THE DIGITAL DIVIDE: ICT DEVELOPMENT INDICES IN MEXICO

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Abstract: *The integration of Information and Communication Technologies (ICTs) to the manufacturing sector enables to reduce production, management and marketing costs, allowing achieve higher levels of competitiveness. In the social area, ICTs are tools of inclusion improving the provision of education, health and government services, as well as expanding its coverage area of these services. To achieve these benefits it is required a proper incorporation and adaptation of ICTs in the social area, as well as, the development of required ICT services, properly. In this work, we analyze the role of the digital divide in the information society, as ground for social exclusion in the use of ICT in Mexico. Afterwards, the behavior of the digital divide is analyzed, with its different dimensions through time, also describing the penetration and development levels of ICT. Moreover, the case of study of university students enrolled in Information Technology careers is discussed in order to determine the existence of a digital divide and its parameters. Finally, a diagnosis about the growth of the Internet and mobile telephony services in Mexico is carried out, considering the prevailing world economic situation.*

Key-words: *Digital Divide; ICT; Internet; Social Exclusion; Information Society*

1. Introduction

In recent years, Information and Communication Technologies (ICTs) have become the backbone for the efficient information management, encouraging the emergence

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of the information society. The main objective of the ICT is to improve and provide support process business operation and to increase the competitiveness and productivity of people and organizations in the treatment of any type of information (Tello-Leal, 2008). These technologies facilitate the rapid collection and dissemination of information, the interaction between user groups, communication and collaboration (Shirazi et al., 2010).

In CEPAL opinions, the digitization of various forms of information, such as text, sound, images and voice, have had a profound impact in four basic operations: 1) capture and adaptation, i.e. the reproduction of information from one format to another, 2) computation, in relation to their implementation according to a procedure and processing; 3) the storage, and 4) the transmission, in the sense of reproducing a given message from one point to another point. These functions closely interrelated are interdependent and compose the technological system is known as ICT. The economic benefits associated with the use of ICT are derived from its ability to increase efficiency in management processes, exchange and information management. From a social perspective, these technologies are a means to access information that enables the creation of knowledge, and thus represent important tools for reducing poverty indexes, where the knowledge gained is a means of improvement and progress (Guerra et al., 2008).

However, in order to realize these benefits, is not only necessary that people have the ability to access these technologies, but also to have the knowledge to perform efficient use of them. Accordingly, to the extent that use and integrate these resources to productive and social activities, will increase the opportunities for improvement. Different socioeconomic and cultural variables determine effective use of ICT, thus creating a digital divide (Guerra et al., 2008). The digital divide is one of the first concepts with which to start reflection about the issue of the social impact of ICT. It is clear that the use of these technologies will produce differences in opportunities for development of populations and cause a gap between communities that have or do not have access to these technologies, which is conceptualized as the digital divide (Pinkett, 2003).

The analysis of the concept of digital divide has changed over time. Originally was referred basically to connectivity issues (access and infrastructure). Subsequently, the analysis included the development of capabilities and skills required to use ICT (training and education). Afterwards, was added the analysis of usage intensity of resources and services integrated into these technologies (frequency/hours of use). Currently the intended purpose of the Internet usage is incorporated to the analysis of digital divide (Castaño-Muñoz, 2010).

The level of access to ICT varies considerably from one country to another. Although there have been efforts to close the digital divide, there are substantial inequalities in

access to and use of ICT in developing countries (Matuchniak, 2010). Therefore, the international organizations have defined their development policies aimed at reducing the digital divide. However, despite the evolution of the concept of digital divide, investments and policies to close the digital divide are oriented primarily toward the development of connectivity (Tello-Leal and Sosa, 2008).

Furthermore, it is important mention that one the ICT most representative and influential in recent times is the Internet. It's a cultural communicative structure, allowing the expression of experiences, knowledge and practices of human interaction (Cabrera, 2004; Villatoro and Silva, 2005). Internet has transformed the concept we had of ICT, converting to information and communication networks in an essential resource of modern society. Currently, the Internet is a basic resource for transmitting information, so it is important to have the skills needed to effectively use this technology. Therefore, we conclude that people who are excluded ICT, are also excluded from the benefits they can provide Internet (Rodriguez, 2006).

