CONTENTS

LIST OF TABLES AND GRAPHS

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ABSTRACT

Developed countries rely ever more on Information and Communication Technologies (ICTs) for education, research and work. However, the cost of the media and the underdevelopment of developing countries such as Paraguay generate a gap between the sector of the world population that has access to ICTs and the sector that does not. The same aspects of this technology that can make a difference towards increasing inequality between developed and developing countries can make a difference in bridging the gap. Since there is evidence that the use of this technology will continue to spread, it is necessary that universities align their strategies to incorporate the changes ICTs bring. This ICT phenomenon and its influence on education come coupled with greater interaction among peers, greater emphasis on transdisciplinary research, testing and analysis as well as in interdisciplinary scrutiny. These represent the core characteristics of Research Mode 2, Design Thinking and Knowledge Management, a move away from more traditional instruction methods.

The National University of Asuncion (UNA) through its University Outreach Program (UOP) proposes to engage the problems of society in accordance to the current trends in research and education. It proposes to reach out to society by means of its staff, teachers, professors and students, presenting projects to deal with real social problems and then using the results to restart a project cycle. This is well in accordance with a shift from Research Mode 1 to Research Mode 2 and with Design Thinking. This form of engagement allows the university to learn more about its environment, and through this knowledge change itself to offer what society needs in terms of education and research.

However, the UNA has not addressed a number of issues in its Statute and the General Guidelines for the University Outreach Program. The theoretical framework and the subsequent analysis show that it is necessary to establish an ICT-based Knowledge Management system – a key requirement for Research Mode 2 – in order to fully develop and deploy the University Outreach Program of the National University of Asuncion.

The implementation of such as system requires complete reviews of several components of the university. Some of the necessary reviews are related to 'soft' aspects, such as the General Guidelines of the University Outreach Program, the curriculums of every faculty and the hiring practices of the university as an initial step. The other parts are the 'hard' aspects, which would require some investment in acquiring equipment, training personnel and establishing partnerships. A lack of provision of the possible effects of leaving those issues unsolved could spark a series of problems of inadequacies in the Program, and impact society negatively.

KEYWORDS: Education, University Outreach, ICT, Stakeholders, Development

1. INTRODUCTION

The National University of Asuncion (UNA) is Paraguay's first university, founded in 1889. It is also the largest, offering sixty-nine different career options in twelve faculties, spread across fifteen districts in the country (Universidad Nacional de Asuncion 2009). It is the most attended university with almost forty thousand students and it is therefore also the most recognized university in the country (Universidad Nacional de Asuncion 2010a). As such, the university recognizes the importance of developing technology and knowledge, encouraging technology to have an impact on society. The UNA has ratified that importance in its Statute and has additionally proposed a major set of actions aimed at improving the development of technology and knowledge and the accessibility of that technology to society. This set of actions is called 'University Outreach Program' (UOP) or 'Proyecto de Extension Universitaria' as is the name in Spanish. The overarching goals of the University as an institution and of the Program are to develop the human person in national values, study the situation of the country and its needs, encourage research in all domains (areas of knowledge) and then put this knowledge to work to improve all aspects of society.

However, in stating the goals of the UOP and the means by which to achieve its goals, the UNA has not specified a number of aspects that must be taken into account to draft the plans and that are instrumental in carrying out the actions they proposed to achieve their goals. Although several points are stated clearly –such as the intended impact of the Program on quality of research and on society – important background situations and elements of information technology have not been mentioned. Since this is a time when the flow of information and the construction of data and knowledge bases are the keys to reaching the desired status in almost all domains, it is utmost important that information technology – and the lack thereof – be seriously taken into account as a factor that can affect research capabilities and social impact.

The questions raised in this work are related to the importance given by the National University of Asuncion to the various aspects mentioned above. The focus are on the effects of globalization on the digitalization of education, the changing face of research

due to these changes in education and the need to manage knowledge. In this sense, the field of information technology is currently regarded as a means by which to reach the goals of the University Outreach Program. Information technology has changed the way learning and research take place, as it provides the means to organize and document activities and make their results available to a wider audience in less time at lower costs.

In analyzing the importance of the use of information technology as a central piece of the UOP, four factors that are shaping educational and business activities in the country must be taken into account: a) the general degree of access of the population to the internet and the use of information and communication technologies (ICT) in education; b) the current and steady trend of sharing knowledge within and among organizations by means of ICT, and the changes this requires in education; c) the introduction of the concept of the Third Task in university education and d) the globalization of economy. The present work delves into these issues by analyzing relevant bodies of literature to provide a framework that consists of the current situation of education at a Paraguayan national level as well as at an international level, the use of ICTs both at school and outside it and the need to incorporate ICTs to improve research capabilities.

The current situations is compared to what is proposed in the Statute of the National University of Asuncion and its General Guidelines for the Outreach Program to establish the degree to which it addresses the needs identified earlier. The relevance of such analysis and comparison lies in the need to know if the university is well oriented to suit the needs of society that it seeks to address or if it should enhance certain aspects of its goals and means.

2. BACKGROUND OF THE PROBLEM

2.1 The Information/ Knowledge Society

The next six points illustrate the rise of what is nowadays called 'the information society' and 'the knowledge society', the latter being the term chosen as the focus of this piece. Knowledge societies are the ones formed after the industrial revolution, in which the prime source of income and status is knowledge, both for individuals and for organizations. Knowledge Societies are formed based on Information Societies. Information societies are the ones in which information is readily available in a variety of means. A knowledge society is the one in which the information has been put to use to develop further, adding value to goods by applying knowledge to enhance them (Papoutsakis & Valles 2006). In the latter, there is a shift from production of physical goods as the main producer of income, to the provision of services as the main source of income (UNESCO 2005b: 18) (see section 4.2.1. for the three kinds of knowledge). An important characteristic of knowledge societies is that information permeates every aspect of them. Another equally important characteristic is the interconnectedness of activities and the impact of this interconnectedness in the way people interact with each other and with their governments (European Commission 2010). This is also a major factor for greater development, innovation and productivity in the developed world. At the same time, the lack of connectedness and sharing of innovation in the developing world is seen as the responsible factor for the differences in development between developing and developed countries – a phenomenon termed 'the digital divide' (UNESCO 2005b: 18). These points establish some comparisons between developed and developing countries – such as Paraguay in this piece – so as to then set and clarify the research objectives.

2.2 A Forum for Discussion

At the time of the shaping of Europe into the cluster of nations as we know it now, the theater was one of the most important factors. The theater allowed people to unite,

represent what was happening in their environments and form their own sets of values as well as their own identities. One important aspect that must be pointed out here is that the theater provided people not only with a place to practice a form of art or where to let others hear compositions, it was rather a place where people could meet, present points of view, share information and build on their knowledge. The idea behind having a theater was to have a "forum… …or public sphere… … an intellectual space for egalitarian exchange and communal reflection of matters of common importance" (Leerssen 2006: 96). That was the real power of the theater, allowing people to grow in knowledge and organize. The same is true today, except that two spheres have replaced the theater stage. The first sphere is a physical gathering of individuals seeking intellectual development: the university. The second sphere is a digital and interconnected platform that likewise has the capabilities to unite people and to allow them to form their own identities and adopt their own values: the Internet.

Nowadays, the university can serve the same purpose as the theater in those times and become the public sphere. Due to the heterogeneity of its student population – derived from its varied body of students (De Wit, Jaramillo, Gacel-Ávila & Knight 2005: 43) – and the variety of social organizations that depend upon its infrastructure, its teaching and its research, it can serve as the aforementioned forum for discussion. In this forum all domains of knowledge can come together to discuss matters upon the input it could receive from those around it. However, in order to do so, it must have current information regarding what is happening in all mayor areas of knowledge and of social affairs. At the same time, the university must not forget that all such areas are relying on one great tool to advance faster: the Internet. In this case, the university may become or remain the physical location of the public sphere, while the internet becomes the transmitter of messages and knowledge to the audience.

There is criticism against this view though, especially from developing nations. In 2007, Nigerian Education Minister Dr Igwe Aja-Nwachukwu stated that there was no point in increasing access to technology when most people in the developing world study at schools that have "no roof, no chairs, no uniforms and practically no facilities" (quoted in McDonald 2009: 36-37). In a similar vein, Nouria Benghabrit-Remaoun states that a

simple increase in access to technology is not beneficial if the environment in which it is deployed is not stable and does not allow the technology to remain for long (Sörlin and Vessuri 2007: 111). However, when establishing parallels between the modern world and 15th and 16th century Europe, it can be seen that five centuries back there were few facilities and few people were schooled, yet there was a platform for public debate about what was to be done to overcome the situation at the time. The same could be said of developing countries today: it is true that there are few facilities, but the necessary facilities are already in place or do not necessarily cost much to deploy if done correctly (Gill 2009: 02). What is more, the greatest difference between developed and developing nations is access to knowledge (Stiglitz 2008: 1694). Therefore, the greatest need in developing countries is also free access to knowledge. In the modern world, access to knowledge necessarily requires access to technology. Therefore, the necessary next step is that universities provide this access, since university education is already available to a great number of people worldwide. What a country in the situation of Paraguay would need is not only access to technology, it also requires an institution that can help establish a basis for the use of technology and that can educate people to use this access wisely.

The purpose of a university in the Humboldtian view, is to have freedom to do research, teach and study (Kantanen 2007: 38). Accordingly, there should be an interconnectedness of research, teaching and studies with the primary aim of educating and not that of training professionals. However, a number of factors impede this view from continuing to dominate the purpose of universities. One of these factors is that nowadays universities serve an audience that mainly seeks professional training and better career opportunities rather than 'formation' in its own right. This is another reason why it is important that universities become a hub for development: it trains future workers, owners of companies and public servants (Harding, Scott, Laske, & Burtscher 2007: 98-103). In its service as a development hub, it can give insight into problems and propose solutions. Nevertheless, a good point established by sociologist Niklas Luhmann is that the knowledge generated at universities tends to be theoretical and scientific. This makes it difficult to incorporate that knowledge in a practical environment where communication takes place with considerably different language

codes. (Rasche & Behnam 2009: 244). Therefore, the presence of universities is even more important: by becoming active actors and working in close cooperation with other organizations to promote development, they can disseminate their knowledge in 'user-friendly' language that will make it accessible to a wider audience –if not to all of society.

2.3 Materials for the Forum

The latest materials for the teaching and learning of disciplines are not always readily available in developing countries to suit local needs, and very often they are not available in the local language either. Likewise, the solutions to most problems in developing nations currently originate outside these countries (James 2009: 45), i.e. the solutions needed are not produced within the country but rather in foreign universities, institutions or organizations. This is especially true in more technical fields such as hardware and software engineering in communication (Stevenson 2009: 16-17), medical sciences and engineering (Stiglitz 2008: 1694), yet it is no less true when we analyze basic education programs and foreign language teaching (Rosenberger & Ramos 2008).

Following this line of thought and broadening the previous statement, there are two underlying assumptions: a) there are national problems that need to be solved and b) the solutions to those problems can be found mostly outside the country. However, there seems to be incongruence at the same time because there are national and international institutions that finance scholarships for students from different domains to specialize in universities abroad (Consejo Nacional de Ciencia y Tecnología 2007) while there are national universities that could be working locally on the problems identified at a national level. It is important to stress this, given that students who leave the country on scholarships or by their own means are usually successful in their studies abroad, while there is also a growing concern about intellectual capital migration worldwide (The Economist 2002: 24-28; Consejo Nacional de Ciencia y Tecnología 2010; De Wit, Jaramillo, Gacel-Ávila & Knight 2005: 39,62). Additionally, developing and developed countries usually face the following question: are developed nations better off because

they invest in research and development, or are they investing in research and development because they can afford it? The development of a country depends on the degree of access to knowledge that the average individual has (Stiglitz 2008: 1694), and the use that is given to that knowledge (this is discussed in more detail in the section about the different kinds of knowledge). This indicates that there is a need to have better access to data and information in order to develop the required knowledge locally, as well as the need to disseminate the knowledge produced locally to encourage local development.

2.4 Actors in the Forum:

The main unit of analysis in this work is the National University of Asuncion (UNA). The actors, also called stakeholders, of the UNA are those individuals and/or organizations to who it must answer in its actions and dealings, or "those groups without whose support the organization would cease to exist" (Jongbloed, Enders & Salerno 2008: 305). In order to point out its stakeholders, it is necessary to analyze the activities of the university and those taking part in them.

The UNA and its twelve faculties are already established as the main university in the country, and they fulfill the important role of training the students who will later become teachers, civil servants and employees at private or non-governmental organizations. As was explained earlier, these are the responsibilities of every university. The UNA has actually ratified its interest in doing so, as has been stated earlier and will be further discussed in the section about the Outreach Program. It is necessary to mention that there are several factors the National University of Asuncion does not have to struggle with: it has a steady influx of students, it is funded by the government and the students are already required to produce a certain level of research in order to pass courses and graduate. Here then, the main stakeholders can be identified: the students the university is training, the public offices and the government who will later receive the students as workers and the private sector who is in the same position as public offices in this regard.

2.5 The Need for a Forum

In all research done, it is necessary to compare one item to another in order to learn the differences and similarities so as to be able to understand both items better. As Woodrow Wilson, 28th president of the United States would word it: "So long as we know only ourselves, we know nothing" (quoted in Hyde, Parkes & Shafritz 2008: 20). However, most of the knowledge, expertise and best practices that the developing world receives from the developed world are ready-made products that are to be implemented and from which results are expected (Stevenson 2009: 2; Stiglitz 2008: 1705). Yet, if development means only implementing foreign systems in a certain country, there cannot be more comparisons than those focusing on the regional adaptations of similar plans that originated elsewhere.

On a parallel train of thought, there is the question of learning and reaching the level of wisdom (see section 4.2.1. about the three kinds of knowledge). If foreign systems are implemented in a country instead of a country taking the time to develop programs locally, how and where would they acquire the thorough knowledge and wisdom (see section 4.2.1 on page 30) that comes from the process of building a system that actually responds to local needs from the very beginning? In the world of education this is known as the impossibility to learn simply by distributing data. In order to say that a person has learned something, a learner must go through several stages, as described by Benjamin Bloom in his "taxonomy of learning" (Nérici 1992). In other words, learning and teaching are not mechanical emissive-receptive actions. Knowledge between people cannot be transmitted the same way as data between machines. This is especially true if we consider that machines do not think; they simply process information. Learning, teaching, knowledge transfer and reaching the level of wisdom in human communities, especially between very different communities, depend on several cultural, environmental and developmental factors (Laporte 2005).

Likewise, the transition of societies from agricultural to knowledge societies has come about due to the gathering of knowledge and building of updated knowledge on the previous knowledge. There is currently a strong emphasis on generating knowledge as a

substitute for material production, because knowledge leads to the improvement in mechanization and this translates into fewer work posts due to industrialization of material goods production. This in turn means that in order to have access to jobs, a higher level of knowledge is required. Knowledge has become the main producer of income for people in service societies (Stiglitz 2006). However, possession of knowledge alone is no longer all-important. The ability to produce the necessary knowledge has now become the challenge. This challenge is also a double-sided one, since there are four kinds of knowledge: explicit knowledge, know-how, tacit knowledge, and the knowledge to relate to others (see section 4.2.1.). Whereas the first two can be more or less easily codified and transmitted to others, the latter may not, making tacit knowledge not only important for being the real producer of explicit knowledge but also more difficult to keep. Thus, the situation is complex: not only is there a difference in the knowledge gathered in different parts of the world, but there is also a gap in knowledge generation and in the actions necessary to generate, keep and disseminate knowledge (Stiglitz 2008).

2.6 Building a Forum Common to All

An additional problem is that the solutions generated in any field in any part of the world tend to be stand-alone solutions. In other words, academia sees problems within an "instrumental rationality" framework. In this framework problems are seen and fixed within a "narrow-minded" context (Williams and Gunatunge 2000: 401). This becomes evident when we realize that universities teach careers and subjects as stand-alone units that focus only on certain aspects of society. This differentiation is also present after university instruction, as Joseph Stiglitz would point out in his review of global governance (Stiglitz 2004: 320). While this instrumental rationality framework may help identify problems, establish boundaries for analysis and ease part of the problem-solving process, it tends to create additional problems due to its restricted range of sight. This characteristic of university level education (and perhaps of education in general) causes barriers to be created between careers and subjects. To quote in full for lack of better words:

> New graduate engineers are ushered into the engineering environment and situated among other engineers—likewise the new recipients of a master's degree in business administration (MBAs) move into the nontechnical side of the business… …Business and technical collaboration, if present at all, is not emphasized or facilitated. The barriers between disciplines grow…. …Historically, associated professional organizations have further exacerbated this situation by not having a common vocabulary and not engendering collaboration… … Instinct replaces understanding, and when the product fails to satisfy, it is often attributed to the customer's "lack of appreciation". (Forsberg, Mooz & Cotterman 2005: 17)

In the same way, knowledge and solutions cannot be received, processed and understood by unprepared recipients; this necessarily includes any learning environment, and especially that of international cooperation and sharing of know-how. Again quoting Woodrow Wilson, "that man is blindly astray who denounces attempts to transplant foreign systems into his country; they would simply not grow there" (Hyde, Parkes & Shafritz 2008: 17). This brings up the following question: what is the cradle for the generation of knowledge in a country? A university is usually the place where students learn how to do research and where they hone their research skills. Universities are where the greater and better part of knowledge is generated (Stiglitz 2008: 1697). Since universities are the main hubs for the development of knowledge and know-how, developing countries such as Paraguay could consider paying closer attention to their models of university education. The underlying premise here is that universities are the in fact the center of knowledge advancement in a country and that therefore they can act as the center of development of locally-relevant solutions.

2.7 A Forum with Resources

Intellectual development in all universities is based on the availability of materials, especially in libraries and other means of storing not only data but also the knowledge developed from that data. Of course, no university would be what it is without the scholars who transform that knowledge into wisdom. There are then three important factors in the development of universities: a) the infrastructure factor composed of the

physical aspects of university, its buildings and premises; b) its capability to store knowledge and make it accessible to those who need it; and c) the human part of the university, its scholars and students who use the knowledge to reach the level of wisdom while doing research and also disseminating knowledge (see section 4.2.1.).

The last part of the previous paragraph requires that there be two constants in order for all to work successfully: a) a culture that promotes and encourages research and b) a system for the management of information to allow key activities to take place (Gill 2009). These activities are: a) reception of applications, inquiries and needs from as many different institutions as possible, b) the storage of this information so that it is available to all, and c) sharing of information with as many stakeholders from as many domains as possible. The more eyes look at a problem, the easier it is to tame it (Raymond 1999).

3. RESEARCH OBJECTIVES

3.1. General Objectives

The University Outreach Program seeks to implement a set of activities to improve the education it offers and its impact on society. The objective therefore is to evaluate qualitatively and formatively the Statue and the General Guidelines for the University Outreach Program of the National University of Asuncion in relation to the changes that are taking place in and around education.

