



# *ICT in UNAN-Managua, growth and development, 2015-2016*

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*“The flexibility that higher education institutions possess to get adapted to the necessities of the current society goes through the exploitation of information and communication technologies during the teaching process. Nevertheless, it implies a change of ideas in the student-user, changes in the teachers, and administrative changes regarding the design and distribution of education and the communication systems that the institution establishes.” (Salinas, 1999).*

## **SUMMARY**

This article explains, as a justification, the impact of ICTS through the SIU-DT in UNAN-MANAGUA, impact on teaching, research, university extension and internationalization. A brief description of its evolution up to the present time is being made with the purpose of presenting how it has been giving Computer Technology answers to all Faculties, Research Centers and Administrative Units.

These increasing impacts are precisely due to the right decision making in favor of Quality in all processes; for this reason, since the rectorate has been investing steadily, to also maintain a growth and development of ICTS, and enhance the use and its academic and administrative applications.

## **INTRODUCTION**

Any country, in order to advance its development, has to invest in ICTS. The ICTS has intervened significantly in the cultural, social, economic development and in the development

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of the technology itself, its value is incalculable. Companies, institutions, people, need these tools to minimize costs, diversify the market, enhance the quality of the processes, let alone the educational, which is so much aided by these tools: Data show, Tablet, Mobile phones, Video conferences, and others. Nicaragua, as a country, is advancing on this route, seeking to invest in technology for future development.

Educationally speaking, investments in technology in UNAN-MANAGUA, have been growing each year, since it is a necessity that teachers and researchers demand to fulfill with higher quality their work both teaching and research. The importance of ICTS for the development of other university functions, such as Extension, Internationalization and Management itself, cannot be ignored.

In the knowledge society, no one should take for granted that everyone knows or knows everything. Every day people learn something new, moreover, it is necessary to take into account that the knowledge received in primary, secondary and in the university itself, are not the necessary ones to carry out in the social and labor life. ICTSs provide the complementary tools to reach this stage, to have an updated knowledge, but at the same time very biased. Why? We hardly know a little about the area of our specialty in which we form and know less those other areas that by general culture we want to document or internalize something new. Knowledge today is very changing; what yesterday was true about reality for certain phenomena, hours later, that truth can completely change.

ICTS in UNAN-MANAGUA have taken a very important turn and are focused on meeting all the student's demand, which for different reasons cannot enter the campuses spread throughout the territory. Now, on the principle of equity, it will be possible to virtually provide greater access to higher education.

With the use of ICTS, the teaching-learning process is favored; these help the pedagogical-didactic methods used by both teachers to promote teaching and collaborative learning, as well as the student's autonomous learning.

Recently, UNAN-MANAGUA, through the Department of Degree teaching, has informed that they will evaluate the curriculum taking advantage of the ICTS. It is important to recognize that the use and potential of ICTS allows, among other things:

- Access to all kinds of information.
- All types of data processing, quickly and reliably.
- Channels of immediate, synchronous and asynchronous communication to disseminate information and contact any person or institution in the world.

ICTS will be the most important resource in the present century, for universities, institutes, secondary and primary schools. From Preschool, coverage will be required to give better and greater fulfillment to one of the challenges of the millennium. Many children, young people and adults in general, technicians and professionals will demand virtual education. The presence-based approach is being a little relegated, the education of the future will depend on the use of ICTS in all of its modalities and forms.

The Department of Degree Teaching is developing a curricular evaluation process in its Faculties and the Polytechnic Institute of Health “Luis Felipe Moncada” (POLISAL), with the objective of identifying strengths and weaknesses of the 2013 Curriculum of the different careers that offers UNAN-MANAGUA and thus improve the quality of the professionals it forms.

To this end, it has conducted training workshops with the teachers of the different Departments on the SPSS system (*Stark Product and Service Solutions*, also known as: *Statistical Package for the Social Sciences*), a system for the handling and processing of data that will serve as a tool to analyze statistically aspects related to career profile, administrative actions, use of technology during classes, social outreach activities, among others.