In this paper we analyze the concept of digital divide as a cause of social exclusion in the use of ICT in Mexico. It describes the behavior of the digital divide over time, evaluating the level of absorption and the development of ICT. It also presents a case study focused on university students enrolled in Information Technology (IT) careers, with the objective of determining the existence of a digital divide and its dimensions. In this scenario, the methodology designs are exploratory and quantitative. Finally, we analyze the increase in the use of Internet services and mobile telephony in Mexico.

3. Literature review

The global digital divide is perceived of as the inequality in use and ownership of computers and the internet across nations (Wijers, 2010). Also, the digital divide has also been generally defined as the socio-economical difference in the use of ICT (Vehovar et al., 2006). We use the OECD's definition “the gap between individuals, households, businesses, and geographic areas at different socio-economical levels with regard both to their opportunities to access information and communication technologies and to their use of internet for wide variety of activities” (OECD, 2001).

There are two primary dimensions of digital divide: domestic and international. Domestic digital divide refers to a digital divide in a certain country or region, while the international digital divide refers to a gap between regions, countries, or continents. Although indicators used for determining international and domestic digital divide may vary, many common indicators are also used. Other than regions or geographic locations, a digital divide can also occur between genders, ages, education groups, income groups, racial, and ethnic groups (Ono & Zavodny, 2007). Studies indicate that an international digital divide originates from the difference in

social development and economical growth in developing and developed countries and regions, and in differences between the demographic quality of the citizens (gender, race, lifestyle, family structure, and size of family) (Chen and Wellman, 2004; Cuervo and Menendez, 2006; Ono & Zavodny, 2007).

In many studies, it is seen that the digital divide negatively affects women, old people, people with low education and with low income, large size families, people living in rural areas, low-skilled persons, and minorities at the domestic level, and poor or low-income countries at the international level (Chinn and Fairlie, 2004; Mariscal, 2005). The study variables have been taken from national and international institutions such as INEGI (INEGI, 2010), EUROSTAT, the OECD, the World Bank, the United Nations Development Program (UNDP) (UNDP, 2001), the International Data Corporation (IDC) (IDC, 2007), and the International Telecommunication Union (ITU) (ITU, 2003). Questionnaires have been often used in data gathering, and the multi-dimensional aspects of the information society have led to the development of various index measures to compare levels of the information society, such as the information society index (IDC, 2007), digital access index (ITU, 2003), and the technology achievement index (UNDP, 2001). Various components of the information society have been measured with these indices. Various components of the information society have been measured with these indices. These components determine international digital divide, among which are included ICT sector; ICT market and external trade; ICT penetration; ICT usage in households; ICT usage in enterprises; ICT education, training, and skills; and ICT in government and health. In addition, there are many variables measuring each component. ICT penetration; ICT usage in households; and ICT education, training, and skills components have gained importance in measuring the digital divide between individuals (Corrochner and Ordaninin, 2002; Shirazi et al., 2010).

