Can technology assist the disadvantaged student?
A case study at University of Limpopo

By

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Abstract

The overwhelming majority of students entering the Historically Disadvantaged Institutions (HDIs) of Higher Learning in South Africa have not had any exposure to ICTs (computers) when they first start their education. This study examined the level of students' ICT use and the extent that it was influenced by their cultural and motivational background. It then examined the instances where academic performance could be attributed to ICT use.

While the role of technology was clearly found to be of vital importance, its impact on academic performance was manifested only when ICT use is encouraged through academic programs. The mere use of ICTs or the length of student experience with ICTs did not show a demonstrable difference, in most cases, in terms of academic performance. In particular, the use of the Internet, email and online search were found to influence academic performance when encouraged by the academic community.

Intrinsic, extrinsic and self-efficacy motivation were tested using the Motivated Strategies for Learning Questionnaire (MSLQ) and were found not to be predictors of academic results as anticipated by the literature. However, strong evidence for self-directed learning in disadvantaged students was found where ICTs are used in pursuit of their academic goals. The study showed that the students despite their lack of ICT background were highly motivated to acquire the required skills and use them when needed. Off campus access was shown to be problematic, and, unless special provisions are made to compensate for this lack of access, disadvantaged students' full academic potential will remain unrealized.

Key Words: Disadvantaged students, Culture, Motivation, Technology, Academic performance, ICTs, Intrinsic, Extrinsic, Self-efficacy.

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Chapter 1 – Introduction

1.1 Objective

This study sets out to discover the role that Information and Communication Technology (ICT) can play in a higher education institution with specific reference to disadvantaged students, cultural aspects and motivation.

1.2 Introduction

At University of Limpopo (UL), a typical student has not worked with a computer before coming to the university. In this study, I refer to such a student as disadvantaged or under-privileged student. It should be noted that UL belongs to the category of universities in South Africa that are referred to as Historically Disadvantaged Institutions (HDIs).

As the head of ICT, I introduce the available ICT facilities at the University to the new students during the orientation program each year. A question that I often ask during my presentation is how many of the new students have had any exposure to a PC, the Internet or email. In a group of roughly one thousand students, less than a handful respond positively. During the last 19 years of my involvement in ICT management in two South African universities, I have been witnessed to the tremendous transformation that takes place as such students visit our computer laboratories and start using them. Often in a short span of time, ICT tools such as the Internet, email and Office products become an indispensable part of student learning life. This happens without necessarily any direct intervention from the ICT division to introduce any formal courses. All that is required is to have the infrastructure available for student access. Provided such resources remain available, they become the most useful and dependable resource for the students' academic life. Indeed, such a phenomenon is not without parallel. The idea of self-directed learning has been extensively discussed in the last two decades. A similar experience was reported initially in India and later replicated globally, albeit in relation to a younger group of learners. Professor S. Mitra, following a series of studies in India (Mitra, 2000, 2003, 2005) commonly referred to as “Hole-in-the-Wall” or “Minimally Invasive Learning” projects, highlighted the possibility of children learning various topics such as computer literacy using computers with little or no supervision. The research generated interest elsewhere with similar conclusions. Mitra and Rana (2001), Inamdar (2004), Van Cppelle (2004), Dangwal, Jha, Kapur (2006), Cronje and Burger (2006), Gush, Cambridge and Smith (2004) are but a few examples. In the words of Mitra and Rana (2001, p.11) “underprivileged children without any planned instructional intervention, achieved a certain level of computer literacy”. Subsequently, there have been many similar studies to verify the universality of these initial findings. Dangwal, Jha and Kapur (2006, p. 295) feel that this category of learning falls into the ambit of a “special case of the interplay of information technology (computers) and learning processes and emphasises the role of self-directed and participatory learning.”

In this phenomenon as described above, a group of children with the common denominators of cultural and underprivileged backgrounds are exposed to technology, and, as the result, there appears to be a level of self-directed learning that takes place. A number of questions came to mind. To what extent are these principles applicable to students of an older range group, i.e., university students? Where does this interest in technology come from, and what motivates these students to be attracted the technology? Do their newly discovered media make a difference in their academic achievement?

The scenario depicted above illustrates the general theme of this research and the sort of questions that it sought to answer. It is true that large scale quantitative studies indicate that ICT produces a statistically significant difference in learning outcomes on standardized tests of literacy, numeracy and science (Wenglinsky 1999; Weaver 2000, Blackmore, Hardcastle, Bamblett, and Owens

2003). However, little attention has been made in literature to disadvantaged students.

In summary, therefore, this study looks at UL with its particular historical background and attempts to discover the possible roles that ICT can play to accelerate learning. The next section of this chapter reports on the rationale for this study from practical and academic perspectives.

1.3 Rationale

The rationale for this study is reported at two levels: practical and academic. The practical rationale deals with my personal experiences that encouraged me to follow this path. The academic rationale highlights the preliminary justification for the study as I consulted the literature.

1.3.1 Practical rationale

Since my graduation in B.Sc. Computer Science in 1980, I have been involved in various forms of ICT support functions in my various occupations: application development, systems analysis and design. More significantly, in the last 19 years as a senior manager, I have been responsible for providing ICT tools and facilities in two academic institutions of higher learning in South Africa. There is a common agreement that providing operational services such as the running of administration systems, the Internet, email and the network infrastructure in a university environment is an indispensable function that must be fulfilled. During the past few years, ICT in UL has attempted to provide some level of academic support by facilitating various e-learning computer literacy courses together with designing online courses for interested lecturers. It is in the area of teaching and learning that the real challenges seem to be emerging. As ICTs becomes more widely used in classrooms and schools, attention is being focused on how ICTs can make teaching and learning more effective (Blackmore, Hardcastle, Bamblett and Owens 2003, p. 11). This led to a decision to conduct a formal research and explore the ways that a student, and in particular a previously disadvantaged student, like those in UL, can more effectively benefit from ICT tools. Similar conclusions on the need for "institutional research" to unravel ICT potential have been expressed elsewhere. "Institutional research should focus on determining the value that ICT can add to teaching and learning activities, the specific barriers and incentives that will work within the institution, the most effective paths for individual learners and a greater focus on the monitoring and measuring of costs" (Twigg, 2001, p. 30, Van der Merwe, 2004, p. 339).

If I were to summaries my observations in terms of students' response to ICT use it would include the following:

- There is a keen interest to use ICT facilities by a high percentage of the students.
- ICT tools, such as the Internet, email and Microsoft Office products have become critical and indispensable in the learning life of a student.
- More access to ICT tools means improved access to educational material.
- Accessible ICT facilities imply improvement in the quality of learning.
- A high level of collaborative learning takes place amongst the students in showing each other newly discovered computer features.
- Minimal supervision or intervention is needed to promote computer literacy. Once the correct environment is created, most of the effort comes from the student.

There were many questions I was looking for an answer. Where does the fascination with computers come from? Is it real and lasting or imaginary and transitory? Has this apparent interest and therefore association with ICT tools resulted in any academic excellence?

1.3.2 Academic Rationale

In this section, I relate the academic puzzle of this research to the relevant literature so as to discover if there is justification for such a study.

In this endeavour, I turned to Hartley (2007) who reminded me of the well known research "Hole-in-the-Wall" which, in some ways, has had practical implications for this study. Here, at UL, often a student with no prior experience with technology (a computer) walks to the computer laboratories with a few friends and a few days/weeks later he/she is already addicted to this new way of learning. This is partially due to the informal communication that takes place amongst students. Following a similar experience for the developing countries, Hartley concludes: "Such a picture of the potential use of new technology in developing countries is perhaps an idyllic one" (Hartley 2007, p. 55). This well-documented and well-known phenomenon brought about many questions. How, and to what extent can such interest or motivation be harnessed and directed for educational purposes? Beneke (1999) feels that empowerment can only occur when it is clear who the learners are that require this empowerment. Each institution should have a clear picture of the profile of their students (Beneke, 1999, p.1). Although here Beneke makes special reference to distance learning, the principle of knowing your students for effective learning is applicable to all types of students. Oblinger, Barone, and Hawkins (2001, p. 43, 32), similarly, identify the "understanding of" one's institutional "culture/context, values and sensitivities", in the context of positive change, as one of the twelve essential conditions for a "venture to succeed". My focus in this study was on the student and the manner in which he/she is influenced by the learning environment. In order to provide an effective service, ICT needs to understand the culture from which students come from, their values and sensitivities to be able to provide technological solutions that will attract the student. Lomas and Oblinger (2006, p.8) extend this concern to include students' learning space, i.e., classrooms, computer laboratories and technologies that a learner is surrounded by. They bring to one's attention the importance of knowing students' traits and habits in order to be able to create an environment that is suited to learners' particular background and expectations. "This alignment is important because well-designed learning spaces and enabling technologies encourage students to spend more time on campus, increasing engagement and improving retention."

The question that comes to mind is what are these unique cultural traits, habits and sensitivities that are associated with a typical disadvantaged setting like those in this study? Niles (1995, p. 381), in his study, recommends finding answers to a number of questions. First, he says, "we need to differentiate clearly between different types of **motivation** in different **cultures** and examine the relationship between them and academic achievement." He further suggests that we then need to examine the relationship between different types of motivation and achievement. In other words, motivation is affected by culture. We need to understand a culture to be able to arrive at a possible motive.

Therefore, what literature seems to suggest, is that, in order to provide an effective educational environment, we need to understand the culture from which we can determine students' motivation for learning. Once motivations are known, an educational environment can be provided that is motivational. Kirkwood and Price (2005, p.270) takes this idea further and brings in a variable that is of major interest in this study, namely, technology, into the equation.

> "We contend that it is essential for teachers and decision-makers in higher education to develop a better understanding of the issues surrounding the use of ICT, so that innovations are not driven by technology. The new circumstances for learners and learning require consideration to be given not only to the characteristics of technologies, but also to:
>
> (a) the pedagogic models and processes they have to serve; and

(b) the contexts within which learners engage with ICT."

Although Kirkwood and Price are not specifically referring to culture and motive, he is confirming that technological solutions must meet the specific needs of the students.

Bates (1997, p. 3), who comes from the directorate of Distance Education and Technology at the University of British Columbia, completed a comprehensive strategy for implementing technology-based learning shares the same sentiments:

> "(A)lthough there has been widespread adoption of new technologies for teaching in the last few years, they have yet to bring about major changes in the way teaching is organized and delivered. Without such changes, though, technology-based teaching will remain a marginalized activity, while at the same time leading to increased unit costs".

For technological change to be effective, it usually needs to be accompanied by major structural and organizational changes for its full potential to be realized.

However, a change must be informed by relevant information about its intended recipients, in this case the students. Literature seems to suggest that the relevant variables are those associated with students' culture and motivation that, once known, prescribe the technology solutions that must be applied. Study should be conducted into the role that culture plays in learning (Ackerman, 2004, p. 252). Hence students' cultural and motivational orientation together with technological background are explored and documented in chapter 4 of this study. Lazenby (2003, p. 297), in her suggestion for further research, points to the need to investigate whether strategies are used at other higher education institutions in terms of innovation and perhaps find a correlation between the strategies used and the culture of particular universities. She further identifies that an area that requires considerable research is the "needs of South African learners and lecturers in a flexible learning environment – specifically web-supported learning" (Lazenby, 2003, p. 297).

Based on these recommendations from literature, I have attempted, in this study, to examine the interplay between student culture and motivation on one hand and the influence of these on technology use and academic performance. This, in turn, has enabled me to make a series of recommendations in chapter 5 for an improved and effective learning environment.

In summary, literature seems to suggest a physician like approach where one first must find and understand the needs of the patient (student) before prescribing a remedy(design educational environment). The elements of the diagnosis are motivational and cultural factors that in turn inform the technology options and solutions that must be provided.

1.4 Gaps in the Literature

In this section, having covered the practical and academic rationale for this study, further justification, in terms of need for such research, is documented.

A serious deficiency in the motivation literature is the relatively little attention that has been given to differences related to socio-cultural backgrounds (Maehr,and Meyer 1997, p. 371). Nelson, O'Mara, McInerney and Dowson (2006, p. 400), while acknowledging that there has been much research on "psychological constructs relating to academic engagement and achievement in a cross-cultured setting", feel that they have "rarely been extended to the developing world." They further point out "the processes by which students from majority, indigenous and under-developed nations are motivated in school are unclear". In this study, the focus has been on the majority, indigenous and under-developed with the aim of finding psychological constructs that result in academic achievement.

Blackmore, J., Hardcastle, L., Bamblett, E. and Owens, J. (2003, p.iii), as part of an Australian study, concluded that "while ICT offers considerable possibilities, the ways in which ICT improve learning outcomes has not yet been fully investigated, particularly in the case of students who are **disadvantaged**." This is precisely what this study aims to accomplish.

In her recommendation, Van der Merwe (2004, p. 339) suggests further research on "how the use of ICTs can promote diversity in terms of teaching and learning styles." This study aimed at finding students' special cultural and motivational orientation so that befitting ICT solutions in the learning environment can be recommended.

Fresen (2005, P. 230), in her study and recommendation for further research, asks "what steps can be taken to reduce levels of student frustration and increase levels of student satisfaction", a question that this study aims to discover.

As can been seen from above illustrations, literature provides a wide range of expressions in support of research to be conducted in disadvantaged settings to find an appropriate role for ICTs by examining students' motivational and cultural orientation.

1.5 Theoretical Framework

In this section a number of theoretical frameworks that this study aims to examine are documented.

Figure 1.1 – Depicts the Theoretical Frameworks for this study showing the influence of culture, motivation and technology on the learning environment.

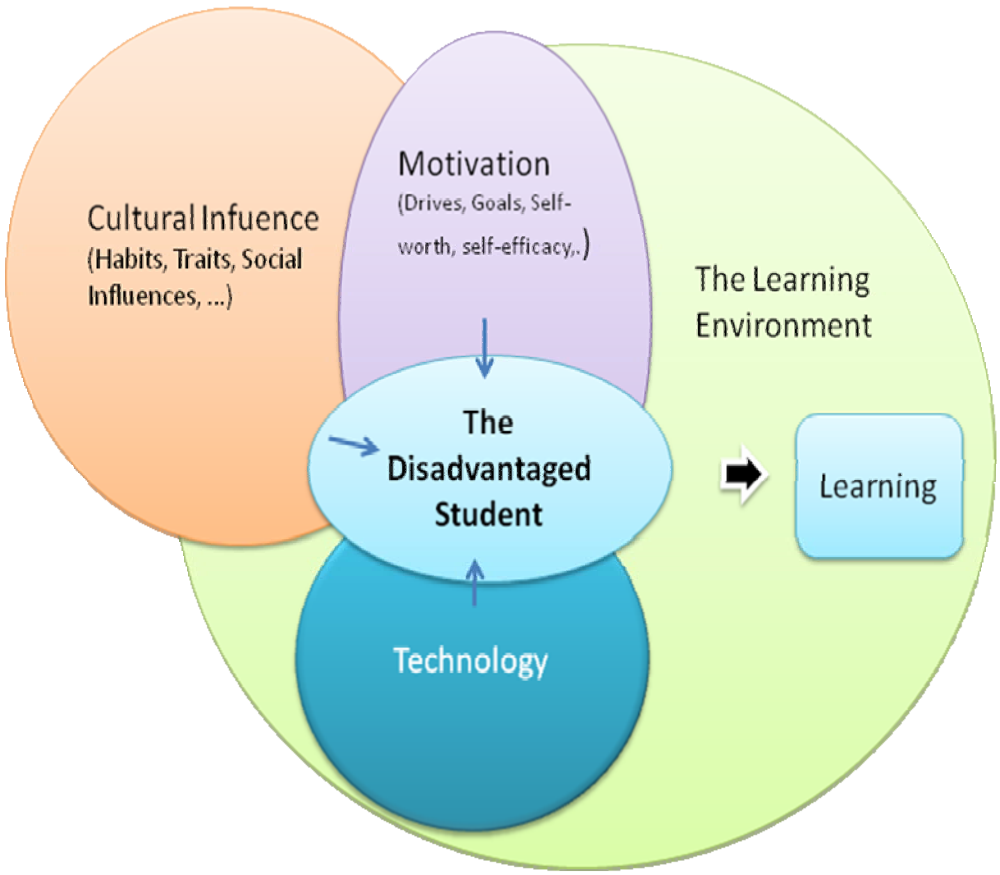

Figure 1.1 I illustrates the underlying theoretical frameworks that govern this study. At the centre of the educational environment is the disadvantaged student that is affected by a series of influences.

First of these influences come from students' **cultural** background. Much of research conducted in recent decades believes that learning is influenced by a student's culture and personality (McClelland, Atkinson, Clark and Lowell,1976, p. 288; Anderman and Anderman, 1999; Nelson, O'Mara, McInerney and Dowson, 2006; Ramburuth and McCromick, 2001; Niles, 1995; Kennedy, 2002).

Bandura, Bakbaranelli, Capraba and Pastorelli (1996, p. 1206) as an example found that parents' sense of academic efficacy and aspirations for their children were linked to their children's scholastic achievement through their perceived academic capabilities and aspirations. Similar findings have been reported elsewhere (McClelland, Atkinson, Clark and Lowell, 1976; Covington, 1998, pp. 47–48; Bandura, 1997; Weaver, 2000). All such assertions are tested to find if there is a cultural influence in terms of students' technology use or academic performance. In other words I look to find answers to the following questions.

Does culture influence motivation and academic performance?

Do family and friends play a role in motivating ICT use and thereby influence academic results?

If so what is the implication for ICT service delivery in an educational environment?

The second area whose influence on the educational environment is examined is the role of **motivation.**

Professors S. Mitra's (Mitra and Rana 2001, p.11) asserted that "underprivileged children without any planned instructional intervention achieved a certain level of computer literacy". This theory, while tested repeatedly against young children in various parts of the world will, in this study, be tested against UL students who are older than those of previous experiments. The second variable in Professor Mitra's statement, the underprivileged student, will remain the common denominator in both class of studies.

In this study, I examine the relationship between culture as having a dominating influence on an individual's character and motivational drive towards learning. In this aspect of the study several theories are tested:

- McClelland assertion that links culture and performance (i.e., motivational achievement)

- Mitra's assertion that the use of technology can accelerate learning in a disadvantaged setting.

1.6 ICT Status at The University of Limpopo (UL)

UL came into being as the result of a merger between the University of the North (UNIN) and the Medical University of South Africa (MEDUNSA) in January 2005. The two campuses are approximately 300 kilometres apart. This study primarily focuses on the activities of what used to be the University of the North, which is now referred to as the Turfloop campus of the University of Limpopo, with 75% of the total student population of the new institution.

The Turfloop campus has seen a major transformation in terms of student computer access during the last few years. In 1997, despite global awareness of ICT importance in learning and education, 95% of our students graduated without ever touching a computer keyboard. This trend started to change in 1998, when ICT had the first set of general-purpose computer laboratories (Labs) with a total of 100 Personal Computers. The new computer labs were available to the general student population. In 1999, a donation of additional PCs improved the situation. In 2009 there are over 600 Personal Computers that are available for general student use. These are being managed by ICT. There are another 400 Personal Computers in specialized computer labs that are managed by other departments such as Computer Science, Statistics, and Mathematics that are not detailed in this report.

The general-purpose computer laboratories are now opened from 07h30 until 24h00 during weekdays and slightly shorter hours during weekends. There is a keen student interest to use the facilities. The evolution of computer literacy has been steady and continuous. UL students have embraced the new technology and feel very comfortable to use it. Indeed, to witness and be part of such a transformation has been most heart-warming. Ready access to information through the Internet has become an indispensable tool for every student. Every registered student automatically gets a GroupWise email account as soon as he/she is registers. Every Personal Computer in the Computer Laboratories is connected to the Internet. The available bandwidth is 14 Mbps, half of which is used by students at any given time. There are various online courses that are available to students. In Turfloop, in 2008, close to 3000 students registered with courses with online content. Some of these have been developed by the lectures as part of an e-learning initiative. These are designed for specific disciplines while others are of general nature, such as computer literacy courses.

UL uses WebCT (now Blackboard) as its Management Learning System. It was initiated by one academic department with interest in e-learning and gradually became more accepted by the rest of the community. It is, however, driven by ICT rather than holistically by the academic community. Today there are a dozen lecturers that are using the tool on a voluntary basis.

There is a computer literacy program that is run covering Office products. The material is available online with access given to every interested student. During the last three years, an average of 1000 students registered each year for computer literacy, took its test and obtained a certificate.