Another group of teachers from the Faculty of Sciences, for example, receive a specialized course on Microsoft to be certified in these new technologies, others already received it at the beginning of the year (certified by the company Microsoft), course at Masters level, implemented to specialize teachers to optimize the use of ICTS in the development of their classes.

## GOALS

1. To present to the university community and population in general, the growth and development of ICTS in UNAN-MANAGUA.
2. To describe what the impacts of ICTS in teaching, research and university extension have been.
3. To highlight the funds invested in services, equipment and IT resources in the SIU-DT in UNAN MANAGUA.

## BACKGROUND

The Directorate of Information Systems and Technological Development at UNAN-MANAGUA, started in 2004, known at that time as the ICTS Project. As of that year, a new conception has been created and for this, the entire infrastructure of networks and servers began to be developed to meet all the demands and ICTS services of the different academic and administrative units. Practically, reengineering was given throughout this unit or system.

At that time, UNAN-MANAGUA had machines that did not have the necessary capacity to manage the automated information or to provide the services demanded at that time; only met the demands of the RURD Central Library. The contracted personnel, mainly the technical personnel, in the period 2005-2016, has been forming and experiencing along the way. Today, the human talent of the SIU-DT unit has qualified technical and professional staff. It has specialists in Servers, Computer Security, Telematics, Electronic Engineers, all certified by Microsoft. The type of infrastructure currently being developed at UNAN-MANAGUA is one of the most competitive, but in addition, software has been developed that has boosted technological advances in Faculties, Centers and Institutes.

Likewise, the teams with which the demands of all the academic and administrative units are met have been improving their capacity and quality. It can be seen in the final tables that reflect the budget investment, equipment and services that have allowed the favorable conditions to meet the demand for services and the information technology required,

UNAN-MANAGUA is one of the Public Universities, at national level, better equipped and with the equipment and infrastructure better developed (Gerardo Paz, Technician of SIU-DT).

### **Transition and Development of ICTS in UNAN-Managua**

Justin García, SIU-DT technician with three and a half years of service and Derman Zepeda, current Director, show that the Student Academic Register has ICTS applications since the 1980s. In the 1990s, UNAN-MANAGUA invested more in computer equipment, equipping all Faculties and Polytechnic Institute of Health (IPS). The first computer labs were built for related careers. It is from year 95 that the local networks (ISDN)<sup>1</sup> are introduced; at the end of the decade, UNAN-MANAGUA, had interconnected to the Internet a good part of its equipment, mainly the offices of the addresses and the computer labs. In 2000 the first NODO with internal telephone network was installed. This node also provided all kinds of services related to the higher instances, Faculties and Centers and Research Institutes.

In 2005, a local network that worked for the entire University was developed for the first time. All the pavilions had Internet access. Teachers were already willing to use the technical means in the classroom directly.

Among other services provided by this unit were, for example:

- Closed User Group
- Caller ID
- RestrICTsing caller ID

1. Digital Network of Integrated Services. Available in: <http://informatica.uv.es/iiguia/AER/Tema8.pdf>

- Identification of connected user
- RestrICTsion of connected user identification
- Call waiting identification
- Direct dialing of extensions
- Conference to three
- Call forwarding
- Call transfer
- Tariff and consumption information

From 2005 to 2016, the investment in media and equipment for the Direction of the SIU DT and the Faculties has been as much in equipment and means, as in its growth and development of Information Systems. Only in the last two years, 2015 and 2016, almost C\$37 million of córdobas have been invested (*see annexes*), an advantageous situation for the university, because it has the means, infrastructure and technical and professional personnel trained to provide the services through the different Information Systems currently developed.