3.2 Specific Objectives

a) Identify current factors shaping higher education internationally and nationally.
b) Identify the goals and objectives of the University Outreach Program of the National University of Asuncion as stated in the Statute of the National University of Asuncion and the General Guidelines for the Outreach Program.
c) Evaluate the University Outreach Program in relation to objectives a) and b).

3.3 Study approach and scope

The study is exploratory because there are no studies about the correspondence of the University Outreach Program to the trends shaping education at both national and international levels. It is also a case study because the piece analyzes only one case, that of the National University of Asuncion. It is qualitative because it does not rely on quantitative empirical data, but on an analysis of the qualities of the context of the program and the program itself. It is formative because its aim is to “strengthen or improve the object being evaluated” (Trochim 2006).

According to (Trochim 2006) an evaluation is the systematic acquisition and assessment of information to provide "useful feedback" about some object, in this case the University Outreach Program. Three processes are necessary to evaluate an object: defining the evaluative issues, identifying the stakeholders and determining a set of evaluative questions (Preskill & Torres 1999: 51). The theoretical framework – Sections 4.1. and 4.2. – gathers the information related to the environment around the university in terms of education and its connections to industry, work life and society – that is, the evaluative issues and the stakeholders. This framework is the basis to identify "who needs what, how great the need is, and what might work to meet the need" (Trochim, 2006) – which is presented in 4.3. The criteria to assess the UOP – the set of evaluative questions – are presented in a table at the end of point 4.3.

The piece evaluates the UOP in relation to its context, personnel, procedures, inputs and stakeholders and the interaction between these within and outside the university (Section 5). This evaluation will allow the identification of possible gaps in the Outreach Program, and assess the existing infrastructure available at the university in comparison to "what might work to meet the needs" (Section 6). The evaluation also addresses additional issues that cannot be solved by the solution proposed based on the needs assessment and the available infrastructure (Section 7).

The framework is composed of the changes taking place in selected domains around and within the university. The evaluation focuses on how these changes affect the validity of the aims and measures of the Outreach Program proposed by the University. Since the University Outreach Program involves several stakeholders and seeks to reach out to society by means of research and proposing solutions to national problems, it is vital to ask if the university has met all the necessary dependencies and considered all possible alternatives. If a program for more extensive and diverse research exists at the UNA: Does the program have a focus in order to address the needs of society/stakeholders? Are the needs of the stakeholders considered in the program? Can the continuity of the program be ensured? Are current ICT technologies being considered to deploy this program? What are the legal considerations for the formation of such a program regarding the dissemination of the knowledge generated within it or co-generated with

other organizations outside the university? In this regard, the purpose is to provide some insight into what could be changed should any deficiencies be found. Additionally the aim is to be regionally and culturally relevant in the process of improving the University Outreach Program of the UNA.

4. THEORETICAL FRAMEWORK

The literature consulted for this piece responds to the nature of the environments analyzed in the research. The sources related to Knowledge Management, Design Thinking and Research Modes 1 and 2 correspond to research done by their authors, in nearly ideal conditions at well-established companies in the developed world. However, the sources related to the use of technology in education and the digital divide correspond in part to research done at or related to less developed countries and their needs. The logic behind this selection of literature is that the need to implement knowledge management and design thinking comes from a perceived incongruence among various situations between developed and developing countries, which will be explained further below.

4.1 Changing Social Aspects

4.1.1 Social Responsibility at Universities

The concept of Social Responsibility is fairly new, perhaps only two or three decades old (Rothman, Kors, O'Brien, Allen & Agresto 1999). It is also called the Third Mission and it is quite a new concept as such, even when most universities in Europe as well as in other developed parts of the world, have been focusing on training the workforce in specific domains to some degree (Kantanen 2007: 39). The definition of exactly what the third mission entails has not been established. It is seen as a role beyond conventional teaching and research within the boundaries of a university's physical infrastructure, which should somehow help regional development (Jongbloed, Enders & Salerno 2008). It has been given at least two additional names: 'community service' and 'university outreach'. The term chosen for this work is University Outreach. The term is normally used to refer to the provision of research and training capabilities to stakeholders within and outside university, in an attempt to establish new partnerships, extend research domains and capabilities, and have access to additional sources of funding.

There is a problem establishing exactly what 'university outreach' is because of the diversity of its aims and because those aims can be found in many other aspects of university life. If it means aiding in the professional development of stakeholders outside or inside university, it is still part of the overall aim of 'teaching', which the university is already doing. If the aim is to establish partnerships between the university and industry for commercial purposes, it is still research, which again the university is already doing (Jongbloed, Enders & Salerno 2008: 312).

The answer to this problem is that a University Outreach is a program, by which the university develops the human intellectual capital of the community around it and tries to find solutions to regional problems by working with the stakeholders on solving actual tangible problems rather than dealing with theories and merely proposing solutions (Ordonez 2005: 273-274). This has been called engagement rather than outreach, because engagement entails a more cooperative style of work. When the university 'engages' in problem solving, it does not 'reach out' to others being the center of knowledge, but rather learns by becoming involved in the process of analyzing existing problems and solving them; it does this 'with' the stakeholders and not 'for' the stakeholders (Jongbloed, Enders & Salerno 2008). According to the same authors, this has come as a reaction to the notion that "the interaction between the public knowledge infrastructure and society is not optimal." This is called 'knowledge gap', and it refers to the gap between the knowledge that is public and the access to that public knowledge by any individual or group in society who wishes to access that knowledge.

4.1.2 University and The Third Task: Communities and Stakeholders

There are several connections between universities and communities of people inside and outside of it. The communities are seen mostly as collectivities. No literary sources pinpointed one individual or specific organization as a major stakeholder since it is more practical to think of them as groups with the same characteristics and objectives. Communities are groups of people mostly not united by any other string than being part of a certain sector of society. That is, they may not always be a united group of people

who know each other. Examples of communities in this field are students or student unions, civil society organizations, government offices or companies (Ordonez 2005: 267) (Jongbloed, Enders and Salerno 2008: 205) (Gill 2009: 610) (Kantanen 200: 71). When communities are connected with the university in this field, they are considered stakeholders. The term 'stakeholder' stems from the business world where it refers to the groups of people to whom the administration of a business must answer (Jongbloed, Enders and Salerno 200: 305).

Examples of communities are: businesses, areas of business (telecommunications, trade, agriculture) or the business sector in general, social movements such as non-governmental organizations or even town meetings, schools and school districts, teacher associations, the wider population, etc (Gill 2009: 610). One of the largest communities affecting universities is the government. However, the government is not a single stakeholder (Jongbloed, Enders & Salerno 2008: 305) (Kantanen 2007: 71); it is composed of different ministries (health, agriculture, foreign affairs, education, etc) and as such, it represents very varied interests. Thus far, the status, prestige and reputation of a university are related to their discipline in research, their values and their attainments. However, the degree to which the university is able to fulfill the needs of the *community* or its *stakeholders* also dictates its status.

Returning to the sense of community, stakeholders in this case share a common culture or location, that is, they are united in a certain way and represent common interests. Since the university is the one in charge of educating those who will later work in stakeholder communities, and since stakeholders provide the university with some kind of support (economic or otherwise), it is clear that the university must work closely with those stakeholders to meet their needs (Ordonez 2005: 267). Yet another issue here is that it cannot favor one stakeholder over others, since depending on their needs and interests, stakeholders can again be regrouped and represent greater influence than the previously favored group, leading to never ending struggles.

This leads to the need for neutrality and transparency in all actions at the university. This is where documenting and making documentation available is necessary. If all

interconnections are to be transparent and neutral, then all actions should be documented and all stakeholders should be given access to the documentation, even those that are not directly involved in one particular transaction or another. (Mutschler & Hasenfeld 1986). Since universities are institutions that seek verifiable truth through scientific methods and higher education, and since its main stakeholder is all of society, favoring one stakeholder over others would cause ethical problems. Furthermore, universities issue degrees that are recognized publicly and that enable the graduate to offer services according to the scientific rigor expected of universities. If a company runs a university or funds the program of a university in one way or another, it may disseminate research results that benefit its interests and goes against that of others, or in the worst of cases against the interests of wider society. Even if a privately sponsored university proves to be monetarily profitable, "it hardly qualifies as a university" (Harding, Scott, Laske & Burtscher 2007: 99).

4.1.3 The Globalization of Economy

Economic Globalization is mentioned as one of the greater factors calling for a change in university level education. According to Tynjälä, Välimaa and Sarja (2003) (quoted in Williams 2007: 514) universities must and are changing their curricular structure and content to adapt to economic globalization. Constant and fast changes in knowledge in the knowledge society lead to a need to change the methods by which universities make education available to more individuals, over a longer and mostly not unified period of time with a focus on providing skills for work and life-long learning.

This is becoming more relevant at a South American regional level as well, where the enrollment in higher education has doubled over the past twenty to forty years, especially in the region's more advanced countries such as Argentina, Chile and Brazil (De Wit, Jaramillo, Gacel-Ávila & Knight 2005: 39-40). Studies about Paraguay reveal that the higher the educational level of the parents, the better their children perform in school and the farther they are expected to reach academically (Baird, Elias, Aranda, Peralta &Vera 2009: 43-45). This means that the number of people requiring university or post-secondary education of some sort will continue to increase. This in turn means

even more strain on an academic structure that has a low number of graduates, faces quality problems and offers courses that do not address the needs of society in terms of job market skills (De Wit, Jaramillo, Gacel-Ávila & Knight 2005: 40).

This kind of situation has already been experienced in South America. The introduction of the Education for All development goals caused an increase in primary education This led to an expected increase in secondary education as well, yet the necessary articulation between primary and secondary programs was in many cases not planned This caused a situation in which the influx of students from primary to secondary schools soared, which governments could not handle properly (Ordonez 2005: 268).

With regards to higher education internationally, corporate dissatisfaction has been a major factor calling for a change in universities. Some corporations have formed their own colleges and universities or are strongly supporting certain universities' programs because they perceive a lack of congruency between what is offered as university education and what is actually required in the market (Williams 2007: 518; De Wit, Jaramillo, Gacel-Ávila & Knight 2005: 07). In a similar vein, companies do not rely solely on the knowledge and wisdom produced at universities, but are also generating their own in departments or teams of research and development (R&D) (Latham 2001; Jongbloed, Enders & Salerno 2008: 309-312). However, this could turn against the universal purpose of the university. If the university does become market-like, it could produce results in favor of its greater contributors at the expense of the wellbeing of wider society. It could also become monetarily selective when choosing students, accepting research ideas and buying materials. This would affect the reach of the university allowing only the highest bidders to become sponsors, propose ideas and demand results. Should this happen, the aim of the university of promoting science as a means to achieve knowledge to benefit all would be lost (Latham 2001).

There are also technological pressures due to economic globalization. Most university level students today (at least in developed countries) are 'digital natives.' This means that they are used to having, using and being around technologically advanced devices that give them access to a wide range of information almost instantly. 'Social

computing' further strengthens this digital nativity. This refers to students communicating with each other through digital means in peer-to-peer networks, wikis and social networking sites. As Howard Gardner mentions, digital natives often instruct their 'digital immigrant' parents and teachers who were not born within the digital age. He also states that students working collaboratively over digital networks are capable of carrying out "sophisticated projects in the arts and sciences… … (which was) inconceivable a generation ago" (American Society for Training and Development, 2008). The introduction of information and communication technologies (ICTs) has brought tools that change the ways digital natives organize their activities and create the tools they need, while it also provides new ways of expression, collaboration and ways of thinking (Williams 2007). The idea that individuals share knowledge through their exchanges in communities is called 'social constructionism' (Crotty 1998) (quoted in Jaeger 2008: 165)

4.1.4 The Digitalization of Education

According to the Robert Hawkins from the World Bank (Hawkins 2010), there are currently ten international trends in the use of information and communication tools in education. These trends are related to the rapid development of internet and ICT tools and a move towards cooperation across domains. They are related to the ways in which sharing knowledge and wisdom is necessary in order to provide local solutions, and how these solutions can again be shared in order to accelerate the advancement of knowledge. Stiglitz (2008) also supports this view.

Among the ten trends, there is a strong emphasis on universal access to information, information sharing and local generation of knowledge in a ubiquitous environment more easily dubbed 'anytime, anywhere.' These means of communication are powered by the internet, satellite campuses and other forms of distance learning (De Wit, Jaramillo, Gacel-Ávila & Knight 2005: 08). More concisely and clearly, it refers to being able to access and share information among individuals almost instantly. There is likewise an increase in teacher collaboration expectations. Teachers – or professors and researchers in the case of the university – are expected to generate locally relevant

teaching material that they can share in a wider network where peers can take advantage of the material created (Joint Information Systems Committee 2009: 09-10). It is therefore also logical to assume that there would be a higher demand for assessment of student learning rather than regular tests, since it would be difficult to measure the development, deployment and results of an entire project in a single exam or even a set of exams.

However, even in light of these trends and needs, there is a significant need to train people to use them properly. It is generally recognized that even when there is a need to work more closely with technology, the human factor is still the most important one for successful implementation (Trucano 2010). "The success and failure of technology projects… …hinge on the human factor and the willingness… …to step into uncharted territory" (Hawkins 2010). There is another point to consider when discussing the human factor: research has shown that introducing technology in classrooms does not necessarily mean better instruction or learning. A successful implementation of technology in classrooms depends on the preparation that teachers have to make a difference by using the technology (O'Dwyer, Russel, Bebell & Seeley 2008: 39). Since the most important factor is the human factor, it is important also to see that it is individual persons and groups of people in the more developed parts of the world who are leading the introduction of technology in all domains. It is this level of penetration of technology – especially information technology – in all aspects of our lives, that indicates how important it is to train the necessary staff for local development, so that the solutions needed at a certain point can also be provided locally.

4.1.5 Access to Information: Inequity in Access

Currently, 6.5% of all Paraguayan homes have their own computers or regular access to them (Rodriguez Alcala 2010). Less than half of them have access to the Internet (about 2.8%); this number is slightly higher than the average percentage for the region estimated at 1.5% in 2000 (Serrano Santoyo & Martínez Martínez 2003: 22) or 2.7% (Salazar Ramos 2009: 08). Among all schools in Paraguay – both public and private –, only 10% have computers and exactly half of them have Internet access (Rodriguez

Alcala 2010). Commercial mobile communication in the form of mobile phones has been accessible in the country since the early 1990s. As at 2007, at least 75% of the population has at least 1 mobile phone line, and the numbers are expected to increase (Ministerio de Hacienda 2008). With this expansion in mobile telephony also came the penetration of internet applications on mobile devices and the introduction of wireless systems that could make connectivity more accessible even in remote areas of the country. Although this does not mean that everybody in remote areas can afford these services, it does show evidence that there are fewer technological barriers to bring connectivity to them.

However, as stated earlier, the ability to use information technology tools is becoming increasingly important in all aspects of life within the information society. Although in Paraguay there are no national programs for education in the use of communication technology, there are internal and external efforts to make this education available. Currently, the One Laptop Per Child program (OLPC) is working on the deployment of laptop computers for school children in many developing countries including Paraguay, in an attempt to bridge the digital divide. An example of the program is carried out by the "Paraguay Educa" Foundation (Paraguay Educates Foundation). The development of digital fluency consists of three stages: a) access to information and ability to establish communication, b) ability to apply the knowledge to one's own situation and life and c) constructing knowledge – which in Knowledge Management would be termed 'wisdom' (see section 4.2.5.).

This movement to promote access to knowledge, to process the knowledge and to apply it to local reality is a step forward in producing solutions that address the immediate needs of a community. The solutions generated this way need not be re-adapted to the reality of those applying it, since they themselves generated the knowledge in ways that suit their needs. Applying this experience to the task of adopting and adapting foreign books as well as other materials to suit the needs of local developing communities could fill the gap between what is needed and what is offered in terms of education –as seen in the case of Paraguay especially (Rosenberger & Ramos 2008).

In terms that are more concrete developed countries very often offer advanced materials for carrying out activities and solving problems in many disciplines, while the needs of people in developing countries are different. Developing nations need to discover and apply their own culturally appropriate way of handling situations and learning, in order to better understand their situation and then be able to provide contextualized solutions that fully meet their developmental needs –this view is also supported by (Stiglitz 2006: 06). This implies then, that there should be a place where local problems can be analyzed locally, under culturally appropriate light and where locally relevant solutions can be provided. However, it is also necessary that all citizens can access the solutions provided. Such an institution must bridge "social capital which connects actors to resources, relationships and information beyond their immediate environment." (The World Bank 2010).

4.1.6 The Digitalization of Education in Paraguay and the Digital Divide

As stated above, OLPC is deploying laptop computers in Paraguay to bridge the digital divide. The program is not carried out in the capital city, but rather in a city that is not entirely the countryside yet has many aspects of it: lower population density than in the capital city, lower degree of access to the Internet, lower income, etc. This is especially important to consider given the results of the study of Quality of Education in Paraguay, which shows that the more rural the school setting, the lower the achievement of the students, and the more urban the better the achievement (Baird, Elias, Aranda, Peralta & Vera 2009). The study also considered nutritional issues, previous teacher training and living conditions of pupils and their families, among several other factors that affect student achievement. Although these studies did not focus on the city the OLPC program is starting, the city itself is well located in the sense that it does not present characteristics of either the capital city and its higher access to services, nor the countryside with its less-than-ideal access to services.

The contributions of the program to basic education in the area are the initial digitalization of education and the development of digital fluency, the ability use modern electronic information and communication technologies. The acquisition of this

ability to use computers and access data for educational uses is expected to have a trickle-down effect in the families of the students and in their communities. Students are expected to learn how to use the technology, then how to access information, then how to apply the information they have accessed to improve their own living conditions and then pass that knowledge on to their families and peers (Paraguay Educa 2009).

The central purpose is that students will develop as agents of digitalization of their communities by means of the education they receive (Paraguay Educa 2009). The process of digitalization, as a pilot project, also points out the need to adapt the current education curriculum of the country to include all aspects of ICTs in education. One principal problem addressed in the use of laptops in basic schooling is the dissemination of reading material. The distribution of reading material for school education has been cited as a reason for poor reading and overall poor performance in three different official publications in the past 15 years (Inter-American Development Bank 1996), the Education For All country assessment for Paraguay (UNESCO 1999) and the 2005-2010 Reading Plan (Ministerio de Educación y Cultura 2010). With the current deployment of the OLPC laptops, over 100 digital books can be distributed without the need to print them prior to reading, as they can be stored in every school's servers (Paraguay Educa 2009). This also helps improve delivery time since no physical distribution is needed. Additionally, becoming acquainted with reading electronic texts and accessing material on-line is becoming a necessity in order to progress in all knowledge contexts in present times. Meanwhile, social networking and news are also delivered over the internet faster and more quickly than through other more traditional means (Organization for Economic Co-Operation and Development 2009: 22).

The expected impact on the community is the search and research for solutions to problems faced locally, the development of local wisdom and the dissemination of this wisdom, and therefore the democratization of local decision-making based on the knowledge acquired by means of the use of ICTs (Paraguay Educa 2009). A meaningful technology classroom must keep students engaged and in contact with the world within and outside the classroom. Students should remain in contact with the world by

providing solutions to problems in their homes, in their schools and for others as well (Middleton 2005: 67).