1.7 Report Outline

In chapter 1, I described the objective, aims and the rationale for the study. Further, evidence from literature was used to demonstrate the need and academic justification for this research. This was followed by a brief expression of the literature gap that exists in this line of research, which provided further justification for it is being conducted. This led to the theoretical framework that governs this study followed by the research questions.

The remaining chapters for this study are as follows.

Chapter 2, the literature survey, documents findings based on literature as related to this study, where the academic foundation of the research is situated. The literature review examines three inter-related variables that constitute the main focus areas in this study. These are first, **Culture** where the student comes from and where his/her character, habits and traits are formed. Second, is **motivation** for learning, which, in this study, is assumed to be influenced by the students' culture. The third variable is the **students' response to technology**. Here, the perceived role of technology is examined to see if it does indeed act as a motivational tool in the learning environment.

Chapter 3, the research design and methodology, outlines the plan that is adopted to unravel the mystery that I attempt to solve. Areas such as the philosophical framework, research strategies, data sources, and the tools used i.e., the questionnaire, are covered in this section.

In chapter 4, I describe and analyse the responses to the questionnaire and document the findings. It consists of four major sections. Section 4.1 focuses on students' extent of ICTs use and dependency. Section 4.2 explores the ICTs usage in relation to academic performance. Section 4.3 and 4.4 discuss the findings from students' cultural and motivational perspectives.

In chapter 5, the major findings of this study are summarised before the conclusions and recommendations for this study are documented.

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Chapter 2 - Literature Review

2.1 Introduction

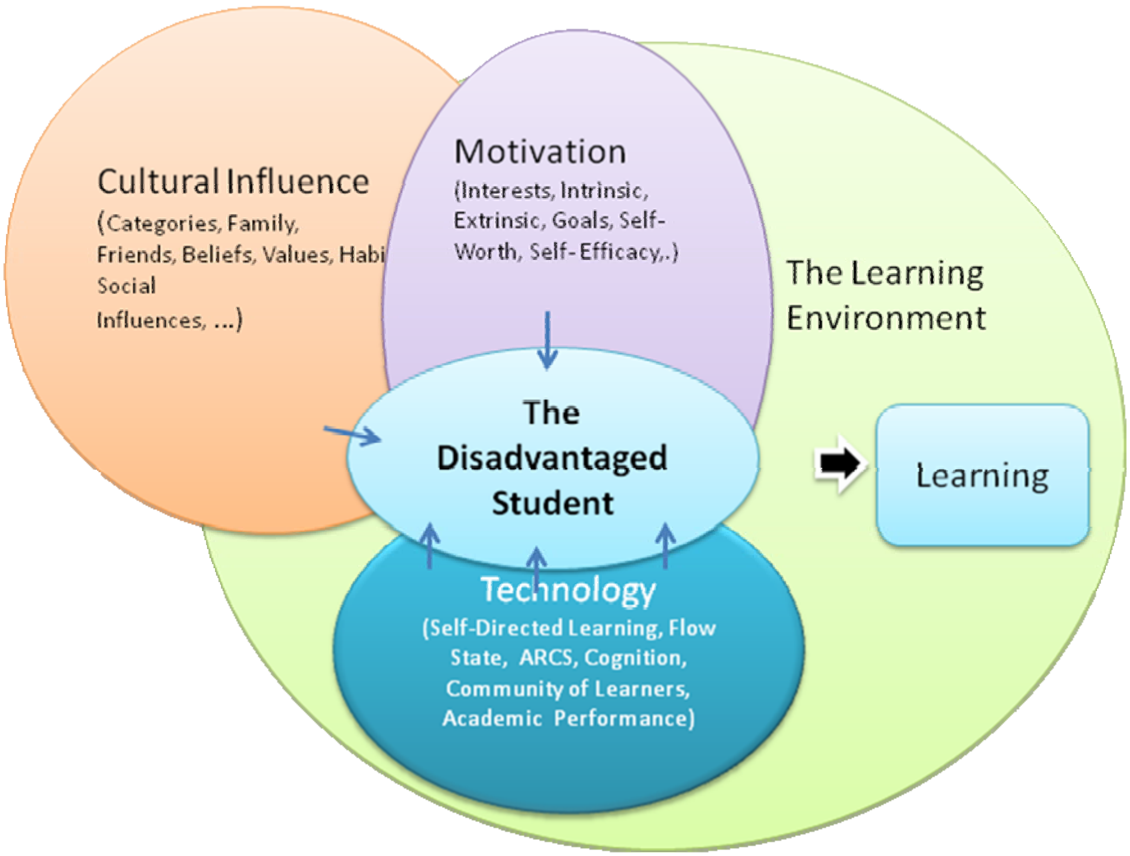
In an attempt to find answers to the research topic that states:

The role of Information and Communication Technology (ICT) in a higher education institution: with specific reference to disadvantaged students, cultural aspects and motivation,

the literature review examines the three inter-related variables that constitute the main focus areas in this study. First among these is **culture**—where the student comes from and his/her character, habits and traits are formed. Second, is **motivation** for learning, which, in this study, is assumed to be influenced by the student's culture. The third variable is the student's response to technology. Here, the perceived role of technology is examined to see if it does indeed act as a motivational tool and assists in the learning environment.

In Figure 2.1, below, I show how these three variables may influence the learning environment that surrounds the disadvantage student. The statement by Moos and Azevedo (2009, p. 578) summarizes the concept when they say "student's behaviour is based on the interaction between personal factors and the learning environment". One of the educational theories that this study aims to test is the notion that the students that come from a disadvantaged background will have a level of receptivity towards the educational environment that is influenced by his/her particular cultural background. The assumption is that it is the cultural background that to a large extent provides the reservoir from which the student draws his/her motivation, encouragement, hopes, direction and steadfastness in his/her course of study. A key component for success is the students' level of motivation, which is also developed and nurtured in the cultural setting that he/she grows up. An inevitable variable in a higher education environment, these days, is technology that a student typically has access to when he/she first starts his/her studies. A notion that is the subject of scrutiny in this study is to measure how the cultural and motivational variables affect the use of technology and therefore learning.

Figure 2.1- Learning environment is influenced by cultural, motivational and technological elements.



Our understanding of students' source of success for academic achievement has moderated from the traditional way of thinking of intelligence as being the main contributor for success to a host of other possible contributors, with emphasis on "students' orientation and consequent motivation" (Beard and Senior, 1980, p. 20). However, since at least the 1980s there has been a sustained research focus on how motivational and cognitive factors interact and jointly influence student learning and achievement. In more colloquial terms, there is recognition that students need both the cognitive skill and the motivational will to do well in school (Linnenbrink and Pintrich, 2002, p. 1).

In the next section, I introduce some of these ideas, starting with my findings on culture and how it relates to motivation.

2.2 Cultural Influence on the Learning Environment

In this section of the literature survey, the influences that one's cultural background might have on one's motivation in general and motivation for learning, in particular, is explored. In relation to the disadvantaged students, I look to the literature to find if there is any evidence that students' motivation for learning is affected by their cultural background. An analysis of some early pioneering work is followed by a definition of culture and the subsequent development.

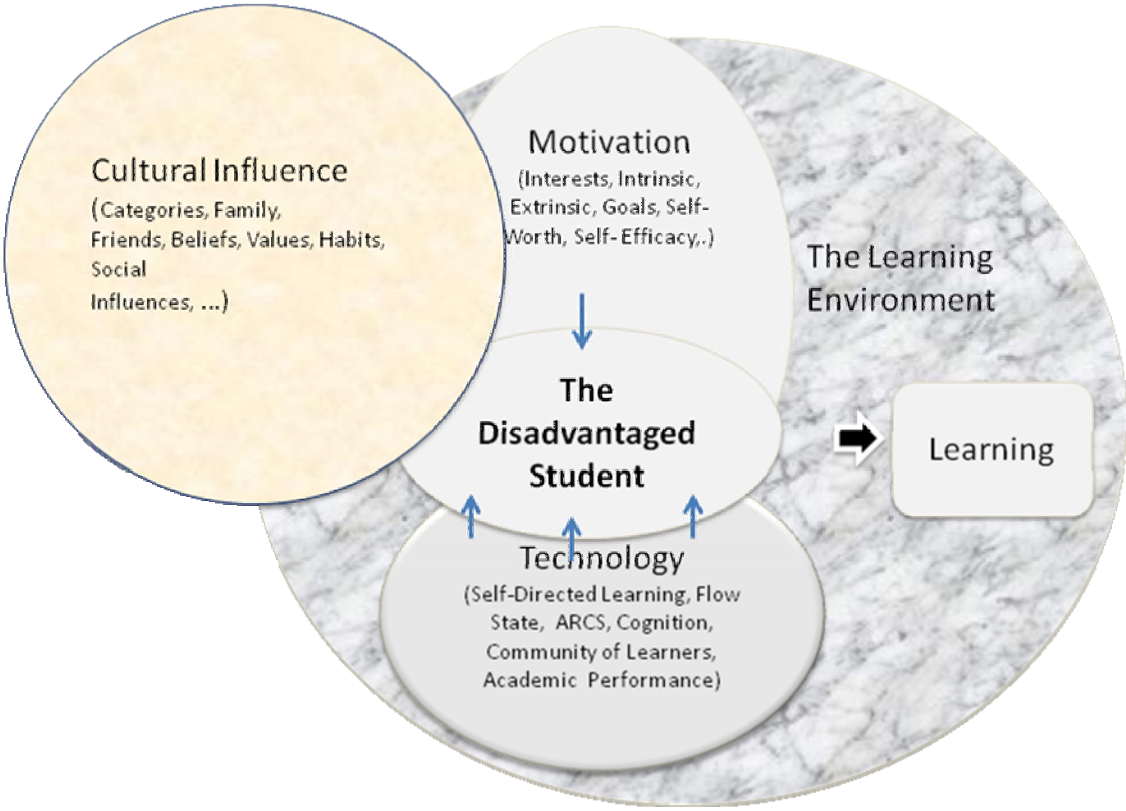
Figure 2.2 below, depicts how disadvantaged students' cultural background has a bearing on their motivation and therefore affects their overall educational experience. In particular, the literature survey will, in this section, focus on answering the following research questions,

Does culture influence motivation and academic performance?

Do family and friends play a role in motivating ICT use and thereby influence academic results?

If so what is the implication for ICT service delivery in an educational environment?

Figure - 2.2 – Depicts Cultural Influence on Student's Learning



2.2.1 Background

The question that has bedevilled minds from time immemorial is how and why individuals become motivated to do something and what their source of motivation is. In the computer laboratories at the University of Limpopo, where I have often taken the University's guests to observe, one sees a feature of this phenomenon, where dozens of students are seen sitting quietly behind the computers eagerly studying. One factor that is gaining momentum and is the focus of this study is one's cultural roots, i.e., to consider an individual's interest/motivation in a particular phenomenon one needs to examine the individual's upbringing and related social and cultural elements to find answers. This section looks for clues in the literature for possible answers.

Much of the research conducted in recent decades shows that learning is influenced by a student's culture and personality (McClelland, Atkinson, Clark and Lowell,1976; Anderman and Anderman, 1999; Nelson, O'Mara, McInerney and Dowson, 2006; Ramburuth and McCromick, 2001; Niles, 1995; Kennedy, 2002, Hwang and Kim,2007, Alavi, Kayworth and Leidner, 2006, Diamant, Fussell and Fen-ly, 2008, Moos and Azevedo, 2009). It should be noted that there are exceptions to this view and some studies have shown motivation to be independent of ethnic background (Passey, Rogers, Machell, McHugh, 2004).

2.2.2 Definition and Categorization

Hofstede (1980, p. 43) defined culture as the collective mental programming of the people in an environment. More recently, Goold, Craig and Coldwell (2007, p. 166) repeat an earlier definition that describes culture as 'that complex whole which includes knowledge, belief, art, morals, law, custom, and any other capabilities and habits acquired by man as a member of society'. The implication of this is that the environment creates its own set of values and beliefs which, in turn, have a bearing on the individual members' motivational levels. Culture may affect not only the type of information provided by the various sources but also which information is selected and how it is weighed and integrated in people's self-efficacy judgments (Oettingen,1997, p. 151). Hofstede (1991, p. 14), in his study of different cultures, outlines four different categories of culture: individualism/collectivism, power distance, uncertainty avoidance and masculinity/femininity. In each of these categories the value system of an individual is affected by the culture of the environment. Of these categories, individualism/collectivism is of central interest in this study, as there seems to be a collective approach amongst students in almost all projects. Individualism pertains to societies in which the ties between individuals are loose. Collectivism pertains to societies in which people are integrated from birth into strong, cohesive "in-groups", which, throughout people's lifetimes, continue to protect them in exchange for unquestioned loyalty (Hofstede, 1991, p. 51). It would be interesting to see if UL students' apparent display of this cultural attribute influences academic performance.

2.2.3 Cultural Influence on Motivation

A pioneer in the field to help with the question of, "**Does culture influence motivation and therefore academic performance?"** is McClelland (Maehr, 2008, p. 917, McClelland 1961) who examined extensively various factors that might have contributed to the economic prosperity of various people throughout history. Because of his prominent position in the field, his ideas deserve special attention.

McClelland examined race (1961, pp. 5–6), as an example, and found that the same people who were once prosperous, lost their advantage at another period in history. He examined climate (p. 6) and favourable weather and found that two almost geographically identical regions do not demonstrate any similarity in terms of economic success. His long search brought him to the conclusion that the main factor in success must be an achievement motive which he found is rooted in the religious (p. 406), moral and cultural beliefs of a given people that are initially developed during child-rearing practices in the family (p. 391) and that this translates itself into achievement motivation that drives them to economic success.

Subsequent developments have expanded this idea. More recently, writers have come to acknowledge that achievement motivation is not a universal construct and that motivation in a cultural context is multidimensional (Niles 1995, p. 369). In a study that Niles conducted, he demonstrated that "there are some similarities and differences between cultures in what motivates students and how they approach learning." McClelland's ideas were challenged by those who redefined achievement in the context of the same culture into three sub-groups: "ability orientated, task orientated and social-approval-orientated motivations" (Niles, 1995, p. 370).

2.2.4 Influence based on Family, Friends and Society

In this section, I document the role and influence that family, friends and society in general, as critical components of a culture, might have on motivation for learning. In this context, and in this study, "social" and "cultural" influences are interchangeable terms.

In response to the question of 'where does one finds the desire to study?', literature is clear on a host of contributors. Firstly, Mansfield explains that, social goals, such as relationships, responsibility and status, have been shown to influence students' motivation and engagement in learning contexts (2007, p. 2). However, social goals find their root in the family. Bread and Senior (1980, p. 4) record similar findings with special influence contributed from mothers, fathers and families in determining the levels of need for achievement motivation. Bandura, Bakbaranelli, Capraba and Pastorelli (1996, p. 1206) found that parents' sense of academic efficacy and aspirations for their children were linked to their children's scholastic achievement through their perceived academic capabilities and aspirations. Similar findings have been reported elsewhere (McClelland, Atkinson, Clark and Lowell, 1976; Covington, 1998, pp. 47–48; Bandura, 1997; Weaver, 2000).

It must be noted that culture, in an environment, reflects the values, habits and standards that families of that culture hold. Much of what has been said about the family in terms of its influence on motivation can also be said about culture, since family values and traditions are rooted in the culture they come from and vice versa. Parents of success-orientated children play a key role in cultivating the essential element for achievement motivation by the way they encourage, nurture, reward and punish their children as they grow up (Covington, 1998, p. 47–48). In fact, there is a direct correlation between students' academic performance and their parents' level of education (Weaver, 2000, p. 121). On the other hand, the main contributor to low academic performance and high dropout rates amongst some ethnic groups is their cultural background that inculcates values that are not conducive to high achievement in the minds and hearts of children (Covington, 1998, p. 44–47). Weaver's conclusion regarding the need for achievement was that "scholars have moved, initially, from viewing ethnic differences in achievement motivation as matter of inferiority of some groups, and superiority for other, to seeing the issue in terms of diversity." While this view is fundamentally agreed upon by most, it does not adequately emphasize how this diversity needs to be accommodated in educational approaches for an effective response. Maslow (1970, p. 22) examines the same concept in a slightly different dimension. "There is now sufficient anthropological evidence to indicate that the fundamental or ultimate desires of all human beings do not differ nearly as much as do their conscious everyday desires. The main reason for this is that two different cultures may provide two completely different ways of satisfying a particular desire." In other words, human beings have similar desires, such as wanting to be loved, but, depending on one's cultural background, manner and values, this desire manifests itself differently. It is in these manifestations, which are often different in different cultures that we look for the source of motivation.

2.2.5 Implication for the Learning Environment

Covington (1998, p. 44) in his study of motivation concluded that investigators paid little attention to the contribution of ethnic differences in determining achievement motivation. However, from the late 1970s onwards, Covington says there is more awareness of the role that cultural background plays in determining one's level of achievement motivation. For example, he believes that words such as "independence", "competition" and "hard work" are closely associated with notions of success among white Americans and West Germans. Instead, words such as "family", "cooperation", and "tradition" have more association with success in young black Americans. His conclusion is that "we must arrange school learning so that it encourages more varied achievement goals than the narrow set of values often associated with competitive excellence and high standardized test scores at all costs." Covington further emphasizes the fact that, in the process of reform, we must not ask students to give up their cultural identities. The reason being that while people like moderate doses of strange and unexpected events, they feel the closest affinity to things they already have some familiarity with or can relate to through specific images (Keller and Suzuki, 1988, p. 412). One must consider: What are the moderate doses of unexpected events and things that are familiar to our students? Keller and Kopp (1987, p. 295) prescribe an analysis of the audience "to determine how much emphasis to give to a particular area of motivation." In relation to the development of online courses Singh, O'Donoghue and Worton (2005; p.22) warn that this "diversity of the new student population requires that institutions carefully develop programmes that will satisfy a broad range of learning requirements". One interpretation of this statement is that an understanding of one's culture is an essential prerequisite if the educational experience is to remain interesting and learners motivated.

2.2.6 Studies Involving the Comparison of Various Cultures

McInerney, Jinkley and Dowson (1998), in their study of three different cultural groups in Australia—aboriginal, Anglo and immigrant students—found a remarkable similarity between students who adopted a mastery orientation towards their academic goals. However, Aboriginal students were found to be more influenced by social goals.

A slight and interesting variation is reported by Kennedy (2002, p. 434) in his study of the Chinese cultural influence on students who were living in Hong Kong. While there is the usual confirmation of the relationship between learning style and the Chinese culture, he reports that motivational variables, both intrinsic and extrinsic, have a different meaning, with most students having a mix of both motivations, and believes that a student must have an interest in learning the intellectual aspects (intrinsic) as well as in the financial and practical outcomes of a course (extrinsic). "Western ways of categorizing motivation do not travel well, at least not to the Orient" (p. 434). He concluded that socio-cultural insights and an understanding of students' previous learning experiences can undoubtedly help teachers to develop more culturally sensitive pedagogies. "Chinese learning styles", he found, are "far more subtle and complex than they are often made out to be" (p. 442). This is a confirmation of Guild's views (1994, p. 16) that cultures do have distinctive learning styles or patterns but that the great variation among individuals within groups means that educators must use diverse teaching strategies with all students.

Another interesting observation reported by Kennedy (2002, p. 431) is the source of influence in the Chinese culture that is attributed to "Confucian values". It is interesting that McClelland, as mentioned above, found religion as the critical force in shaping, directing and sustaining motivational drives in people. However, developing countries generally, and disadvantaged communities in particular, have not been under extensive study, an issue which this study aims to address. What are the cultural and motivational characteristics prevailing in our students? How should that determine our educational technology solutions? Often educational remedies which have been adopted do not take into consideration the cultural requirements, particularly in the developing world. This view is echoed by Nelson, O'Mara, McInerney and Dowson (2006, p. 400): "There is a paucity of research on motivation and education in developing countries. Although psychological constructs relating to academic engagement and achievement have been identified and researched in a number of cross-cultural settings this body of research has rarely been extended to the developing world".

In summary, human thought, affect, and behaviour can be markedly influenced by observation (socio-cultural elements) as well as by direct experience (Bandura, 1977, p. vii). Human behaviour (learning) is explained in terms of continuous reciprocal interaction between cognitive, behavioural (motivation) and environmental (socio-cultural) determinants (Bandura, 1977, p VII).

Thus, literature expects that disadvantaged students would be influenced by their cultures in terms of their desire, their level of motivation and their reasons for studying and using technology. On the other hand, the educational environment needs to look for culturally appropriate measures to ensure effective communication aimed at students in the learning process. In the next section, I explore how motivation plays a role in the learning process and in academic achievement.

2.3 Motivation and the Learning Environments

"There are three things to remember about education. The first is motivation. The second is motivation. The third is motivation."