Currently, the university is in charge of the data and communication network that comprises the networks located in the FAREM, Economic Sciences, Ricardo Morales Avilés Campus, Aquatic Resources Research Center, Rubén Darío University Campus, and is the creative unit of the information systems. In addition, special spaces have been created for “KIOSKOS” students with Wi-Fi links in all areas of the Rubén Darío University Campus, the same happens in all FAREM’s (C\$3 million córdobas has been invested). All Faculties have a space for videoconferences with the necessary technological conditions to connect at any time, with any national or international institution or university.

Information and Communication Technologies, also known as ICTS<sup>2</sup>, *"are the set of technologies developed to manage information and send it from one place to another. For this reason, the use of telecommunication networks in education is applied in distance education. It should be noted that, university institutions are in transition. For this reason, distance education can become a little strong, due to the fact that sometimes there may be some problems, as far as the communication of the networks, but now they are not only given at a distance but also that their use is applied in classroom teaching, showing benefits."*

Juan Navas, with almost 15 years of services in this unit, mentions the need for Certification of SIU-DT, *"we already have the conditions created and to be even more competitive, certification is necessary."*

2. <http://aprendeenlinea.udea.edu.co/lms/investigacion/mod/page/view.php?id=3118>

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The interviewees consider it important to train (and they are willing to do) teachers and researchers on ICTS and its potentialities as an information tool, their ignorance implies misuse of the means and equipment, but above all, they lose the opportunity provided by these tools to optimize the quality of their classes and the development of learnings and abilities of students. Finally, they suggest to establish contact with the GRUN (Government of Reconciliation and National Unity), to optimize the use of Broadband recently introduced in Nicaragua.

**Services offered by TIC UNAN- MANAGUA, FAREM-CHONTALES**

1. Training in Moodle and technological tools for the education of teachers from FAREM-CHONTALES
2. Acquisition of multimedia equipment to support teaching work
3. Online Courses and Videoconferences
4. Elaboration of printed and digital material of university projection:
  - a. My Account
  - b. Advertising Spot
  - c. Banner
  - d. Journals
  - e. Diptychs and Triptychs
5. Creation of Applications and Administrative Systems, Website Development
  - a. Technologies HTML5, Angular, React, Javascript, NodeJS, among others
  - b. Academic and Administrative Management Systems
6. Structured cable and server configuration
  - a. DHCP, PROXY, network cabling
  - b. Conforming ICTS area
  - c. Area of software development, Web applications for companies
  - d. Dedicated server for testing, development and production
  - e. Equipment: HD Cameras, Professional MICROPHONES

**Services offered by TIC UNAN-MANAGUA, FAREM-CHONTALES**

1. Courses and semi-daily and classroom training, aimed at the social and educational sector oriented to the use of ICTS as a necessary tool in daily life



2. Maintenance of hardware and software to computer equipment
3. Multimedia services (videos, images, radio programs and television)
4. Web Page Design and Information Systems
5. Web Hosting
6. Design and installation of networks
7. Technical advice
8. Recording music groups
9. Carrying out companies and institutions
10. Installing and Configuring Servers
11. Technical advice to municipalities

### **Impact of ICTS in UNAN-MANAGUA**

The impact of ICTS, after investing more than C\$ 37 million córdobas, is incalculable. These are intangible impacts, in addition, to improve the teaching-learning process. ICTS has changed the institutional culture and all its members; for example, the amount of C\$ 1,000 per student<sup>3</sup> (Degree and Postgraduate) is invested in this period. Practically, C\$ 3.7 million is invested by faculty, but how to measure the impact on learning? how to quantify the impact of value added to the university? How to quantify the skills, abilities and skills developed by ICTS users? How to measure the volume of information available and accumulated by the knowledge society?

It should be noted that, with state funds, each Faculty, Center and Institute invests year by year in technology. Each year the different Faculties, Centers and Institutes manage other forms of financing ICTS. Medicine, Optometry, POLISAL, LAF-RAM, among other academic units, systematically exchange knowledge, technology, technology transfer, medical equipment.