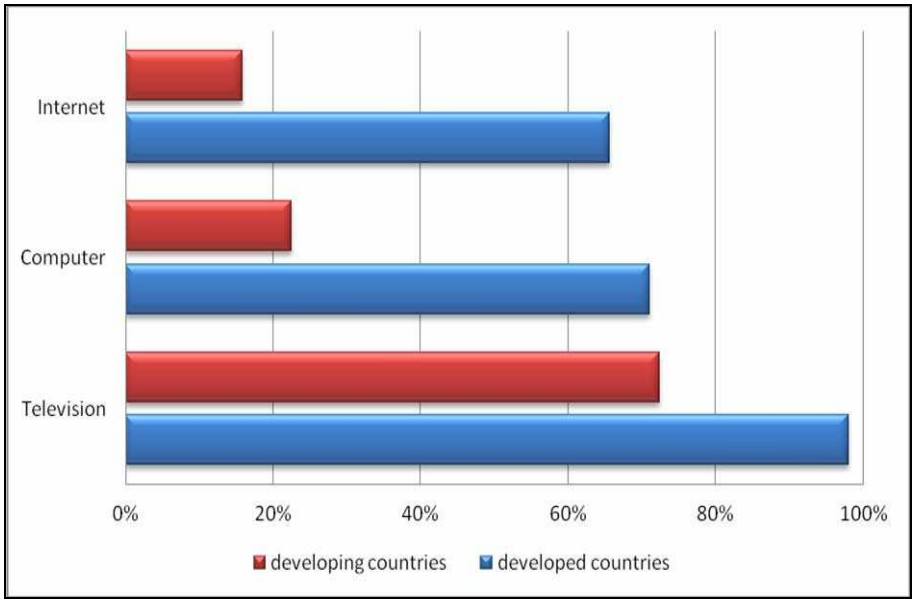
In (Billón et al., 2009) use canonical correlation analysis in order to take together a large number of dependent variables, such as computers, Internet users, broadband subscribers, mobile phones, telephones mainlines, and secure Internet servers. However, despite the impact of the digital divide socially, politically and economically, there is still a lack of theory supporting the existing measurement of the digital divide (Corrocher and Ordanini, 2002; Mariscal, 2005; Falch, 2007).

4. Level of absorption and development of ICT in Mexico

The ICT has a great influence on each of daily activities, where information and communication are essential to the progress and welfare of the persons, supported by education, allowing knowledge generation. Such is the importance and magnitude of ICT that the degree of progress in the use of these technologies will determine the level of development to be achieved in a society. This assertion is based on the

statistical information submitted by the ITU, in its report of ICT indicators, which are summarized in Figure 1. This figure presents a comparison between developing countries and developed countries, which include indicators of Internet access from home, households with a computer, and households with at least one television. On one hand, it shows that in developing countries the 72.4% of households have a television, 22.5% have a computer and only 15.8% have access to Internet. On the other hand, in developed countries, 98% of households have at least one television, 71% have at least one computer and 65.6% have access to broadband Internet (ITU, 2010). The data presented in this comparison (Figure 1) clearly shows that the difference in access to ICTs between developed and developing countries.

Figure 1
Variables of ICT access in homes, in developed and developing countries



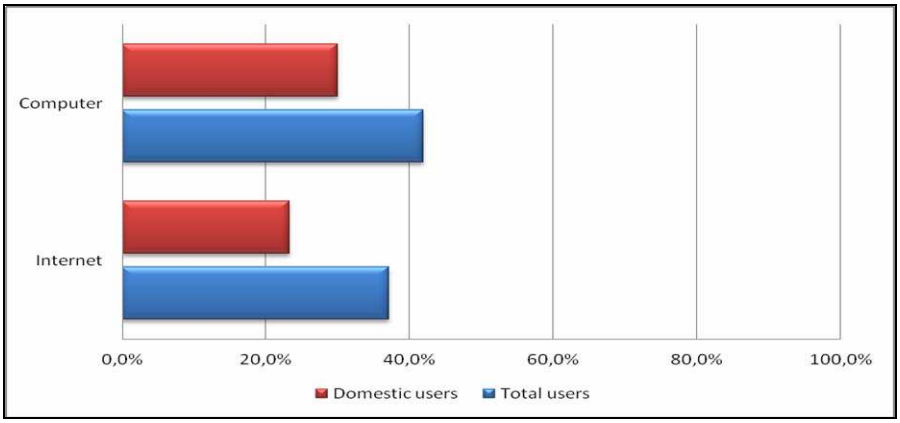
Source: Developed by the authors, based on INEGI reports (INEGI, 2011)

3.1. Related data to ICT in Mexico

ICTs are considered tools to trigger the change in terms of the productivity and competitiveness of a company. However, Mexico is below the world average on some indicators. Studies conducted by the INEGI (2011) showed that 41.6 million people in the country (México) have access to Internet-based services and 47 million of people

have access at the computer. These data reflect an increase in the use of ICT, especially in the use of Internet and all the services involved, compared to previous years. Figure 2 shows a comparison between computer and internet household users versus the total computer and internet users in the country. Data presented in this figure shows that 37.2% of the country's population are Internet users and 41.9% have access to a computer. It also shows that 30% of households have a computer, and 23.3% of households have Internet access, which represents an increase of 4.9% and 3.2%, compared to the indicators of 2010, respectively (INEGI, 2010).