-Terrel H. Bell

The above statement from the United States Secretary of Education, Terrel H. Bell, must be one of the most quoted statements in educational literature (Ames, 1990, p. 409; Covington, 2000, p. 171; Maehr and Meyer 1997, p. 372).

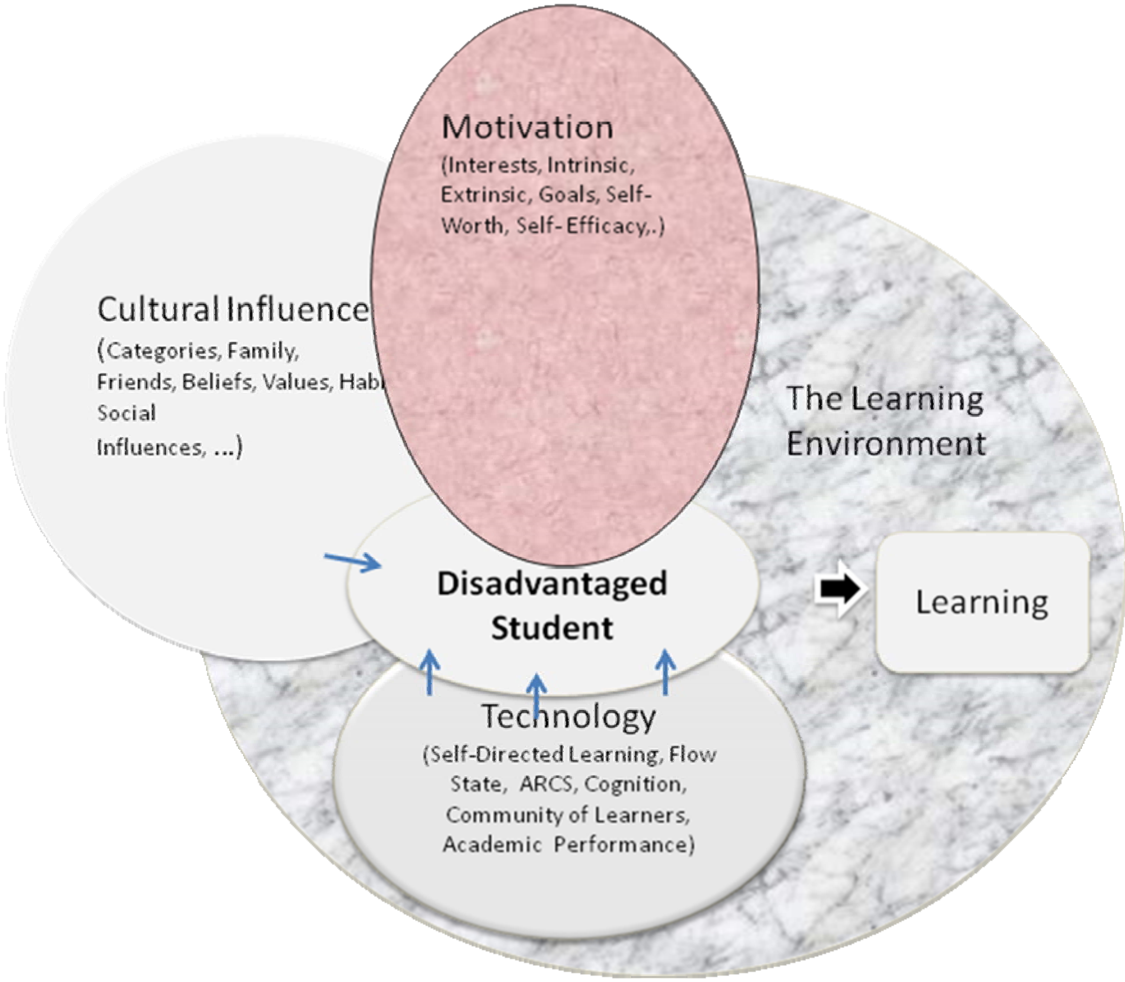
I documented in the previous section, the cultural influence on motivation for learning. How motivation is shaped, directed, encouraged and even sustained by cultural (social) factors. Thus the literature implies that in the findings and discussions, recorded in subsequent chapters of this study, there would be traces of cultural influence in the way UL disadvantaged students are motivated and respond to the technology that affect their learning.

In this section, I explore what literature suggests are the possible motives behind students' academic pursuits, i.e., the link between various motivational orientations and academic achievement. In particular, the research questions that are addressed in this section of literature survey are:

- **Why are students interested in technology?**
- **Is there evidence for self-directed learning, and if so, how does it affect ICT use and academic performance?**
- **How does intrinsic motivation play a role in ICT use and academic achievement?**
- **How does extrinsic motivation affect ICT use and academic achievement?**
- **What is the role of self-efficacy in the level of ICT use and academic achievement?**
-

In Figure 2.3, below, I illustrate, how motivation and desire for learning find their origin in the culture where the student comes from and how they then relates, in their manifold aspects, to the educational environment.

Figure 2.3 - Motivation Influence in the Learning Environment



I begin with a brief outline of some of the general and early discoveries in the field of motivation.

2.3.1 Introduction

For someone who comes from exact sciences such as mathematics and computing, like me, one is lost at the beginning of the literature to observe the diversity of thought and approaches in the field. One does not see a clear progression of ideas logically following each other but rather different views based on different personal experiences. For example, Alfred Adler (1870–1937) was Freud's colleague and initially a defender of his ideas. Later in life, he developed his own rather independent concepts which are in contrast to Freud's theories. No wonder, then, that Wittgenstein (1968, p. 232), Murphy and Alexander (2000) claimed that psychology itself was a discipline marked by ''conceptual confusion''.

Kolesnik (1978, p. 3) had the same experience. "When we turn to psychology for elucidation about what makes people tick we find reputable psychologist are by no means in complete agreement with one another." "Although we actually do know a good deal about motivation, our knowledge on close inspection is quite uneven. We know how to arouse people to greater effort, especially for short periods of time—how, for example, to arrange incentives for factory workers so that production improves and absenteeism falls, and even how to rearrange the social organization of schools so that students are more willing to learn for its own sake. But knowing how to motivate people is not the same as knowing what motivation is" (Covington, 1998, p. 1).

It is for this reason that an initial survey of what has been said about motivation is necessary if one wants to understand what motivates students to learn. The study of literature will demonstrate how the understanding of motivation has evolved.

2.3.2 Definition and the Early Beginning

This section of the literature review covers the basics of what has been said about motivation in so far as it affects learning. It serves as an introduction and a base for what follows in subsequent sections. I start with a formal definition and continue with other dimensions of motivation reflected in the literature.
Keller and Litchfield (2002, p. 86) define motivation as:

> A person's desire to pursue a goal or perform a task, which is manifested by choice of a goal and an effort in pursuing the goal.

Simply put, it is why human organisms think and behave as they do (Weiner, 1992, p. 1). To be motivated means *to be moved* to do something (Ryan and Deci, 2000, p. 54). The term "motivation" is derived from the Latin term *movere*, which means "to move" (Roos, van Eeden, 2008, p. 54). Maehr, (2008, p. 917) complements this definition by adding the need to consider motivation as a process rather than a trait.

Freud must be the most quoted psychologist and therefore I begin with some of his findings on motivation. Freud maintained that most human behaviour is literally irrational. He believed that a person's motives for acting, as well as the real meaning of those acts, are often unknown, even to the individual himself (Kolesnik, 1978, p. 12). Sex is the dominant impulse in Freudian ideology (p. 22). One of Freud's most revolutionary and controversial theories has to do with the sex life of very young children and its effects on their later personality development and motivation. Or it is the procurement of pleasure and the avoidance of pain (Elliot, 2006, p. 111).

Unlike Freud, Erik Erikson puts less emphasis on sex as a source of motivation and more on social development (Kolesnik, 1978, p. 27). According to Erikson there are eight stages in one's life and each is characterized by a dominant problem that needs to be solved. The sixth stage, young adulthood, is relevant to this study, as it usually corresponds with the age of the typical student, namely from 18 to mid 30s; According to Kolesnik (1978, p. 27), the development in this stage centres on a sense of intimacy with other people as opposed to a sense of isolation. This is clearly visible in an average UL student's life as often there is a group-orientated approach to tackling any project.

"Alder maintained that it was potentially more productive to understand a person's goals" states Kolesnik (1978) "to understand his behaviour". Maslow (1970, p. 22), a well known and respected psychologist agrees when he said: "the study of motivation must be in part the study of the ultimate human goals or desires or needs."

Weiner (1992, pp. –17) regards Darwin's contribution to have a revolutionary effect on our understanding of motivation when God-like humans turned to become machine-like men by Darwin's theories. These two distinct origins, according to Weiner, continued to affect the various motivational models that are dominant today—one regarding man as affected by a creator and man as a machine (Weiner, 1992, p. 14).

Since at least the 1980s there has been a sustained research focus on how motivational and cognitive factors interact and jointly influence student learning and achievement (Linnenbrink and Pintrich, 2002, p.1). Over the past fifteen years there has been an increased research interest in motivation in a learning context (Mansfield, 2007, p. 2). An interesting and relevant contribution of his study is the idea that "motivation is a dynamic, multifaceted phenomenon" that can be managed, directed and developed. The assumption that students are grouped as "motivated" or "not motivated" in some global fashion no longer holds. Rather, "students can be motivated in multiple ways and the important issue is the understanding of how and why students are motivated for school achievement" (Linnenbrink and Pintrich, 2002, p. 1). Having covered a few basic facts and definitions about motivation, I now aim, in subsequent sections, to cover some pertinent aspects of motivation that are relevant to this study.

2.3.3 Maslow's Contribution

Since this is a study of students that come from backgrounds where their basic needs, e.g., food, shelter and security, are often not met, I looked for a school of thought that best explains the conditions that such a student experiences and the implications that these conditions have for learning.

A psychologist who has profound impact in this field is Abraham Maslow (1908–1970), also referred to by some as Mr. Humanistic Psychologist. Maslow identified five broad areas of needs, which he arranged in a hierarchal order. They are: 1) – Physiological, 2) – Safety, 3) – Love, 4) – Esteem, 5) – Self-Actualization (Maslow, 1970, p. 35–46). In other words “basic human needs are organized in hierarchy of relative prepotency” (p. 38).

Maslow (1970, p. 24) summarizes his findings in these words: “Man is a wanting animal, and rarely reaches a state of complete satisfaction except for a short time.” According to Maslow, these needs are not acquired but are innate in every human being. When one need is satisfied, another comes into the foreground. In relation to motivation, it must be noted that these needs are such that a lower level need must be completely satisfied before a higher level need is explored. If a learner is worried about basic needs such as food and shelter, it is likely that learning will not be a priority. Maslow believed that most people will not go beyond esteem, the forth step, in their psychological development. As most people require all their energies on satisfying their security, affection and recognition needs, they hardly have the opportunity to excel to the next level, fulfilling themselves—self-actualization. At this stage, once one has satisfied all lower-order needs, it is possible for one to begin self-actualization and emerge as a major motivator.

Based on this school of thought, human beings behave in order to receive an outcome that is pleasing to them. In a way there are similarities between Freud and Adler, in that, in all cases, one is driven by some inner force that brings about some level of satisfaction. Freud felt that this is the sex impulse. Adler believed it is the desire to bring about control and superiority. One gets the feeling that each one of these experts has looked at motivation from their own life experience and that each has contributed partially to the solution of the puzzle.

If one were to examine UL's educational technological environment from a behaviourist perspective, one would look for selected discriminative stimuli and differential reinforcements in the educational environment that have caused the students to become interested in learning through technology. What is relevant to this study, in terms of behaviour, is the concept of reinforcement—social, symbolic, tangible, intermittent, internal, imitative, etc.—which will have bearing in this study.

In summary, humanists believe that human beings, by their very nature, are endowed with tremendous potential for growth. While we have personal and environmental limitations, we do not get close to our full potential. Bahá'u'lláh (1817–1892) the founder of Bahá'í Faith puts it beautifully with these words: "Regard man as a mine rich in gems of inestimable value. Education can, alone, cause it to reveal its treasures, and enable mankind to benefit there from" (Bahá'u'lláh, 1983, p. 260).

Maslow's contribution and relevance to this study is significant because of the special and unique circumstances in which this study has taken place. In circumstances when basic security, privacy and the physical arrangement of the educational facilities are less than ideal, according to Maslow, the likelihood is minimal that students will, of their own accord, become interested in their studies or become intrinsically motivated. Chapter 4, will examine the extent to which these variables are an issue in UL's service-delivery systems.

2.3.4 Motivation – the Basic concepts

In the search for an answer to the question of the source of motivation for a student's desire to use technology, I document in this section, the literature findings in term of the basics of what is covered in contemporary literature on the subject.

D. C. McClelland is regarded by some as the father of the contemporary studies of motivation (Niles, 1995; Maehr and Meyer,1997, p. 379). He introduced the concept of achievement motivation and is reported by a number of researchers (Beard and Senior, 1980, p. 5; Niles, 1995, Maehr, 2008, p. 917) to attribute it to religion or philosophy that the individual comes from. He was not in favour of regarding motives as “deficit” in need of reaching a state of equilibrium as was believed by many of his predecessors (McClelland, Atkinson, Clark and Lowell 1976, p. 8). Thus, according to this point of view, the source of motivation for students’ use of technology and learning is the desire to achieve their goals in life and see an opportunity to achieve these goals through the use of technology. Students with a high level of need for achievement are relatively independent of adults; are less likely to conform to the opinion of their peers in social situations; are better able to work under delayed, reinforcement conditions and prefer moderately difficult tasks to easy or very hard ones (Beard and Senior 1980, p. 6). Such students engage in energetic, innovative activity; and work hard only when there is some challenge in a situation. UL students do show some of the attributes described above. It would be interesting to see if there is correlation between these orientations and ICT use or academic performance. An added dimension to this definition which is relevant to this study comes from Wang, Slaney and Rice (2007, p. 1281) who believe that Chinese social-oriented achievement motivation includes a desire to fulfil the expectations of groups such as family, clan, or society.

Everyone has the need for achievement in some area or another, but this need is stronger and deeper in some people than in others (Kolesnik, 1978, p. 123). Kollesnik further explains that unless this need for achievement is aroused and encouraged it may become or remain dormant. In another study, McClelland, Atkinson, Clark and Lowell (1976, p. 275) addressed the origin of achievement motivation: "all motivations are learned" and "they develop out of repeated affective experiences connected with certain types of situations and types of behaviour". A helpful summary and definition comes from Covington (1998, p.12) who feels that there are two broadly different approaches to achievement motivation. "One perspective views motivation as a ***drive***, that is an internal state or need that impels individuals towards action. This motives-as-drive approach typically views motivation as an enabling factor—a means to an end…. The second perspective considers motivation in terms of ***goals*** or ***incentive*** that draw, not drive, individuals toward action".

This brings us to the next section where I will be documenting my findings on the motivation goal theory.

2.3.5 Motivation Goals Theory

Over the past fifteen years, there has been an increased research interest in motivation in learning contexts. Research in the field has been lead by those working with the **motivational goal theory**, which emphasises the reasons students engage in achievement-related behaviour and takes into account both environmental and individual influences on student motivation (Mansfield, 2007, p. 2). Rather than focusing on the content of what people are attempting to achieve (i.e., objectives, specific standards), goal orientations define *why* and *how* people are trying to achieve various objectives (Anderman and Maehr, 1994, p. 294, Kaplan, Maehr, 2007, p. 142) and refer to overarching purposes of achievement behaviour (Kaplan and Maehr, 2007, p. 142; Mansfield 2007, p. 2). In this school of thought, a difference in behaviour is attributed to a complex set of goals that a learner pursues (Mansfield, 2007, p. 2). An element that is gaining prominence is the social (cultural) aspects of a student's life that play an important role in defining these motivational goals (Dowson and McInerney, 2001) or more generally the environmental characteristics that foster these motivational orientations (Kaplan, Maehr, 2007, p. 142).

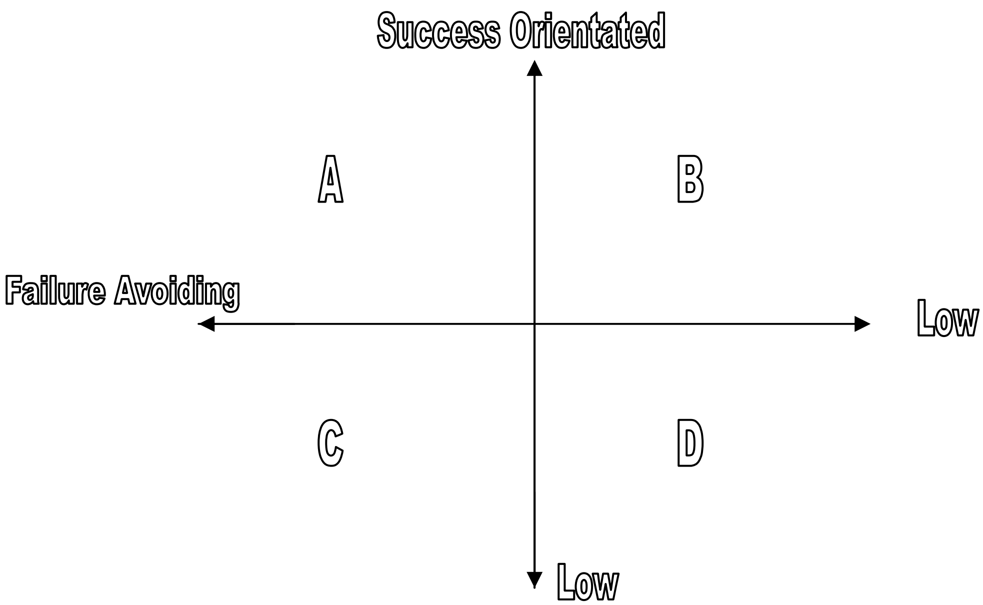
Research on achievement motivation has long emphasized the cognitive base of behaviour, but the recent literature has advanced an achievement goal framework that integrates cognitive and affective components of goal-directed behaviour (Ames, 1992, p. 261). Thus, another angle is provided to look at the question that is of interest in this study. To understand why and how students are interested in technology and learning, one must look at the complex set of goals that drives motivation.

Contemporary conceptions of student motivation define goals as the purposes or intentions driving academic engagements (McInerney, Hinkley, and Dowson, 1998, p. 621; Ames, 1992, p. 261). More precisely, goals are defined as integrated patterns of belief attributions that produce the intentions of behaviour. Understanding the goals of others allows an understanding of their intentions, and to anticipate how, when, and where these others may act on the basis of these intentions (Dik and Aarts, 2007, p. 727). Two contrasting achievement goal constructs have received the most attention. These are mastery and performance goals (Ames,1992, p. 261; McInerney, Hinkley, and Dowson, 1998, p. 621). It should be noted that this dichotomous view of goals with mastery and performance orientation sitting on opposite sides is moderated to a position of a multiple goal perspective being accommodated with various degrees in an individual (Harackiewicz, Pintrich, Barron, Thrash and Elliot, 2002, p. 638). In addition, social goals have been added to the equation in recent years and are gaining in popularity.

Purposefulness, also seems to be a unique quality of human thought and human behaviour (Feldman and Csikszentmihalyi, 1994). This implies that human behaviour is directed towards a goal. These goals emanate from various needs such as: psychological, affiliation, affection, approval, self-esteem, independence and new experiences. A behaviour that aims at satisfying more than one need is multi-motivated. Others have defined goals in an academic perspective as simply “the purposes or intentions driving academic engagement”.

The main drive behind goals and incentives are the hope for success and avoidance of failure with its possible implications of humiliation and shame, "according to Atkinson, all individuals can be characterized by two learned drives, a motive to approach success and motive to avoid failure" (Covington, 1984, p. 33). This implies that there are two opposing orientations with respect to success with one being optimistic and the other less so. However, Covington believes that this provides an "endless variety of motivational patterns."
Figure 2.4, below, illustrates this concept. It depicts four general groups of students. Group A represents individuals who posses two strong conflicting orientations. They need to succeed and avoid failure. These are referred to as ***over-striders***. Group B consists of individuals who aspire for success but are not particularly concerned with failure. These are ***success-orientated*** students. Group C, which is found on the opposite side of the previous group, consists of those students that are highly concerned with failure but are not concerned necessarily with success. These are referred to ***failure-avoiders.*** Finally, Group D, consists of individuals who are moved neither by success nor failure. These are ***failure acceptors****.* In this school of thought, the motive behind a drive could be emotion or cognition. Atkinson was the main advocator for emotion being the main driver in achievement motivation. He defined the motive to approach success as "a capacity to experience pride in accomplishment". Weiner's version of this concept, from the cognitive school of thought, is "a capacity for perceiving success as caused by internal factors, particularly effort" (Covington, 1998, p. 56).