The process of scientific research is also strengthened by the use and application of ICTSs of those researchers who have knowledge and apply it in their thesis, from the presentation and in all its contents, nothing better than to use Office of enhancement and aesthetics in his presentation.

In both qualitative and quantitative studies, different computer programs are used for the use of descriptive statistics, such as inferential statistics. The latter using the statistical package: SPSS (*Statistical Product and Service Solutions*). Currently, most research is mixed, so researchers use different sources, blogs, websites; look for repositories of indexed and impact

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3. Student population: 37 000 enrolled students, 2016

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journals to substantiate their thesis. ICTS provide technological tools to innovators, who make models of simulation of different prototypes.

Furthermore, many UNAN-MANAGUA research works are carried out with the purpose of determining and delimiting how much use and applications teachers make during the teaching-learning process. This will be an important input to continue making sound decisions in this matter.

With these tools a great amount of data is handled, which, processed correctly, allows to make better decisions for the teacher, student, the collaborator, the merchant, the industrialist, the Rector, for the entire society as a whole.

The Internet provides tools to improve the traditional information and communication channels of distance education, allowing students greater control of their work and the teaching staff, a better monitoring of activities carried out by students.

In the eighteenth century, the rise of radio and TV, the student, for example, received and listened to what these media spread. He had to be aware of some knowledge. At the present time it is the opposite, with the Internet, for example, you listen and study what you want and at any time you manage the information you are interested in, in addition, the Internet reduces the need for infrastructure to develop the teaching-learning process and less cost. Communication is versatile, through e-mail, chat, mobile phone, Tablet, computer, it reduces distance and time. Currently a product is purchased via the Internet, a transaction is made via mobile wallet. This is done, for example, in UNAN-MANAGUA, at the same time as the students manage a series of information that was previously a problem: print the semester grades from a “cyber” (business that sells ICTS services) in any part of Nicaragua, receive their scholarship or economic stipend via bank debit card, connect with their teacher via mobile phone, by mail, or by any social network.

ICTs provide administrative facilities for teachers: obtaining lists of students, provisional submission of report cards. Administrative facilities for students: check their grades and perform certain bureaucratic and other procedures. Links can be provided to other university web pages (or other institutions) that can provide information and services of interest to students. Today, videoconferencing services are very common for exchanging knowledge, techniques, information and communication within and between universities. In addition, economic resources and time are saved, as people move from the faculty of origin to Managua.

At the national level, the telephone service has been growing significantly, so, for example, between 2010 and 2015, demand has doubled. According to the document, in 2008,

in Nicaragua there were only 19,280 Facebook profiles. However, in eight years, the number of accounts has grown by as much as 77.8 times.

For Manuel Diaz, manager of Listo Marketing, *“these numbers refer not only to inhabitants in Nicaragua, but people who can live in another country, but is Nicaraguan or vice versa, a foreigner who at some point settled in Nicaragua.”*

On the other hand, another factor that affects this enormous growth is that many users who do not have constant access to the Internet usually have more than one account in this social network. *“The most common scenario is that he had access to a computer with Internet, he created his account. He had access later, but he created another account because he does not remember the key or the email”*, added Diaz (Metro de Nicaragua, July 13, 2015. See Annex Users).

You can see in the annexes that there are several companies dedicated to the sale of ICT services that have a socio-economic impact in the country. At the same time, it provides a characterization of where we are going and how we are today in ICTS.

This is an opportunity that teachers have to enhance the use of the cell phone. In the university classrooms, almost 90% of the students carry cell phones with Internet services, another good percentage uses it in the corridors where there is a Wi-Fi connection. While it is true that PCs and Tablets are used to do assigned tasks, it is also true that they are used to connect to social networks.