Figure 2
Users with access to ICTs in Mexico



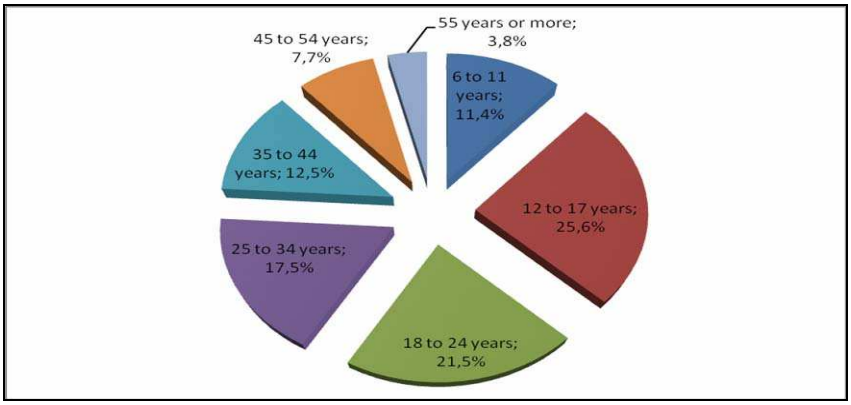
Source: Developed by the authors, based on INEGI reports (INEGI, 2011)

Furthermore, considering the composition of ICT users by gender, women represent 49.5% and men 50.5% of computer users. On the use of Internet, the participation of women is 49.6% and 50.4% are male users. According to these data, we conclude that there is no significant difference by gender among users of ICT in the country.

However, the situation is very different when the same indicators are analyzed considering the age of the users. Figure 3 shows Internet users by age in Mexico. This figure shows that people with more access the Internet are users whose ages range between 12 and 34 years. This group of users is composed of students, professionals and workers using ICT in their business, which represents a 64.6% of Internet users. People between 35 to 44 years old represent the 12.5%, users of the age range of 45-54 years represent the 7.7%, and children 6 to 11 years constitute 11.4% of total users. A group behind in the use of technologies is people over 55, of which only 3.8% use the Internet (INEGI, 2011).

According to the above data, the age of the users can be seen as a cause of delay in the adoption of ICT. However, based on the data presented in (INEGI, 2011) socioeconomic status, related to lifestyle and annual income of the inhabitants of the country, are the variables that have greatest impact in creating a digital divide. In this sense, the low-income population that uses ICTs lies well below the population mean, this leads to a huge internal digital divide in Mexico.

Figure 3
Internet users in Mexico classified by age



Source: Developed by the authors, based on INEGI reports (INEGI, 2011)

3.2. The case of study of university students enrolled in IT careers in the North of Mexico

The Internet, computers and mobile phones are now indispensable resources in most activities, mainly in the teaching-learning processes (Buela-Casal and Castro, 2009). With the use of these technologies teaching strategies and feedback are enriched to facilitate the search for information, sharing such information, generates knowledge and then transmit it to others, regardless of their location and the type of connection used.

In order to know the level of absorption and utilization of ICT at the university environment, we conducted a study focusing on the students enrolled in careers of Engineering of Information Technologies (IT) in the state of Tamaulipas in the North of Mexico. Tamaulipas state has more than 5 graduates of IT per 1000 inhabitants, ranking among the states with the highest number of graduates in that area (SE, 2007). According to studies conducted by INEGI (2010), 26.9% of Internet users are college students, which in turn represent the 23.4% of computer users in the country.

The study consists of three groups with different geographical settings. The first group is comprised of students who live in cities located in northern Tamaulipas state, which have the characteristic that are U.S. border and its main economic activity is the electronics manufacturing industry. The second group is composed of students who live in cities located in the center of the state and its main economic activities are small companies and government employees. The third group is comprised of students who live in cities located in the southern state and its main economic activity is the petrochemical industry.