Figure 2.3 - Quadripolar model of need achievement. Source: Covington(1998)



2.3.5.1 Mastery Goal

In this class of motivational goal the learner aims at developing his/her competency. "Mastery-oriented students focus on learning, understanding, developing skills, and mastering information" (Kaplan and Maehr, 2007. p.142). A very similar definition is provided by Meece, Anderman and Anderman (2006, p. 490) where mastery goal orientation is defined in terms of a focus on developing one's abilities, mastering a new skill, trying to accomplish something challenging, and trying to understand learning materials. Success is evaluated in terms of self improvement, and students derive satisfaction from the inherent qualities of the task, such as its interest and challenge. Mastery goals have a positive impact on students' metacognitive knowledge, strategy usage and academic effort (Ames, 1992, p. 262) and have been positively associated with deep processing, persistence and effort (Mansfield, 2007, p. 3). A mastery student is able to find meaning in the work (Seifert, 2004, p. 147). In terms of affective outcomes, mastery goals seem to lead students to feel proud and satisfied when they are successful and guilty when they are not successful (Ames, 1992, p. 262). Mastery goals increase the amount of time children (or learners) spend on learning tasks and their persistence in the face of difficulty and, more importantly, the quality of their engagement in learning (Ames, 1992, p. 262).

2.3.5.2 Performance Goals

Conversely, performance goals refer to the desire to show competencies by trying to obtain positive judgments (Darnon, Butera and Harackiewicz, 2007, p. 61). Performance goals orient learners to focus on their ability and self-worth, to determine their own ability by outperforming competitors, surpassing others in achievements or grades and receiving public recognition for their superior performance (Ames, 1992, p. 262). Meece, Anderman and Anderman (2006, p. 490) believe that a performance goal orientation represents a focus on demonstrating high ability relative to others, striving to be better than others, and using social comparison standards to make judgments of ability and performance. A sense of accomplishment is derived from doing better than others and surpassing normative performance standards. Mastery and performance goals have traditionally been conceptualized as oppositional, but more recent work on approach and avoidance variants suggests that a more nuanced and multidimensional perspective is needed (Pintrich, 2000). Students who perceive their classrooms as places that stress learning, as opposed to performance goals report, more positive attitudes towards the subject, more intrinsic motivation and more cognitive engagement or thoughtfulness (Blumenfeld and Mefgendoller,1992, p208).

2.3.5.3 Social Goals

It is suggested that students may also hold social goal orientations that influence their academic achievement (McInerney, Hinkley and Dowson, 1998, p. 622). This is particularly relevant in this study since the initial observations that led to it showed the signs of a clear relationship between cultural (social) influences and motivation. As a consequence, academic achievement may be influenced by a complex array of motivational determinants related not only to students' mastery and performance goal orientation but also to their social goal orientation. In fact, a combination of mastery and social goal orientation might be more productive than mastery alone because feelings of belonging and social responsibility engendered by social goals may provide added impetus for academic efforts (McInerney, Hinkley and Dowson, 1998, p. 622). Darnon, Butera and Harackiewicz (2007, p. 67) examined achievement goals in social interactions and compared learning with mastery vs. performance goals. Their conclusion indicated that when a partner disagreed, the induction of mastery goals led to significantly better learning than did the induction of performance goals. Again this has an implication in this study since the collective approach and ability to arrive at solution could mean enhancement for better collective and individual performance.

Hwang and Kim (2007) found that knowledge sharing by email is a fundamental driver of TML (Technology Mediated Learning) and KM (Knowledge Management) success. Their research establishes an empirical link among affective commitment, collectivist culture, social influence, and attitude toward sharing knowledge by email in a technology-mediated learning environment. In a similar conclusion Hwang and Kim (2007), Alavi, Kayworth and Leidner(2006), regard knowledge sharing as an important variable in the technology mediated learning (TML and knowledge management (KM) literature incorporating social and cultural factors).

2.3.6 Intrinsic vs. Extrinsic Motivation

> *I have become convinced that an essential ingredient for sustaining creative effort is intrinsic motivation, or the ability to derive rewards from*

> *the creativity itself rather from external incentives like power, money or fame.*
>
> Feldman and Csikszentmihalyi (1994)

The similar orientation between mastery goal and intrinsic motivation should be noted. They both emanate from the same type of character, while, performance orientation behaviour and extrinsic motivation have similar origins. Most achievement goal and intrinsic motivation theorists contend that mastery goals are facilitative of intrinsic motivation and its constituent processes, whereas performance goals are posited to have negative effects. That is, mastery goals are said to promote intrinsic motivation by fostering perceptions of challenge, encouraging task involvement, generating excitement and supporting self-determination, whereas performance goals are portrayed as undermining intrinsic motivation by instilling perceptions of threat, disrupting task involvement and eliciting anxiety and evaluative pressure (Elliot and Harackiewicz, 1996, p. 462). Intrinsic motivation is based on wanting to learn because the student is interested or curious about a task itself (Biggs and Telfer, 1987, p. 96), or adopting goals that are more aimed towards deeper learning strategies (Pintrich, 2004, p. 388). Being intrinsically motivated in an academic task indicates that the student's participation in the task is an end in itself. An intrinsically motivated student is likely to display autonomy and employ self-initiated exploratory strategies (Bye, Pushkar and Conway (2007, p.144).

Extrinsic motivation, on the other hand, refers to doing something because it leads to a separable outcome (Ryan and Deci, 2000, p. 55) or to adopting goals that are more inclined towards surface learning strategies (Pintrich, 2004, p. 388). Bread and Senior (1980, p. 3) feel that learning is an intrinsic motive which finds both its source and reward in its own exercise. They further point out that the lack of motivation is likely to become a problem only when learning is imposed on the learner. Bread and Senior (1980, p. 4) summarize the behaviourist point of view that speaks more of providing motivation through

incentives and rewards with a view to establishing behaviour which may in themselves become their own reward. It is expected that students with a high level of intrinsic motivation will also have a high sense of self-directedness (de Bruin, 2007). McCauley and McClelland (2004, p. 34) found higher levels of self-directedness in postgraduate students than undergraduates, which they attributed to the nature of the work, maturation, changes in expectations and methods of instruction. By contrast, extrinsic-motivation orientation is mostly disfavored by the literature. Pintrich, for example, says that self-regulated learning can be facilitated by the adoption of mastery and relative ability goals and hindered by the adoption of extrinsic goals (Pintrich, 1999, p. 459). However, this position is by no means universal. Ryan and Deci (2000, p. 60) feel that most of people's activities are not, strictly speaking, intrinsically motivated. This is especially the case after early childhood, as the freedom to be intrinsically motivated becomes increasingly curtailed by social demands and roles that require individuals to assume responsibility for non-intrinsically interesting tasks. In schools, for example, it appears that intrinsic motivation becomes weaker with each advancing grade (Ryan and Deci, 2000, p. 60).
Playing is an example of intrinsic motivation since children rarely need encouragement to play a game of their choice. Can computers be organized in such a way that education becomes like a game for the learner?
Intrinsically motivated students find learning as an end in itself, just as looking at beautiful scenery is enjoyable and does not require other external motivation.
The question is: Does technology provide the necessary incentive to assist education? Is there something technology can do to facilitate enjoyable learning? Is this the explanation for the high number of students that circle the computer labs in search of learning?
Interest has been defined as the most basic and ubiquitous of universal motivating emotions for humans. High levels of interest are necessary to trigger and maintain a strong intrinsic motivation for learning (Bye, Pushkar and Conway (2007, p.145).

A well respected scholar of these ideas is Jean Piaget, whose views, while he "has not dealt with motivation extensively ... have been given strong support to the concept of intrinsic motivation. He believes that human beings by their very nature have an intrinsic tendency to assimilate and accommodate and thus to grow intellectually" (Kolesnik, 1978, p. 137).

Pintrich and De Groot (1990, p. 37) found intrinsic values to have a strong relationship with the use of cognitive strategies and self-regulation, i.e., students who were motivated to learn the material (not just for grades) and believed that their schoolwork was interesting and important were more cognitively engaged in trying to learn and comprehend the material.

Reigeluth (1999, p. 6) takes this idea further and finds a place for intrinsic and extrinsic motivation in his definition for instructional design theory. In other words instructions should include "activities that are amply rewarded, either because they are interesting and engaging in themselves or because they feed into other achievements and concern the learner."

Having established the ideals of intrinsic motivation and the practical realities of extrinsic motivation, the question that emerges is how does one provide ICT services in such a way that students become intrinsically motivated while they pursue their learning career? This is a question that Chapter 4 of this study will cover.

2.3.7 Self-Efficacy

The origin of self-efficacy goes back to the concept of expectancy that has a rich history in psychology (Schunk,1991, p. 207). It is referred to beliefs in one's capabilities to organize and execute the courses of action required to manage respective situations (Bandura, 1997, p. 2; Schunk, 1991, p. 207) and one's personal judgments about his or her performance capabilities in a given domain or activity (Bates and Khasawneh, 2007, p. 178). Self-efficacy makes a difference in how people feel, think, and act (Schwarzer, 1992, p. ix). Students who have more positive self-efficacy beliefs (i.e., they believe they can do the task) are more likely to work harder, persist and eventually achieve at higher levels (Linnenbrink and Pintrich, 2002, p. 3). Evidence has also been reviewed suggesting that self-efficacy promotes adaptive strategy use, such as self-regulation, suggesting that students with high self-efficacy beliefs will also be likely to use adaptive and appropriate study skills. In particular, self-efficacy has been associated with increased persistence relating to engagement. Evidence has also been reviewed suggesting that self-efficacy promotes adaptive strategy use such as self-regulation suggesting that students with high self-efficacy beliefs will also be likely to use adaptive and appropriate study skills (Linnenbrink and Pintrich, 2002, p. 3). Self-efficacy predicts such diverse outcomes as those of academic achievements, social skills, smoking cessation, pain tolerance, athletic performance, career choices, assertiveness, coping with feared events, recovery from heart attack and sales performance (Schunk, 1991, p.207).

In the search for the sources of self-efficacy in human beings, I turned to Albert Bundura, a Professor of Social Sciences at Stanford University whose work is much respected and repeated in literature. He identifies four sources that contribute towards the formation of peoples' belief about their efficacy (Bandura, 1997, p. 3–5). First, they are the most effective through their mastery experiences. Success builds robust belief in one's personal efficacy. This could explain why technology is so welcomed by so many students. The reason could be the fact that it provides differing levels of solutions depending on one's level of sophistication and intelligence. In UL even the cleaning ladies show an interest in learning ICT tools, since they see themselves as being able to use and complete tasks that appeared impossible at one point. When disadvantaged students who have until that point only heard about technology see it in action and realize that it is easy to use, they become productive. Their sense of self-efficacy is awakened, and this results in their becoming motivated to carry on.

Going back to Bundura's four sources that contribute to self-efficacy, the second influential way of creating and strengthening efficacy belief, he says, is through the vicarious experiences provided by social models. Seeing those similar to themselves succeed by perseverant effort raises the observer's beliefs that they too possess the capabilities to perform comparable activities (Bandura, 1997, p. 3). This observation is particularly relevant to UL's environment where students take a collective approach and often learn from each other. Most of the basic ICT tools are learnt from one another in the student computer laboratories. Social persuasion is the third way of strengthening people's beliefs that they have what it takes to succeed. Technology-assisted learning involves growing social relationships and allows students to find their voice in these relationships (Lankshear, Peters and Knobel, 2000, p. 20; Greyling and Wentzel 2007, p. 655). Because mandatory involvement requirements may not intrinsically motivate learners to achieve high-quality learning, social factors under commitment are especially important determinants of TML (Technology Mediated Learning) success (Hwang and Kim, 2007, p. 232).

The fourth source of self-efficacy in people, according to Bandura, is the physiological and emotional states in judging their capabilities, i.e., the interpretation of stress reaction and tension as a sign of vulnerability to poor performance. One of the most powerful influences on a person's behaviour is another person. We do things because it is important to us that we appear favourably in the eyes of significant others, whether those others be peers, peer groups, neighbourhoods, employers, one's spouse, authorities, etc. (Biggs and Telfer, 1987, p. 106).

Yi and Hwang (2003) in their research linked self-efficacy with technology. They make reference to a concept called general computer self-efficacy (CSE) which is defined as an individual judgment of efficacy across multiple computer domains and application-specific self-efficacy is defined as an individual perception of efficacy in using a specific application or system within the domain of general computing (p. 434). In their research they talk about application-specific self-efficacy that exerts a significant effect on system use (p. 443). Moos and Azevedo (2009, p. 591) in relation to Computer Based Learning Environments (CBLEs) found that self-efficacy is a particularly important construct. However, they point out several salient issues. First, the relationship between computer self-efficacy and learning with different CBLEs may vary (p. 593). It is critical to measure computer self-efficacy with a variety of different CBLEs because the cognitive and metacognitive demands vary between distinct CBLEs. Some CBLEs, such as hypermedia, place high levels of cognitive and metacognitive demands on learners (p. 593). They further point out that (p. 592) self-efficacy research has treated this construct as one dimensional. These measurements have typically examined the strength of an individual's computer self-efficacy, whereas the other two dimensions of level and generality have rarely been included in these measurements. In a similar line of thinking Bates and Khasawneh (2007, p. 188) bring an interesting point that has some significance in this study. In their research they found that previous success with online learning systems may be a critical factor in the development of self-efficacy and attitudes about online learning system use. In this study where most students do not have previous exposure to ICTs, it would be interesting to see how the results from this study compares.

What then is the practical implication of self-efficacy? In other words, once one becomes aware of one's capabilities, such awareness leads to the delivery or the execution process. Again, Bandura (1997, p. 5) identifies that four processes are involved. Two of these, cognitive and motivational processes, are, within the scope of this study as they explain, in my opinion, our student's behaviour.
The effects of efficacy belief on cognitive processes take a variety of forms. Much human behaviour, being purposive, is regulated by forethought embodying valued goals (Bandura, 1997). When students get the feeling that they can use a PC and obtain critical information, this feeling of being effective leads to the cognitive awareness that he/she can accomplish an academic task and therefore

sets goals to be achieved. People with high self-efficacy are more likely to set high goals or to accept difficult, assigned goals; to commit themselves to difficult goals; to respond with renewed efforts to setbacks and to discover successful task strategies (Locke, 1996). A major function of thought is to enable people to predict events and to develop ways to control those that affect their lives. Such problem-solving skills require effective cognitive processing of information that contains many complexities, ambiguities and uncertainties (Bandura, 1997, p. 6). Motivational processes are followed. Most human motivation is cognitively generated. When I am confronted with a difficult task, I try to motivate myself by thinking about pleasant and positive aspects of the things that might be associated with the task. Here the cognitive and motivational forces join hands to accomplish a deliverable result. An interesting observation is made by Pintrich and De Groot (1990, p. 33) that knowledgement of cognitive and metacognitive strategies is usually not enough to promote student achievement. Students must also be motivated to use the strategies as well as to regulate their cognition and effort. That is why students with remarkable intelligence often may not necessarily perform adequately academically. A similar view is expressed by Seifert (2004). While it may seem sensible enough to say that students who perceive themselves incapable will not be motivated to learn, it is not necessarily the case that students who are not motivated to learn see themselves as incapable. This point is evidenced by the bright but bored underachieving student who does the minimum amount of work necessary to achieve some minimal acceptable standard (p. 144).

2.3.8 Self-Regulated Learning

In this section of the literature review, basic concepts and a definition for self-regulated or self-directed learning are provided. There are a number of reasons for interest in and the relevance of this topic in this case study. Firstly, because it stresses a balance between motivational and cognitive elements, it serves as a befitting link between the previous section, motivation, and the next section, which is technology. Secondly, one of the characteristics of the student population in this study is that students demonstrate strong interest for learning by themselves (self-directed learning) once given ICT tools. The concept of self-regulated learning, therefore, first has to be understood and then the phenomenon tested for this case study.

There are a variety of definitions for self-regulated learning. I have chosen the definition from Pintrich and van de Groot (1990, p. 33). First, self-regulated learning includes students' metacognitive strategies for planning, monitoring, and modifying their cognition. Second is students' management and control of their effort. A third important aspect of self-regulated learning that some researchers have included in their conceptualization is the actual cognitive strategies that students use to learn, remember, and understand material. Self-regulated learning refers to our ability to understand and control our learning environments (Schraw, Crippen, and Hartley, 2006, p. 113).

"Metacognitive" refers to what one knows about the learning process and about oneself as a learner (Brown, 1988, p. 312)—in other words, any form of learning in which the individual is primarily responsible for the planning, implementation and evaluation of learning (de Bruin, 2007, p. 231; Knowles, 1975, p. 18). Academic self-regulation is not a mental ability, such as intelligence, or an academic skill, such as reading proficiency; rather it is the self-directed process through which learners transform their mental abilities into academic skills (Zimmerman, 1998, p. 1, Zimmerman, 2008, p.166). The key to self-regulation among learners is intentionality (Jonassen 1996, p. 259). The term "intention" has also been used to refer to goal or motivation (Locke, 1996, p. 117). Thus an explanation is provided for how self-directed learning, motivation and cognition join hands to assist in learning. Students first become motivated to learn, and, since they get satisfaction in using ICTs as tools, they become encouraged to continue and control and manage their self-directed learning environment. The two elements of motivation and cognition work hand in hand in this process. An interesting extension of self-regulated learning is given by Simons (1993, p. 291), who looks at constructive learning with attributes that include: active, constructive, cumulative and goal orientated. He then extended this idea by finding a relationship between constructive learning and self-directed learning. Similar studies showed a correlation between self-regulated learners and academic performance, students' giftedness, self-efficacy and strategy use (Zimmerman and Martinez-Pons, 1990, p. 51).

It is not just the individual's cultural, demographic or personality characteristics that influence motivation and achievement directly, but rather the individual's active regulation of his or her motivation, thinking and behaviour that mediates the relationships between the person, context and eventual achievement (Linnenbrink and Pintrich, 2002. p. 2). Wang and Newlin (2002, p. 160) verified the relationship between self-efficacy and academic performance. They further found that students who chose to do a Web-based course had higher levels of self-efficacy, indicating that students who embrace new technology might benefit from higher levels of self-efficacy.

Zimmerman (1990, p. 6) feels that students' self-directed learning involves three features: a) - Student use of self-regulated learning strategies, b) – Student responsiveness to self-oriented feedback about learning effectiveness, and c) - interdependent motivational processes. Yukselturk and Bulut (2007) in a study that included 16 related variables concluded that self-regulation to have the strongest correlation to academic success.
One of the by-products of self-efficacy is self-regulation. Pintrich and van de Groot (1990, p. 38) found a close relationship between the two.

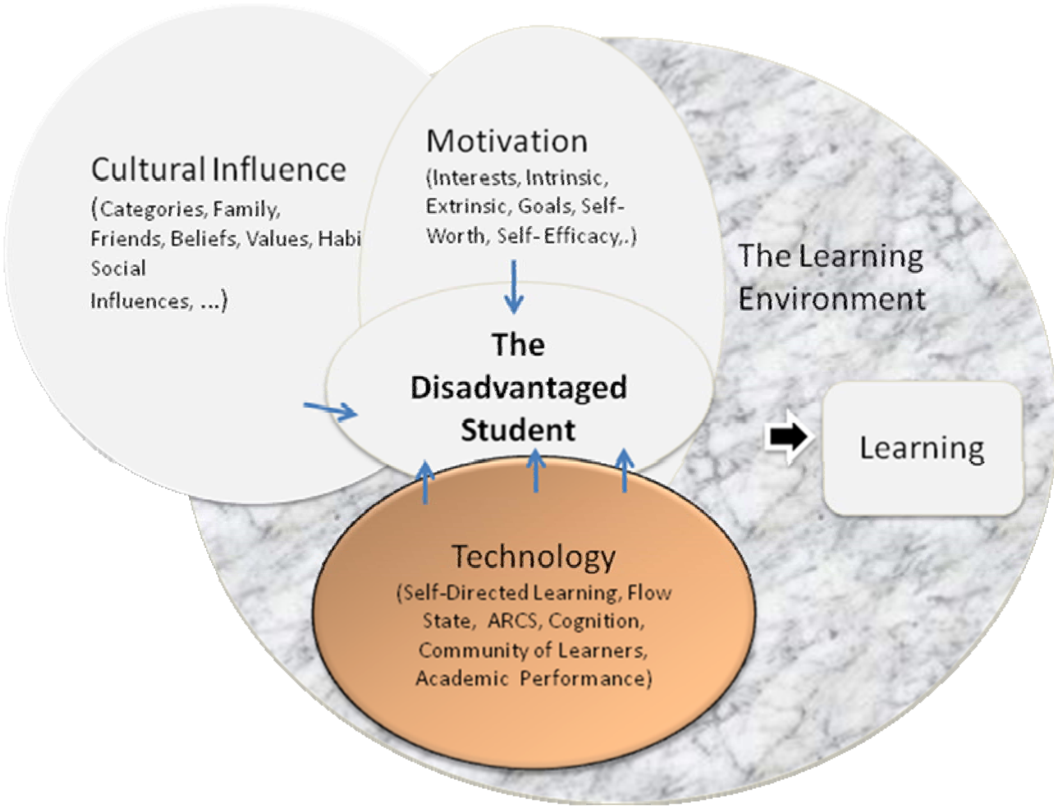
2.4 Technology and the Learning Environment

In the literature survey so far, I first examined whether students' cultural background has been found to have an influence the learning process. It was suggested that it plays a key role and is a main contributor in influencing and forming motivational forces that shape the aspirations and behaviour of a human being. I then looked at various aspects of human motivation and found that learning essentially relies on motivation and that it is the practical expression of various motivational forces within us.

