetration or competition in telecommunciations (fixed and mobile). Number of ISPs in fact is in an avarage level compared to others. While most of market indicators for ICT infrastructure are increased, while investment in infrastructure have decreased.

Further research must be focused on the investigation of relationships between the market evolution of services and their technology infrastructure on one side and their use of the new technologies identified in the literature review. IT services, competition, innovation and investment in infrastrucutre are factors that must be considered further from in depth quantitative analyses.

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