The population is integrated by students in IT careers, being exactly the population size of 4460 students. We defined a sample size with a confidence level of 95% and a sampling error of 2%, using a stratified random sampling with disproportionate allocation, the sample size calculated is of 1566 students (see Table 1).

Table 1
Stratification of students enrolled in IT careers

	Group 1				**Group 2**			**Group 3**	
Cities	Mata-moros	Reynosa		Laredo	Victoria		Mante	Tampico	
Careers	BSc Eng	BSc Eng	BInf Tech	BInf Tech	BInf Tech	Telecom Eng	BSc Eng	BSc Eng	BInf Tech
Students	174	174	174	174	174	174	174	174	174

The study results presented reflect the current situation in the use of ICT by students from domestic and university approaches. Table 2 shows an extract of the questions in the survey and its relation to the parameters to measure of the Internet usage. Regarding access to ICT at the university environment, we found that all students in the sample have access to computer equipment and the Internet at your universities.

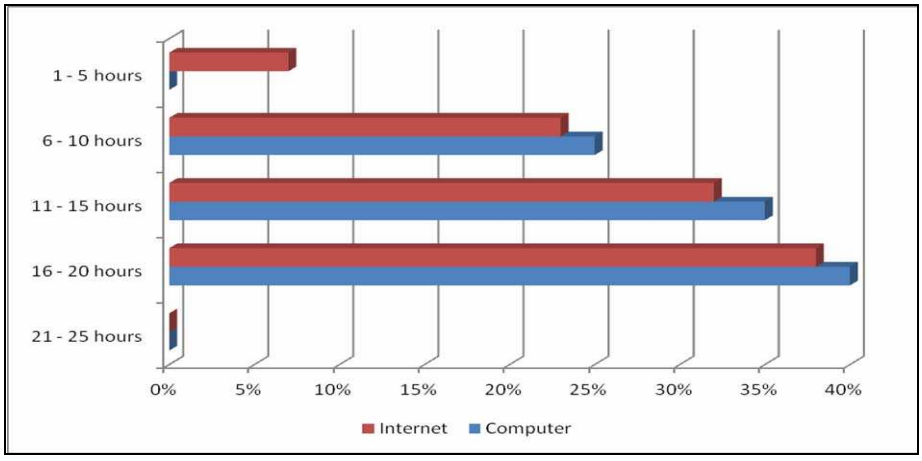
Table 2
Extract from the questionnaire applied

Internet use parameters	**Questionnaire items**
Frequency of use	How many hours a week you use the computer at home? How many hours a week using the Internet service in your home?
Type of Internet connection	What connection used for Internet service? What is the speed of internet service you use in your home?
Online activities	What type of information do you look on the Internet from home? What is the main purpose of the Internet usage at home?

Figure 4 shows the number of hours that IT students dedicated both to Internet usage as use of computers at campus. On one hand, the 25% of students used computers from 6 to 10 hours, 35% of students did it from 11 to 15 hours and the remaining 40% from 16 to 20 hours by week. The hours of use of computer equipment is showed both for educational approach as for browsing the Internet. On the other hand, the 7% used the Internet service from 1 to 5 hours, 23% used it from 6 to 10 hours, 32% of students surveyed used the Internet access from 11 to 15 hours, and the 38% of students use the Internet service from 16 to 20 hours by week.

Considering that all students have access to the Internet within their university, one of the parameters to be evaluated is the purpose of using Internet services. The study results shows that 75% of the students of the sample have as main objective the access to social networks, email services and interactive communication applications (chat), and only 25% use it primarily for educational or research. It is noteworthy that 5% of the total sample performs e-commerce occasionally and 15% carried out visits to news sites. Based on that ICTs facilitate access to information allowing participation both in social issues as political aspects (Shirazi et al., 2010), within the sample of students identified that IT does not participate and/or use the Internet to perform consultations related to e-health and e-government.