In this section, I explore the third key variable of this study, **technology**, and its role in the learning environment. First, I examine whether technology's presence in education is inevitable or if there is an option not to embrace it. Second, I look for answers to the question that has been the driving motivation in this study and look for the reasons why students are keen to use technology. In this endeavour, topics such as the state of flow and tailoring technology to suit learning will be discussed. Here, some of the well-known scholars that have won respect in this field are documented as examples of how ICT tools can be used to advance learning. Third, I examine what literature has to say about the correlation between ICT use and academic performance.

Figure 2.5, below, illustrates this concept. It shows that technology is a variable in the educational environment. The response it gets from students depends to some extent on students' cultural and motivational backgrounds and the way that it is presented in the educational environment.

Figure 2.5 – Depicts the influence of technology on student's learning process



2.4.1 Inevitability of Technology in Education

> *It is difficult and maybe even impossible to imagine future learning environments that are not supported, in one way or another, by Information and Communication Technologies (Punie, Zinnbauer and Cabrera, 2006, p. 5).*

In the previous section I documented how learning begins and ends with motivation. Perhaps it is technology's ability to fascinate and therefore motivate that has given it its penetrative power in education. But, to what extent has technology's influence been pervasive in the world of education and the learning process? For colleges and universities trying to stay in this competition, the main question these days does not seem to be whether they should adopt ICT in their study programs, nor the many consequences this might have for higher education, but rather how fast they can realise in practice the opportunities the new technology is offering (Stensaker, Maassen, Borgan, Ofterbo and Karseth (2007, p.418).

Spencer (1999) likens the advent of the new technology in education to the developments of language, writing and print. He says "some technologies, such as writing and printing, have been so successfully embedded in education that we are hardly aware of them: These are the ubiquitous technologies that have formed the very foundations of education for centuries". In other words, in the past, technology was concerned with fitting people's bodies; today it must fit people's minds (Norman, 1993, p. 9).

Others have used similar, befitting examples to demonstrate the pervasive and all-encompassing influence of technology in education. The term "ecology of education" is used in the sense of the totality of interactions between an organism and its environment or, in the case of humans, the complex interactions between mind, action and environment. Just as an ecosystem can be understood through its interacting subsystems, so an ecology of education would subsume ecologies of learning, knowledge, ideas and so on. Such ecologies may provide a means of establishing how "the weaving together of mind and action, individual and group, macro- and micro-contexts and historical framings [allow] us to see how individuals are positioned within the possibilities of the actions available to them and what they make of those opportunities" (Dillon, 2004, p. 148). However, Spencer warns us that progressive change in education requires that emphasis be placed upon the technology *of* education rather than the provision of technology *in* education (Conlon and Simpson, 2003, p. 149). However, the rapid speed of the expansion of technology has, at times, been interpreted more in the economical interest of a few rather that based on sound pedagogical principles (Dillon, 2004, p. 138). On a similar theme, Conlon and

Simpson (2003) document cases where the introduction of technology has not had any "clear and substantial evidence of students increasing their academic achievement as a result of using IT". A closer examination of the study, however, suggests that the absence of a number of key essential support mechanisms in the process may have occasioned the slow progress. It reminds us that the successful implementation and use of technology is associated with the stage of the development of a society and the availability of the necessary support structures that must be in place. As an example, in the above study, it was found that the academic community had multiple competing priorities, inadequate computer infrastructure and lack of ICT skills, all of which are critical for successful implementation of technology-based initiatives.

Another well known debate that needs to be mentioned in relation to the role technology in learning is Clark's statement that "Media is not significant" (Clark and Sugrue, 1990, Clark, 1991). Here the value of media is minimized if not dismissed and emphasis is put on the content, method (Clark 1991, p. 35) or economic (and not psychological) advantages. Media are "mere vehicles that deliver instruction but do not influence student achievement any more than the truck that delivers our groceries causes changes in our nutrition" (Clark, 1991, p. 35). Clarks views have been "reframed" by Kozma (1994) who demonstrated that in certain applications, there is clear evidence of the capabilities of a particular medium to make a difference in the learning process. In other words media and method both influence learning (Kozma, 1991, p. 11). In terms of the disadvantaged students the case is even clearer. Although a stove or a pot in the kitchen are mere tools in the cooking process without them the chef will have great difficulty producing good results. In the disadvantaged student setting, access to technology, clearly makes the learning environment more accessible, available, diversified and practical.

Like any tool, ICT makes life a lot easier for the student. In the case of the disadvantage students, with their particular cultural and motivation background, there is an additional motivational aspect that technology appears to make a greater impact. Not only does technology makes the information easily and readily accessible, in addition, it uses its multi-dimensional capability to communicate more effectively since there is possibly a greater receptively towards technology use in the disadvantaged students.

As with the advent of language, writing and printing, technology's penetrating influence is inevitable. It is clear that the new technology and the Internet in particular, are having profound effect on education across the world (Standish, 1999, p. 417). Advances in information and communications technologies have brought about exciting opportunities for fundamental changes in education. Instructors increasingly leverage available technologies to enhance their students' learning experiences, such as by creating vivid, playful, interactive learning environments that support multimedia presentations, adaptive online exercises, and virtual discussions with greater student control of learning and pacing (Hui, Hu, Clark, Tam and Milton, 2008, p. 245). The digital age is throwing many of our educational practices and emphases and their underlying epistemological assumptions, beliefs, concepts and substantive theories into doubt (Lankshear, Peters and Knobel, 2000).

Keller and Suzuki remind us that there are many things that can be done effectively with computers that would be difficult with any other media (1988, p. 410). A good example is computer games where a combination of clever graphics with relevant information that can be revealed to solve a mystery and which manages to motivate the participants to solve the mystery. In an instructional setting, learners can be led toward the final answer by working through a succession of problem-solving activities combined with the partial release of facts. With graphics and animation, the learner can "move" through a series of scenes and situations (Keller and Suzuki, 1988, p. 410), making it more exciting and interactive than mere text-based learning.

2.4.2 Self-Regulated Learning with Technology

The early beginning of self-directed learning and ICTs' practical experiment must be attributed to Professor S. Mitra who in an Educational Computing Conference in 1982, together with a colleague, R.S. Pawar offered a methodology for the teaching of computer languages as a learning tool (Mitra and Rana, 2001). Later in 1988, Professor Mitra conducted two experiments and concluded that unsupervised use of computers can lead to accelerated learning of skills in children. Specifically, he saw a difference between children and adults' response to technology. In 1995, the first experiment in rural area was conducted. Here, a few computers were placed in a school and children were allowed to use them after minimal instruction (Mitra and Rana, 2001). This was followed by a second and much larger experiment, which took four years and involved 150,000 computers, called "learning through exploration, discovery and adventure". In 2001, there was already a clear evidential support for his initial ideas. "Urban children all over the world seem to acquire computing skills without adult intervention" (Mitra and Rana 2001).

In a series of studies pioneered by Professor Mitra the phenomenon of ICT as an instrument for self-directed learning was repeatedly confirmed (Mitra and Rana, 2001; Inamdar, 2004; Van Cappelle, 2004; Dangwal, Jha and Kapur, 2006; Cronje and Burger, 2006; Gush, Cambridge and Smith, 2004).

The common denominator in these studies was a combination of children of young age—between 6 and 18—coming from poor (disadvantaged) communities, with little or no prior experience with ICT, being given an opportunity to have access to ICT tools. The outcome has provided a clear evidence that "technology offers children unique intellectual experiences and opportunities" (Dangwal, Jha, Chtterjee and Mitra, 2006, p.42). Appropriate use of computers can "provide children with new possibilities for learning, thinking, and growing emotionally as well as cognitively" (Papert, 1980, p. 17). In this study, I follow up the same principles and test them against an environment in higher education with a student population that is predominantly from a disadvantaged background.

Wang and Newlin (2002, p. 160) demonstrated the correlation that exists between self-efficacy for technology use and academic performance, i.e., students that showed confidence in their abilities to use technology also did well in their exams. Learner perceptions of personal efficacy, therefore, have a reciprocal relationship with the self-regulatory processes that affect motivation and performance (Lynch and Dembo, 2004). This evidence is by no means universal and there have been exceptions. For example, in relation to online learning Eom and Wen(2006) used self-efficacy to measure self-motivation and found no relationship between self-motivation and perceived learning outcomes.

2.4.3 *Possible Explanation for Students' interest in ICTs*

A general theme throughout this research study has been the search for an explanation for students' interest in technology, i.e.,

> **Why are students interested in technology?**

2.4.3.1 The Flow State

In section 2.4, above, I examined, from an educational psychology point of view, why students might be motivated to use technology for learning. In this section of the literature survey, I look for an alternative explanation, referred to as "state of flow", for students' interest in technology.

It is commonly accepted that computers are engrossing to young and old alike. A wife that complains about her husband being in front of the computer all the time and, parents that are concerned about their children constantly playing and chatting are all scenes that we are well familiar with. One puzzle for the researcher has always been this phenomenon in students and their response to technology at UL. This is not by any means universal and is not applicable to every student. There are those that look at technology (PCs) with indifference. The questions are why and how and from where this motivation and phenomenon come from. One explanation is given by Csikszentmihalyi (1992, p. 71).

We have seen how people describe the common characteristics of optimal experience: a sense that one's skills are adequate to cope with the challenges at hand, in a goal directed, rule bound action system that provides clear values as to how well one is performing. Concentration is so intense that there is no attention left to thinking about anything irrelevant or to worry about problems. Csikszentmihalyi refers to this state as "flow". When a person's skill is just right to cope with the demands of a situation—and when compared to the entirety of everyday life the demands are above average—the quality of experience improves noticeably (Csikszentmihalyi and Csikszentmihalyi, 1988, p. 32). This also explains why every individual that associates with computers has his/her own special approach. This could also explain why in a teamwork exercise everyone can contribute towards the solution in their own way. Technology, with its many paths for solutions, allows individuals with different capacities to feel accomplished since they all, in some way, feel they have achieved something. It is said that through technology students can think better and more clearly; they have access to accurate information; they can work effectively with others, whether together in the same place or separated by space or time (Norman, 1993, p. 3).

Now that the phenomenon of interest in technology is explained in psychological terms, the challenge for an educational technologist must surely be to facilitate a learning environment that is conducive to reaching a state of optimal flow while

learning. This phenomenon is readily attributed to the use of technology in education. One is inclined to ask, should it not be recognized by educators as such, particularly in areas with disadvantaged students, and be used more extensively as a means to leapfrog students' learning development?
This provides an explanation for student's interest in technology. In this school of thought, technology acts as an effective catalyst that, owing to its ability to attract students, is able to facilitate learning.

2.4.3.2 Tailoring Technology to Suit Learning

Features such as the flow state with its ability to motivate, together with many other positive ICT features, ideally, could become through a systematic plan, integrated into the daily educational environment of a student's life.
Linnenbrink and Pintrich (2002, p. 1) remind us that instructional efforts and the design of classrooms and schools can make a difference in motivating students for academic achievement. The implication of this fact is that technology, with its natural motivational power, can, provided it is used appropriately, enhance motivation and therefore accelerate learning. For example, the ability of computers to withhold access to information until the student has qualified for it allows the designer to build inquiry and mystery into lessons (Keller and Suzuki, 1988). This makes computers a natural tool to create curiosity which is a motivator. The audio and visual capabilities of the computer can be particularly effective in capturing attention. Animation, inverse, flash and sound are all effective ways to capture a student's attention (Keller and Suzuki, 1988, p. 409). However, it should be noted that students do not learn from computers but rather that students learn from thinking in meaningful ways (Jonassen, 1996, p. 3). Decisive direction and planning are needed to progress in the correct direction. Unless the introduction of technology is as part of a holistic management plan that takes into consideration all aspects related to the overall culture, stage of development and environmental circumstances that surround teaching and learning, such as content and pedagogy, the benefits will be negatively affected

(Reynolds, Treharne and Tripp, 2003, pp. 152-155). The same study points out that in some examples of exceptional performance there was an ICT expert who drove the process.

2.4.4 Motivation from John Keller's Point of View

In this section of the literature review, examples where technology is used as a motivational tool to improve learning are presented. In addition, elements of instructional design that are recommended to enhance motivation, and therefore learning, are also provided. In an earlier section of the literature review, basic components of how and why students are motivated were discussed. In this section, we see how those attributes could be used to enhance learning. One such example is provided by Keller in his ARCS (Attention, Relevance, Competency and Satisfaction) model. John M. Keller is a professor of instructional systems and educational psychology at Florida State University. The basis for his model is founded on two motivational characteristics of state and trait. Keller and Litchfield (2002, p. 87) differentiate between these two motivational characteristics in an individual: "State is a condition brought on by situational stimulus or process, whereas a trait is a stable psychological need or drive." While trait is believed to be fairly static and does not easily change in an individual, state can be changed by appropriate motivational strategies. It is in this area that Keller introduces his model. The goal of an instructional designer in an ARCS-based learning environment, therefore, will be two-fold. On one hand, a designer must accommodate factors that are associated with elements of **trait** that are likely to be motivational and, on the other hand, be conscious of those elements that are **state** and therefore could easily be used to motivate learners. The focus of the ARCS model is thus to create a learning environment that takes into consideration the motivational side of the learner.

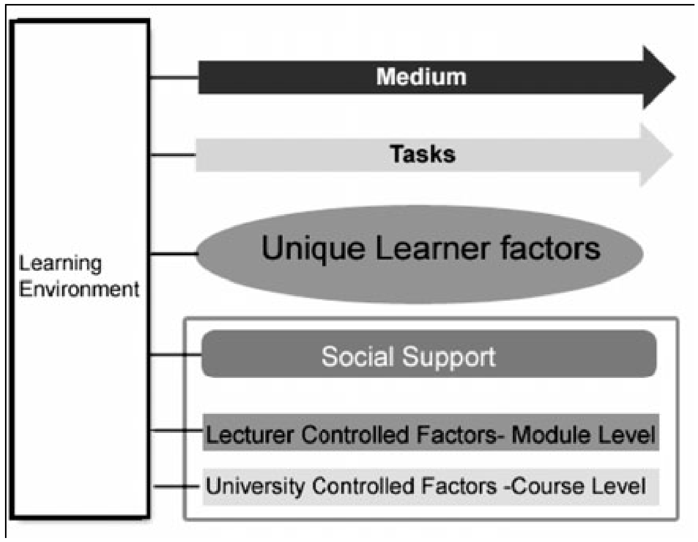
"The theory was derived from a synthesis of many areas of research that pertain to human motivation and its purpose is to help answer questions about how to design motivational strategies into instructions that will stimulate or sustain students' motivation to learn" (Keller and Suzuki, 1988). Hodges (2004, p. 4) summarizes Keller's ARCS model as a "method for systematically designing motivation strategies into instructional material". He further elaborates that the model consists of three components. The **first** component is related to motivation. The emphasis in on creation and sustenance of four distinct motivational attributes: attention, relevance, confidence and satisfaction in offering a lesson. The **second** component is a set of strategies for enhancing motivation in instruction and the **third** component is a design model for motivational design. In a study where he played a key role, Keller adds an interesting dimension to his model. "The ARCS model is based on a synthesis of motivational concepts and a problem-solving approach to design, rather than the application of specific motivational solutions that are advocated without regard for the specific characteristics of a given situation" (Keller and Zuzuki, 2004, p. 1) . This makes the model a dynamic solution that can be applied in different situations and can provide the appropriate remedy relevant to the given situation. Keller's recommended strategy includes "varying the delivery of format of the instruction using humour, participation and facts that contradict a learner's intuition to sustain attention" (Hodges, 2004, p. 4).

Hodges (2004, p. 5) tells us that the ARCS model includes a design process. Like a typical system-development cycle, it consists of four phases: definition, design, development and evaluation. Once an instructional problem has been identified to be that of motivation, it is stated formally and clearly. Based on the stated problem, motivational strategies are employed to design and develop the required material. The final stage is an evaluation process where the methods and strategies used are evaluated.

Keller's ARCS model has been the subject of subsequent research with varying results. Means, Jonassen and Dwyer (1997, p. 1) found inconsistent results on motivation levels and learning outcomes in different groups. In their study they examined a number of ARCS-based research projects and found strong evidence for “relevance” as a major motivational factor. One area that is silent in Keller’s work is the role of the lecturer, his/her level of enthusiasm, for example. In research conducted by Concannon, Flynn and Campbell (2005, p. 509) the lecturer’s level of enthusiasm was reported to be an “important initial motivator”. Similar arguments from Seifert (2004, p.148) and Seifert and O’Keefe (2001, p. 90) show how other relevant attributes if displayed by the teacher will have an influence on the level of motivation of the students. Teachers who are perceived as being nurturing, supportive and helpful will be developing in students a sense of confidence and self-determination which will be translated into the learning-oriented behaviours of the intrinsically motivated student (Seifert, 2004, p.148, Seifert and O’Keefe, 2001, p. 90). It might be argued that the level of enthusiasm generated by the lecturer and generally his/her role is vital and outside the scope of this study. It should be noted, however, that success or otherwise of many of these technological interventions assume an appropriate and befitting role for the lecturer that cannot possibly be the case under all conditions.

Figure 2.6, below, illustrates how various factors, such as institutional and lecturer controlled factors together with social support and learner factors combine with tasks and medium and are all interrelated in an educational environment. Medium or technology, thus, is just one of these factors. If, for example, in an educational environment with the best technology, there is no passion from the educators and the institutional leadership, as often is reported to be the case in many of our rural schools, the effectiveness of technology will be limited.

Figure - 2. 6 – Graphical illustration of the factors influencing the learning experience ICT tasks (Concannon, Flynn and Campbell, 2005, p. 506)



This confirms what has been mentioned earlier about the educational environment. The students' response to technology, therefore, depends on many influences. These include students' social, cultural background and motivational orientation. To these areas of influence, other institutional factors, such as the role of the lecturer, the department and the faculty are added. In fact, the list is long, and what is being mentioned is but a few of the major players in the educational environment.

I now turn my attention to each of the four motivational components in the ARCS model. What follows is a prescription for the design of e-learning material that is motivational and therefore assists in providing a sustained learning environment.

2.4.4.1 Attention

"First, a lesson must gain and sustain the learner's attention" (Keller and Suzuki, 2004, p. 4). Here a variety of tactics are used to gain a learner's attention. These could include graphics, animation or "any kind of event that introduces incongruity or conflict" (Keller and Suzuki, 2004). In the earlier study of motivation, it was mentioned that "a stimulus can hold or attract our attention driven by our sense of curiosity" (Kolesnik, 1978, p. 203). Teachers often complain about students' lack of attention. Actually there is attention but not in the areas of interest to the teacher. The course design offered in its collective form takes into consideration elements that would be attractive to the learner, with regard for culture and other variables related to the student it is intended for. "Berlyne has identified three kinds of factors that are most likely to attract our attention: psychophysical, ecological or collative" (Kolesnik, 1978, p. 203). Psychophysical factors refer to factors such as colour and sound adjustments. Ecological factors are those that are biological and emotional, such as a threat. Collative factors refer to elements that give rise to tension, surprise or intellectual conflict etc. In a study by Keller and Suzuki (2004, p. 4), the concept of curiosity in relation to the ARCS model is further expanded: "A second level of curiosity is aroused by using mystery, unresolved problems and other techniques to stimulate a sense of inquiry in the learner." Another concept that is recommended in the model is *variability*. "No matter how interesting a given tactic is people will adapt to it and lose interest in it over time" (Keller and Suzuki, 2004, p. 4). Hodges (2004, p. 4), as mentioned earlier, summarizes Keller's strategy for attracting attention by employing humour, participation and facts in the delivery of instruction.