According to the report presented by Paraguay Educa, it takes the average child four months to go through each stage – information, knowledge, application – (Rodriguez Alcala 2010). Every child is supposed to implement in their lives the knowledge they have acquired by means of community development in that period. The level of application that the OLPC program expects from the children corresponds to level five – the highest level – of the reading comprehension scale of the PISA program (Organization for Economic Co-Operation and Development 2009: 34). In comparison, the National Reading Plan (Ministerio de Educación y Cultura 2010) expects 15-year old students to reach only level three of the PISA standard, which is "developing an interpretation". The results expected of the OLPC program by Paraguay Educa then seek to exceed the expected outcome of the National Reading Plan by using ICTs.

The ICT-equipped school is also expected to develop a series of local services around it. As part of the program, schools are to become development hubs. For example, local technicians receive training to solve hardware and software problems that the computers may have. The school itself is seen as a center to hold meetings with local stakeholders to discuss improvement plans and the performance of the program; and the project serves as an example of how to coordinate these activities where both individuals and organizations (universities, NGOs, schools, etc) are invited to participate as volunteers to develop the project further (Paraguay Educa 2010).

4.2 The Systems and Research Dimensions

4.2.1 Data vs. Knowledge and Classification of Knowledge Types

As was explained in the introduction, documenting and storing information, experiences and procedures is an elemental part of progress in any field. However, in order to understand this process better, it is first necessary to clarify some important concepts

regarding data, its use and its storage. This explanation of concepts is also important when discussing research, since doing research requires that the researcher understand the differences between these concepts in order to organize the work and the findings appropriately.

Data refers to raw information available from a variety of sources –with the advent of the internet sources are now globally available- and are not linked to any specific use. Data becomes knowledge when they are used with a purpose, especially if they are being used as building blocks to generate further resources or assets. This view is supported by (Martensson 2000). According to Bobrow (1999) and Nonaka and Takeuchi (1995) (quoted in Al-Hawamdeh 2002) and Papoutsakis and Valles (2006: 02), there are three types of knowledge – presented below as a., b. and c. However, Kantanen (2007: 49) acknowledges the three kinds and adds a fourth – d.

a. *Explicit knowledge*: this refers to information that can be retrieved from any printed, electronic or other media. It can be reproduced, gathered and passed on to others easily. Examples of this would include data about the population of a country, the description of a product, quantities of a certain item in a storage facility, etc.

b. "*Know-how*" or *implicit knowledge*: this refers to explanations of how a certain task can be performed, which can be captured and codified as information again. Examples of this include a software engineer's account of how to test a certain program for programming defects and the procedures to be followed to debug it. Another example would be cooking according to a recipe where it is easy to provide direct information about the ingredients as well as the process to be followed to actually put the ingredients together and then cook it.

c. *Tacit knowledge*; this refers to the internal (or mental) usage of information and know-how and their application in certain ways, which are inherent to the person who does it. This would include the mental process by which a

person arrives at a certain idea by making use of the information that is available as well as their know-how. This cannot be captured and codified as information. Implicit knowledge is seen as being within people, so that losing an employee or member of an organization directly means losing their know-how and personal knowledge. Adoption or development of a corporate culture –the norms and values by which an organization develops- is also considered part of implicit knowledge.

d. Connection Knowledge: This kind of knowledge refers to having the "human capability" to access the information that another person or other people within or outside and organization may have. This may be the hardest kind of knowledge to foster, since it requires what is commonly called 'chemistry' or 'charisma' to ask others to supply their expertise on request.

There is one more item that can be regarded as encompassing all the points developed in this section: the issue of Retention. This refers to the capability of a company (or in this case an organization) to keep its knowledge workers for as long as possible. This is related to the previous item, tacit knowledge, because every knowledge worker has part of that tacit knowledge that cannot be codified and transmitted in their absence (Brelade & Harman 2003: 76). This becomes even more crucial when certain persons within the organization developed the ideas behind core structures of the organization or if they carry some form of charismatic leadership. This is also true in all kinds of organizations; a high turn-over rate also implies a high rate of reinventing the wheel at an institutional level. In this respect, Guy Peters (2001: 80) states that although flexible organizations are sometimes necessary to carry out a specific task without keeping a unit in the payroll after its duties are fulfilled, the disadvantage of dismantling a professional group is that the corporate knowledge and the dynamism gathered by that group can be lost. This can be somewhat alleviated by thorough documentation of all actions. However, this still does not equal retaining tacit knowledge, since the group dynamism that allowed the data to turn into useful knowledge and wisdom will no longer be there.

With the advent of information and communication technologies (ICTs), explicit and implicit knowledge can be stored and disseminated much more easily than before. Connections among individuals are also easier to maintain thanks to instant communication, and the wisdom reached through research and application can be accessed again thanks to this communication. This has also had an effect in the way research is done, applied and disseminated. While it used to be the case that the knowledge produced at one university stayed within it, or at most influenced its surrounding areas, currently it can reach audiences far away from its point of origin and in completely different disciplines as well.

However, even with this ease of transferability of explicit and implicit knowledge, there is still the issue of applicability. When practitioners read material produced at universities – scholarly-written material – they find them unreadable or very complex due to the nature of their vocabulary, and leave them aside (Rasche & Behnam 2009). This problem of applicability can be extended when more variables are included in the context: differences between culture of origin and culture of application where certain practices may not yet have developed, differences between the original language of research and the target language in which certain concepts may not exist, etc. One of the main issues some researchers have found when discussing changes in the way research is done is the issue of relevance and transferability of knowledge from the academic environment to environments where the scientific knowledge must be applied (Rasche & Behnam 2009: 244).

According to Newell and Simon (1972) (quoted in Middleton 2005: 62), problems within the scientific methods – grossly speaking – are presented within a framework that allows a limited set of variables to influence the model. The model is analyzed based on the effects of those variables. They represent this in their model of "problem space". This model consists of three elements: a) the problem state, everything that is known about the problem at the beginning of problem-solving; b) the goal state, the solution for the problem; c) the search space, everything the problem-solver has in their repertoire to help solve the problem –the three kinds of knowledge explained above. The example that the article provides is that of a river and a person trying to cross it.

The river and its depth, current and width and the persons need to cross it represent a), while b) is represented by a bridge or tunnel, and c) is their knowledge about bridge construction as well as access to data sources and know-how. It has been proposed that this method be used for problems simple and complex alike. It has been used in that way by breaking down more complex problem into smaller units and then applying the model.

Schools and higher educational institutions still apply this model in the same IMRD manner: introduction, methods, research, (solutions) and discussion, with an additional 'evaluation' element at the end. Note that in this case, there is a linear view of problems: the problem, the data, the one solving the problem, conversion of data into information, the knowledge generated as to how to solve the problem and the final wisdom arising from solving the problem. However, this method only works on the aforementioned situations, and assuming that there are a clear starting point, research and solution. There are a number of factors or elements that would not fit in this linear approach in real-life problems: very broad problems that are influenced by several different disparate aspects of a situation as well as contradictory requirements. The author presents examples of this: there are contradictory situations that may arise when trying to build an item that is at the same time strong and light, characteristics that tend to be mutually exclusive. Yet, should this be possible, there are some more variables in the problem: is the light and strong material comfortable? Is it safe for human beings? Is it safe for the environment upon degradation? Does it degrade? No questions are within the traditional model of problem space, and given that most problems facing educational institutions today are more complex than linear models can handle, there is a need for a slightly different model.

The modified model presented by Middleton (and supported by the changing Research Modes on the next pages) works on the interconnections between the knowledge about the problem, the research – which he calls research and construction – and the solution and evaluation – which he calls the satisfying zone. Instead of one single line between knowledge about the problem and research and another between research and goal/satisfaction, there are several lines – points of view – between the knowledge and

the research/construction, then other lines between the latter and solution zones and knowledge about the problem. In this way, he seeks to provide a model that takes into account several different points of view – as we said earlier, 'different boxes' – on certain problems to give the idea that one 'solution' in a linear way may have an effect on other domains. The effects of the solutions provided in one domain have to be taken into account before their implementation, to avoid greater damages on other domains. The example Middleton provides is that of congestion in cities. The linear approach to congestion would be to build more highways and streets for cars to be able to circulate more efficiently through the city. The non-linear approach to solving the problem would be to provide more effective, efficient and convenient public transportation on the existing roads (Middleton 2005: 68).

The notion that a linear analysis of problems is not always the solution and that more feedback is necessary has brought changes in research. It has caused some development of the university as a social actor as well, since it is now recognized that more practitioners from more domains should take part in scientific developments to provide more varied points of view (Rasche & Behnam 2009: 03-04). Around three to four decades ago it was not even on the discussion table if universities had to be involved in the matters of its surroundings (Rothman, Kors, O'Brien, Allen & Agresto 1999). However, concreter initiatives arose in the United States around thirty years ago (Jaeger 2008).

In this sense, the development of ICTs has made information more widely available. This in turn has made it easier for distant scholars to look at problems from different perspectives and offer alternative solutions or improvements in less time. Heim (1998) (as quoted in Williams 2007: 513) states that the introduction of ICTs will displace more traditional aspects of university research and introduce new processes because of the aforementioned changes it is introducing. It is necessary then to look at the two modes of research identified as a result of the advent of ICTs and non-linear problem solving.

4.2.2 Changing Modes of Research: Research Mode 1

Research Mode 1 (RM1) is characterized by "the hegemony of theoretical or, at any rate, experimental science, by an internally-driven taxonomy of disciplines" (Nowotny, Scott & Gibbons 2003) or as Williams (2007) states "an authorized version of external givens." This refers to research normally being done by one individual or a group of researchers in an academic environment, where hypothesis, methods, tests and results are reviewed and accepted within the world of academia only, and usually within the same institution. Some researchers state that the traditional mode of research done in a purely academic environment, as is research mode one, cannot be passed on to the application sphere. This is due to discrepancies in language use, environment of application and actual diversity of responses upon application between those who produce the knowledge and those who apply it (Rasche & Behnam 2009: 246-248).

RM1 is either disciplinary (solving a problem under one single discipline), interdisciplinary (solving a problem by subjecting it to research under two or more separate disciplines) or multidisciplinary (combining the solutions provided by each discipline). Problems are analyzed in a centralized unit, usually a laboratory at the university, based on theory and with the aim of producing knowledge. The main origins of the problems analyzed in Mode 1 are theory, the research community or the changes that take place in a discipline due to changes in the environment. (Van Manen 2001: 851)

As further explained by Dana Holland (Holland 2009: 551-552) Mode 1 differentiates between problems by assigning them to the different disciplines they may fit into, which means that the boundaries of every problem must be clearly stated within a bounded rationality scheme as was explained earlier. Since it must fit properly within one discipline, it is also analyzed according to the codes of practice of that one discipline using the terminology and methods of it. This in turn means that the outcome of the analysis of a certain problem under the light of a specific discipline may indicate a certain course of action to solve that problem. While this may represent the best possible way to solve the problem in that discipline, the application of this course of

action in real life circumstances may have implications on other areas of knowledge, public life, etc., which may, in the worst of cases, produce results contrary to the desired ones. An example of this was provided in point 2.6 above.

4.2.3 Research Mode 2

Research Mode 2 (RM2) is research that is seen more as a process (Williams 2007: 513), and is "socially distributed, application-oriented, trans-disciplinary, and subject to multiple accountabilities" (Nowotny, Scott & Gibbons 2003: 179). Manuel Castells (2000) (quoted in Scott 2005) as well as Latham (2001) speak of a Network Society or Network University in which fluid connectivity is more important than the fixed points of connection. They refer to a growing trend in which knowledge is generated and wisdom is reached by subjecting research and findings to a network of peers and reviewers who can apply it under several conditions to test their validity. It is because of the interactive nature of RM2 that it has been proposed as a solution to the problem of the relevance of the knowledge that is generated and the instruction that is offered at universities. If knowledge in Mode Two is produced in conjunction with academia and those who must later apply in the real world, then there should be fewer problems in the process of comprehension and applicability.

Research Mode 2 goes beyond disciplinarity and interdisciplinarity. It focuses on transdisciplinarity, that is, instead of focusing on the solution one single field can provide for a given problem, or the combination of solutions provided by research in two separate fields, it seeks to mix methods from different disciplines in order to provide holistic views, assessments and solutions to problems from the very beginning of the process. This allows for the discovery and/or implementation of more creative methods to solve issues. In the same vein, RM2 proposes to take advantage of different research sites outside university. The aim is to improve the applicability and practicality of the solutions proposed or to have a clearer idea of the circumstances that originate the problems. This makes research more context sensitive, while also providing non-disciplinary sources of possible solutions by exposure to real context. (Van Manen 2001: 851)

There are four main aims in Research Mode 2: heterogeneity, reverse-communication, socially-distributed knowledge framework and socially-robust knowledge (Shinn 2002: 610-611) and (Van Manen 2001: 851). Heterogeneity refers to differentiations between "nature/culture and society/science" not being relevant any more. These four aspects of human life interact and produce knowledge in their interactions, a form of public and open debate about all issues and their influences on each other. Reverse communication means that society voices its concerns and needs to academia and researchers, and these do research to address those concerns; the research is then transmitted back to society for application, testing and evaluation, which forms a feedback loop. A socially-distributed knowledge framework means that teaching and education aim at addressing identified social needs and is done in conjunction with society, not separate from it. The last point refers to the notion that teaching, learning and researching now become relevant only when they aim at practical applications to accomplish specific, needful tasks.

The following chart provides an overview of both research modes, as presented by Gibbons (Gibbons, Limoges, Nowotny, Schwartzman, Scott & Trow 1994) (as quoted in Kantanen 2007: 41).

Table 1: Comparison of Research Mode 1 and 2

Mode 1	**Mode 2**
Problems are set and solved within self-governing academic communities	Problems are set and solved in a transdisciplinary fashion
Knowledge production within disciplinary boundaries	Context of application with diverse set of intellectual, economic and social interests
Research results communicated through institutional channels	Research results communicated interactively and continuously throughout the research process
Universities are dominant knowledge-producing institutions	Organizational diversity linked together through functioning networks of communication

Research groups homogenous and institutionalized	Research groups are heterogeneous and transient (producing knowledge beyond itself)
"Knowledge for knowledge's sake"	Increased reflexivity on the impacts of research and social accountability
Peer review as quality control	Quality determined by a wider set of criteria

4.2.4 Design Thinking

Current trends in education as well as in job markets suggest that there is a growing need for students, professors and job seekers to be able to analyze situations, problems, questions, etc critically and thoroughly (Wallace 2010). According to Anna Rylander (2009: 01-04) creativity is a very desirable attribute in an environment in which innovation is the key for succeeding in the economy. Design Thinking (DT) is interpretive, emergent and explicitly embodied work. DT focuses on processes that are iterative, descriptive and emergent, alternating between problem definition and solution, characterized by imagination, prototyping and empathizing with the user (Conklin 2006)(*ibid*). It focuses more on "what might be" instead on "what is", the latter being more the scientific/knowledge approach. Dunne and Martin (2006) (*ibid*) and Walters (2009: 16) suggest that there is a "design mind-set", characterized by three types of knowledge: a) knowledge about technological opportunities, b) knowledge about user needs, and c) knowledge about user language -culturally appropriate language to deliver content to users, with which they will construct meaning.

According to these authors, design thinkers are trained at art schools (or as Bachelors of Arts) where they interact with visual cues, physical elements, words and numbers holistically. This kind of education is called "learning by doing", which is the alternative to "learning by studying and analyzing" which is rather knowledge-work oriented (Lawson 2006) (quoted in Rylander 2009: 05). Additionally (Collopy 2004) (*ibid.*) states that "drawing and sketching" are essential to design thinking knowledge generation. Design Thinkers learn to "think with their hands using sketches, prototypes and intuition to arrive at a final solution" (Schön 1983) (*ibid*) Therefore, problem-

solving requires DT to embrace many different kinds of thought and knowledge such as art and technology. A DT environment is one that welcomes different points of view, encourages multi-faceted approaches to problem solving and requires physical representations of problems to study them and to anticipate how a proposed solution may work (Middleton 2005: 66).

4.2.5 Knowledge Management

KM derives from the "broader concept 'intellectual capital'" (Martensson 2000: 205). According to the same author, intellectual capital can be defined as "the possession of knowledge, applied experience, organizational technology, customer relationships and professional skills." Martensson also provides a definition by Roos (1997) which says that intellectual capital can be seen as strategy and measurement. Strategy refers to the generation and use of knowledge and to the relationship between knowledge and success or value creation. Measurement refers to the need to engineer information systems to measure performance both in non-financial areas as well as in financial areas. Therefore, intellectual capital is the knowledge and the application of that knowledge in generating financial and non-financial gain.

Knowledge Management is then "the management of the intellectual capital" (Martensson 2000: 205). In the past decade, this has turned into a paradigm that states that the knowledge available at different sections of an institution should be shared among the different sections (or disciplines). This allows a better flow on information from and towards sections that would benefit in the improvement of their work from the knowledge being generated at other sections (Liu & Parmelee 2002) (Brelade & Harman 2003). A complementary view stated by Rylander (2009) is that knowledge work is a rational and intellectual approach to problem solving. Its aim is to have a sustainable source of competitive advantage through the people in an organization, to foster retention within a competence model –where retention refers to capitalization on existing knowledge, as well as the capability to keep within the organization those individuals that are important to develop tacit knowledge (Brelade & Harman 2003). In the same sense KM should always be tied to the strategies of the organization, since it is

successful when the "knowledge capital is employed to accomplish specific [business] strategies" (du Plessis 2007: 92). This added emphasis on managing knowledge to allow it to be used to generate more knowledge is even more important if we consider that there has been a shift from harvesting natural resources to a knowledge society. Knowledge is currently considered to be the only source of real competitive advantage and goods and service provision (Sabet 2009). Knowledge and its management should then be the main focus of every competitive organization.

KM implies having a system that allows information to be shared easily across a wide network of people, and depending on the case, also across several entities (Wylant 2008; Davenport, De Long & Beers 1998; McFarlan 1984). Brelade and Harman (2003) conducted interviews with three companies to find out exactly what each company meant when they referred to Knowledge Management. The results of the interviews revealed that there are both human and technological aspects in KM. The following is a comparison of the principal components of a knowledge management system, according to the three different interviews from Brelade and Harman. These are then compared to additional ideas presented by Liu and Parmelee.

Interview 1

1. Defining the field of expertise – that is 'domain' or 'field of science' – and the level of competence in them;
2. Identifying the learning resources needed for the identified field of expertise and competence level;
3. Establishing a feedback loop that can constantly check what is needed and how to fill that gap as well as possible; also supported by the UNESCO report on Knowledge societies (UNESCO 2005).

Interview 2

1. Establishing the information needs of the organization.
2. Planning a system to address the issues of how to capture the information, store it and then making it accessible.
3. Providing access at the necessary level to all persons within the organization.

Interview 3

1. An intranet –computer-based internal communication system- that would allow quick organization-wide access to information;
2. Defining the information that each area of the organization needs in order to do its job;
3. "Reviewing and replacing" the necessary key areas for the communication systems to fulfill its duties.