Figure 4
Frequency of use of computers and Internet access within the university campus



Source: Developed by the authors

Furthermore, the students who formed the study at the 45% have Internet service at home, through xDSL broadband connection. Figure 5 shows the Internet access

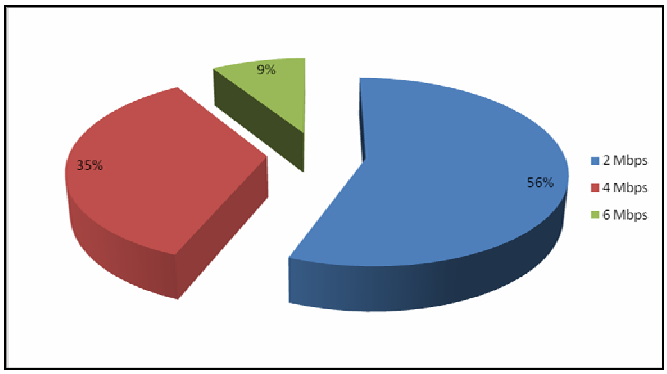
broadband classified by connection speed. The 56% surfing on the Internet with speeds up to 2 Mbps, 35% of the connections have speeds up to 4 Mbps, and 9% have a broadband link up to 6 Mbps. The 43% of the connections are through a USB or Ethernet cable between the computer and the modem/router, and the 57% of the connections are wireless between the computer and the modem.

Another indicator evaluated in the present study is the time (frequency of use / hours of use) that students use the computer and Internet at home, considering that 49% of students in the sample have access to a computer in their homes. Figure 6 shows that 20% of students use the computer from 6 to 10 hours, 36% of students did it from 11 to 15 hours, 34% use the computer equipment from 16 to 20 hours, and the 10% use the computers from 21 to 25 hours by week. With respect to the frequency of use of the Internet service, 4% of students accessed 1 to 5 hours, 23% from 6 to 10 hours, 34% use it from 11 to 15 hours, 30% use from 16 to 20 hours, and 9% of students use it from 21 to 25 hours a week.

In this case study of IT university students identified that the main purpose of Internet usage by students are communication and entertainment, as most of them focus on the use of Internet services as social networks (such as *facebook* and *twitter*), chats, blogs, wikis and email. A smaller percentage of students use the Internet service to support academic and research tasks. On the one hand, this behavior can be caused by the low level of implementation and limited use of tools based on Internet services, oriented teaching-learning process, by educational institutions (Duart et al., 2008; Castaño-Muñoz, 2010). On the other hand this behavior can also be caused by the environment in which in which university students develop themselves today.

Figure 5

Connection speed to Internet used by the university students in their homes



Source: Developed by the authors

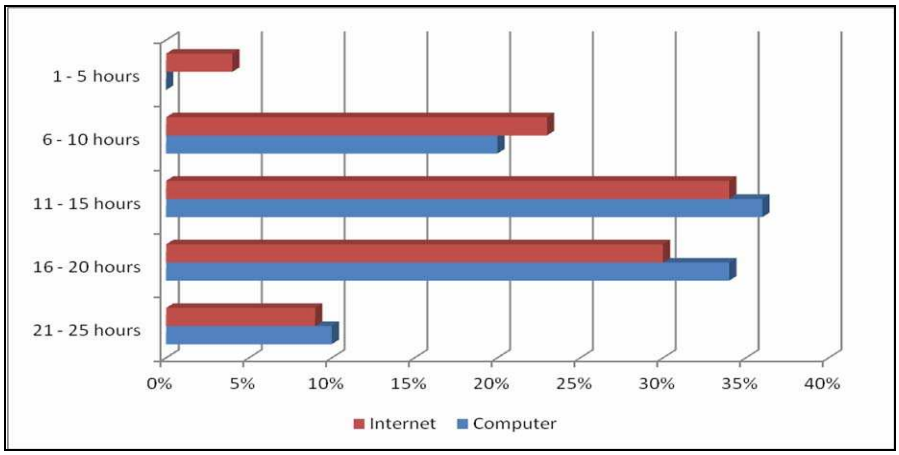
4. Mobile telephony, the immediate future of Internet access

The use of ICT services, such as mobile telephony and the Internet, continues growing up around the world (ITU, 2010). This has been driven by the development and refinement of various technological resources that allow access to information in an efficient and immediate.