Under this heading three specific strategies are suggested by Keller and Kopp (1987):

- Perceptual arousal: Gain and maintain student's attention by the use of novel, surprising, incongruous or uncertain events during instruction.

- Inquiry arousal – Simulate information-seeking behaviours by posing or having the learner generate questions or a problem to solve.

- Variability – Maintain the student's interest by varying the elements of instruction.

In summary, Keller, in his ARCS model, recognized the value of curiosity as a motivational sense and used it to attract attention and thereby provide a tool in a learning environment.

Indeed, in a disadvantaged student setting, this could be a prime motivator for initial attraction to technology. A student that comes to the University, even though he has heard a lot about ICTs but has never used them, is curious to experience them. This is not the same with other students who have used PCs extensively prior to coming to university. Provided the attention is sustained, ICTs become a new way of life and an essential tool for learning.

2.4.4.2 Relevance

Once a learner's sense of curiosity is stimulated, Keller feels that the material must be relevant to the students' needs for the initial attention to continue to be sustained. The educational environment needs to offer services that are compatible with student goals and connected with their past experience. "In general, it is more difficult to establish the relevancy of the instructions than to generate attention" (Keller and Kopp, 1997, p. 293). Here the designer of the educational material ensures that the student is presented with relevant information. Technology, with its power of offering different levels of interactive responses (menus), is well suited to accommodate the desired level of flexibility. A simple option chosen from a menu can focus on the type of material that the student is precisely looking for. Keller and Kopp (1987, p. 293) recommend three strategies to accommodate relevance.

- Familiarity - Use concrete language, examples and concepts that are related to the learner's experience and values.

- Goal Orientated - Provide statements or examples that present the objectives and utility of the instructions, and either show their accomplishments or have the learner define them.

- Motive Matching- Use teaching strategies that match the motive profiles of the students.

This is of particular significance in this study since often the elements of familiarity and motive matching are ignored in our educational settings. It is not often that a student's background, culture and preferences are taken into account when designing academic courses offered.
In Hodges' s(2004, p. 4) interpretation of Keller's ARCS model for relevance, I came across the following: "relevance is addressed by incorporating a choice in method of accomplishing course goals into the instruction, or stating how instruction relates to the learners at the present time, or how it will help them meet future goals." He further recommends that the use of enthusiastic guest lecturers who had themselves completed the course, relating how the course had helped them, would make the material more relevant.
In the study conducted by Bonk (2002, p. 11), 88% of the respondents found relevance to be the highest motivational factor for using Web-based material. This agrees with Hodges' (2004, p. 5) statement that "Relevance is by far the most reported successful motivator." Means, Jonassen and Dwyer (1997, p.1) conducted research with a particular emphasis on relevance. They concluded that "both intrinsic and extrinsic strategies enhanced the motivation of the college learners. Embedded relevance-enhancing strategies resulted in greater motivation and performance gains than did intrinsic relevance."
Thus, the relevance of technology to the disadvantaged students' needs becomes another factor that encourages students continue to use it. They first became attracted to it because of the curiosity as discussed in the previous section. Once attracted, interest is maintained, provided it is relevant to overall student goals, objectives and culture.

2.4.4.3 Confidence

There needs to be confidence in one's ability to complete the objectives of a course reasonably successfully, otherwise the motivation to continue with the course could diminish. “A positive expectancy for success is the third requirement for motivating learners. The risk level needs to be adjusted according to the confidence levels of the learners and the type of learning objectives” (Keller and Kopp, 1987, p. 293). Keller and Kopp recommend three strategies to accommodate confidence:

- Expectancy for Success – Make learners aware of performance requirements and evaluative criteria. “When learners know what to expect, they are more likely to be confident in their estimate of success than when a high degree of ambiguity surrounds the testing and evaluation processes” (Keller and Suzuki, 1988, p. 415).

- Challenge Setting – Provide multiple achievement levels that allow learners to set personal standards of accomplishment and performance opportunities that allow them to experience success. Provide challenge levels that allow meaningful success experience under both learning and performance conditions (Keller and Suzuki, 1988, p. 415).

- Attribution Moulding - Provide feedback that supports student ability and efforts as the determinants of success. Motivation to learn is more likely to be enhanced by providing learner control over access to different parts of the courseware, and over the difficulty level. A menu-driven structure is the ideal way to provide this feature. Provide challenge levels that allow meaningful success experience under both learning and performance conditions (Keller and Suzuki, 1988, p. 417).

Alessi and Trollip (2001, p. 27) feel that three practices increase confidence:

- Making expectations clear to the learner,

- Providing reasonable opportunities to be successful in the lesson, and

- Giving the learner personal control; provided success is achieved without luck and the perception of being easy.

Hodges' (2004, p. 5) interpretation of the ARCS model with respect to confidence is that "clearly stating learning goals, organizing materials in order of increasing difficulty, helping students set realistic goals, attributing success to effort, and allowing students to become independent learners are all strategies for instilling confidence in the learners."

A general feature that has been attributed to computers is their ability to provide multiple paths with varying degrees of sophistication to solve a problem. That is why so many people from different backgrounds, young and old, rich or poor, clever and not so clever find them attractive. The implication for the disadvantaged student is that, having become attracted to the new tool and finding it relevant, he/she continues using it in an ever-increasing manner, since his/her sense of self-confidence is increased as he/she faces challenging but not overly difficult problems to address. Culturally, in a disadvantaged student setting, the main source of acquiring knowledge and support are other students and friends. Technology facilitates this. This sense of gaining confidence is accelerated, which is the reason why technology plays a critical role in the life of a disadvantaged student.

2.4.4.4 Satisfaction

Here, elements of design take into consideration factors that ensure the student's satisfaction with his/her educational experience, once initiated. Keller and Kopp (1987, p. 293) provide us with some examples where motivation could die out.

- If the evaluation and grading system seems subjective and arbitrary,
- If an intrinsically motivated person is locked into an externally controlled contingency system, or
- If the experience of the instruction simply isn't what was expected.

Alessi and Trollip (2001) provide other suggestions to ensure the continued and positive motivation of the learner: positive consequences following progress, encouragement during times of difficulty and fairness on the part of the lecturer.

According to Hodges (2004, p. 5), "satisfaction strategies include verbal reinforcement, rewards, personal attention, feedback, and deliberate avoidance of negative influences. Negative influences include threats, external performance evaluations, and overt surveillance."

Keller and Kopp (1987, p. 294) recommend three strategies to accommodate satisfaction.

- Natural Consequence – Provide opportunities to use newly acquired knowledge or skills in a real or simulated setting.

- Positive Consequence – Provide feedback and reinforcements that will sustain the desired behaviour.

- Equity – Maintain consistent standards and consequences for task accomplishment.

2.4.5 Motivation from Malone's Point of View

Another example of an instructional designer who uses technology to motivate learners in a learning environment is Malone. This section summarizes his contributions. The importance of such developments for this study emanates from the fact that, in a way, they demonstrate examples for the noblest fruits that the marriage of motivation and technology has produced. Here psychological principles are identified and technology is used to server students' learning environment.

"The successful use of microcomputers in education depends critically on the cognitive and motivational processes in learning and the social structure of the educational setting" (Malone and Levin, 1983, p. 1).

As can be seen from the comments from Malone and Levin, they recognize the fact that technology has the remedial power to provide educational solutions to the needs of divers groups of social structures.

Malone suggested three elements that contribute to motivation in the design of educational material. These are challenge, curiosity and fantasy. He later added learner control.

2.4.5.1 **Challenge**

This is individually based and aims at making the content neither beyond the capacity of the learner nor too easy. This principle is further maintained through educational experience.

In order for an activity to be challenging, it should present a *goal* for which the *outcome is uncertain.* This can be achieved for a wide range of players by (a) having variable difficulty levels (either chosen by the player or determined automatically) and (b) having a number of goals at different levels all embedded in a single environment. These multiple-level goals can often be encouraged by score-keeping or speeded responses (Malone and Levin, 1983, p. 8). This is a practical manifestation of many of the ideas mentioned above. For example, Bandura (1997, pp. 3–5) in his work on self-efficacy, reminded us how success builds robust belief in one's personal efficacy, which in turn is a predictor of academic performance.

2.4.5.2 Curiosity

Malone identifies that cognitive curiosity is aroused by information that conflicts with the learner's existing knowledge or expectations, is contradictory, or is in some way incomplete (Allesi and Trollip, 2001, p. 25).

Educational activities can evoke *sensory curiosity* by including audio and visual effects, such as music and graphics. They can evoke *cognitive curiosity* by leading learners into situations in which they are surprised. To be educational, the surprising situations should include information that helps the learners understand the misconceptions that led them to be surprised in the first place (Malone and Levin, 1983, p. 8).

Closely linked ideas are interest, creativity, curiosity and attention. Interest is a personal attribute and differs from one person to another depending on sex, age, levels of maturity and personal tastes. The idea is that, based on what one is interested in, one could be motivated to move in a particular direction. Human beings have a natural inclination to explore their environment, i.e., we have a sense of curiosity. "We want to satisfy our curiosity and find out more about the world around us" (Kolesnik, 1978, p, 199).

"Curiosity is more likely to develop in an emotionally comfortable, nonthreatening, relaxed atmosphere in which the individual student feels secure and free to investigate the kinds of things he wants to investigate. Thus, a classroom atmosphere conducive to intrinsic motivation is one in which the student feels free to make mistakes as he ventures into new areas of his own, knowing that he will not be ridiculed or rejected for making the effort" (Kolesnik, 1978, p. 201).

2.4.5.3 Control

According to Alessi and Trollip (2001, p.25), in Malone's motivation theory there are three rules relevant to control: contingency, choice and power. The contingency rule implies that a lesson sets out to achieve, in the expected manner, what it is expected to. There are no surprises or disappointments. Choice provides flexibility and maneuver capability based on menus and branching capability. The notion of power implies the experience is overwhelming and thus motivating.

2.4.5.4 Fantasy

Fantasy facilitates the provision of an imaginary state of what a learner could experience once the course or lesson is completed. It acts as a motivating stimulus. "Fantasy situations encourage learners to imagine themselves in imaginary contests or events using vivid realistic images" (Alessi and Trollip, 2001, p.25).

Fantasies in instructional activities can make the activities emotionally appealing. They can also provide practical examples and vivid images for the use of the skill being learned (Malone and Lenin, 1983, p. 8).

This concludes my literature findings on technology and the learning environment. I started by recording how in a state referred to as the "*flow state"* it is possible for an individual student to become so immersed in the feature of technology that he/she can easily spend long periods in search of information. I then offered the suggestion that the advent of technology is similar to other milestones in the developmental stages of humanity such as the invention of language and printing and therefore to a large extent is inevitable and indispensable. I then presented contributions from literature that offered suggestions that technology, through its unique and special motivational power, is capable of arousing a sense of curiosity, attracting attention, providing suitable challenges and is therefore able to satisfy and capture students' attention in the learning environment. Two examples of Keller and Malone were forwarded with each case emphasizing different types of various motivational variables that could be used in an instructional-design setting.

Now that the student is motivated, the cognitive elements must be processed before learning can happen which is the focus in the next section.

2.4.6 Technology and Cognition

An essential element that needs to be mentioned in this study is the cognitive side of learning. It was mentioned earlier how a student is motivated through his/her cultural and social background and how technology can provide motivational tools. However, in the final analysis, unless this process is combined with cognition, or the thinking process, learning will not take place. Norman (1993, p. 15) tells us that there are many modes of cognition, many different ways by which thinking takes place. The two modes particularly relevant are called experiential cognition and reflective cognition. Experiential thought is reactive, automatic thought, driven by the patterns of information arriving at our senses but dependent upon a large reservoir of experience (Norman, 1993, p. 23). The reflective mode is that of comparison and contrast, of thought, and of decision making; this is the mode that leads to new ideas and novel responses. Modern technology has the power to enhance reflection, to make it even more powerful than before (Norman, 1993, p. 16). Technology is not always used optimally. The manner in which the television is used in most instances is a case in point. A typical viewer sits passively and watches scenes that are not necessarily reflective. Our educational system is more and more trapped in the experiential mode: the brilliant, inspired lecture; the prevalence of pre-packaged films and videos to engage the student and the textbook that follows a predetermined sequence (Norman, 1993, p. 17). The use of computers for education, in most cases, if designed properly, will fall into the reflective category, provided it is challenging but solvable, able to attract attention and cause excitement. When learners actively construct knowledge, it is more meaningful, applicable and memorable (Jonassen, 1996, p. 13). Learning from computers or about computers should be replaced with learning with computers (Jonassen, 1996, p. 17).

2.4.7 Computers and the Community of Learners

Literature also mentions social elements that technology facilitates to motivate learning. Meaningful technology-assisted educational experience is embedded in what is called the “Community of Inquiry”. This model is based on the assumption that learning occurs through the interaction of three essential elements: cognition, teaching and social interactions. The last, i.e., the social presence, supports both cognition and teaching by its ability to spark, sustain and support interaction (Garrison, Anderson and Archer, 2000; Greyling and Wentzel, 2007, p. 656). This confirms our understanding that learning is a complex interaction between cognitive, motivational, affective and social processes which culminates in the development state where students assume responsibility for their own learning (Greyling and Wentzel, 2007, p. 657). The social phenomenon of technology-based learning is of particular interest in this study since there seems to be a group and collective approach amongst students in this study when seeking for a solution to a problem.

The literature does provide us with a word of warning. It is acknowledged that technology offers many innovative features that can be used to make instruction more appealing to the learners. However, many of these features are interesting only because they are novel and may lose their appeal as learners become accustomed to them (Keller and Suzuki, 2004, p. 1). A second voice of concern is expressed in the literature regarding the number of drop-outs in an online delivery setting, which is said to be higher in online learning and distance education when compared with face-to-face delivery (Keller and Suzuki, 2004, p. 3). While this is not directly related to this study—since the delivery mode under consideration is that of a blended approach—it is important to note some of the limitations of e-learning.

2.5 ICT Use and Academic Performance

Having established that ICTs are inevitable and indispensable, I now look into the question of their effectiveness as a teaching and learning tool. One of the critical questions that this research needs to answer is whether ICTs assist with improvement in academic performance. Weaver (2000) provides us with an example of a longitudinal study which spanned a number of years and examined the role of the use of technology in teaching science and mathematics. He concluded that improvements in academic results could be positively correlated to the amount and type of computer use in science and math classes. Keengwe, Onchwari and Wachira (2008, p. 80), in analysing the benefits of technology in education, report conflicting outcomes with cases with no significant difference in students' academic achievements. Another example of an apparently negative connotation to the use of ICT in education is found in a study by Bradbrook, Alvi, Fisher and Lloyd, (2008, p. 49).

It says:

An analysis of student data collected in 2,000 schools across 31 countries concluded that once other resources, institutional characteristics and the socio-economic composition of the classroom are taken into account, no statistically significant difference in pupils' performance could be found between schools 'strongly lacking' computers and those without such a shortage (Fuchs and Woessmann 2004, p. 17).

A deeper examination of the research reveals the facts. In the same document, Fuchs and Woessmann (2004, p. 17) mention: "By contrast, student performance is positively related to the use of computers at home for accessing emails and web pages and to the availability of educational software at home". This once again confirms that it is not merely the availability of a computer that improves academic performance but it is the manner in which it is used. An issue that needs to be emphasized in relation to providing a solution to the disadvantaged students is that the mere presence of technology is not likely to make much difference. Kirkwood and Price make this point very clear in their study. Although ICTs can *enable* new forms of teaching and learning to take place, they cannot *ensure* that effective and appropriate learning outcomes are achieved (Kirkwood and Price, 2005, p. 257). Alexander and McKenzie provide more details in their study. First, they say that:

The use of a particular information technology did not, in itself, result in improved quality of learning or productivity of learning. Rather, a range of factors were identified which are necessary for a successful project outcome, the most critical being the design of the students' learning experiences (Alexander and McKenzie, 1998, p. 3).

They then elaborate on the factors that contribute towards a successful learning outcome. I have shortened substantially the originally extensive list but included what I believe is relevant to the UL project at this point in time:

- The way the project is integrated into the learning experience is well thought through and implemented, and the support needs of students and staff are identified and planned for,
- The project team has adequate access to technical support and educational software development expertise,
- Individual members of the project team are committed to the project and have adequate time to carry out their roles and responsibilities in the project (e.g., through release from teaching),
- Students have adequate access to the hardware and software required for implementing the project,
- Where required, sufficient funding for implementation of the project is available,
- The head of department/School and the dean are supportive of the project, recognize the value of the project to the department or faculty, and they are committed to its implementation,
- The institution's promotion and tenure policies recognize teaching developments as a significant contribution to the university.

As can be seen from the above, the successful implementation of technology in the academic program is a complex and involved process that necessitates a well-planned integration at all management levels. The 2006 Council for Higher Education thus summarizes the changes facing the universities in South Africa: There has been a shift in the use of ICT in higher education institutions, from the initial emphasis since the late 1980s/early 1990s on the administrative

environment, to an expansion into the academic environment, accompanied by e-learning policies, structures, and new academic related practices.
This confirms the literature findings that a holistic and comprehensive plan needs to be in place before ICT implementation can have a visible impact on the academic performance of students.

Blackmore, Hardcastle, Bamblett and Owens (2003, p. iv), in their ICT report with focus on disadvantaged students in Australia, summarized their findings based on the literature as follows.
Case studies and larger systemic reviews of the literature (Meredyth, Russell, Blackwood, Thomas and Wise, 1999, p. xxxiii; Wenglinsky, 1999) suggest that teachers and parents agreed that ICT did the following when underpinned by innovative teaching:

- Motivated and stimulated learners,
- Solved some problems of students' 'motivation' for academic work and competence with literacy,
- Encouraged problem solving, analytical and creative thinking,
- Improved students' understandings, assimilation and creation of new knowledge,
- Provided new modes of communication to network locally and globally,
- Provided access to data bases, Web-sites and discussions that were previously unavailable,
- Assisted in the development of independent learning and research skills.

It is interesting to note that every one of these points were also raised, in one form or another, by the questionnaire that was used in this study and serves therefore as a verification of the findings stated above.

In terms of specific tools within ICTs, email has been subject to some studies with some findings that relates to both motivation and academic performance. In a recent research on motivational aspects of the interaction with email between students and their lectures Kim and Keller (2008, p.45) found a positive effect especially when the emails are personalized.
Next, I turn to the disadvantaged student with his/her particular background, needs and attributes and document the salient points that literature has offered in this regard.

2.5.1 ICTs and the Disadvantaged Student

> *"There is a considerable risk that already disadvantaged groups and marginalized people will not be able to benefit fully from the new opportunities offered by ICT."*
>
> (Punie, Zinnbauer and Cabrera, 2006, p. 15)

Aspects related to the culture, technology and motivation associated with students and their learning patterns were documented in earlier sections of this chapter. Although these aspects were approached, mostly, from a general student perspective, the underlying motive was to examine the effect of these variables against disadvantaged students. In this way, it was shown how a disadvantaged student who often comes from a particular cultural background is influenced by it and how this in turn has a bearing on motivation and response to technology. In this section, I document what literature contains, in general, about disadvantaged students.

Before any further discussion on the topic, I should explain what I mean by a disadvantaged student in this study. The term "disadvantaged student does not imply some deficiency on the part of individual students or groups of students. Rather, it understands disadvantage as a complex set of factors that prevent some students from equitable access to, and participation in, worthwhile educational experiences" (Blackmore, Hardcastle, Bamblett and Owens, 2003, p. 7). Educational disadvantage is: "the impediments to education arising from social or economic disadvantage which prevent students from deriving appropriate benefit from education in schools" (Madden-Hallett and Ho, 2008, p.1).

One of the common features in the literature regarding ICTs and the disadvantaged is the almost universal acceptance that its existence is synonymous with the improvement of learning patterns. Its degree of success, however, is documented to be different and depends on the way that it is implemented.

For example, in his work with disadvantaged students, Carr (2001) found that, overall, the results obtained by students using a web-based delivery system were slightly better than that of students on the equivalent paper-based course. However, students from disadvantaged backgrounds fared marginally ***worse*** than those on the paper-based course (Carr, 2001, p. ii). There are two points that catch the attention in Carr's - statement. First, all students that used the web-based delivery method did better than those that were doing it face-to-face, and second, the disadvantaged students, overall, did worse than those on the paper-based course.