Additionally, Liu and Parmelee (2002) view KM in terms of

1. People: how the knowledge produced by a single individual can influence others in an organization.
2. Processes: the processes installed that make the transfer of knowledge possible.
3. Technology: the means by which this collaboration is made possible (which should be decided after establishing points 1 and 2)

Analyzing all five views, the key elements may be synthesized in establishing: a) the area of expertise, its people and their capabilities and needs; b) the organizational, structural and technological means to accomplish KM and c) a feedback loop to examine the results of a cycle and the necessary changes before the next cycle starts. As mentioned earlier in the section 'Changing Research Modes', these key elements are nowadays permeated by Information and Communication Technology (ICT) systems, since it is the fastest as usually cheapest means of communication and dissemination of knowledge.

However, simply introducing the technology and establishing a knowledge management system will not start a wave of research or instantly modify the research culture if the staff of an organization is not used to doing research (Brelade & Harman 2003: 87). There is also a need for strong leadership in the implementation of knowledge sharing capabilities, without which efforts may be lost in confusion (Mohr & Dichter 2001: 745-746). Liu and Permelee (2002) suggest analyzing an organization in search for the following enabling features.

a) Culture: establishing a culture of knowledge that promotes success through knowledge-sharing. There should be a culture of knowledge that promotes advancement through knowledge-sharing. If this is not present, it should be cultivated.

b) Structures: the layout and structure of an organization that allows the sharing of knowledge. This may include the physical as well as hierarchical layout or structure.

c) Technology: In view of points 1 and 2 in this list, technology should be seen as an enabler rather than the solution to the issues of culture and structures.

Du Plessis (2007: 93) supports this view when she states that the solutions must be a mix of "cultural, organizational, process, management and technology initiatives." The World Bank follows the same logic in their presentation titled "The Knowledge Bank from Vision to Implementation" (Laporte 2005), presenting the following 'main features' of KM: Strategy, People, Culture, Accountability and Technology. These categories include all the aspects mentioned previously. Culture includes: the paradigms, views, values and behavior specific to a branch of science or profession and their peculiarities as much as it refers to the characteristics of a group of people in a nation. The structure refers to the system an organization uses, the processes they employ or the division of the organization in areas and hierarchies. The technology means the communication systems, the equipment used for hand labor or the one used for production of physical goods. Accountability is the responsibility for the

development of the system and the progress of the research. According to the sources consulted, a well-established ICT system can help to do this work.

4.3 Needs Assessment

The theoretical framework shows changes in the social aspects of the life of universities and the institutions that precede them in educating the population, namely primary and secondary schools and similar institutions. It also shows the changes taking place in industries and in technology. These changes affect the relationship between the educational and productive sectors. The changes taking place in both sectors can be linked to and by the changes in research modes and the use of technology. The change in research modes means that the focus is on the applicability of knowledge in order to achieve specific goals, both in industry and in education. In both fields, ICTs help improve the applicability of research and knowledge. In other words, there is an increased need to introduce ICTs due to the facilities it provides.

There is a good distinction between what are data, information, knowledge and wisdom. Educational institutions are becoming increasingly aware of the somewhat limited applicability of the results produced under RM1. RM2 is becoming more important due to the need to test research results in as many varied situations as possible in order to perfect the results and be able to address more accurately the needs of stakeholders. This also calls for the involvement of a greater number of stakeholders from more varied backgrounds in order to provide fresh insight into problems, as was discussed in the section on Design Thinking. However, all this must be coordinated properly, and this currently means the use of ICTs. KM systems provide the tools for this coordination, and additionally, as identified earlier, to disseminate the generated knowledge in order to achieve some international presence as well.

According to Kidwell, there are similarities between businesses and other organizations, and universities and other higher education institutions. In their view, both try to reduce costs, improve administration and develop products faster and better (Kidwell, Vander

Linde & Johnson 2000: 31). Even when the products they produce are different (consumer goods in industry vs. scientific enquiry and curriculum development at universities), both need good consensus among their parts in order to do their work better. While it is difficult to say if companies or universities have to deal with a greater number of stakeholders, both can make use of information and communication technologies to reach their target faster and at lower costs as well.

4.3.1 Assessing the Need to Introduce ICTs in an Organization

In order to qualitatively assess the need to implement ICT technologies in organizations, there are five questions that should be answered (McFarlan 1984: 98). According to the authors of the study, should any of these questions be answered positively, then there is a need to implement ICTs. Though the questions were originally intended for companies, the questions still apply given the similarities between the needs of companies and educational institutions to implement such technologies, as presented by Kidwell.

Can ICTs build barriers for entry?

This refers to building a system for cooperation, which will give the organization an advantage in membership preference over other organizations. In the case of a company, ICTs may help it capture customers due to the ease of access, order and delivery as well as personalization. In the case of an educational institution, it can be an edge in the area of communication, studies, facility availability, and access to multidisciplinary research. This would enrich education and draw attention away from competing organizations. The earlier the organization moves into ICTs and offers innovative solutions, the more difficult it will be for competitors to "play the difficult and expensive game of catch-up ball."

Can ICTs build in switching costs?

The article presents cases in which companies have introduced ICT systems that are convenient for the customer and help save costs and/or time so that it is inconvenient not to have them. In other words, once the technology is introduced and the results are

satisfactory, it would be a drawback to opt for another organization that does not offer the same tools or ease of access.

Can ICTs change the basis of competition?

This refers to using the technology available to apply the existing information in an innovative form to produce better or new results. It can also mean yielding the same results yet at a lower cost. The final option is to use technology to focus on a specific strong point of the organization to produce better results than any competitor in that one field.

Can ICTs change the balance of power?

In the business approach, it means that a company with strong ICT systems and a rationalization of costs therewith can influence its buyers or suppliers to also implement ICTs. Complying with their methods of organization would mean improved productivity resulting from compliance, as well as a reduction in costs due to the congruence of systems.

Can ICTs generate new products?

For companies as well as universities, this refers to using the knowledge they have and bringing them together more easily over ICTs. This would allow them to offer better, more or innovative services that would otherwise not be available or would take much longer time to be developed.

4.3.2 Globalization and ICTs: Hindrances or Enablers?

Globalization represents a challenge in terms of adapting to it to be able to compete. ICTs in education and in organizations also require training and changing many known aspects of teaching and learning. These aspects of globalization may be considered hindrances to development, especially in the face of the aforementioned difficulties faced by developing nations. However, globalization and ICTs may be necessary drivers and tools for development. Globalization may make local ideas globally known, spark new ideas in distant places, and show local populations that their ideas have an impact

beyond their physical limits. ICTs can help spread these inventions more easily, when importing as well as when exporting ideas.

In this regard, there are three key elements for successful development, termed the Three Cs: Concepts, Competence and Connections (Kanter 1995: 120). 'Concepts' are new ideas, products or processes that are proposed as solutions for the surroundings where the concepts originate. 'Competence' refers to having the capability to actually concretize the ideas and provide the solutions. 'Connections' refers to partnerships with other organizations that can expand the capabilities of those with 'concepts' and the necessary 'competence'.

These three Cs synthesize the points presented previously. In order to cope with globalization, it must become a driver for change and serve the needs of communities. When there are drivers for change, new concepts may originate in order to adapt locally to the changes brought in from outside. This may in turn spark the need to develop competences to do so. Competences can spark regional development based on the new concepts, since a range of new or modified services may be required to implement the necessary concepts and competences. It is also very likely that not all required elements will be found locally or in one single place, which means that it may be necessary to establish connections with other organizations to complete the process of adapting to changes.

In this chain of events, there are outside influences represented by globalization. The influences must be analyzed from different points of view in order to adapt the changes to society and vice-versa, a central point in Research Mode 2. As new concepts are introduced from outside, new concepts also arise within the receiving community in the form of local innovation. The receiving community must be able to communicate with its different stakeholders in order to process the changes taking place. This initiates a need to establish working partnerships with other sectors of society, which can further enhance adaptation by providing new competences and/or new concepts. However, the means of communication are changing from more traditional to ICTs, due to their

characteristics: faster access, ubiquity, storage capability, and communication with several stakeholders at the same time.

The factors shaping education and development analyzed in the theoretical framework can be synthesized in seven criteria to analyze the validity of the University Outreach Program. The following table presents the seven criteria.

Table 2: The Seven Criteria to analyze the validity of the UOP

4.1. Changing Social Aspects	4.2. The Systems and Research Dimensions
A) Provision of connectivity through ICTs Does the UOP provide and use ICT tools to suit the needs of digital natives and globalization, which are: equal access to information, information sharing capabilities, research and ubiquitous knowledge generation through ICTs for all? (as stated in points 4.1.3., 4.1.4. and 4.1.5.).	E) Needs assessment Is the UOP aware of technologies, user needs and user language? (4.2.4.)
B) Connection between classroom education and real world situations Does the UOP establish a connection between the classroom and the outside world to generate knowledge and disseminate it by means of ICTs? (4.1.6.)	F) Establishment of a system to link knowledge Does the UOP establish a system to link the four kinds of knowledge across all domains and with all stakeholders, to address the needs of Research Mode 2 → (4.2.5.)? Is there a system to manage Intellectual Capital? (4.2.1. and 4.2.5.)
C) Availability of public dependencies and knowledge to all stakeholders Does the UOP connect and engage the	G) Implementation of Research Mode 2 Does the UOP implement a non-linear, reviewed-by-applying, transdisciplinary

public knowledge infrastructure to society. (4.1.1.)	research scheme (corresponding to a change from Research Mode 1 to Mode 2)? (4.2.2. and 4.2.3.)
D) Transparency Is the UOP transparent to ensure equality towards stakeholders? (4.1.2.)	

5. ANALYZING THE UNIVERSITY OUTREACH PROGRAM (UOP)

The analysis of the University Outreach Program begins with a comparison between the Statute of the National University of Asuncion and Research Mode 2 for the following reason. As stated above, there are links between the education received at primary and secondary levels and the quantitative and qualitative educational expectancy in university. There are also links between the education received at university, its outcomes and the applicability of those outcomes with employability and overall improvements in the quality of life of the stakeholders of the university. In this regard, the implementation of RM2 in universities connects all the aforementioned issues: the need to recognize and act upon the social responsibility of universities with its stakeholders, the changes in society brought about due to globalization and technology, the changing modes of delivering education and the difference in access to it and a need to better understand the ways in which research is now expected to take place. Research Mode 2 requires social input from a variety of sources, an engagement of universities and its research teams with the needs expressed by society, proposing solutions and testing them in real environments. Research Mode 2 serves as a central piece from which all other items can be analyzed.

5.1 The UOP according to the Statute of the National University of Asuncion.

According to Title I, chapter I, Point 2 of the Statute of the National University of Asuncion (Universidad Nacional de Asuncion 2005a), the UOP is one of the seven goals of the university, which are as follows:

a) Develop the human person based on the values of justice, democracy and liberty.
b) Teach and develop higher professional education.
c) Do research in the different domains of knowledge.
d) Serve the community in all areas in which the university develops its activities.
e) Build and disseminate universal and national culture.
f) Develop the Outreach Program.

g) Study the situation of the country and its problems.

An analysis of the goals of the UOP shows some congruencies with the goals of the Humboldtian university in which there is freedom to store and disseminate knowledge (teach and do research), as seen in sub points b), c) and e). However, one of its goals is also to train professionals for work, again as stated in sub point b), which means that it also has the aim of applicability that European universities have (Kantanen 2007: 38-39). Sub point d) indicates that the knowledge acquired should also be put in practice in serving the community. In this regard the knowledge acquired elsewhere should also be blended with the knowledge that is produced locally, since the university does not depend only on locally generated knowledge to teach and do research. The goals also establish a kind of feedback loop: sub point a) develops the human person in values; sub point b) disseminates knowledge and trains professionals; sub point c) applies the knowledge in doing research; point d) applies the knowledge to serve the community; and sub point g) sets the focus on national situations and problems. Sub point g) signals the beginning of the feedback loop by doing research on the effects of the previous engagement and then plan upon that to start the cycle again.

The University Outreach Program is a plan to promote better qualifications for university students at undergraduate and graduate levels. The aim is to convey to society the scientific and technical knowledge acquired and produced at the National University of Asuncion -Title VIII, chapter II, Point 107- (Universidad Nacional de Asuncion 2005b). The objectives of the plan are to:

a) Link the UNA and society by means of dissemination and extension of humanism, science, technology and other manifestations of culture.
b) Develop its functions and achieve its goals while helping improve Paraguayan culture, arts, humanism, science and technology.
c) Do research on, rescue and preserve all cultural, humanistic, scientific and technological contributions of Paraguay, especially those that enhance its identity.

d) Promote in all university students the strengthening and perfecting of a sense of responsibility and commitment towards society as well as towards the UNA.
e) Extend unto society the activities of the UNA, as well as the results of its academic work, prioritizing those aimed at delivering services or offering support to the community.
f) Constitute, preserve, increase, administer and disseminate the university's cultural patrimony and the humanistic, scientific and technological acquis of the university.
g) Organize and deliver social services as well as professional internships, preferably as a means of addressing social needs.
h) Link university-level teaching to society by offering plans and programs for the dissemination of knowledge that addresses specific societal needs. The plans and programs may be academically linked to formal academic teaching.
i) Establish programs for the delivery of services and offer of the results of academic work that may help address social needs.
j) Disseminate the postulates, principles and all other elements of identity of the UNA.
k) Register, preserve and disseminate the activities that may be of interest to the development of the institution in all its aspects.

From this description, it can be seen how the UOP encompasses all the goals of the university, from doing research, to forming citizenship in students to addressing national social problems. It is worthwhile to note that six of the ten objectives of the UOP are related to addressing social problems from within the infrastructure of the university. This is repeatedly stated throughout the General Guidelines for the Outreach Program (5.2.4. and 5.2.5.) and especially in article 12. Another point that should be mentioned is that four of the ten objectives are also directly related to the use of technology and the promotion and use of locally made technology.

Sub points a), d) and f) refer once again to the aforementioned feedback loop. Students must link the knowledge acquired at university with the one acquired culturally, enhancing both by means of dissemination. Sub point g) points out the aim of direct

hands-on involvement of the university in addressing social needs, reinforcing the feedback loop. Sub points c), e), j) and k) mention the need to install a database where all the knowledge acquired by means of research can be stored and disseminated in order to improve not only the knowledge but also the services offered thanks to the knowledge. Sub point f) underlines the need for a database once again. Sub point h) refers to a direct link between teaching and researching, while sub point i) points out that the outcome of formally academically teaching and doing research on the social needs addressed in sub points a), d), f) and g) should be disseminated and applied to solve the problems identified.

Article 102 also states that the research done at the university aims to:

a) Become the place to develop, create and recreate the knowledge and education of researchers and scientists.
b) Know and understand nature, humankind and society, as well as the processes and phenomena that take place among then, to contribute to the advancement of knowledge and the solution of problems.
c) Create materials, systems and procedures that help in scientific and technological development of activities that may become agents of change.
d) Develop knowledge linked to social problems, contribute to raise the economic, social and political standards of living; support all expressions of culture and foresee the ways in which these aspects will develop in the future.
e) Be congruent with the teaching aspect of university life so as to offer support that may improve its quality and strengthen its development; it should also focus on the outreach program of the university so as to offer it the benefits of its development to ease the process of reaching the research community as well as all of society.
f) Serve all other objectives mentioned in the laws of Higher Education, the Statutes and By-laws of the National University of Asuncion.

As is evidenced in this article of the Statute, research is seen as a means to develop the human person. Students and professors are encouraged not only to aid in research and put it to use but also to become researchers themselves. Sub points b) and d) state that

all persons in university are expected to provide solutions to problems in society; they are expected to do so by creating the means to do so – point c). Research is expected to solve real social problems independently of the UOP, yet point e) states once again that research should seek to support the UOP. Therefore, it can be concluded that all research should be applied research, whose aim is primarily to solve national social problems. This is where point c) is once again relevant: it is expected of both students and professors engaged in research to "create materials, systems and procedures for development" to produce the necessary social change. Following this train of thought, Article 103, sub points b) and e) state that the research shall be carried out at the university in one faculty or among many or at one faculty together with one or several external actors. It also refers to doing research reflexively and critically, orderly and systematically.

Table 3: Characteristics of Research Mode 2

Mode 2
1. Problems are set and solved in a transdisciplinary fashion
2. Context of application with diverse set of intellectual, economic and social interests
3. Research results communicated interactively and continuously throughout the research process
4. Organizational diversity linked together through functioning networks of communication
5. Research groups are heterogeneous and transient (producing knowledge beyond itself)
6. Increased reflexivity on the

	impacts of research and social accountability
7.	Quality determined by a wider set of criteria

From all the points analyzed from the Statute of the National University of Asuncion, there is evidence that there is an inclination to Research Mode 2 and Design Thinking in its proceedings. All faculties within the university are called to look into, do research on and propose solutions for the problems society faces. As stated in Article 103, sub points b) and e), faculties can work together or independently, yet must include one or more external actors or stakeholders. Although this does not directly mean that the research will be transdisciplinary – involving methods from other domains – it is a step in that direction in that the research will at least be interdisciplinary and make it possible to extend the research into transdisciplinary work. The work must then be interdisciplinary with a direct recipient of the work done by the university, which fulfills the first point of Mode 2. In the same vein, if there are interactions between stakeholders and researchers at university, there is also heterogeneity in research, and the research becomes transient in that it impacts more than only the research team This fulfills the fifth point of Mode 2. Once the university involves teaching, research, solving social problems and disseminating information, it is inherently connecting the second point of Mode 2: connection of intellectual, economic and social interests. Likewise, by making use of the aforementioned feedback loop between research, application, results, teaching and research again, point three 'continuous and interactive communication of results' is also met. Following the thought of point 4, if the research is applied and results are seen, communicated and then analyzed in class as is stated in sub point 'h' of the objectives of the plan mentioned above, then it will probably increase the awareness of social problems and the reflexivity of students regarding the problems. Point 6 would then be fulfilled as well. If problems are identified and presented to students, and solutions are proposed and tested in real situations, the means by which learning outcomes are measured will not only be peer-reviews, but the actual impact of the work done as reported by several different stakeholders involved in different situations. This would fulfill the last point: 'quality determined by a wider set of criteria'.

However, the University Outreach Program has not addressed one of the points of Mode 2: point number 4 'organizational diversity linked by a network of communication.' It is a point that is crucial if it is to be implemented successfully, according to Knowledge Management theory. In order to understand the implications of this better, it is necessary to analyze the General Guidelines for the University Outreach Program. The next section analyzes the General Guidelines of the University Outreach Program in order to understand how it is structured, what its requirements are and how it would take action to fulfill its mission.

