THE PROBLEMATIC OF DEFINING ICT SECTOR AND MEASURING ITS IMPACT

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1 WHAT IS ICT?

The information and communications technology sector was formed as a result of the convergence between two branches: information technology and communication technology. Both refer to the gathering, storing, processing and transmission of data. People from ancient times have been concerned about the issues mentioned above. From historical point of view, we can mention that information technology refers in particular to changes in gathering, storing and processing of data, being directly related to computer technology [1]. The term information technology was introduced in 1958 by Harold J. Leavitt and Thomas L. Whisler, which mean – processing technologies, application of statistical and mathematical methods in decision-making process and simulation by using computerized programs [2]. In other words, information technology implied the provision of tools to managers for collecting, processing and simulating in the decision-making process; and the computer (both hard and soft components) was used as working tool, they weren't communicating with each other. At the same time, parallel to information technology, communication technology was developing, the basic purpose of which was the transmission of information in different ways. The turning point in the evolution was the use of electricity to transmit the information, the telegraph and telephone invention, and later, the use of radio waves to transmit the information, which allowed accelerating the process of information transmitting. We can say that by the 60's-70's of the 20th century, these two industries were developing in parallel, the turning point, from which we can already talk about the information and communication industry, are the first attempts to make communication between computers, aimed to transmit the information [3] as well, the use of computers for routing and making telephone connection [4]. As result, appear first communication networks, which allow the transmission of information within a restricted area that has led to the emergence of Local Area Networking (LAN), as well at long distances - Wide Area Networking (WAN). First communication networks were based on switching technology used in telecommunications and existing telephone lines. In 1969, ARPANET emerged as a result of US Army Department research, which was the predecessor of the largest WAN network, the Internet (1980). In the late 80's, early 90's of the 20th century, starts the convergence epoch, when the link between the communications and information industries is getting tighter. The emergence of the Internet, and the increasing use of Internet protocols (IP), has led to the convergence of LAN and WAN networks, which has allowed the transmission of a large amount of information in real time, in various forms - image, voice and video (as an example of data convergence is the World Wide Web (WWW)). At the same time, there is a convergence between telecommunications networks, which initially were aimed to information transmitting in the form of voice (telephony and radio) or image (television) and computer networks, which initially transmitted data in alphanumeric format. Thus, the so-called Integrated Services Digital Network (ISDN) appears, that allowed both data transmission and telephone connection. Currently the convergence is based on digital transmission of information, packet switching, and pre-defined services (conference call, call transfer), which makes difficult to separate the communications industry from the information industry. As a result of the aforementioned changes, emerged the Information and Communication Technology sector.

Information and Communication Technology has evolved from the convergence of such industries as hard producing (computer) and media producing (telephony, switching systems), with communication infrastructure, initially oriented to assure telegraph and telephone connection, radio and TV signals, and later used as an infrastructure to achieve communication between remote computers (WAN) and with local infrastructure (LAN), that lead to the increasing of data transmission capacity. The increase of data volume, the convergence of used technologies, has led to a decrease of production activities share within the

sector, and the increase of offered services. If initially the services was auxiliary to basic product, used for example to make the connection between 2 remote points, used software were standard in order to ensure the functioning of computers, the progresses and the wider use of the computers led to changes in consumer requirements towards ICT products. Thus, at the moment, the consumer will not acquire a product, if it only allows making the telephone connection, he will ask for a product that assembles both the good (the phone or the computer) and the service (the volume of data it can transmit, the security of the transmission, the speed). As Jayraj Ugarkar mentioned, by the late of 90's telecommunication was about networks, but in the 21st century it refers to the consumer's wishes and the services offered to them. [5] The consumer has the same requirements for soft products, which mean that the soft is not only adapted to its requirements, but also suppose post-services and maintenance. The same situation is internal communication networks, which are not limited to network design, but also to its subsequent installation and maintenance.

Based on the above, we believe that the Information and Communication Technology Industry can be defined as a Product-Service Oriented Industry, which has as main objective the satisfaction of the society's need in its product, i.e. the storing, processing and transmitting of information in various forms. We can also affirm that the convergence between the Information Industry and the Communication Industry has led to the creation of a global communication network that has affected all areas of human activity, resulting in the emergence and development of the Information Society.