At face value, the statement says that those who used the Web-based method and were also disadvantaged did worse in their academic results. On a closer look at the research, it becomes clear why there was a difference. Later on, Carr in his research document states: "It should, however, be noted that allowing students to work off campus would favour the advantaged students. The disadvantaged students would still only be able to access their course material from computer laboratories on campus" (Carr, 2001, p. 97). It becomes clear, therefore, that students that were being compared did not have access to the same level of resources outside the campus and therefore cannot be expected to produce the same level of performance. This addresses another critical point with respect to the institutional role that needs to be played when dealing mostly with disadvantaged students. A critical finding from a study by Blackmore, Hardcastle, Bamblett and Owens illustrates this point: home computer use significantly impacts the capacity of ICT to improve the learning outcomes for all students. Home access is a key element in whether and how students integrate ICT into their learning in school (2004, p. ix). This puts extra responsibility on the institutions to compensate for this deficiency if their disadvantaged students must compete nationally with other students from other educational institutions with access to computers at home. It is this dimension of ICT that concern Muller, Hernandez, Giro and Bosco (2007, p.1177) that rather than providing a reliable relief from injustice it tends to reinforce existing social structures and inequalities. In a study done by Bradbrook, Alvi, Fisher and Lloyd (2008, p. 47), which has a special focus on disadvantaged students, the implication of ignoring this resource imbalance is highlighted.

Without intervention, resource-rich families are the most likely to adopt technology. Resource-rich families develop ICT skills as - crucial cultural capital for the current and emerging digital age. ICT is used as a tool to increase and strengthen both social and cultural capital, through - tools to support and extend social networks and by easy access to information. ICT can also increase financial capital by giving access to cheaper goods and services.

The other factor to bear in mind is that one needs to take into consideration the quality of work and dedication that might go into course preparation. Just as it is possible to have a pen that does not write well, it is possible to deliver an online lecture that is not attractive to students. What is certain, based on what is documented in the literature, is that ICT is a powerful tool for effective communication, but its success in teaching and learning still depends on the quality of teaching skills used in the delivery. Further evidence in Carr's research that the delivery might have been a problem is shown further in the research -:

"The majority of the students were against web-delivery of course material" (Carr, 2001, p. 98). This statement, and the fact that the majority of students did not favour the particular Web-based course, indicates that there must have been fundamental problems with the way the course was presented and not with the mode of delivery. In other words "learning seems to be affected more by what is delivered than by the delivery system" (Kirkwook and Price, 2005, p. 259). Therefore, technology does matter to academic achievement, with the important caveat that whether it matters depends upon how it is used (Wendlinsky, 1999, p. 34). Bradbrook, Alvi, Fisher and Lloyd (2008, p. 50), following the detailed analysis of a series of research papers that had positive and negative comments about ICT, conclude that the crucial component in the use of ICT within education is the teacher and his or her pedagogical approaches. In other words, if the coordination and the preparation of the material to be presented is carefully considered and the necessary dedication and care is used in preparing for the presentation for the lecture, the outcome will be positive; otherwise, even with the best tools, i.e. technology, will not make much of a difference.

Having explored various studies on the effect of ICTs on disadvantaged students, I am reminded of one of the best examples of success in this area of study that needs to be mentioned as this section of the literature review comes to an end. For this, I turn to the research Professor of Psychology Hartley who reminds us of the well known "hole- in- the-wall" study, which in some ways has some practical implications for this research study. Often, a student with no prior experience with technology walks into our computer laboratories with some friends. A few days later he/she is already hooked on the new way of learning. This is owing to the informal communication that takes place amongst students. Following a similar experience for developing countries, Hartley concludes: "Such a picture of the potential use of new technology in developing countries is perhaps an idyllic one" (Hartley, 2007, p. 55). He then summarized the experience, which I feel is what happens in the University of Limpopo's computer laboratories on an ongoing basis.

Typically, learning proceeds as follows:

1. One learner explores randomly and others watch until an accidental discovery is made (e.g., if you press this button, the following happens).

2. Several learners repeat the discovery for themselves by requesting that the first learner let them do so.

3. While in Step 2, one or more learners make additional accidental or incidental discoveries.

4. All of the learners repeat the discoveries made and, in the process, make more discoveries and start to create a vocabulary to describe their experiences.

5. The vocabulary encourages them to perceive generalizations (e.g., when you do this, then that happens).

6. They memorize entire procedures for doing things (for example, how to open a painting programme and retrieve a saved picture). They teach each other shorter procedures for doing the same thing whenever one of them finds a new, shorter, procedure.

7. The group divides itself into the 'knows' and the 'know nots' much as they did into 'haves' and 'have nots' in the past. A learner that 'knows' will share that knowledge in return for friendship and exchange.

8. A stage is reached when no further discoveries are made and the children occupy themselves with practicing what they have already learned. At this point, adult intervention is required to introduce new discoveries.

A number of references are made in the literature that recommend knowing the environment as the first step before an effective solution can be offered in a disadvantaged setting. "Empowerment can only occur when it is clear who the learners are that require this empowerment. Each institution providing open and distance education should have a clear picture of the profile of their students" (Beneke, 1999, p.1). While this recommendation is specifically addressed to a distance-learning environment, I feel there is no reason why it could not equally be applicable in a blended-mode approach.

Ackerman (2004, p. 251) goes further and feels that a study should be conducted into the role that culture plays in learning. Hence, a learners' background will be one of the variables that will be taken into consideration.
Lazenby (2003, p. 297), in her suggestion for further research, points to the need to investigate whether strategies are used at other higher education institutions in terms of innovation and perhaps find a correlation between the strategies used and the culture of particular universities. She further identifies an area that requires considerable research: the needs of South African learners and lecturers in the flexible environment—especially Web-supported learning. Another research field pertains to the question of whether a Web-supported learning environment fosters students who are academically more mature. The common feature that underlines all these suggestions is that, before educationalists can prescribe a remedy that meets the needs of the students, they must study the environment. This means understanding the culture, motives, habits, family background, likes and dislikes of the students. It is only in such informed settings that educational solutions can be effectively offered. It is indeed to this end that the cultural, motivational and technological tendencies of the students were surveyed in this study so that, based on an informed situation, recommendations could be made for a solution.

In conclusion to this section, I feel the findings from BECTA (British Educational Communication and Technology Agency) are a befitting ending. **Education is a way to overcome disadvantage, though this is complex to achieve** (Bradbrook, Alvi, Fisher and Lloyd (2008, p. 89).

In the next section, Chapter 3, I will be documenting the research plan and the methodology that I used to solve my research questions.

Chapter 3 – Research Design and Methodology

3.1 Overview

In Chapter 1, the introduction to this study, I dealt with the background to the research, my initial motivation for undertaking it, and the research questions that I devised for this study. In Chapter 2, the literature study, I examined a variety of theoretical frameworks and took into account what previous studies in this field had achieved. This chapter outlines the strategy that I adopted to answer the research questions. Other matters, such as the philosophical framework, research strategies, data sources and the tools that were used, are also described in this section.

3.2 Research Philosophy

This research is based on a functionalist epistemological orientation that includes elements of a deductive approach. The research utilizes a quantitative research strategy. This implies the following:

- Such an approach recognizes that a strategy is required that respects the differences between people and objects (positivism and interpretivism) in the social sciences (Bryman, 2004, p. 13).

- Such an approach is predicated on the assumption that social reality has a meaning for human beings and that human action is therefore meaningful – that is to say, social reality is meaningful to human beings and people act on the basis of the meanings that they attribute to their own acts and to the acts of others (Bryman, 2004, p. 14).

- Social phenomena and categories are not only produced solely through social interaction, but are in constant state of revision (Bryman, 2004, p. 17).

- The use of a deductive approach to the relationship between theory and research results in a valid research strategy (Bryman, 2004, p. 19).

- Education is a process and school is a lived experience (Merriam, 1998, p. 4).

- Understanding the meaning of the process or experience produces the data (knowledge) that is obtained from an inductive, hypothesis or theory-generating mode of inquiry (Merriam, 1998, p. 4).

- Such an approach incorporates elements of action research. This means that its purpose is to produce a solution or suggest an answer to the practical problem implied by the research questions (Krathwohl, 1997, p. 28).

Figure 3. 1 – Positioning of this study in terms of Black's quadrant

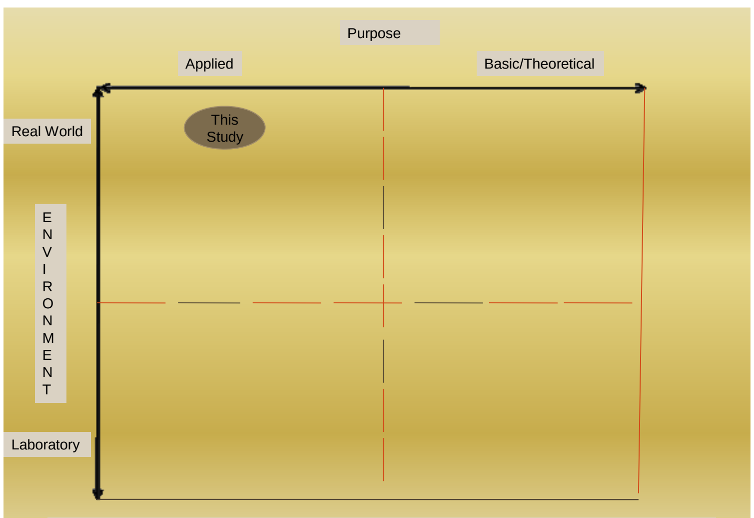


Figure 3.1 - Positioning of this study in terms of Black's quadrant

Black (1999, p. 13) divides the world of research into four quadrants according to their degree of real-world orientation and the extent to which the research is either applied or theoretical. This study can be situated in the upper left-hand quadrant because it has emanated from a real-life situation and because it addresses practical issues (Figure 3.2 above).

3.3 Research Design

Research design (which deals with design choices) is covered in section 3.3.1. This is then followed by a description of the methodology (section 3.3.2). Validity and reliability considerations are then covered in section 3.3.3 and 3.3.4 respectively.

3.3.1 Design Choices

The study design choice for this investigation was a case study. It was conducted at the Turfloop campus of the University of Limpopo with a student population who mostly originate from disadvantaged communities. A case study is an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident (Yin, 2003, p. 13). While the investigation reported here took place between early 2004 and September 2008, my intention is to continue to investigate the phenomena described in the study because the research was designed in such a way that larger samples and continuous observation of the relationship between the variables will serve to increase the reliability and the validity of the findings presented here. This study entails the detailed and intensive analysis of a single case – which is how Bryman (2004, p. 48) defines a case study. Bryman adds that a school (or, as in this case, a university) can offer ideal circumstances for the prosecution of a case study.

The case study falls into the category of what Bryman (2004, p. 51) calls “an exemplifying case”. Such a case is chosen because it provides answers to certain research questions rather than because it is able to fit certain extreme conditions. Such a case allows key social processes to be examined. Bryman (2004, p. 51) offers an example of case study research which, in many ways, is similar to this study. His chosen example involves a researcher who seeks access to an organization because it is known to have implemented a new technology and because the researcher wants to know what kind of impact the

new technology is making. Because such a researcher may have been influenced by various theories about the relationship between technology and work and by the considerable research literature on the topic, he or she might, as the result, seek to examine the implications of some these theoretical and empirical deliberations in a particular research situation (Bryman, 2004, p. 51).
In the case of the present study, the University of Limpopo, which came into existence as result of a merger process in January 2005, already had a long history of being associated with historically disadvantaged students. I have already assembled evidence to support this description of the institution and of its students in Chapter one. It had been my responsibility to provide ICT facilities and tools for the students of the university for a number of years prior to the commencement of the study. I have always been intrigued by the interest in technology displayed by the university's students, and have often wondered how, why and where this particular interest in technology originated. It was my curiosity about these imponderables that led to this study.

3.3.2 Validity

Validity is concerned with the integrity of the conclusions that are generated in a particular piece of research (Bryman, 2004, p. 28). Internal validity in particular is concerned with the question of whether a conclusion that posits a causal relationship between two or more variables is valid (Bryman, 2004, p. 28). The validity of the results of this project is supported by the fact that numerous studies by the research community have already established a causal relationship between the extent of ICT use and the motivational levels of students and the quality of academic performance. What has not yet been established by such research is the extent to which this causal relationship is demonstrable in students who originate from disadvantaged communities. It is undeniable that if this study had been extended over a longer period and had utilized a much larger sample, its conclusions would have demonstrated a much higher degree of validity. It is for this reason that I intend to extrapolate the research reported here for a number of years into the future. This process will be facilitated by the university's routine practice of measuring the effectiveness of various forms of ICT and correlating such measurements with the support offered by the academic community.

With regard to the validity of data collected by means of the MSLQ (Motivated Strategy Learning Questionnaire), it should be noted that the questionnaire was originally developed by a team of researchers from the National Centre for Research to Improve Post-secondary Teaching and Learning and the School of Education at the University of Michigan (Pintrich, Smith, Garcia, and McKeachie, 1991, p. 2). Pintrich et al. (1991) have the following to say about the early years of its development:

These early instruments were subjected to the usual statistical and psychometric analyses, including internal reliability coefficient computation, factor analyses, and correlations with academic performance and aptitude measures. We continually revised items on the basis of these results. The correlational studies were carried out on over 2,000 students during the 5 years of funding for the National Center for Research to Improve Post-secondary Teaching and Learning have shown fairly consistent results (Pintrich et al., 1991).

Locke (1996, p. 118) emphasizes the legitimacy and reliability of the process when he says: “Introspective reports provide (in principle) useful and valid data for formulating psychological concepts and measuring psychological phenomena (e.g., purpose, goal commitment, self-efficacy, etc.)”. It is clear from these quotations that reputable academics regard the MSLQ as being able to deliver a high level of validity.

3.3.3 Reliability

Reliability is concerned with the question of whether it is possible to repeat the empirical work involved in the study under comparable circumstances. The term is used to denote consistency of the measures that are devised for concepts in the social sciences (Bryman, 2004, p. 28). I have used as many individuals as possible in this study so as to reduce, as far as possible, the margins of error that may be present in the findings. One of the weaknesses of self-reporting questionnaires is the probability that the data they provide is highly subjective and, in some cases, not even stable. While self-reports can be used effectively to measure student perceptions of motivation and cognitive engagement, the results need to be replicated by means of other measures such as think-aloud protocols, stimulated recall procedures, structured interviews, and other forms of behavioural measurement (Pintrich and De Groot, 1990, p. 38).

The ideal scenario would have been to have combined the data from self-reporting in certain areas with data obtained from structured interviews. The use of a self-reporting technique makes the researcher dependent on what student thinks of himself or herself. The reliability of the study when it comes to motivation depends on the chosen instrument. This is reassuring because the MSLQ has been used extensively in research throughout the world and its reliability has therefore stood the test of time. The reliability of the MSLQ is confirmed by Lynch and Dembo (2004, p. 7) in the following statement: “It was validated through factor analyses, reliability analyses, and correlations with measures of achievement”.

Duncan and McKeachie (2005, p.117) are of the opinion that the MSLQ has proven its reliability and use as a tool that can be adapted for a number of different purposes for researchers, instructors, and students. Its main focus – the interplay between motivation and cognition – is a central theme of Paul Pintrich’s work. Duncan and McKeachie (2005, p.120) provide a table of what they refer to as “a small sample” of the research that has used MSLQ between 2000 and 2004. This “small sample” was sourced from 56 mostly undergraduate academic institutions which use many different languages as the medium of instruction in many different parts of the world.

3.4 Research Methodology

Research methodology refers to a particular approach to the collection of data (Bryman, 2004, p. 27). It was mentioned earlier that this study uses quantitative research. Quantitative research is “deductively pre-planned and designed around one hypotheses with data that are numbers representing quantities of whatever was measured” (Krathwohl, 1997, p. 26).

I have also tried in the study to find evidence for the remedial role that ICT might exert in the improvement of the academic performance of disadvantaged students. Krathwohl, (1997, p. 22) asserts that such an attempt could be defined as quantitative research. He maintains that, in quantitative research, the explanation guides the development of the study whereas, in qualitative research, the explanation grows out of the assembled data. He also notes that the quantitative researcher is committed to the epistemological assumption that there is an objective reality that is “out there to be discovered” (Krathwohl, 1997, p. 23).

There are two other distinctive characteristics of a quantitative research methodology. One is that quantitative research measures observations by means of scales (Krathwohl, 1997, p. 24). The scales in this case study are represented by grades. The second characteristic is that a quantitative study focuses on a direct cause-and-effect relationship between two variables (Krathwohl, 1997, p. 24). The academic puzzle at the root of this study is the relationship that is hypothesized to exist between a student’s ICTs use and the motivational orientation of students on one hand and an improvement in academic performance on the other. This is the basic hypothesis that drives this research. The following quotation by Bentz and Shapiro (1998, p. 121) serves to confirm the quantitative nature of this research: “Inquiry in the quantitative (and behavioural) tradition is most broadly characterized by a concern with explanation, and explanation is conceptualized in a manner similar to the natural science model. That is, researchers look for general law-like relationship among phenomenon as the key to casual relationship. At this point it is important to take note of the long debated argument that “correlation is not causation” (Holland, 1986, p. 945). That is, with so many possible factors effecting students’ academic performance, even if there might exist a statistical correlation between various variables of this study and the academic performance, it does not necessary imply that they are the cause of it. One needs to look at the particular case to arrive at such a conclusion.

I used two main tools to obtain the necessary data. The first tool was a questionnaire that was designed to provide the required data about student computer access, computer use, and motivational orientation. The second tool collected information about the academic performance of students from the University of Limpopo’s student database.

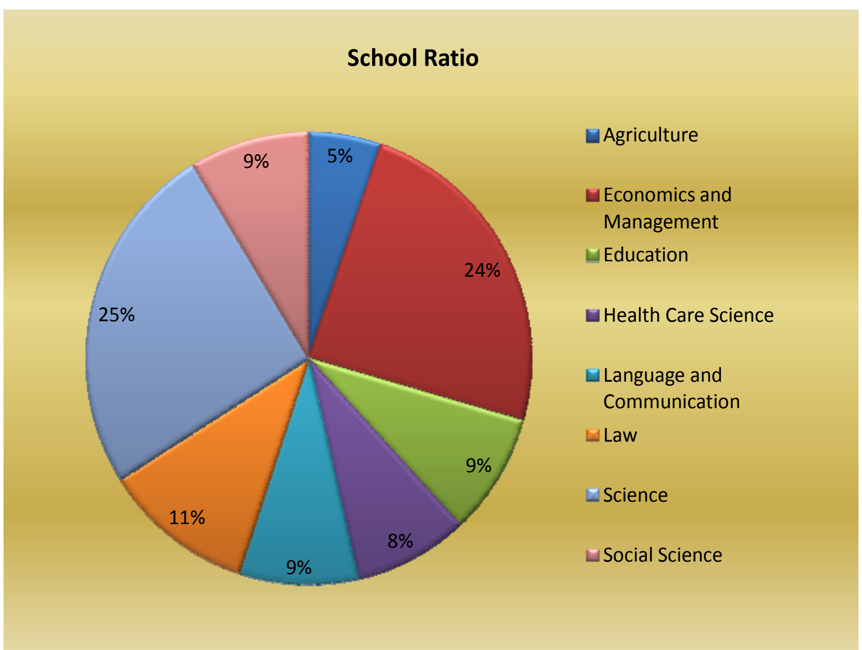
3.4.1 Participants

This section provides a brief analysis of the students who participated in the study. Special attention is given to the number of participants from each school and faculty and to the gender composition of the sample. A more comprehensive analysis with appropriate findings can be found in the findings and discussions sections of Chapter 4.

This study is specifically focused on students from a disadvantaged background. The University of Limpopo is one of the higher education institutions that was historically disadvantaged by the social, economic and political circumstances that prevailed prior to 1994. Much of the historical culture of the university has remained the same as it was under the old regime, even though it has been gradually changing since 1994. For the purposes of this study, the term “disadvantaged” refers to a student who, because of economic and social conditions, received an inadequate academic education prior to registration at the university and who therefore requires special attention and remedial assistance in order to meet the standards of the university. The question that this study undertakes to answer is whether technology (ICTs) can play a role in providing such remedial assistance. The data elicited by the study serves to quantify the amount of computer access that a typical student had prior to his/her registration for undergraduate study. The figure below shows the distribution of participants according to their school attendance.