With the use of ICTs, it is necessary to create friendly platforms with the devices, inside and outside the classroom. Students should use these devices to receive, exchange, download, and transfer information for themselves, the tutor and their co-workers. This would have its advantages in the sense of ensuring a good class session with better student discipline. It prevents them from connecting for a while to social networks, which may be unproductive for the same student.

There is a cultural impact with the use of technology, as it facilitates the use of ICTs from every point of view and from different forms and circumstances. In this century, where ICTs have proliferated, there are still hermit professors in technology, they do not accept the versatility of these, and they do not like to be trained in this sense. This paradigm must be broken and we have to start now!

From the social point of view, the social use of technology and its access from the university is a social impact, there is greater sociability among the working groups, both students, teachers and administrators; communication is encouraged, contacts and knowledge are increased. Currently, in many Central Parks of the country there is Wifi available for society, mainly for young Nicaraguans. Starting in 2017, mobile is a very important instrument for all

those students who want to study at the Open University Online from any remote area of the country: a new cultural paradigm.

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**ANNEXES**

*Table 1. Investments in ICT, UNAN-Managua 2015-2016*

No	Name of the processes 2016	Budget
1	Licensing for the data center of the UNAN - Managua	C\$ 480,000.00
2	Server chassis with capacity up to 8 servers blades, 2 servers blades installed	C\$ 1,600,000.00
3	Hardware and parts for the UNAN data center - Managua	C\$ 1,615,000.00
4	Office remodeling service SIUDT	C\$ 245,000.00
	Acquisition of Electrical Materials for the UNAN-Managua Data Center	C\$ 160,000.00
	Furniture supply service for the SIUDT office	C\$ 307,500.00
5	Active devices and complementary audiovisual accessories for the network and streaming system of the UNAN-Managua	C\$ 270,000.00
	Materials and tools for the maintenance of the fiber and copper network of UNAN-Managua	C\$ 300,000.00
	Support and maintenance services for power and electrical protection devices of UNAN-Managua	C\$ 230,000.00
6	Acquisition of equipment for the wireless network of the UNAN Managua	C\$ 2,000,000.00
7	Structured cabling for RURD and FAREM Carazo	C\$ 650,000.00
8	Data and Internet Links for the UNAN - Managua (Annual Payment)	C\$ 4,000,000.00
9	Acquisition of Subscription for Microsoft Desktop Education Licensing for (two hundred and fifty) users. Dsktp Edu ALNG Lic SAPk OLV E 1Y Acdmc Ent Quantity: 250 users. Open Value Subscription.	C\$ 500,000.00
10	Antivirus Licensing	C\$ 500,000.00
11	Acquisition of licenses for Microsoft Certifications - 250 MTA; 500 MOS - 250 MCE	C\$ 285,000.00
12	Extension of Internet Contract (1 month)	C\$ 41,030.80
13	Electrical Materials, Datacenter	C\$ 2,319.55
	<b>Total invested</b>	<b>C\$ 13,185,850.35</b>