At the moment there is no single definition, a unanimous acknowledgment of the notion of Information Society, a conclusion confirmed also by the study of the local researcher Crudu R. [6]. Based on our research, we can conclude that the treatment of the notion is made according to the concern of researchers. Some, as Bell's D. [7], Drucker P, [8, 9] Castells M., Hargreaves A., define information society from social point of view and respectively refers to the evolution of human society and its impact. Other, as M. Porter [10], defines it from economic point of view, and refers to its impact on economic development. Also, joined to the term information society, there is also the term society of knowledge, sustainable development. It is sure that the emergence of the term is linked to the decline of the role of traditional production factors, and the raise of the role of advanced factors, namely information and knowledge. It is considered to be a post-industrial society, which arises as result of globalization, and the information and knowledge, as well as the degree of their penetration, as Karvaclics L. considers, represent one of the most competitive advantages of countries [11]. The above statement is also apparent from the study by Crudu R., in which the author asserts that the basis of the development of contemporary society is the information and the way of it using, manifested through knowledge, as well the fact that the impulse of the development of the information society was the development of the Internet network [6, p. 21]. Haagman J. asserts that the Internet serves as a way of gaining knowledge by which nations can become more competitive [6, p. 24], and states, according to Andersson [6, p. 24], should to develop policies to train people in the use of the Internet and to ensure access to these technologies. As Chistruga B [12] and Gribinicea A. [13, p. 72] mention that ICT is recognized as an instrument of development strategies, poverty reduction strategies, education and health promotion strategies, as well of democracy and human rights promoting. It is important to note that access to ICT is one of the indicators that characterize the quality of people's lives.

To fully understand the degree of penetration and the influence of ICT, OECD has proposed in 1997 to assess the development of the Information Society, focusing on developing a set of definitions and methodologies that would facilitate the compilation of various data for measuring various aspects of the information society, the information economy and e-commerce. To this end, the conceptual model of the information society [11] has been developed, which should allow systematized accumulation of data. Based on presented model we can find that the information society consists of:

- ICT products;
- ICT infrastructure - which refers to the information society infrastructure - access to services, their quality, investments in such services, tariffs;
- ICT providers - de facto the ICT sector, its impact, other ICT-producing entities, as well as ICT-related activities;
- ICT demand - business demand for ICT, in particular what it refers to e-business and e-commerce. Also, how much business spends on ICT, the economic impact of ICT investments and their use;

- ICT demand from families and individuals - their access to and use of ICT, including e-commerce, and the social and economic impact of ICT on individual level;
- The content - all related to information and electronic content, including the media sector and its products
- Cross-cutting aspects of information society, such as e-Governance, the trust on online, digital discrepancies, ICT skills and ICT in education. Also, a wider vision of ICT in the social, economic and environmental contexts.

2 THE VALORIC ESTIMATION OF ICT SECTOR

The ICT industry contributes to the development of the economy through the infrastructure that puts at the disposal of society, thus contributing indirectly to the creation of added value. Globally, the ICT development is determined by the capability index (Figure 1). Between 2011 and 2015, after a slow decline registered in 2007-2009, Moldova's relative position in the rating of the capability index recorded a significant increase. In 2015, Moldova is on the position 71, having a close position with its neighbors, Romania and Ukraine. Compared to other countries, part of the former USSR, the development of Moldova is slower, which tells us that there are reserves in infrastructure development.

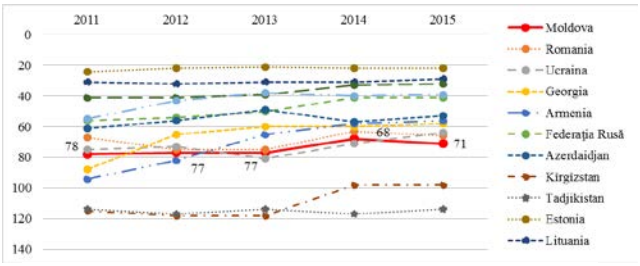

Figure 1. *The evolution of Moldova's position in the overall ICT infrastructure rating, 2011-2015*
Source: „The Global Information Technology Report", 2012-2016, www.weforum.org

The index consists of 4 subcomponents, which characterize the environment, the capability, the use and the impact of ICT. Of the four components, the highest value has the sub-indicator access, which characterizes infrastructure, availability and skills, positioning Moldova on the 52nd position. Analyzing data, the major problems faced by Moldova are: the low level of judicial independence and of fair application of regulations, deficiencies in the protection of intellectual property, fraudulent use of software, lack of capital, reduced use of modern communication facilities by state institutions, low quality of training in the field. Some local authors, such as Melniciuc N. [70], studied the impact of computerization on the economic development of the Republic of Moldova, his mathematical model show that the contribution of computerization to economic growth is about 14.21%.