Consequently, the sector of mobile broadband has evolved rapidly because of its widespread presence feature, new service plans offered, and flexible payment terms. Therefore, the demand for access to high-speed mobile Internet has increased, and this increases the number of Internet users. This is presented both in the developed countries as in developing countries, despite the economic variables that might influence the generation and utilization of such resources (Ramirez and Burgos, 2010).

The use of mobile phones and the Internet has been increased significantly over the past three years in Mexico. However, participation in the Internet continues to be low by OECD standards (World Economic Forum, 2009). In Mexico the offer for mobile broadband has become an engine of growth for the Internet access service, as it facilitates the deployment of communication networks in remote areas, where there is usually no other connectivity (CEPAL, 2010), allowing more citizens to access the benefits of ICT.

Figure 6
Frequency of use of computers and the Internet by university students in their homes



Source: Developed by the authors

Mobile telephony is the ICT segment which will continue increasing, moreover the number of active mobile phones will rise, exceeding the 870 mobile phones per 1,000 people in Mexico (Everis, 2011), of which a significant percentage will include plans of data to Internet access.

5. Conclusions

Nowadays, the optimal implementation of ICT in all areas is an essential requirement to participate in a global increasingly dependent society on technology. ICT is a key element in the information society, therefore, those communities promoting the development of its infrastructure, and adequate preparation to use them efficiently, will have a great capacity of decision and influence in building the knowledge society. In this paper has examined computer and Internet adoption in México based on a nationwide survey of individuals/homes by INEGI in 2010. The result analysis shows that age of user, socioeconomic status, related to lifestyle and annual income of the inhabitants of the country, are the important drivers for adoption and Internet usage.

Furthermore, in the case study presented, which is integrated by students in IT careers, the result analysis indicate that university students use the Internet mainly for entertainment and communication, considerably exceeding the educational or research purposes, adverse situation if they are to reduce the digital divide. When the university institutions engage students in generating knowledge through appropriate strategies and leveraging resources based on ICT services, there will be a larger possibility of closing the digital divide, thereby increasing the opportunities for development and improvement.

Moreover, in recent years significant progress has been achieved in terms of equipment and access to ICT services, which has reduced somewhat the digital divide. Results of several studies forecast that mobile phones will overtake telephone fixed-line, increasing the number of Internet users through mobile broadband network. However, the challenge is to overcome regarding the purpose of use of the Internet.

Finally, important factors reducing the digital divide variables are: capacity development and skills required to use ICT, the intensity of use of the integrated resources in technology, and the purpose of use of the Internet by individuals; is the increasing involvement of multidisciplinary groups in public policy to ensure that a greater number of research lines and knowledge generation (research and development, R+D) in the field of ICT, in order to certify their effectiveness, from the viewpoints economic, social and cultural.

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SOCIAL POLICIES OF INCLUSION OF THE PEOPLE WITH PHYSICAL DISABILITIES IN ROMANIA – SOCIAL DIAGNOSIS

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Abstract: *The paper aims to debate this particularly complex phenomenon, aims to be a social diagnosis of the social policies for the people with disabilities from Romania. After a brief review of the concepts and relevance of some sociological theories on the disability as social problems, of the special character of the needs of the people with disabilities, we make a social diagnosis of this problem. For a better understanding of the topic we will present the parts involved in this process, the factors contributing to the social reintegration of the people with disabilities, the principles governing the policies for the social reintegration of the people with disabilities, we will show the current statistics, the legal framework of this problem, the causes and effects of the exclusion of the people with disabilities and the dynamics and running strategies. For the truly disadvantaged people with disabilities, the measures of social protection seem to be insufficient.*

Keywords: *people with disabilities, handicap, social policies, social diagnosis, discrimination, social inclusion*

1. Conceptual and theoretic framework regarding the people with disabilities

1.1. Conceptual delimitations, definitions

In Romania we often use the term of handicap; the handicap makes reference to social disadvantages and to unequal opportunities. Most often it is associated to

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