Table 2. Investments in ICT, 2016

No	Name of the processes 2015	Budget
1	Purchase of materials and tools for the maintenance of the fiber cables of the Rubén Darío Campus.	C\$ 124,279.86
2	Purchase of hardware for SAN and NAS for the data center of UNAN-Managua	C\$ 293,702.80
3	Purchase of software license software for the data center of UNAN-Managua	C\$ 449,733.13
4	Purchase of disposable for UNAN-Managua	C\$ 448,236.86
5	Purchase of unit server type rack in order to amplify the capacities of cluster of UNAN-Managua	C\$ 396,750.00
6	Purchase 2 memory kit of 128GB for servers DELL R72, servitag 1er server 5LHRV12; servitag 2do server: 2475FX1 of the Rubén Darío Campus	C\$ 108,640.00
7	Purchase and installation of infrastructure of wireless network of Rubén Darío Campus / UNAN (Second phase)	C\$ 500,000.00
8	Purchase of disposable for SAN and access to Rubén Darío Campus UNAN Managua	C\$ 500,000.00
9	Purchase of air conditioning inrow 33,000 BTU and installation service for the data center of Rubén Darío Campus	C\$ 250,000.00
10	Power source for Cisco equipment 4500	C\$ 100,000.00
11	Purchase of disposable and implementation services for the telephone system of IP de la UNAN-Managua	C\$ 494,809.23
12	Purchase and installation of infrastructure of wireless network of the Rubén Darío Campus /UNAN (First phase)	C\$ 273,507.31
13	Purchase of structured cable for UNAN-Managua	C\$ 489,623.41
14	Conference room for the faculties of science engineering, education and languages and medical sciences, IPS (POLISAL) of UNAN Managua	C\$ 2,000,000.00
15	Purchase of structured cable for FAREM Carazo	C\$ 270,020.00
16	Service of internet and data links for UNAN Managua	C\$ 3,250,551.50
17	Purchase of 2500 antiviruses license for UNAN Managua	C\$ 463,456.00
18	Microsoft certifications	C\$ 98,000.00
19	Maintenance of the center data of Rubén Darío Campus UNAN Managua	C\$ 400,000.00
20	Live Streaming Transmission system from the auditoriums of Rubén Darío Campus / UNAN-Managua	C\$ 191,076.13
	<b>Total invested</b>	<b>C\$ 11,102,386.23</b>

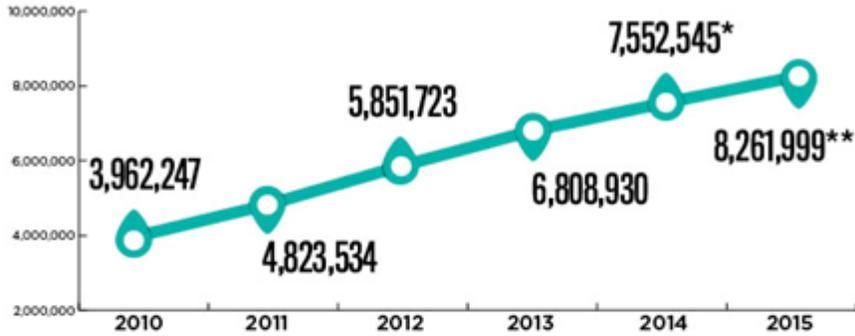
Table 3. Current ICT projects in Regional Faculties from Carazo, Chontales, Estelí and Matagalpa

No.	Project 's Name
1	Acoustic Conditioning and Lighting by USAV FAREM-Carazo.
2	Insertion of optical fiber Claro company to provide Internet services with a bandwidth of 40 megs and 20 megas of data.
3	Change of optical fiber from the network area located in building Torreón Universitario, Postgraduate and Laboratories.
4	Fiber Optic Redundancy from the Network Area, Library, Juan Sánchez and Lab 3.
5	Insertion of the company's clear optical fiber to carry data and internet services at the Santiago Regional School Hospital.
6	Installation of a stretch of optical fiber in the Augusto C. Sandino building to carry internet service through data.
7	Acquisition of electrical backup for 6 hours.
8	Development of Virtual Platform for MOOC Courses.
9	Training in Micro Robotics.
10	Training Program for the development of skills for ICTS staff.
11	Diploma in Music Education.
12	Execution of a Diploma in Music Production.
13	Acquisition of Equipment for the USAV area (18TB NAS for storage of generated materials) and Video Capture and Streaming.
14	Acquisition of 5 smart datashows.
15	Acquire a fully equipped Video Conference room.

## USERS

The average growth rate of telephone services in Nicaragua is of 743, 615 new users every year.