As a direct creator of added value, the ICT sector includes the Information Technology Industry, the Electronic Communications Industry, the ICT Equipment Industry and the ICT Equipment Trade Industry. The share of ICT industries in GDP creation was in the average of 4- 5% (Figure 2).

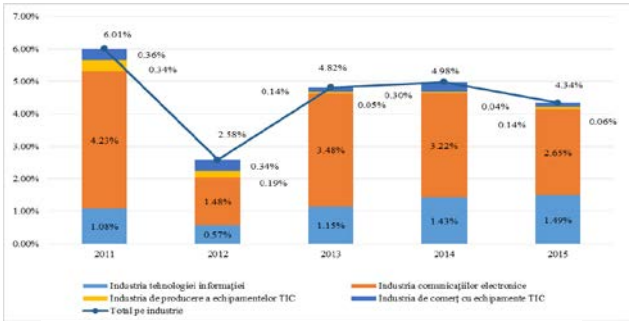

Figure 2. *The share of ICT industries in GDP*
Source: National Statistical Department, 2011-2015

Statistical analysis revealed that in the ICT industry are registered more than 1,500 enterprises, of which about 50% are enterprises from information technology industry, another 300 enterprises provide services in the electronic communications sector. So, approximately 80% of sector enterprises are involved in services provision, the remaining 20% have as core activity the production and selling of hard and soft products. The figures show that the most important contribution to the performance of the ICT sector lies with the electronic communications industry, followed by the information technology industry and the selling industry, and at the end of the list is equipment production industry.

The electronic communications industry include mobile communications and fixed communications market, fixed Internet and data access market, broadcasting and audiovisual programs market and other electronic communications services market. The sub-sector has the largest share in total ICT sector activities, and is the sector that assures country's infrastructure. Compared with the production and provision of software services sectors, this one is the most developed. It is worth to mention that the market is growing continuously, and global trends are also found on the local market: decreasing of

fixed communications market share, market saturation and as result the stabilizing of mobile communications market share, increasing of Internet and data access market share, especially Internet in mobile points.

The second industry as a weight is the information technology industry, which includes editing of computer games, editing of other software products, custom software development activities (client oriented software), information technology consultancy, computer management and exploitation, data processing, web page managing and related activities, web portal activities, as well other information services. Currently is considered to be the one with greatest growth potential. According to statistical data, in 2015 the number of enterprises implied in the sector reached to 780, most of them being employed in client-oriented software and information technology consultancy activities, respectively 36% and 22%. The given industry remains attractive because offers the highest salaries, the average salary was about 9000 lei in 2015, the highest being in the software editing and software development activities about 12000 lei per month. Compared with other activities, salaries in the information technology industry are rising year by year. From financial point of view, these activities are cost-effective, by assuring an operational profitability of 30%, the most cost-effective are data mining activities and web site managing activities (35% in 2015). The client oriented software and software editing activities are less profitable, namely 25% and 10% in 2015.

The assessment of ICT sector impact shows the following: the information and communication technology industry is in development, the largest share has the sub-sector that provide services; taking into account the potential of the Republic of Moldova, we cannot expect some spectacular growth of the production sector. At the same time, we consider that electronic communications industry will continue to grow due to the increase of Internet services users, especially mobile Internet; we consider that the ICT selling industry will be concentrated in the hands of a few larger vendors, and smaller companies will disappear; and the industry with most growth potential is the information technology industry.

3 CONCLUSION

From the above we can conclude that the ICT sector should be viewed as a whole, as producing and service offering sector, as well as provider of infrastructure. As producing and service offering sector it is a direct creator of added value, and as provider of infrastructure it contributes to the creation of value added by other industries, being, in this case, an indirect creator of added value.

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