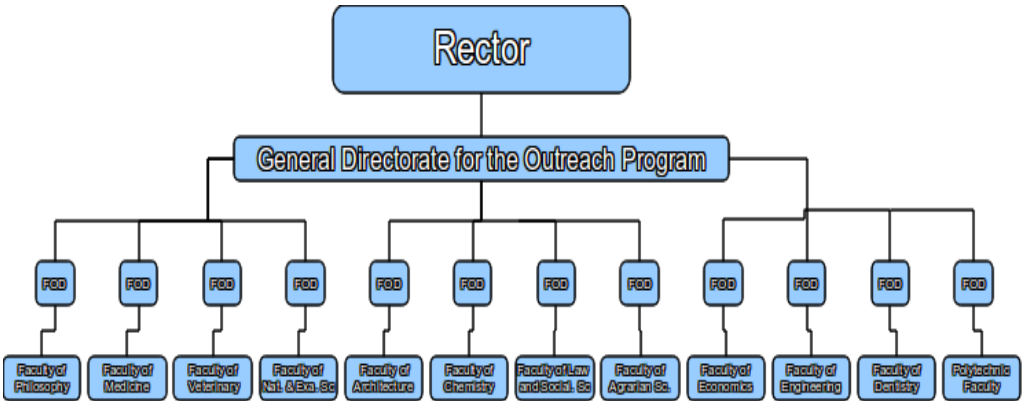
5.2 The General Guidelines for the University Outreach Program

The following is a part-by-part analysis of the General Guidelines for University Outreach. This section analyses the entire guidelines but not exactly in the order it was originally written. Articles 1 to 10 describe the organization of the UOP and are therefore more related to the 'Systems and Research Dimensions' of the theoretical framework. Articles 12 to 20 as well as 20 to 26 are related in part to the systems dimensions though they focus more on the 'Social Aspects'. Articles 27 to 31 explain registration formalities, the recognition given to students and professors and additional organizational points. Explanations are provided for each section separately again as necessary.

5.2.1 Articles 1 to 10 - Coordination Offices: The KM Aspect of the UOP

According to Article 4 of the Statute, two hierarchical instances have been instated in order to organize the University Outreach Program projects drafted within the university and its faculties: the Faculty Outreach Department (henceforth 'FOD'), and the General Directorate for University Outreach (henceforth 'GDUO'). There is one FOD per faculty in order to coordinate all proposals at a faculty level first. After every faculty decides what proposals to carry out as outreach projects, they report these to the GDUO. The GDUO is then responsible for coordinating the projects from the different faculties

and present them to the rector for final approval. The following graph provides an overview of the hierarchy.



Graph 1: hierarchy for the presentation of outreach projects

Article 6, of the official in charge of the FOD, states that a person eligible for the position of director of the FOD is one who has graduated from that same faculty with at least a Bachelor's degree or possesses some other equivalent degree from the same faculty that enables them to take that position. Article 5, of the official in charge of the GDUO, states that a person eligible for the position of director of the GDUO is one who has received a Bachelor's degree from the university (the UNA) and has vast knowledge in the elaboration, management and assessment of projects. Articles 6 and 5 both require that the person in charge hold at least a Bachelor's degree from the UNA. As was stated earlier, it is necessary that the person in charge of coordinating Knowledge Management projects be familiar with the proceedings and culture of the organization.

Analysis of the Section

Article 5 requires that the official of the GDUO have vast knowledge in drafting, managing and evaluating projects, yet it does not clarify the level of expertise necessary for the position nor the area of project management necessary. In the literature reviewed, projects in knowledge management revolved around key issues that those in charge knew deeply: sales, engineering, marketing, etc. In this case it is not mentioned

if the director of the GDUO must have expertise in human resources, accounting, field project coordination, research, etc. especially that of a university with twelve different faculties. There is an inconsistency between the requirements for the post of director of the GDUO and the tasks necessary to carry it out. The director is required to have at least a Bachelor's degree from one of the faculties, yet the outreach projects presented to the person in charge will originate from twelve different faculties, addressing the twelve different projects and at least the same number of different conditions under which they must implement the projects.

Another issue in the job description of the position of director of the GDUO is the educational level required. The post requires that the applicant have a Bachelor's degree, while the university does offer Master and Doctorate programs (Universidad Nacional de Asuncion, 2010b). As was explained in the paragraphs above, a great variety of abilities is required of the director of the GDUO, as well as knowledge of proceedings in several different domains of science. This difference between the education offered and the one required can lead to hiring personnel that has lower qualifications and less extensive research background than is required for this position. In the same vein, while the work of the director of the FOD is more localized and focuses only on their field of study, they must still work with schedules, finance, human resource management, and other similar issues even if only at a faculty level. Nevertheless, the description of the requirements for this position does not cite previous work or research experience.

From a Knowledge Management Point of View, the job description presented above indicates that the directors of the FODs and the GDUO must manage intellectual capital. The directors must have enough expertise to handle the three kinds of knowledge and to know how to access human resources available outside the university. Though the issue of retention is addressed below by keeping databases, it is also necessary that 'connection knowledge' be coupled with retention. In other words, knowing the contact information of the person required at a certain moment does not mean that the necessary human contact can be evoked between different people. (See sections 5.2.3. and section 6.2.)

The directors must also allow a free flow of information between the sections that may need certain information. They must also know how to manage the intellectual capital available at the university in order to assign the right people for the different jobs. This also requires that the person in charge know what are the long-term development strategies of the university and each of the faculties. According to the theory reviewed, only then can the right decisions be made. It is therefore necessary that the persons in charge of the FODs and GDUO have not only a basic bachelor's degree but more academic instruction. They should have not only working experience in carrying out projects, but also in higher level research that is usually required in post-graduate education. They should possess solid knowledge of what are the needs of society in general. As stated in the theoretical framework section, this knowledge must include the effects of globalization, the digitalization of education, and the changes taking place in the productive sectors of society among others. These requirements are also the ones necessary to implement successfully Research Mode 2.

The analysis of the educational and professional requirements for the directors of both the FOD and GDUO indicate that there is an unanalyzed gap between what the work itself will most likely require and the minimum level of expertise elicited from the applicants. Nevertheless, a favorable condition for applying for the post is that the applicants hold a degree from the UNA. This does mean a higher level of familiarity with the institution than if the candidates held degrees from other institutions, which is necessary for greater integration with the institution and its goals from a knowledge management point of view.

In brief, the directors of the FODs and the GDUO are in charge of determining key element a) of Knowledge Management: establishing the area of expertise, its people and their capabilities and needs (See point 4.2.5.). Given the level of preparation required to occupy the post, however, there is a possibility that criteria E, F, G and A (4.1.3.) would not be met. If the directors of the FOD and GDUO are not fully aware of the needs of the users (E), then they would also not be able to connect the necessary resources even

if a system such as the one in criteria A and F existed. Therefore, criterion G (implementation of RM2) could not be met either.

5.2.2 Coordination of the Outreach Program at a University-wide Level

Article 7, The Duties and Attributions of the General Directorate of University Outreach.

Article 7, point a) requires that the GDUO elaborate the annual operative plan and coordinate it with those of all other outreach departments. Point b): It must draft a budget estimate for all outreach operations for the year. Point c): It must also schedule four annual meetings with all outreach departments to ensure their adherence to the General Guidelines of the UOP, the Statue of the University and its policies. As part of its coordinating duties, it must promote the formation of multidisciplinary inter-institutional workgroups to carry out joint outreach projects. Point h) requires that the GDUO establish contact with natural and juridical persons so as to gather the necessary resources for the outreach projects. In this sense, Point i). requires that the GDUO supervise and guide the projects of all faculties and outreach departments, while point j. requires that it gather all project reports from the previous year in the month of March. It must then evaluate these reports based on an instrument made by all outreach departments – Point k). Upon such review, Point l) ads that its director must participate in meetings called for by the recto or vice-rector to analyze the results of the projects and based on these results propose the necessary actions. It must then gather all reports from all outreach departments and prepare a consolidated report to submit it to the rector; Point n. adds that should other reports be necessary, it is the duty of the GDUO to write and submit these as well. These records of projects and evaluations must be kept available, preferably in electronic and audiovisual means – Point o). As a last duty, the GDUO must make the necessary arrangements to publish the outreach projects and their results.

Points e), f) and g) state that it must promote outreach projects that have a social impact and that satisfy the needs of the community to improve its living conditions. It must promote and organize cultural, artistic and sports activities.

Analysis of the Section

In the previous section, it was proposed that the position of director of the GDUO would entail several duties for which a bachelor's degree may not be sufficient in terms of research experience and overall qualifications. The description of the duties of the GDUO in this section indicate that such proposition would be correct, since the duties require knowledge of project management (points a), h) and k), accounting (point b), law and internal regulations (point c), team management (point d) and knowledge of current social situations and needs in at least twelve different domains (point e). It would be logical to assume that the director of the General Directorate for University Outreach would not be expected to perform the aforementioned tasks on his own. However, it is clear that they must be capable of having a clear general vision and comprehension in order to lead all these actions and establish the relevance and overall performance of several different faculty projects, as is defined by KM key element a).

Another issue that stands out in the description of the duties of the GDUO is the need for reports. While this is a common requirement especially in large organizations, little attention is paid to the means by which such reports are to be exchanged. According to Article 7 and its sub points, the GDUO must coordinate the efforts of twelve faculties, gather resources with any number of external actors and/or stakeholders, call for meetings with these at least four times per year, receive the reports of the faculties every February and then re-report these to the Rector. However, it is only suggested and not required that the record of reports be kept in digital and/or audiovisual material. Furthermore, point a) requires the planning of an annual project plan and budget estimate, while point j) requires the reception of the reports of the activities of the previous year in February.

While all the organizational processes and reporting mentioned above are common requirements especially in large organizations, little attention is paid to the use of information and communication technologies in this case. The theoretical framework presents a global idea of the use of information technology in these processes and the ways they could enhance speed and accuracy in these matters. These considerations pertain to key element b) of KM, the organizational, structural and technological aspects of managing the required knowledge. However, the General Guidelines do not mention the use of any specific system or technology in order to organize the delivery, exchange or retrieval of reports. The drafting, proposal and approval systems are schematized, the hierarchical structure is set, yet the means by which to enable a fluid exchange of documents is not addressed.

Additionally, in this case, it would be logical to assume that the reports of previous years would be necessary to draft the projects of the following years, which in terms of knowledge management would be a partial feedback loop. It would be partial in the sense that during the previous year, at least four meetings had to be held to coordinate the projects and budgets, yet points m), n) and o) only state that the final reports would be delivered to the Rector and not shared with all other faculties as well. Should this actually take place, it would comply with key element c), the need to establish a feedback loop to examine the results and the necessary changes before the beginning of the next UOP cycle.

Thus far, the analysis of these articles indicates that there is a Knowledge Management-like structure, but its parts are not entirely well represented. There is the required structure of communication between staff, professors and authority, though it seems that communication flows in one direction from the lower echelons to the higher ones. There is a hierarchy for decision-making: from the stakeholders that can propose projects to the rector who can finally approve them. This is necessary in order to maintain coherence in the efforts carried out by the university as a whole. There is also a partial feedback loop, in which all faculties report their activities and degree of success to higher authorities.

The feedback loop should not be partial only, but complete. According to the literature reviewed, the information produced at all levels should be available at all levels as well (criteria A and C). This is necessary in order to allow better comprehension of the processes taking place within the organization and thus more adaptability to any changes that may occur (criterion E). Understanding the need for changes can help stakeholders adapt to them faster and produce better results since they will know what to aim for, what to expect from the changes and how to modify their work in order to fulfill the new expectations. It would therefore be necessary that the communication structure allow sharing information not only from the lower echelons to the higher ones but in all directions (criterion F), so that the information can have the necessary impact on time. In this regard, the partial feedback loop should be a complete feedback loop. This shows that criteria A, C, E and F are not entirely met.

5.2.3 Article 8, of the Duties and Attributions of the FODs

Article 3 states that every faculty must write their own Outreach Program by-laws in accordance with the General Guidelines for Outreach Programs. These by-laws must be approved by their directorate, which in turn answers to the Rector. The other divisions inside the university that are not faculties but that depend on the Rector's Office that do carry out outreach activities must also write their own Outreach Program by-laws in accordance with the General Guidelines for Outreach Programs. However, these non-faculty institutions, whose duties and attributions are stated in article 9 and its sub-points, will not be detailed here because they are the same as those of the faculties.

Article 8 points a) and e) state that the FOD must draft outreach project plans for the following year, and submit them to its corresponding directorate by December of the current year. Point b) requires that the projects approved by the directorate be sent to the GDUO by February of the following year. According to Point c), the budget estimate must be submitted in time and in the required format. With regards to reporting activity, Point m requires that FODs keep records of all stakeholders (professors, researchers, scientists, graduates, students, staff, etc.) involved in outreach projects. The reports of all projects carried out in the previous year must be submitted to the GDUO by

February of the following year – Point n. According to Point o, other reports must be submitted upon request as well. All reports and records of projects from a faculty must be kept by their respective FOD, preferably in electronic or audiovisual means. Point p requests that the director of every FOD take part in the work meetings with other representatives of outreach departments called for by the vice-rector and/or the GDUO. Regarding the content of the drafted plans, Point f suggests involving other faculties, entities, associations or communities in carrying out the outreach projects. Point g suggests promoting artistic and sports activities and Point h suggests organizing cultural events.

Regarding the involvement of stakeholders, point d) states that projects should allow the participation of professors, researchers, scientists, graduates, students and staff. The purpose of this participation is to link these individuals to society by means of their corresponding domains of specialization. Point j) proposes that contact be established with natural and juridical persons both at national and international levels in order to acquire and manage resources for the outreach projects. Point k) requires that faculties promote the offering of consulting services and professional services to private companies and public and private institutions, to bi-national entities, international organisms and civil society organizations. Point i) requests that scientific, technological, artistic, sports and outreach activities be disseminated, while Point l) requires that a database be maintained so as to keep records of all outreach projects carried out at every faculty and their dependencies, preferably by electronic or audiovisual means.

Analysis of the Section

The need for reports is once again present in the requirements made to the FODs. In this section of the General Guidelines, however, there is greater emphasis on the need to maintain databases regarding the stakeholders involved in every project. There is again a suggestion that the database be electronic. Nevertheless, this does not necessarily mean that there will be a connected database of all faculties and a main hub for the entire university. In this same line, point i) requires the dissemination of the outreach

projects and their results. However, it is not stated by what means they must be disseminated.

Combining the previous analyses, there is a clear need to maintain an active and dynamic database. The FODs must plan the projects and send them to the directorates for approval. Upon approval, plan drafts are sent to the GDUO for analysis and further approval. After the GDUO analyzes the budget estimates and approves the plans, it sends them to the Rector for final approval. This final approval must then be sent back to all twelve or more FODs in order for them to start the projects. Once the projects are started, every stakeholder, student, professor, staff, piece of equipment and money spent must be documented and stored in databases for future reference. Upon the conclusion of the projects, reports are once again sent to the GDUO and the Rector for consideration for the next cycle.

Should this entire process be done on paper, transported physically to every office for approval with the necessary number of copies for every member of every board, and then stored physically for future reference, the process would be very costly in terms of paper, ink, fuel and above all, time. This is not to mention the environmental impact of continuing such a process by physical means. However, since databases are proposed as a means to store the necessary data for every project, it would accelerate the process if every FOD had electronic database to store the required data. The databases can store all the necessary data regarding the stakeholders involved in the process, the reports of every project, the approval of budgets, the cash flow of the activities and the necessary feedback and assessment that comes at the end of every year and the planning of the next based on the performance of the previous. This again addresses key element c) of knowledge management: the need for a feedback loop. The enabler for such a feedback loop is key element b), the appropriate technological means to achieve knowledge management.

As was presented in the theoretical framework, having a network to connect the different sections of an organization can serve several purposes. The most obvious one would be a decreasing dependence on paper transactions with regards to reports.

Reports can be sent over a computer network without the need to physically transport documents; upon approval of the contents of the document, both a digital and hard copy can be kept. Second, such a network can easily store many other documents or tools necessary to draft plans, which can be accessible to all at all times, reducing waiting time for document transport (criteria A and C). Likewise, it would be the same for all at all times, meaning that the same version of a document can be stored and all interested or authorized parties can read it in real time, without the need to check the version of the document being read, edited or approved (criterion D).

In this regard, Article 10 roughly describes the content of the annual reports that the FODs must present to the GDUO mentioned in the sections above. The documents must contain a synthesis of the activities that were carried out, the degree or percentage accomplished of the goals proposed and the obstacles found in carrying out the activities, with further details not mentioned in the General Guidelines provided by the Department of Planning and Development of the University. However, the article specifies that the documents must be produced in print, with backup copies in electromagnetic or audiovisual means. This confirms that every FOD is already expected to have backup copies of documents in digital form, for which a computer system capable of handling currently available formats is necessary (criteria E and F). Therefore, the points analyzed indicate that there is a need for a more agile and flexible means of communication among the different parts of the university and the UOP departments.

5.2.4 Of the Social Aspects: The Stakeholders

The various stakeholders considered by the university as such are not found in one specific article that lists them or assigns them a degree of importance. As was stated earlier, the most important stakeholder of the National University of Asuncion is the public sector through the government because without the public sector it would not exist. This is so for two reasons: first, the UNA was founded as a public institution; second, it is still publicly funded, with a growing budget to reach tuition-free education for all students.

However, Article 8 lists the sectors of society with which the university would like to interact. More specifically, the university seeks to provide professional and consultancy services to private companies, public and private institutions, to bi-national entities (of which Paraguay has at least two in the form of hydroelectric power plants with Argentina and Brazil), to International Organizations and to Civil Society organizations. National and international natural and juridical persons are mentioned as sources of resources for outreach projects, which entails that the university is answerable to them for owing them reports on the usage of the resources provided. These groups effectively include all of society, since no organization or person is outside these groups in one way or another. Thus, the university is potentially answerable to all of society according to these points. Yet if we consider that the university trains those who will later work in these organizations, as was stated earlier, then this only emphasizes the need to cooperate with these institutions. Therefore, since the university seeks to engage with such a diverse range of stakeholders it must comply with criteria A and D. This further emphasizes the shortcomings identified in points 5.2.1., 5.2.2. and 5.2.3. that indicate that criteria A and D are not met.

5.2.5 Articles 11 to 20 - Origin and Planning of UOP Projects: KM and Social Aspects

Articles 11 to 13 explain the process and objectives of the projects of the Outreach Program. Articles 14 to 16 explain who may propose projects and the approval system. Articles 17 and 20 describe the involvement of students in the projects at one or more faculties. Articles 18 and 19 state the percentage of participation required of students admitted before the OUP came into effect who are still at the university. These will not be analyzed since they do not have any effect on the overall rules of the program, nor do they affect it after the first years of implementation, which have already passed. In order to better analyze and explain the sections, they are presented in the following order: 14, 15, 16 and 20, and then 11, 12, 13 and 17.

Analysis of the Section

Article 14 states that the aforementioned extension departments, that is, the FODs, the GDUO and the other departments, may propose OUP projects. However, any course, department or member of the university can propose projects either individually or through their associations or centers (teacher associations, student unions). These activities proposed by individuals and associations must still undergo the approval process: submitting the projects to the FOD, the GDUO and then the Rector.