Cellphone lines from 2010 to 2015



\*Adding the average annual growth of the last five years

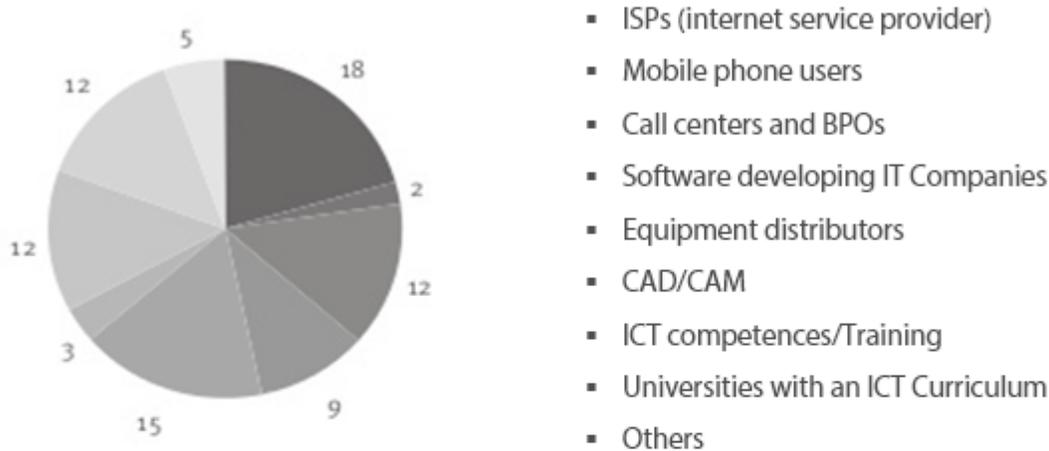
\*\*Based on the 2015 growth projection announced by the government

Figure 1. Translation of the figure "The average growth rate of telephone services in Nicaragua". **Source:** <http://www.elnuevodiario.com.ni/economia/340854-fiebre-nicaragua-smartphones/>

### 3. GENERAL PROFILE OF ICT COMPANIES IN NICARAGUA

It is challenging to determine how many companies are part of the ICT sector in Nicaragua. The main reason is the lack of updated public and private statistics. However, even though the ICT sector in Nicaragua is new and slightly structured, evidence shows that the wireless and fixed convergence has transformed the way enterprises reach out to their customers. The interviews carried out in this study indicate that there are around 88 companies that work with different branches of ICT. The following chart shows its distribution.

#### ICT Sector. Distribution of Companies



The portfolio of ICT business customers is divided into the private sector (60-80%) and the government (20-40%). The last year, firms obtained 25% of the government contracts only, while the remaining 75% was given to companies abroad. The ICT sector, according to estimates by ProNicaragua and The Central Bank, has grown 17% annually for four years in a row. In 2005, the sales revenue totaled U\$ 12.5 million dollars, while in 2008, this revenue reached U\$33 million. Out of it, U\$15 million were generated by BPO's and Contact centers.

#### 3.1. ICT organizations

Although there is not a company that represents the interests of the ICT sector in Nicaragua, it is worth mentioning that several initiatives have been created to support this sector. CONICYT (the Nicaraguan Council of Science and Technology) and the Ministry of development, Industry and Commerce have collaborated with the World Bank and the Swedish Agency for International Development (ASDI) in the elaboration of national ICT strategies. Currently, there is an initiative to organize an ICT chamber of commerce, in collaboration with the Top Council of Private Enterprise (COSEP). To this day, most of the union work has been conducted through the Industry Chamber and the Chamber of Commerce.

There is also the Nicaraguan Association of Internet (AIN) founded in 2002. It is a non-profit with the purpose of unifying and coordinating the internet service providers and all academic institutions whose efforts go in the same direction. There is also a local chapter in Nicaragua of the International Association of Outsourcing Professionals (IAOP) that gathers the largest Call Centers and BPOs providers.

Figure 2. General profile of ICT companies in Nicaragua **Source:** Document "Oportunidades de negocio en el sector de las Tecnologías de Información y Comunicaciones" published by Ministry of Foreign Affairs of Denmark (p. 9)