According to Article 15, if several coursers and departments deem that a project is very important, then that project may become part of the study plan of those courses and departments. In that case, the project will be scheduled and programmed as part of the class hours of those courses, abiding by the required attendance and calendars for the courses and project. Likewise, the courses and departments taking part in the project will then also be responsible for reporting the outcomes to the FOD.

In any case, should the project be part of courses or not, it is necessary that at least one professor, researcher, scientist or professional technician actively employed by the UNA be in charge of the project in order for it to be considered valid – Article 16. According to Article 20, students are free to participate in the activities organized by other faculties to which they may not belong, upon approval by the host faculty and presentation of the necessary documents to the faculty of origin. Students who additionally take part in social assistance programs or emergency relief programs will be awarded special recognition by means of a certificate of participation. In order to organize better the cooperation among faculties it is necessary to have a communication system as well as common rules (criteria A, D and F). However, the General Guidelines do not mention this.

5.2.6 Importance of Project Proposals: Possibility for Conflicts

The structure established for the presentation of outreach projects is very clear. The outreach departments may propose projects, while students, professors and staff may

propose their projects as well. However, this hierarchy does not address a number of scenarios. First, there is no mention of an order of importance for projects presented by the staff of the university or by students; that is, it is not stated if a project presented by a member of staff has precedence over one presented by a student. There is no mention either that a difference in importance should exist between proposed projects solely based on the position of those presenting a project. It may be assumed that the projects presented by professors would have a greater theoretical and argumentative weight, which may not be present in the projects presented by students. According to the descriptions above, both may have an impact on society and produce the required results, yet one may do so at a higher level or greater scale than the other. That is to say, the Guidelines mention no mechanism to decide which project should be carried out, and on what basis the decision would be made. In this regard as well, there is no mention of a system to discuss such matters with those involved in the decision-making process.

A similar issue would arise with the combination of Articles 3 and 20. Article 3 states that every Faculty must write its own UOP by-laws in accordance with the Guidelines, and Article 20 states that students can participate in the projects of faculties other than the ones in which they are enrolled. Should any problems arise between a student and a host faculty in the development of the outreach activities, it is not stated according to whose by-laws the matter is to be settled. Even assuming that no problems arise between two or more faculties in this sense, Article 10 states the minimum requirements for reports for all faculties including only very basic information. According to Article 3, every faculty can populate the reports differently. If students from different faculties interact in project execution, it is not clear whose measurements will be considered for the purposes of reporting. What is more, different projects within one faculty may be designed according to different frameworks for a number of reasons, thus adding more variables to the scenario.

According to the knowledge management theory reviewed, it is necessary that a central hub be the link, discussion and decision-making point as well. The GDUO section mentions that the hierarchy established to present projects serves also as a stabilizing

agent to make the proper decisions, which is a key element in managing knowledge and making decisions. However, a system would be necessary if a greater number of stakeholders are to present, analyze and propose solutions to conflicts between projects. This is especially true when it is considered that in order to draft a project plan and present it, several stakeholders must be consulted and engaged beforehand (see the next section). If a well-drafted plan were not approved, it would also require that the stakeholders know the reason it was not approved.

The first goal mentioned in Article 11 is to "improve the qualification of students and graduates and the projection unto society of the scientific and technical knowledge gathered in the experience of the UNA." The reason the activities proposed must be organized as projects is to clearly state goals, objectives, human resources, costs, financing, etc. Such layout allows for better organization of the activities, optimization of resources and properly analyzing and evaluating every activity. Special attention is paid to joint projects that integrate several institutions with multidisciplinary activities that allow the rationalization of resources and that can have greater social impact.

Article 17 establishes that all students must have worked at least thirty hours in at least three different projects organized by their faculties in order to graduate. However, every FOD will determine the minimum amount of time to be spent at the different activities and the credits awarded to them. Article 12 states that every faculty is required to organize and carry out a minimum of three outreach activities per academic year. Different activities are those that fit in different categories described as follows:

a. Extracurricular courses; training programs for the community, educational talks that address social needs, campaigns to raise awareness.
b. Offering services to society, social assistance.
c. Cultural Activities: music, theater, dance, festivals, concerts.
d. Sports.
e. Publications, electronic transmissions.
f. Congresses, Seminars, Symposiums, Forums, Panels, Conferences, Videoconferences, Expositions.

g. Field Work, Apprenticeships, Study Trips.
h. Consultancies, Advisory Services, Professional Services.
i. Follow-up programs to graduates, dissemination of career opportunities.

These activities may be carried out within university premises or outside them. The most important point to consider is that the final products of the activity – such as teaching, studies and research services – reach society. The aim is to allow the students to have a clearer vision of the social reality of the country and to connect the university with its social environment.

Article 13 details the contents of the project plan, which are as follows:

a. Name of the project
b. Organizing institution
c. Faculties, Institutions and Organizations involved
d. Objectives
e. Goals
f. Expected results and evaluation methods for those results
g. The human resources taking part in the project (number of students, professors, staff of the UNA as well as people from other institutions and organizations that will be involved.)
h. Beneficiaries of the project
    i. Place
    ii. Neighborhood
    iii. School
    iv. Club
    v. Others
    vi. Number of people who will benefit from the application of the project (children, youngsters, adults, etc.)
i. Costs
    i. Means of transportation
        i. Bus or other means

ii. Cost of fares
iii. Fuel

ii. Lodging/ Housing
iii. Non-reusable material to be used
iv. Materials to be distributed
v. Salaries/ Payments to be made
vi. Film, Tape, photo development, printouts, etc.
vii. Information editing

j. Financing
   i. Government resources
   ii. Institutional resources
   iii. Rentals (buses, equipment, others)
   iv. Donations
   v. Others
k. Timetable of the project
   i. Estimated dates to carry out the projects
   ii. Time spent actively working on the project
l. Academic credits, certificates, recognition plates/ certificates, prizes and other motivational means to be awarded to Professors, Students and other participants.
m. Additional information as necessary.

Analysis of the Section

Article 11 states that the drafting of activities in the form of projects allows for a more structured overview of what is to be or has been done. This makes it easier to assess a project in different sections: it is easier to establish what aspects were more thoroughly planned, what needs more planning should it be done again, if the aspects that are more relevant to the learning objectives were met and to what degree as well. This is further enhanced by classifying the projects by type of activity in Article 12, the different

material items to be considered in budgeting in Article 13 and the amount of time to be spent per activity in Article 17. All of this complies with criteria D (transparency in proceedings) and E (awareness of user needs). However, an interpretation problem may arise when combining Articles 12 and 17. The former requires at least three outreach activities to be planned and carried out per year, while the latter requires that the students take part in a minimum of three by the end of their career and in order to graduate.

This may be interpreted as follows: every faculty must present a minimum of three outreach activities per year yet not all students are expected to take part in them. Subsequently, students in a four-year career may select a minimum of four activities from a total of twelve that will be available to them in the four-year period. This may lead to an additional problems. If every faculty takes the time to propose three activities according to the requirements of Articles 12 and 13, this already entails spending some time on planning and proposing the necessary justification for it, not counting that in order to propose it to the students it must first be approved by the FOD, the GDUO and the Rector. Should this approved project not be appealing enough for students and too few of them register to take part in it, the resources spent on drafting and approving it would be wasted. It can be argued that the project can still be stored to be presented to another faculty, group of students or some other time, yet most of the items in Article 13 will have changed price, supplier, place and beneficiary community, requiring substantial changes.

Another factor to be considered in this regard is the amount of time required spent working at projects. Article 17 does not clarify how this amount of time is to be understood. It could be interpreted as that students should spend thirty hours at every one of the three mandatory projects, or, ten hours in each of the three mandatory projects. One interpretation would yield ninety hours of work, while the other thirty. Thirty hours may be enough to fill the list of Article 13 to the required level of specificity, yet it would probably spend the entire thirty hours of one student on one task for one part of one project, after which that student would have no more responsibility in the project. Should the other interpretation be applied, it would leave the list

incomplete for being very little time. Additionally, every activity must be proposed as a project, which means there should be theoretical and/or empirical evidence to support the need for that project. As was stated earlier, students at the university are required to do research work/thesis as part of their education and in order to graduate. Thus, most students would recognize that thirty hours would not be enough to provide the necessary empirical and/or theoretical evidence to support the need for a project.

The time consideration is especially important if the project proposal comes from students. If the time spent in drafting the project is counted as part of their service hours, then once they can prove the thirty hours have been invested, their responsibility is over. However, when carrying out a plan, it is important that the initiator of the plan be present in order to guide further activities in the right envisioned direction, as leadership is always an important element in all projects as stated earlier. If the ones proposing projects are professors, scientists or researchers hired by the UNA, then their time spent at drafting the projects are part of their duties as researchers for which they were hired in the first place. Therefore, though initially criteria D and E were met by requiring planning in the form of projects, the wording of the Guidelines may lead to confusion regarding the time students should spend at the projects.

5.2.7 KM and the Digitalization of Education

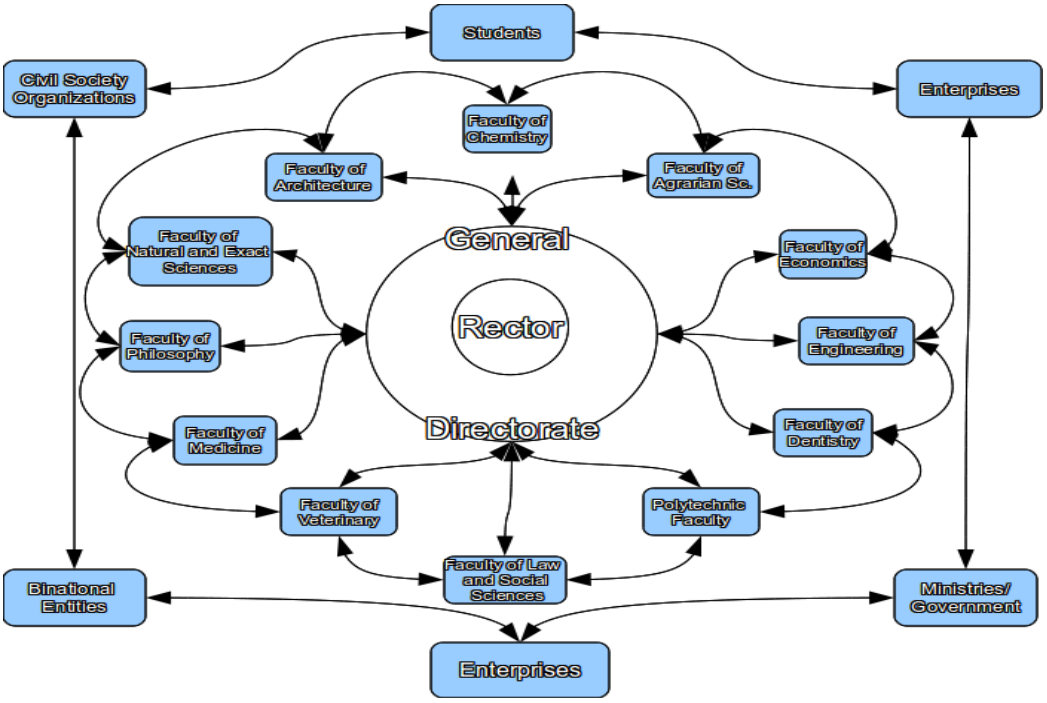
The combination of Articles 8, 12 and 14 yields another point of analysis. While Article 12 lists the different kinds of activities that may be presented as outreach projects, Article 14 states who may present them and how, while Article 8 opens the projects to outside stakeholder involvement. According to 14, only those with 'university citizenship' may present projects, yet they are encouraged to present projects that call for the participation of stakeholders outside of university. As was stated earlier, it is positive to have students from different social groups for at least two reasons: in order to have more varied points of view in all matters related to university, and so that they may propose solutions to the problems they experience in the different groups to which they belong. However, many times these students may not be working or may be working either in areas not related to their careers or in positions that are not

hierarchically relevant to see the real problems of a certain sector. The combination of these three Articles then means that outside stakeholders (see section 'University Stakeholders' from Article 8 above) may not reach the university to propose projects if university members do not act as contact points for them first. This indicates that it is necessary for the university to be open to stakeholders outside itself if it seeks to engage with its stakeholders to fulfill its goals.

This situation could be addressed if there were a provision in the General Guidelines stating that outside stakeholders can also propose projects directly to the GDUO or the FODs, calling for the involvement of the university in matters that affect them (see Graph 2). Should there be such a provision, it would also be helpful if interested parties within university could learn of the projects presented and request to be assigned to a certain project. Should this step be allowed, it would point to the need for a system by which all university members could learn about the projects proposed to the FODs or the GDUO both from within or without the university. This would help members of the university be aware of all projects proposed, select the projects they are interested in, apply for them and then form interdisciplinary groups to work on the projects.

As is stated in the section discussing the importance of project proposals, opening the UOP to input from different stakeholders can lead to conflicts when deciding what projects are to be approved and which are not. There is nevertheless a need to open the UOP to input from different stakeholders if the university seeks to interact with them to provide services and possible solutions to society. Since the theoretical framework presented the current state of the use of information and communication technologies in the productive and educational sectors, the evidence indicates a need to address this issue when opening the UOP to external input and dealing with conflicts in proposals.

In the educational sector, students are using ICTs to access information and apply it in their lives to solve everyday problems of common interest. Even when the penetration of such technology is far from optimal, the efforts to spread it are continuous. The aim is to institutionalize this means of knowledge sharing and capacity building to accelerate



Graph 2: Proposed Layout of Connections of the University and its stakeholders

the rate at which educational problems are addressed and solutions provided. At the same time, private

institutions are also relying ever more on such technologies to reduce costs and enhance their activities by means of faster knowledge-to-product transition. This shows that of the three actors analyzed here, two – education and industry – are relying on ICTs to improve their performance. However, as stated earlier, the university only suggests that electronic means be used to publish and store documents and projects There is no mention of a specific system in which to do this nor is it a requirement to use such a system.

The university has already achieved the following: a) identify its areas of expertise; b) instate structural and hierarchical means by which to channel outreach projects and; c) establish a partial feedback loop. This means that while the university has identified many key elements in its effort to interact with society and its different stakeholders, it has not implemented several others. The university lacks a system by which to receive projects (criteria B and A), coordinate activities and their stakeholders (criteria A and

D), decide which activities to approve, inform the necessary parties (D, E and F.), carry out the projects and disseminate the information and knowledge acquired (criterion A). This could result in several scenarios. Students may not be interested in traditional education that not infused with the connectivity provided by new technologies and newer educational trends, which they are already experiencing in their private lives and in pre-university education. Private institutions may decide to found their own academies or fund certain programs to decide their contents if the current education does not suit the needs of the industry.

As a result of this, the university may experience a decline in its student population. If there are fewer students and these students do not engage as expected in the projects, then communities that may benefit from the engagement of the university through its students may not access this source of aid. Universities may also be subject to what private organizations dictate and require of them, since a lack of proper communication and initiative could mean constantly updating instead of setting the trends, as explained by McFarlan (1984).

5.2.8 Articles 21 through 26, of the participation of professors in UOP activities.

The participation of university teachers or professors is voluntary except in following three cases. A) When the activity is part of the courses they teach in which case they must participate in all the activities according to the activity calendar. B) In case of national emergencies, when the UNA requests the participation of teachers, their participation is compulsory. C) When a teacher or professor is hired in exchange for compensation. As stated in Article 18 for students, Article 24 states that teachers and professors can participate in the activities of other faculties upon requesting permission from both the faculty their work for and the host faculty. Article 25 states that the payments due for taking part in UOP activities shall be established in relation to the remuneration received in exchange for their services as teachers or professors. All faculties shall establish the amounts of these remunerations based on the type of activity, duration, place, etc.

Article 22 states that the merits teachers and professors earn by participating in UOP projects will be considered for promotion purposes when calls for applications are made to occupy higher positions within the university. According to Article 23, the faculties shall include within their promotion system a grading system to evaluate the merits received by teachers and professors for their participation in UOP projects. The grading systems must take into account: a) the participation in national emergencies, b) participation in social assistance programs, c) amount of time participated, d) Ad honorem participation and e) participation in exchange for payment. Article 26 further clarifies the rules for awarding merits, stating that those who engage in UOP activities in the form of offering consultancy and professional services in exchange for remuneration are not awarded any merits. Merits may be awarded when work is done Ad honorem.

Articles 27, 28 and 29, of the Records of Participation.

Article 27 states that at the end of every activity, those in charge of it must provide the corresponding FOD or similar authority the name of every participant and the amount of hours they participated. Additionally, according to Article 28, the FODs or other similar authority must have a record of all participants including names and last name, careers/study course, name of the activities participated in, amount of hours participated as well as any other required information, divided by group (differentiating the origin of the participants in staff, professors, students, etc.).

Articles 30 and 31, of General Guidelines.

The Higher Directorate of the University and the Faculty Advisory Boards shall incorporate in their respective regulations Ad hoc commissions to study and approve all the aspects related to the University Outreach Project –Article 30. Article 31 states that every institution is free to include in their internal regulations special guidelines regarding awarding special merits, scholarships, economic support, awards, partial or complete exemption of payment or other forms of incentives. This applies to teachers, professors, researchers, scientists, graduates, students and staff who are outstanding in

their UOP project initiatives and in proposing self-sustaining outreach projects. This also includes awards received in representation of the UNA in sports, artistic and other cultural activities at national or international levels, among others.

Analysis of the Section

Article 23 requires that a system be developed in order to grade the participation of professors for the purposes of promotion. It is stated that every faculty must develop such a grading system, yet the basic items to be taken into account when developing the system are already presented in the guidelines. Once again the possible differences between faculties could present a problem when professors take part in projects from two or more faculties, or if outside reports must be taken into consideration. This points once more to the need to have a system by which the FODs can consult with each other regarding grading, to compare measurements or simply to learn from the methods or changes of each other.

When taking into account Articles 27, 28, 29, and the need to keep records of participation, there is more evidence that such a database would ease the sharing of documents and decrease the need for double reports when two or more faculties cooperate. Furthermore, since there is no indication that outreach activities must necessarily be prolonged indefinitely, most cooperation groups would split after the end of every project. As Article 30 explains, Ad hoc commissions are in charge of making decisions in every FOD regarding every outreach project presented This means that after they make every decision, those who agreed to reject or approve certain parts of the projects will also split and probably not come together again. This carries the characteristics of ‘flexible government’, which means that much of the process that led to the approval or rejection of a project or to any other decisions made by the Ad hoc committees would be lost once the decision is made. Since it would not be necessary to have such commissions permanently, a possible solution would be to document the process by which they make the decisions and keep these documents available for further reference. This is evidence that criterion F (a system to link knowledge) is not met.

5.3 Summary of the Findings

The following table shows the findings from the analysis in Section 5. The table shows the criteria that are not met according to the analysis from 5.2.1. to 5.2.8.

Criterion / Points	5.2.1.	5.2.2.	5.2.3.	5.2.4.	5.2.5 – 5.2.6.	5.2.7.	5.2.8.
A) Provision of ICTs	X	X		X	X		
B) Life – Classroom connection							
C) Engage public infrastructure and society	X	X	X			X	
D) Transparency			X				
E) Needs assessment	X	X	X				
F) System to link the four kinds of knowledge	X	X	X		X		X
G) Implementation of Research Mode 2	X				X		

The table shows that the University Outreach Program meets criterion B, because the aim of the UOP is to connect the learning process with the world outside the classroom. The least met criterion is 'F', which shows that there is a strong need for a system to link the four kinds of knowledge existing at the university. This corresponds to a lack of implementation of ICTs, as is shown by criterion 'A' being the second least met objective. There seems to be little connection between the public knowledge infrastructure and society, as is shown by criterion 'C' being in the same position as criterion 'A'. This deficiency in connection and engagement between the different sections may be due to criterion 'E' not being met at the highest administrative levels as

stated in Points 5.2.1., 5.2.2. and 5.2.3. (the Coordination Offices, the GDUO and the FODs). Since the higher administrative instances do not seem to be aware of user needs and language and the available technology in order to encourage Research Mode 2 (point 5.2.1.), criterion ‘G’ cannot be present in the origin and planning of the outreach projects (5.2.5.). This could possibly cause conflicts, as presented in point 5.2.6. Given the lack of connectivity between the different sections, there may be a need to enhance the reporting process among all hierarchies in the UOP, where criterion ‘D’ seems to be an issue (point 5.2.3.). This could be done by means of ICTs as well, since the rest of the process also calls for this.

6. EVALUATION OF THE NEED TO INTRODUCE ICTS

The previous analysis shows that there is a need for ICTs systems. The Introduction of the Outreach Program makes this need more relevant and pressing. At the same time, a number of factors that are in themselves going through significant changes are influencing the UOP (such as the digitalization of education and the knowledge society). The main points in summary questions are: 1) where should researchers find the means to find out what the needs of society are? A possibly answer is by allowing stakeholders to present their needs and concerns to the university. 2) How can the university reach society, when there are seemingly no links between society and the university established yet? This could be done by means of an amendment to the current General Guidelines for University Outreach, enabling civil society organizations to present projects they deem necessary. 3) How can the university coordinate its efforts to more thoroughly address the needs of society? It can do this by means of a system where information is accessible to all stakeholders, where ideas and projects can be analyzed from different points of view and in which several stakeholders can participate and make their voices heard.

The system should:

a. offer stakeholders the possibility to propose actions to those who are in other geographical points in the country;
b. reduce the need to meet face to face to plan and organize activities, thereby reducing costs and saving time;
c. keep corporate memory by retaining contact and development message logs in a centralized yet distributable manner;
d. enable students to see the needs identified and knowledge gathered in other areas in order to propose projects and solutions.

6.1 Issues that an ICT system for the UOP is able to address

As the evidence from the General Guidelines show, the University Outreach Program itself does not have a communication system to address the issues identified in the analysis. In order to assess more qualitatively this need beyond the points identified in the General Guidelines for the Outreach Program, it is necessary to answer the questions proposed by McFarlan (1984).

Can ICTs build barriers for entry?

In order to answer this question, the current situation of education and the attempts to introduce ICTs in primary and secondary school must be taken into account. Those students who experienced the changes being proposed for primary and secondary education today would probably choose an institution that also follows these lines in providing higher education later in life. Likewise, introducing these changes sooner will mean that those who leave secondary education in the present time will choose the UNA over other options in the short term as well. This would additionally give the university the chance to develop its program to improve it as much as possible over time before ICTs in education become the norm. Additionally, while it would be somewhat extreme to say "to many of them (students), if something is not on the web, it does not exist" (Kern 2001: 131) it is true at least that if it is not on-line, then it is not as accessible as it could be. Therefore, even if the information is useful, students may not use it as much – or at all.

As was stated earlier, developing a system earlier is an advantage. It means that all other competing educational institutions would have to play an expensive game of analyzing the existing offers to try to offer something innovative. However, in this case, there could be a strong support from stakeholders outside the university as well. These stakeholders may find this interaction helpful to achieve their own goals and could get accustomed to it. The answer to this question is yes, ICTs can build barriers for entry for those institutions that decide to introduce ICTs later. At the same time, it can also build bridges for those who are used to using the technology. "Information technology has the potential to increase social capital – and in particular to bridge social capital

which connects actors to resources, relationships and information beyond their immediate environment." (The World Bank 2010)

Can ICTs build in switching costs?

This point is related to the previous one in that once a society has become used to a system and finds it convenient for its results, it will likely not want to change systems. If the university succeeds in implementing a system by which it can hear the concerns of wider society, work on them and provide solutions, then its mission would be complete and renewable at the same time. This system could provide the necessary complete feedback loop presented in the theoretical framework. It can ensure a constant supply of research subjects for the university, and at the same time a constant supply of solutions for society; considering that no solution will be definitive due to constant changes, there will always be a need to analyze and work on emerging needs. The answer to this question is yes, it can build in switching costs.

Can ICTs change the basis of competition?

According to the first point in this question in the theoretical framework, making ICTs available would mean faster communication among the different members inside university as well as with stakeholders outside it. ICTs could reduce some costs, especially in communication and travel as was stated above. According to the second point, a database or communication hub among faculties can mean developing better products by combining the knowledge available at different units. As design thinking and research mode 2 indicate, different points of view can lead to more holistic insights into issues or products, which can be translated into providing more solid and thorough solutions. It is likely however that the third point could not be implemented. Since the university has twelve faculties, it is unlikely that all efforts would be focused on one of them to provide exceptionally good results. This would go against diversity in education and would mean losing the interdisciplinary insight that is currently sought. The answer in this case is divided in three. The first two options would be answered with yes, while the third with no; therefore the answer is two-thirds majority yes.

Can ICTs change the balance of power?

This is related to the question of switching costs. Since the university would like to engage with outside stakeholders and get involved in the matters affecting wider society to offer solutions, it would be necessary that the university provide solutions in ways that are accessible to all and benefit all. Given that engaging with all possible stakeholders in society would require a balance in not favoring one stakeholder over another, the change in power balance would most likely need to be equilibrium of power. That is to say, if the university is successful in implementing an ICT system to better organize its reception of ideas and need from all of society, coordinate its internal efforts and then publish the results, it would require that the systems used be:

- the same for all stakeholders, to avoid preferences, advantages to some and disadvantages to others;
- open to scrutiny by all public stakeholders, so that all stakeholders can ensure transparency;
- open to improvement as needed, so that stakeholders may propose modifications to it respecting the first two points.

These guidelines are similar to the ones provided by the UK Government in their recent coalition statement (Her Majesty's Government 2010) as well as in their approach to systems engineering strategy for public services (Chief Information Officer Council of the Cabinet Office - United Kingdom Government 2010). The answer to this question is yes as well. Not only can it change the balance of power, it must bring balance in power.

Can ICTs generate new products?

Given that the question regarding changing the basis of competition yielded 'yes' as answer, it can be inferred that introducing ICTs can also generate new products. If the university were capable of reaching a state of synergy between its different faculties thanks to an increased ease of communication and access to information, then it would be able to generate locally relevant solutions to the problems submitted to it. The

theoretical framework presented some evidence that oftentimes the solutions to local problems are provided by organizations outside the environment where the solution is to be applied. The university can innovate in this section by combining the knowledge it already possesses in its different faculties to produce solutions with a local perspective.

The international image of an institution is based on how well it fulfills its duty to produce solid, valuable, reliable research and how often it is cited (Kantanen 2007: 63). As was discussed in the theoretical framework, sharing information is the key to developing new ideas and generate new research questions. However, physical transportation of documents and books is costly and takes very long, considering especially that it also occupies much physical space. A plausible alternative to distribute the knowledge generated at a university then is the use of ICTs. This would require well-built, constantly updated databases and a constant connection to it. As is stated in the section regarding the OLPC section, every one of those small computers used for school education can store one hundred or more books, while a regular computer could store thousands. This capability to store reading material can be turned into a capability to distribute them. A more concrete example would be publishing. As the CONEC report mentions (Rivarola 2003: 112-113), there are few if any publication activities at the UNA at the present time. With the introduction of electronic databases and knowledge management schemes, electronic publication would make it simpler and quicker for students and for the university as an institution to publish knowledge, thereby acquiring higher local and international status.

The administration of the university should take into account how communication has changed, the impact it has had on its stakeholders and how it can adapt to and benefit from these changes. They should take into account how ICTs can communicate the research capabilities of the university that would justify the expenditures involved in developing the system. However, maintaining an old system running and updated can cost large amounts of money and effort while not producing the results necessary to remain competitive (McFarlan 1984: 102). Given these considerations, the currently existing capabilities of the university must be analyzed in order to assess what is already available and what would have to be developed in order to fulfill the needs identified.

6.2 Existing Capabilities of the Computer System of the National University of Asunción

The National University of Asuncion hosts the National Computation Center (CNC, by its Spanish acronym) which controls all matters related to Internet access and connectivity for the university (CNC - UNA 2010b). The CNC operates the backbone of the computer system of the university, installs and maintains all its servers, connects all its sites by Internet and is in charge of assigning domain names for new local sites. It is also an active department of the University, which offers courses and trains the personnel of all other faculties in the use of computer systems (CNC - UNA 2010c).

Among the ICT-based connectivity tools provided by the CNC, there are several in-house developed solutions for the needs of the university (CNC - UNA 2010b):

- Academic system for faculties: allows planning, organizing, management and control of all faculty activities;
- Library administration system: to control library stock, loans and updates;
- Human resource management system: allows oversight of human resource allocation;
- Budget oversight system: controls the assignment and use of the budget of every faculty;
- System for goods and warehouse administration: provides oversight of the equipment available at the faculties;
- Fund administration system: provides support for the management of funds for special activities;
- Mail administration system: catalogues, stores and provides access to mail e-mail and regular mail,
- Course planning systems: aids in planning classes, reserving equipment, register attendance, etc.;
- Problem report system: allows reporting of faults in any of the other support systems;

- Service management system: provides oversight of all services offered and the beneficiaries of these services.

These systems allow the different faculties to control all the aspects of their administration and their course control, such as study plans, student admission, registration and exam results and professors' exam schedules and thesis review duties, among others (CNC - UNA 2010e). There is also an electronic publishing page where the university can publish its research work. Apart from these systems, the university also provides 'Moodle' installation and management courses (CNC - UNA 2010a). Moodle is software for "producing Internet-based courses and websites… for providing social constructionist framework of education" (Moodle Trust 2010), which matches the needs identified earlier.

While there is a publishing page at the CNC, it only hosts research done in technical domains related to its area of expertise. The UNA also has a separate publishing site where it can publish its research (Universidad Nacional de Asuncion 2010c) the first and last documents published correspond to work done in the year 2000. While there are different electronic publishing sites hosted at the CNC – UNA, there is no centralized publishing site to provide better access to all works in one place with a search engine. In the same vein, while the CNC provides technical assistance to individuals or organizations wishing to implement the Moodle learning system, the UNA itself does not make use of it.

As the analysis of the General Guidelines for the University Outreach Program shows, there is a need to have a centralized hub to organize all activities. Such a hub already exists, and it has developed several applications to fulfill certain existing needs. What is more, the CNC still has the capability to develop its own tools, lowering the need for foreign tools, applications or experts. However, all the necessary tools have not been connected to the actual needs of the University Outreach Program, and many of the tools available are not put to the use they could be given.

As was stated at the beginning of section 6, there are four points an ICT-system for the UOP should cover:

- Bring stakeholders together, bridge distances, reduce communication costs and time. The CNC already links all faculties by means of internet access, it provides access to the students' overall statuses to professors, administrators and to the students themselves. However, the Moodle tool which could be used to have a university-wide forum is not deployed even when the capability to do so already exists. This existing yet untapped capability could also cover the 'Connections' expressed by Kanter (see section 'Globalization and ICTs: Hindrances or Enablers').

- Keep corporate memory. As mentioned above, the necessary storage capability exists. If research work could be published on line and kept available from the year 2000 until now, some follow-up could reactivate on-line publication. Therefore, if there is the capability to store research work, then there can be space to publish university documents related to the UOP as well. This could also cover a point from Kanter's Three Cs, namely 'Concepts'. The research done at university can be regarded as a new product, process or idea to solve a problem; therefore, storing and publishing these can help consolidate the university as a producer of concepts as well.

- Make the results of research available and allow students, professors, staff, and all stakeholders access to them. With the use of the existing tools such as the ones already developed by the CNC and others freely available such as Moodle there can be a complete platform for access to information and publication that would make this possible. This can fulfill the last of the three Cs, competence. Providing students, professors and staff with the necessary connections and concepts can enable them to develop the necessary human capabilities to concretize the solutions proposed.

The analysis shows that the capabilities exist, yet the system should undergo certain changes before it can fully address the needs identified earlier. These costs associated with the necessary changes could be cut if the system is changed in large part by restructuring, since the core applications and capabilities are already in place. Likewise, the research and development sections should keep the administration updated with current trends in ICTs and the solutions it can provide so as to be able to analyze the need for implementation. This would include analyzing where new technology can provide competitive advantages –or even opportunities- as well as what part of already-adopted systems must be updated to remain updated.

What is more, the CNC already complies with the three requirements for a system that can bring some balance in power (as mentioned in the section 'Benefits of an ICT system for the UOP in section 6.1.)

- The system must be the same for all stakeholders, to avoid preferences, advantages to some and disadvantages to others. Since the CNC develops its own systems for institutional use, it can freely distribute its system across all faculties. It also provides training to install Moodle systems and since the Moodle system is free of charge and free to modify as needed, it could prove to be a versatile tool to be used as a forum for the necessary connectivity.

- It must be open to scrutiny by all public stakeholders, so that all stakeholders can ensure transparency. Since all systems are developed in-house and with public funds, then it must also be open to public scrutiny.

- Open to improvement as needed, so that stakeholders may propose modifications to it respecting the first two points. Given its public nature and local development capabilities pointed out above, it would also be possible that stakeholders look into the system and propose modifications to enhance the system and better serve all stakeholders' needs.

The evidence mentioned above indicates that the CNC does have the capability to deploy a system with the characteristics needed by the UOP. However, the UOP Guidelines do not fully link its own needs with the capabilities of the university and its different departments or with the existing infrastructure. The circle is then complete. The Statute of the University shows an intention to shift from more traditional instruction to inquisitive studies and transdisciplinarity similar to that of Research Mode 2. For this transition, the university proposed the Outreach Program, which fulfills some of the requirements for Research Mode 2. However, a closer look at the Guidelines of the UOP shows that there are missing links between the objectives and the means to accomplish them, namely the need for an ICT-based knowledge management system. Nevertheless, the means do exist at least; yet these should be somewhat modified in order to fully serve the aims of the UNA stated in its Statute and its General Guidelines for the UOP.

7. WHAT ICT-BASED KNOWLEDGE MANAGEMENT SYSTEMS CANNOT ADDRESS

The points analyzed seem to indicate that there is a need to implement ICTs at the university due to the structure and aims of the Outreach Program. However, there are many issues that ICTs cannot solve. Likewise, other issues arise due to the use of ICTs that must be analyzed before its implementation by careful consideration, and fine-tuned in the same fashion as any other project: via a feedback loop. The following are key issues identified in the literature consulted for the theoretical framework as well as others arising from the particular circumstances of the UNA.

7.1 Staff and Student Engagement, Motivation and Research Culture

While a good ICT-based KM system could help bring together experts, data and knowledge, students from different careers and backgrounds, and external actors and their resources, this still requires a fundamental change in culture (Gill 2009: 606). There are several aspects to this needed change, from the students' point of view to those of professors, teachers and stakeholders.

While students may in future reach university level after completing an education based on ICTs and information exchange, this is not currently the reality. This means at least two different things: a) that students are currently not used to using ICTs for the purposes of research and b) most of them are not used to doing research at all. The evidence for a) is the current level of penetration of internet and the use of computers in education at a national level in Paraguay (see 4.1.5). The evidence for b) is the level of reading comprehension that the Paraguayan Ministry of Education is striving to achieve, which is not high enough to do higher-level research (see 4.1.6.). While this may be overcome if students are motivated enough, much research should be done to deal with this difference in levels carefully.

With regards to professors and teachers, the problem is similar, yet greater. Most university-level teachers, 66,7%, hold only a bachelor's degree. 16,2% hold a master's degree. 15,5% have a doctoral degree while only 1,6% hold a Ph.D. (Rivarola 2003: 108). According to the same study, only 50% of these work full-time at any one university. It must be clarified however, that these data correspond to a survey of private universities in Paraguay, and not directly to the UNA, whose data remain unavailable.

Given these statistics, the following can be inferred: 1) teachers with a bachelor's degree would most likely not have enough academic training to do high level research and are probably the largest part of the 50% who work at universities part-time. 2) While holding a master's degree does mean more preparation to do research, the number is still very low to become a strong mass of research-promoting scholars. The number of individuals with PhDs is even lower, which means that there are very few individuals with the capability to guide larger, more complex projects.

While one may claim that this ICT-based KM system would uncover a wave of new research possibilities, there may not be enough qualified personnel to guide it along well-established, scientific methods – a basic requirement for orderly development of projects and subsequent reporting, feedback loop and planning. However, one may also argue that with the appropriate hierarchy structure and coordination techniques, this understaffing problem could be overcome.

When these obstacles are overcome, there is still a question of motivation. As may be expected, every non-student taking part in UOP projects would expect some form of compensation. For organizations, the projects mean solutions for their problems or at least insight into them. For the staff of the university, the projects represent an opportunity to compete for better positions. However professors and teachers may find it hard to fit extra hours in their schedules due to the aforementioned issue of part-time employment. The General Guidelines state that projects are also an opportunity to compete for better positions when there are calls for them. Besides this, the Guidelines also include compensations for extra hours should they be needed.

Even then, the fact that approximately fifty percent of all teachers are employed part-time means that many of them may not see the day they are promoted, possibly due to leaving the institution before such time. It may be argued that by means of an ICT system their contact information will become available to those interested in the work they have done before leaving the institution, and may then access new job possibilities. This would effectively require that the system become fully implemented and that it be open to all stakeholders.

However, there is still the issue of learning how to use a new system. In some cases, the people involved may be used to using ICTs, yet it cannot be expected that this will be true for every case. While the compensation for work done in their regular roles is covered, additional initial costs may appear in the form of extra time spent in learning sessions or difficulties in first using and adapting the system. This may take a toll in the initial performance of the system and its perception as useful. Therefore, it must be expected that the system be criticized initially, yet it must be allowed to continue to be used to overcome the initial barriers and be optimized. This situation is not uncommon, since many times projects are perceived as having no positive effect and terminated prematurely, before they are given the necessary time to show their usefulness (Peters 2001: 94).

7.2. Answerability Issues of Private – Public Engagement

The National University of Asuncion is maintained mainly by the government and in some cases by government-subsidized student fees (Universidad Nacional de Asuncion 2009: 02-03). A current proposal to the presidency of the country is requesting completely free education via additional government support, citing the fact that 85% of all its students come from lower socioeconomic background (Ultima Hora 2010). Therefore, its purposes are shaped by the needs of those who maintain it, namely the tax payers. It is therefore important that the university clearly identify its stakeholders and establish its priorities accordingly. That is to say, if the main stakeholders in the

university are the government through and with the taxpayers, then it should serve the needs of the taxpayers.

At the same time, the UOP seeks to engage with outside stakeholders and offer services to them. In the same vein, the university trains students who will later work in private companies as well. Therefore, it must also focus on the needs of the market and the companies operating in it. This scenario represents a clash of interests. On the one hand the university must educate students to serve the public and satisfy its needs, yet it must to some degree also educate students to serve in the private sector.

The middle point here is that both the public and private sector depend on entities that remain neutral to each other and seek to answer questions without taking sides. In this regard, while the university is maintained by the public sector, the latter is composed of everybody in society including private organizations through tax payment. In this sense, even when companies would like the university to pay more attention to their own needs, competing private organizations will have different aims. Since every organization would like their points of view to weigh more than that of others, there would be no other solution than to remain neutral in analyzing and offering solutions. This would also ensure scientific rigor, since neutral analysis and solutions call for clearly explaining the means by which solutions are proposed so as not to favor any stakeholders over others.

7.3 Who Owns the Problems? Knowledge Co-creation and Intellectual Property Rights

Universities compete with other educational institutions and even with companies in the field of producing and disseminating knowledge (Kantanen 2007: 42). The university and its Outreach Program consider offering services to private companies as well as to society in general in whatever areas are identified as needing development support of the kind that the university as a research institution can offer. It may be true that "universities support local economic development, for example, through technology transfer, development of skills and by attracting new investment" (Kantanen 2007: 49).

Once knowledge is co-created with private enterprises, these private organizations may, at least temporarily, set the course of research done at the university, especially if the research depends on their funds. Problems may arise from co-creating knowledge with private enterprises, mainly concerning patents and the restriction of use of the knowledge by the wider population for free or at low costs (Kantanen 2007: 50 - 51). If the university does render services to privately-owned companies, then the knowledge generated through that service would be subject to one of two scenarios: a) it will remain patented and unavailable both to the university and to society or b) it may become available to all of society but at a cost. This would be so because companies seek to make profit with their investment and would see the knowledge generated with their resources as their property.

It may even be argued that co-creation of knowledge between the university and private enterprises can benefit society by employing the students who develop the knowledge. However, private enterprises are profit-driven, which means that the money spent on employing the student or students who generated the knowledge will be much lower than the one gathered by the used of the knowledge itself. This would generate an expenditure-income difference that can only benefit a few people instead of benefitting all of society through the dissemination of knowledge and the promotion of innovation by means of development of the disseminated knowledge (Sitglitz 2008: 05-07). In other words, while patenting a product may turn the product into a commodity around which a market would develop, it would also mean that no further development may be made in the same line of that product. This necessarily opposes the basic purpose of the university, which is to allow knowledge to develop further and then to disseminate that knowledge.

As was argued above, the ICT-based KM system must be the same for all stakeholders, open to scrutiny and improvement. These characteristics would allow the public to trust the system for its transparency, to use it freely yet cautiously for its openness, and to seek forms to improve it in ways that everybody may benefit from it. Therefore, if the system is used to produce knowledge that cannot be scrutinized, then it would lose its transparency. If parts of it are transparent and others not, then it would lose its openness.

If some can benefit from it more than others, then there would be an imbalance in the use of the resources that actually belong to all stakeholders. Since the university is a publicly funded institution, then it would be contrary to the interests of those who maintain it that the knowledge generation they are already paying for be either unavailable to them or available but at an additional cost. If the knowledge generated at the university is not made publicly available, it would fail to fulfill a number of the university's duties: serve the community of stakeholders that maintains it, give all individuals the same opportunities to contribute to the improvement of their surrounding society, and help develop the country by means of allowing free access to information.

In order to avoid this kind of conflicts, the General Guidelines for the Outreach Program and the Statute of the National University of Asuncion must clearly state that the main goal of the university is to serve the public sector and not private interests. Another possibility would be to make it a law that whatever knowledge is created by the university, must also enter the public domain and must be accessible without restrictions of patents or additional payments. Such a framework already exists in the GNU General Public License which is already being used not only by individuals but also by companies in several products (Free Software Foundation 2007). However, several arrangements may be made in this regard. However, it would be very extensive to cover all of them here, not to mention that it would entail legal issues outside the scope of this work.

7.4 Language Constraints

Five problems are associated with the transfer of knowledge from academia to organizations outside of it (Rasche & Behnam 2009). 1) The first problem is related to the second: science is a self-referential system where one piece of knowledge refers to other pieces published before. It is therefore difficult for non-academic audiences to understand the knowledge produced in academia for lack of knowledge of pre-existing knowledge on which the whole system is built. 2) Since scientists are judged according to their discoveries and production of theories, it is difficult to write in 'user-friendly

language', because that language would have to include all the terms referring to the previous theories the new theories rely on. 3) Science is usually at a different stage than application, that is, science may not yet have studied the effects of the application of certain knowledge or it may have produced knowledge that is much more advanced than is currently being applied. This can be solved by conducting academic research within specific application areas needing academic insight, though. 4) When there are many possible ways to do a certain job, there is the question about how quickly science can analyze the field and select the most appropriate method. 5) Since research is constantly done to try to show evidence to support or disprove certain methods or relationships between variables, those in charge of applying the outcome of research may not know exactly how to do it because they are not part of the research process. According to this "we cannot achieve direct application of scientific knowledge because the application of this knowledge requires a modification by the system of practice" (Rasche & Behnam 2009: 08). However, the university outreach program does include in its General Guidelines the introduction of systems of practice as well as joint development of application of the knowledge produced in university outreach projects. That is, the basic idea behind the UOP is to help develop solutions that respond to real social needs and that can be applied, and to do this together with the stakeholders. However, it is necessary to do more research to establish what would be the best approach to bridge this perceived gap.

7.5 Access to the System and Required Tools

There is a growing concern over the effects of the results of the research done at universities on their surrounding environments. This has brought up the issue of accessibility to such technology since a large proportion of the population in Latin America cannot, access this technology due to economic and other reasons and is therefore left behind with regards to new knowledge (Stiglitz 2008).

If the University really does have the aim of preparing those who will later occupy public and private sector positions, it cannot fail to work together with those sectors.

However, it must also remain neutral in its position as advancer of knowledge and in the process of developing and upholding scientific principles. The university is the main hub for the generation of knowledge (Stiglitz 2008) and this knowledge should serve all or else the main point of knowledge is lost, as was argued above. Knowledge cannot be the privilege of some, or else some will have an advantage over others and this advantage would lead to differences in means and this to inequalities in opportunities and this to poverty.)

The difference in accessibility to knowledge and technology has been cited as one of the deciding factors for the differences in income and development between countries. Even when several authors have established this link between access to information, employment and income, there is little research on the impact of the technology itself on establishing a system (Stevenson 2009: 03). This is a deeper look into the three qualities the system must have, discussed in the section "Can ICTs change the balance of power". A system that must have these three qualities also complies with what is called 'free software.' Since the university is a public institution, it seeks to maximize results for the public money it spends. Since it will most probably expand the system after its first implementation, it will want to expand its use of the software that runs the system. In the same vein, since the system must be open to scrutiny and improvement, its every part must be analyzable and improvable. In order for this to be possible, the software on which the system is built must allow this to be done in full freedom from restrictions. Such software is available under the aforementioned GPL License, which allows the users of the programs to analyze, modify, and distribute the software to all users freely both in costs and with the same freedoms in return. Utilizing this software as the basis for the KM-system would enable the university to save costs in several ways. 1) It can develop its own systems. 2) It can improve the system without the need to pay additional license fees for updates. 3) The university may distribute the software to as many of its branches as necessary also without additional license payments. 4) It can offer to its programs to other universities and receive programs from them and other institutions around the world, with no or less restrictive licensing fees. At the same time, it would allow all users of the system to analyze the code that runs the system and propose modifications to it, without breaking any kind of intellectual property right.

This can result in a stronger system with improved security thanks to greater scrutiny. This would greatly reduce budgetary burdens and would allow the development of a local market for software engineering and service provision, while improving overall access to technology thanks to decreasing prices.

7.6 Environmental Issues and Fair Trade

When drafting the plans, careful consideration should be taken when choosing suppliers of all items necessary for the outreach projects, and in this case computer hardware. If the university is indeed concerned about having a positive impact on society, it should also be concerned with the materials it uses and with which it provides its students. This would require applying 'life cycle costing' techniques to measure several items including: a) current cost of hardware, b) hardware lifetime expectancy, c) money expenditure vs. extended costs to society in production i.e. sustainability, and d) pollution and waste management (International Institute for Sustainable Development 2009).

Proper waste management is especially important due the demand to upgrade and update the technology used for doing research, disseminating its results and accessing this information. It is important to note that currently there are no specific regulations for e-waste disposal in many countries in which the OLPC program is deployed (The OLPC Wiki 2009). If there is an increase in the use of ICTs in schools and in universities, there will necessarily be an increase in electronic waste as well. While there are no specific numbers for Paraguay, the United Nations has warned that there is a need to deal with this problem before there is a substantial global increase in e-waste (United Nations Environment Programme 2010). Even if there is no need to pay for individual copies of software and one can transfer it over the internet without using CDs or similar media, there is still the issue of obsolete or damaged hardware. Such equipment can contain reusable elements embedded in non-reusable material; separating one from the other can be a difficult and even toxic process that requires specialized

handling (United Nations Environment Programme 2010). Therefore, it is necessary to address this issue as quickly as possible before further ICT solutions are implemented.

8. CONCLUSION

The present work analyzed the University Outreach Program and compared it to the trends that are currently most influential in education and work life. The first aim was to identify the factors that are leading to changes in education and work liaisons around the world. The second aim was to identify the goals of the Outreach Program of the University. The third aim was to evaluate the Outreach Program in terms of the congruency between the first and the second aims. The analysis shows that the university plans to implement certain aspects of the trends identified, yet it needs to make several changes to its Guidelines and Statute.

The trends that are currently changing education and work life can be divided in two: social aspects and the research and systems aspects. Both deal with the use of technology. The first, the social aspects, details the changes taking place in the interactions among students, professors and public-private institutions. Instant communication and sharing of information among peers has changed how people react to information, how they judge its usefulness and how they employ it. This change has allowed a generation to grow surrounded by ubiquitous communication, with a strong emphasis on peer-to-peer knowledge generation and learning by doing. This generation is called “digital natives” because they have grown in an environment of these characteristics. Their immediate predecessors are called “digital immigrants” because this ubiquitous connectivity and knowledge sharing capabilities are not native to them yet they are ‘immigrating’ to it. The main characteristics of the generation of digital natives in education are: provision of connectivity through ICTs, connection between classroom education and real world situations, transparency and availability of public dependencies and knowledge to all.

The second aspect of the digital natives’ generation is that of the systems and research dimension. This refers to the technology and the learning paradigm that allows what was stated in the previous paragraph. The systems dimension deals directly with the technology that allows ubiquitous communication and learning: computer networks, social connections via digital means, databases for quick access to information, etc. The

learning paradigm refers to the change that has taken place in education from a teacher-to-student environment to an environment where learning takes place from peer to peer as well as at a distance or over cooperative methods such as wikis. In this sense, technology has allowed students to interact with each other, generate knowledge and test this knowledge without the need to submit it to an academic hierarchy to corroborate the worthiness of the knowledge –this being exactly the core concept in the change from Research Mode 1 to Research Mode 2.

These two sets of changes require great changes in an institution that seeks to cope with them. In the case of a university, these changes would require a complete review of its curriculum and its rules of engagement, not to mention several aspects of its statute and guidelines. A university that did not previously embrace the technological changes taking place or whose legal constitution does not address any of these issues, must change its approach to education at all levels. These changes affect the way a university carries out its teaching activities, the relations among and between students-teachers, students-students and administration-staff-students relations. This is also true for the connections between the university and entities outside it such as public offices and private companies.

Several changes must be made to implement Research Mode 2 and all it entails. In terms of curriculum changes, a university would have to adopt a project-based and cooperative learning environment, new means of distributing and sharing information and knowledge among its students to develop the projects, and new assessment methods to grade its students on their performance on the projects. In legal terms, it would have to establish what the aims of a university are concerning knowledge generation. It would have to make agreements with all stakeholders (students, staff, professors, public and private organizations, etc.) regarding the dissemination of the knowledge generated at the university and public scrutiny of their discoveries. In terms of its academic staff, it would have to train its staff to adapt to this new learning mode, to learn to use new technology and how to adapt to future changes as well as to the need to remain updated in that field – life-long learning for digital immigrants and natives. In terms of technology, it would have to deploy a network of connectivity and a system to allow all

stakeholders to take part in presenting, supporting, evaluating and developing the projects under Research Mode 2.

The analysis of the Statute of the National University of Asuncion (UNA) showed that there is an inclination to reach out to society to help solve its problems. This would initially continue in Research Mode 1 (RM1) and then gradually change towards Research Mode 2 (RM2) as all parties receive the necessary training. In order to implement RM2, the UNA developed the University Outreach Program, whose regulations are stated in the General Guidelines for the University Outreach Program (GGUOP). The analyses of the GGUOP indicate that while there is the willingness to reach out to society, learn about its problems and engage to try to find solutions, several necessary changes have not been contemplated. If the UNA seeks to implement RM2 fully, it would have to meet the criteria outlined at the end of Section 4. However, according to the review of the Statute and the GGUOP in Section 5, the UNA does not meet the criteria.

More precisely, the analysis in Section 5 shows that the Administration and Coordination departments at the UNA should be more aware of the needs of the users, in this case the stakeholders. The background of the problem and the theoretical framework indicate that the stakeholders need to switch to a more cooperative style of learning and working due to the advances in ICTs and the impact it has had on society. The research also indicates that in order to promote development, the tools available have to adjust to the language of the users, where the university could become a developer of local solutions in local language. However, Section 5 once again indicates that although there is some degree of awareness of the possibilities that technology offers to cope with the changes taking place, there is no clear move towards the adoption of the necessary ICT tools at a unified, university-wide level. However, Section 6.2. indicates that the university does have the manpower and expertise to deploy the possible technological solutions identified earlier. As the theory on Knowledge Management states, it is necessary that the higher echelons of the organization be aware of the needs and capabilities of the organization and its stakeholders in order to guide the activities necessary for improvement. The lack of

implementation of ICT solutions (connectivity, knowledge linking systems, etc.) can be related to the unawareness of stakeholder needs and possible technological solutions that have been found in the Statute and the GGUOP. The disengagement between these three elements – identification of user needs, establishment of a system and connectivity – negatively affect the development of all other criteria and therefore the attempts at implementing Research Mode 2.

The National University of Asuncion has started the process to work together with several stakeholders to address the problems of society, which is the first step towards implementing Research Mode 2. The merit of the University Outreach Program lies in its recognition of the need to get involved in the matters of society in ways it can offer services and provide solutions. This is significant because, as cited earlier, universities are possibly the most important producers of knowledge and drivers for improvement in a society. However the worth of the UOP is somewhat reduced because the Administration of the UNA still needs to clearly identify the needs of its stakeholders. It is therefore imperative that the UNA continue with its efforts to work together with its stakeholders in order to improve its performance.

Regarding the theories and data consulted to construct the theoretical framework, several points can be made. As was stated earlier, the sources related to Knowledge Management, Design Thinking and Research Modes 1 and 2 correspond to situations far from what are the realities in developing nations. While this may seem to undermine the connections made between the technological development of developed nations and those in developing nations, it is worth noting that technology does not stop its incursion in developing countries. The number of individuals in such nations with access to technology is increasing, and it is necessary to include this fact in education at all levels in order to cope with the changes it brings. However, it will only be possible to establish the real impact of technology in developing nations once the population adapts to it. In this sense, the more this adaptation phenomenon is studied from as many different perspectives as possible, the faster and less troublesome future implementations will be. In other words, it is almost impossible to avoid the differences

between the ideal implementations and reality – especially the realities of developing nations – because the adoption and modification of technology will not cease.

9. RECOMMENDATIONS

Based on the observations in Section 4 and 5, the recommendations are divided in three parts: the Administration of the UOP, the System requirements and the Legal aspects.

The Administration

The Administration, the Statute and the General Guidelines should unify the process of presenting projects, developing and reporting the results. It would help the all participants involved in outreach projects to have only one set of rules for all faculties, instead of every faculty having its own variation of the rules because this can cause problems of several kinds. Therefore, it is necessary that the Guidelines detail more specific rules and that these rules apply to every faculty uniformly, reducing the possibilities for misunderstandings and friction among individuals and organizations. In this same line, the rules should be clearer and less open to individual interpretation, as was presented in 5.2.6.

It would also be necessary to raise the minimum requirements for the directors of the GDUO and the FODs. The current minimum requirements are very low considering the amount of work and the specialization that the charges require. The workload of both positions could be decreased if instead of presenting three different projects per year per course, faculties were required to present one larger project per year. However, the minimum requirements would still need to be higher.

The UNA should cooperate with and monitor closely the activities, objectives and strategies of the OLPC and similar programs. These programs are changing the way education takes place and have already acquired some experience in developing learning systems with ICTs. The university could learn from their experiences to provide solutions adapted to the current reality without having to reinvent the wheel. This could save the university time and resources.

The Systems

The National Computation Center (CNC) of the UNA has the personnel and expertise necessary to develop the necessary systems. They should evaluate the current state of the system, establish what additional systems would fit the needs of the UOP and develop the necessary applications. It would also be advisable to use non-proprietary software to develop the necessary systems for several reasons. With the use of free/ non-proprietary software the university would save the money spent on software licenses as well as eliminate the worry of using so-called pirated software. It would have the permission to enhance the software it uses and/ or develop new software based on other pieces of free software enhancing the flexibility and independence of the CNC and the UNA. It could exchange software with other universities or organizations already employing free software. It would also encourage local capacity building, which could later transform into a service industry.

The system should:

e. offer those students who are separated by long distances the possibility to propose actions to those who are in other geographical points in the country;
f. reduce the need to meet face to face to plan and organize activities, thereby reducing costs and saving time;
g. keep corporate memory by retaining contact and development message logs in a centralized yet distributable manner;
h. enable students to see the needs identified and knowledge gathered in other areas in order to propose projects and solutions.

Legal Matters

The university should clearly define its rules of engagement with its stakeholders. As the university is a public institution and because its main aim is to produce new knowledge and disseminate it, it should make clear that all knowledge developed at the

university should be public. This provision cannot be found in the Statute nor in the General Guidelines, and could be a source of conflict when larger projects require the cooperation of private stakeholders or the use or generation of sensitive data. Likewise, if clarified beforehand, it can save the university possible legal problems.

In its position as the most influential university in the country, it has the capability to set standards in transparency and knowledge sharing, instating the necessary precedents and examples to be followed. This can have positive wide-reaching implications in that it could initiate among individuals a sense of improvement through cooperation instead of a feeling of competition through secrecy. As was stated in the previous segment about the systems, this could start a service industry based on knowledge sharing for in which all would be benefitted.

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