In August 2008, the total student population of University of Limpopo in Turfloop campus was 12,227. All these students were distributed among 11 schools. Figure 3.2, below, depicts school distribution in terms of the data collected from the questionnaire. This data is presented in table form in Table 3.1 below. Figure 3.1 and Table 3.1 below reveal that the largest number of respondents were enrolled in the Sciences School (67 participants or 25.3 %). The second largest number were enrolled in the Economics and Management School (64 participants or 24.2 %). The lowest number of participants were enrolled in the Agriculture School (14 or 5.3%).

Figure 3. 2 - The distribution of the participants according to school attendance.

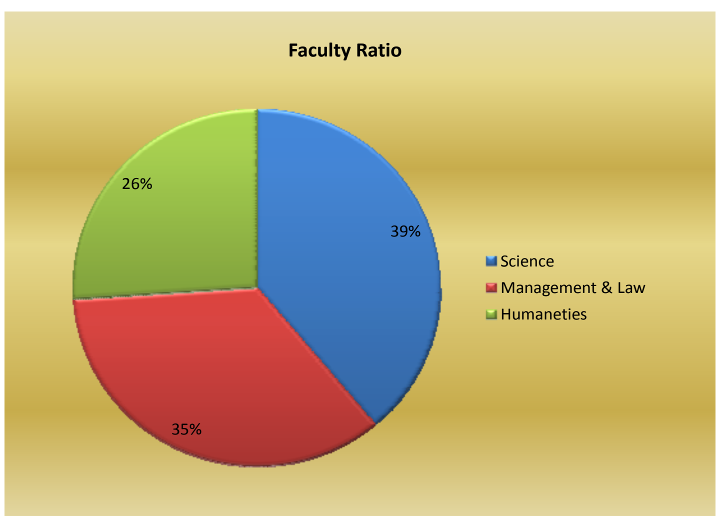


	#	%
Agriculture	14	5.3
Economics and Management	64	24.2
Education	23	8.7
Health Care Science	22	8.3
Language and Communication	23	8.7
Law	29	10.9
Science	67	25.3
Social Science	23	8.7
Total number and percentages of participants	265	100.0

Table 3.1 – The distribution of the participants according to school attendance.

The participating respondents were enrolled in all three of the faculties that operate on the Turfloop campus. Figure 3.3 (below) graphically depicts the distribution of student participation among the faculties, and Table 3.2 (below) provides the same information in terms of numbers and percentages.

Figure 3.3 - Distribution of students among the faculties



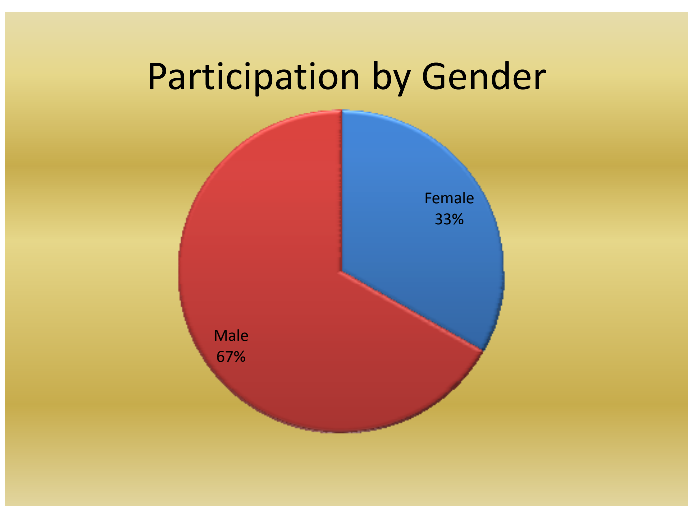
Faculty	#	%
Science	103	38.9
Management and Law	93	35.1
Humanities	69	26.0
	265	100.0

Table 3.2 – Distribution of students among the faculties in terms of numbers of participants and the corresponding percentages**.**

Table 3.2 reveals that Science faculty students constituted the highest number of participants (103 participants or 38.9% of the total). Management Sciences and Law faculty students accounted for 93 students or 35.1% of the total, and the Humanities faculty accounted for 69 students or 26.0% of the total number of participants.

Even though 52.8 % of the total Turfloop student population is female, only 33.2% of the total number of respondents were female. Figure 3.3 and Table 3.4 (below) set out this information in figural and table format below.

Figure 3. 4 - Percentages of participants according to gender participation.



	#	%
Female	88	33.2
Male	177	66.8
	265	100.0

Table 3.3 - Gender participation in terms of actual numbers and percentages.

Of the total of 265 participants, 88 or 33.2% were female. The balance (177 or 66.8%) were male. This means that there were approximately twice as many males as females who participated in the study.

3.4.2 Instruments

The instrument that was used for collecting data was a questionnaire that was made available to the participants in both online and printed format. A copy of this questionnaire may be found in Appendix A.

The questionnaire had to find answers to three sets of questions: technology use, motivational and cultural orientations. Measuring motivation had its own challenges since it had to be a tool that is reliable with a proven track record in the academic world. Motivated Strategies for Learning Questionnaire (MSLQ) provided the solution. It measures motivational variables such as intrinsic, extrinsic and self-efficacy. It is used extensively throughout the world particularly in institutions of higher learning. The MSLQ was developed using a social-cognitive view of motivation and learning strategies, with the student represented as an active processor of information whose beliefs and cognitions mediated important instructional input and task characteristics. The social-cognitive theoretical framework on which the MSLQ was founded assumes that motivation and learning strategies are not traits of the learner, but rather that motivation is dynamic and contextually bound and that learning strategies can be learned and brought under the control of the student (Duncan and McKeachie, 2005, p. 117). The technology component had to have a number of characteristics. It was supposed to measure technology use, its level of integration in teaching and learning and expressed a general sort of opinion about ICTs. An existing questionnaire produced by C. Brown and L Czemiewicz of the University of Cape Town provided the missing link. To ensure the instrument is not too long I decided to be content with some of the existing questions in the same questionnaire that addressed the cultural aspects.

The questionnaire was divided into the following four parts:

Part A investigated student access to ICTs, and consisted of 27 headings and measures:

- How students use ICTs and the respective frequency of their usage
- The extent of ICT usage for academic purposes
- The nature of ICT use
- Physical access to ICT, and the ease or otherwise of accessing ICT facilities by students
- The level of skill with which students manipulate ICTs, and the extent of their familiarity with the ICT tools concerned
- Sources for obtaining assistance
- The level of user (student) satisfaction with ICT services

Part A sought in particular to ascertain the students' responses to ICT as a tool in education.

Part B investigated the extent to which students used ICTs, and consisted of 19 headings and measures:

- The extent to which students used ICT tools such as email, Internet, etc.
- The extent to which ICTs were integrated with academic programmes such as learning, teaching, and assessment

- The expectations of students with regard to ICT facilities and tools

Part C sought information about student gender, the school or faculty in which students were enrolled, and the ethnic group to which students belonged. Part C was arranged under 11 different headings.

Part D presented the Motivated Strategies for Learning Questionnaire (MSLQ). It has already been noted that the MSLQ was originally developed by a team of researchers from the National Center for Research to Improve Post-secondary Teaching and Learning and the School of Education at the University of Michigan (Pintrich, Smith, Garcia, and McKeachie, 1991, p. 2). It is a self-reporting instrument that was specifically designed to assess how motivated university students are to achieve their academic objectives. According to Pintrich (2004, p. 401) self-report questionnaires, such as the MSLQ can provide information about student motivation in the college classroom as well as general capabilities for self regulation.

The MSLQ consists of two main sections – the motivation section and the learning strategies section. The motivation section consists of 31 items. It assesses students' goals, value assumptions and beliefs about their courses, their estimation of how adequate their skills might be for the attainment of success in their courses, and their levels of anxiety about the tests that are a component of the courses of their choice (Pintrich, Smith, Garcia, and McKeachie, 1991, p. 3). This section is the only part of the MSLQ that is used in this study. The second part that deals with learning strategies is excluded from this study.
The motivational component consists of 31 questions and the measures used to assess these factors. The motivational component seeks to elucidate and measure the following factors:

- Intrinsic and extrinsic motivations
- Task values

- Self-efficacy for learning and performance

Not all the questions are used in the analysis. Where the findings are not significant or not related to the main objectives of the study are excluded from the analysis in this research. This is applicable to all four parts of the questionnaire. Although student participation in the research was conducted on a purely voluntary basis, I felt that it was appropriate to encourage students to participate by offering a prize. The questionnaire itself was rather daunting because it was long (it was arranged under 88 headings), and it was administered at a time when the students were busy with their examinations. Because of these difficulties, it was felt that the offering of a suitable prize might function to motivate students to participate in the study.

Before I distributed the questionnaire to the whole sample, I conducted a pilot study that involved distributing the questionnaire to a random number of students so that I would be in a position to observe their reactions and evaluate the suitability of the questionnaire and the circumstances in which it had to be answered. Because the results of the pilot study indicated that the length of the questionnaire was too long, I decided to omit some of the questions that were not critical to the process of finding answers to the main research questions. I was then left with a new version of the questionnaire, and used that version for all the participants. (Only a few questions, such as the ones relating to cellular phones in parts A to C, were deleted from the online version.)

Because MSLQ is a well-tested and proven assessment tool for acquiring information about the motivation and learning strategies of students, it is ideal diagnostic tool for faculties who wish to understand how best to improve student learning (Duncan and McKeachie, 2005, p. 117). Since the MSLQ was based on a social-cognitive view of motivation and learning strategies, it conceptualizes students as active processors of information whose beliefs and cognitions mediate important instructional input and task characteristics. Because the social-cognitive theoretical framework on which the MSLQ is based assumes that motivation and learning strategies are not inherent traits that the learner possesses, it makes the assumption that motivation is dynamic and context-dependent and that effective learning strategies can therefore be learned by students (McKeachie, 2005, p.117).

MSLQ has been extensively tested in numerous research studies since the early 1990s when it was first devised. It has been validated by means of factor analyses, reliability analyses, and correlations with measures of achievement (Lynch and Dembo, 2004, p. 8, Pintrich, Smith, Garcia, and McKeachie, 1991). It was especially designed and developed for measuring the motivational orientation of college (i.e. university) students.

It should be noted that MSLQ is typically used to evaluate students' motivational and cognitive orientations towards a particular course. In this study, I have extended the scope of what MSLQ measures and broadened it so that it includes the entire educational experience of a student at university. I have accomplished this by interpreting the questions that relate to a particular subject as being relevant to the whole degree course for which a student has registered. The limitation inherent in this approach is that a student might well have one set of orientations towards one subject while having a very different set towards another subject.

Parts A-C were developed by C. Brown and L Czemiewicz of the University of Cape Town as part of a national initiative to measure access and use of ICT for teaching and learning in higher education in South Africa. This questionnaire, with the exception a few questions, that would have made the process too long and irrelevant, was used in its entirety. Research question were focused on four different categories- culture, motivation, technology and institutional changes. The research questions in terms of technology and institutional change were adequately covered. Cultural related questions were a few but enough for otherwise it would have made the process much too long. Motivation related questions were absent which I had to look elsewhere for a suitable set of questions which let to the discovery of MSLQ which was explained earlier in this section.

3.4.3 Procedures

The research question which this study sets out to answer relates to the reasons why certain students are attracted to technology and whether this evident passion can be correlated with improvements in academic performance. It was necessary to use as large a sample as possible in order to draw valid conclusions about the measured variables and to determine whether a pattern exists between the variables in question.

The quantitative method was deemed suitable because the size of the sample made the detection of a possible correlation between the use of ICT and motivational orientation to academic performance feasible. A questionnaire had to be developed that required responses to these two sets of questions, the first relating to patterns of ICT usage, and the second relating to motivational orientation. It was noted earlier how a similar development at UCT resulted in the creation of a questionnaire that, in terms of ICT use in its manifold aspects, adequately covered all the areas. The motivational component had to be added from a different source (MSLQ) as was explained earlier. Once the questionnaire had been developed, a decision was made to make it available online as well as in printed (paper) format.

I therefore developed an online version and linked it to each student’s database. Initial versions were modified to maximise user friendliness and ease of access and navigation. The University’s Academic Computing Unit plans to use this tool in the long term in order to continue to measure students’ responses to their various services. Once all the features of the questionnaire had been developed and once it had been ascertained that it conformed to acceptable standards, it was necessary to test it so that the accuracy and integrity of the programs involved could be checked. This process took a great deal of time because the first series of tests revealed a number of “bugs” that had to be corrected and eliminated. The final version therefore only became available early in April 2008. A team from the ICT’s Academic Support Unit accepted responsibility for introducing the questionnaire to the students and for encouraging them to respond to it. A special icon was displayed on-screen on all the university’s computer laboratories (several hundred computers in all), and thus the existence of the questionnaire was made both visible and accessible to all students. This enabled students who wished to participate to access the questionnaire and to respond to it if they wished.

The online version was much easier for students to manipulate because it eliminated the data entry step which, in the printed paper version, was more cumbersome and would therefore increase the possibility of introducing errors during the data entry process. The online version did, however, have one major drawback: it effectively excluded students who made little or no use of the university's ICT facilities. The data would have been more representative if it had included those few who do not habitually make use the computer laboratories. I decided therefore to obtain permission from the student residences to approach students directly in their residences. When this permission had been granted, a set of paper-based questionnaires were distributed among the residences and a specific deadline for the completion of the questionnaire was clearly indicated to participants.

When the deadline for participation arrived, 56 paper-based questionnaires had been completed. It was found that in the case of 12 of the completed questionnaires were handed in with a missing last page. These questionnaires were removed from the total sample because they would have affected the accuracy of the results relating to the motivational section. It was also found that a further 6 questionnaires had been filled in incorrectly because these students had responded with either all 7s or all 1s in the motivational section. This meant that a separate database had to be created which excluded these records for calculations that related to motivation orientation analysis.

In total, 276 students responded to the questionnaire. These responses were carefully examined for correctness and adherence to the protocol. It was found that 8 records contained mostly zeroes (revealing that the respondents concerned had not answered the questions), and that two records contained test data. These were excluded from the database. This meant that there were 266 records that could be used in the study because they conformed to all the requirements of the study design.

MSLQ has a prescribed way of calculating its results. It is available from Pintrich, Smith, Garcia and McKeachie (1991). Accordingly, an average value for each motivational variable was calculated. In this way each student ends up with a value for each motivational variable of intrinsic, extrinsic and self-efficacy that lies between 1 and 7.

In the same document the alpha values are also provided. The alpha coefficient reliability value for Intrinsic motivation is given as 0.74 (p.13), for extrinsic is 0.62 (p. 14) and for self-efficacy is 0.93(p. 17). With assistance from the statistician for this study the alpha coefficients for the data set was produced with 0.732 for intrinsic motivation 0.829 for extrinsic and 0.910 for self-efficacy.

For the remaining section of the questionnaire i.e. the non motivational part it was not possible to arrive at a reliability coefficient due to the type of questions. The data by this time was in UL's Oracle database. A tool called Discoverer 2000 was used to extract the information. Many of the straight forward calculations such as the pie charts and tables were obtained directly using Discoverer. The data had to be exported to SPSS which is recently referred to as Predictive Analysis Software or (PASW) for statistical analysis. The advice of an experienced statistician that is available from the University of Limpopo for such projects was requested to assist with the process. Descriptive statistics like frequency and percentage tables, graphs, means and standard deviation were used to illustrate the results. In cases where two groups had to be compared, in terms of their mean differences, a t test was used and ANOVA (Analysis of Variance) when there were more than two groups. In cases where two categorical variables had to be compared chi-square was used. In very few cases when n was too small the non-parametric Kruskul Wallis test was used. It should be mentioned that in both paper and online versions student number which uniquely identifies each student was used to link the data from the questionnaire to the University's database where academic data is stored. However, in order to protect anonymity no individual student details were reflected in any of the findings or reports.

3.4.4 Data Sources

The main sources of data were a student questionnaire and the university's student database.

Table 3.4 below, summarizes the topics that were dealt with by the research questions and the sources from which the relevant data was obtained.

Research Questions	Q	UL DB
How do students use ICTs on campus and off campus?		
How often are the students on campus?	✓	
What percentage of the ICTs' usage is used for academic purposes?	✓	
Where is the most likely venue that ICT activities take place on campus?	✓	
Is the usage limited to the duration of an academic activity, like a lecture, or is it based on students' own initiative?	✓	
With regard to access and environment, how easy or difficult is it to use ICTs?	✓	
Is the Internet accessible off campus? How?	✓	
How easy is the ICTs access off campus?	✓	
How extensive is the students' ICT experience?		
How long have students been using computers?	✓	
How did they first learn how to use a computer?	✓	
What portion of their usage is for academic purposes?	✓	
To what extent are ICT tools, such as email, the Internet, Skype, are used by the students?	✓	
How extensive is ICTs' integration with Teaching and Learning practices at the University?		
Are there courses where ICTs are used as part of teaching and learning?	✓	
Do these activities account towards students' academic performance?	✓	
How extensive are ICT tools, such as presentation, application,	✓	

and other specialized software, being used by the academic community during the teaching process?		
Research Questions	Q	UL DB
Are students encouraged to use ICT tools such as email and the Internet, as part of the academic experience?	✓	
To what extent has the association with technology been beneficial in academic achievements?	✓	✓
Institutional Performance Based Research Questions		
How important is the role of infrastructure in providing an effective learning environment?	✓	
What institutional changes are necessary to produce a learning environment that is conducive to accelerated learning?	✓	
Cultural Orientation Research Question		
Does culture influence motivation and academic performance?	✓	✓
Do family and friends play a role in motivating ICT use and thereby influence academic results?	✓	✓
If so, what is the implication for ICT service delivery in an educational environment?	✓	
Motivation Orientation Research Questions		
Why are students interested in technology?		
Are there evidences for self-directed learning, and, if so, how do they affect ICT use and academic performance?	✓	✓
How does intrinsic motivation play a role in ICT use and academic achievement?	✓	✓
How does extrinsic motivation affect ICT use and academic achievement?	✓	✓
What is the role of self-efficacy in the level of ICT use and academic achievement?	✓	✓

Table 3. 4 – Topics dealt with by the research questions and the sources from which the relevant data was obtained

Students' performance records are available in the University of Limpopo's central administration database**.** This database is a reasonably reliable source of information and provides information about name, age, gender, first registration date and other academic related-information such as academic results.

3.5 Research Question

The title of the research reflects the major focus areas of the project that is being investigated.

> ***The role of Information and Communication Technology (ICT) in a higher education institution: with specific reference to disadvantaged students, cultural aspects and motivation***

In order to find answers to this main research question, I had to divide it into four main focus areas. The first category deals with ICTs and the manner in which they are used by students. They include **ICT**s' extent of use, their integration into teaching and learning and whether their use contributes towards students' academic performance. The second category explores the effect of students' **cultural** background on ICT use and academic performance. The third category deals with influences based on **motivational** orientation and whether there is correlation with ICT use and academic performance. The forth category looks at areas of institutional performance that need improvement.

3.5.1 Technology Based Research Questions

The questions that dealt with these topics sought to answer the following questions:

How do students access ICTs on campus and off campus?

In order to find this question the following sub-questions had to be addressed.

- How often are the students on campus?
- What percentage of the academic time is spent with ICTs?
- Where is the most likely venue for ICT use on campus?
- Is the usage limited to the duration of an academic activity, like a lecture, or is it based on students' own initiative?
- How easy or difficult is it to use ICTs in terms of ICT access and environment?
- Is there access to ICTs (computer or Internet) off campus? How?
- How easy is the ICTs access off campus?

How extensive is the students' ICT experience?

Under this general heading I attempt to find answers to the following questions:

- How long have students been using computers?
- How did they first learn how to use a computer?
- What portion of their usage is for academic purposes?
- To what extent are ICT tools, such as email, the Internet, Skype, are used by the students?

How extensive is ICTs' integration with teaching and learning?

Under this general heading, I attempt to find answers to the following questions:

- Are there courses where ICTs are used as part of teaching and learning?
- Do these activities account towards students' academic performance?

- How extensive are ICT tools, such as presentation, application, and other specialized software, being used by the academic community during the teaching process?
- Are students asked to use ICT tools such as email and the Internet, as part of the academic experience?
- To what extent has the association with technology been beneficial in academic achievements?

3.5.2 Cultural Orientation Research Question

Under this general heading I aim to find answers to the following questions:

- Does culture influence motivation and academic performance?
- Do family and friends play a role in motivating ICT use and thereby influence academic results?
- If so, what is the implication for ICT service delivery in an educational environment?

3.5.3 Motivation Orientation Research Questions

Under this general heading I aim to find answers to the following questions:

- Why are students interested in technology?
- Are there evidences for self-directed learning, and, if so, how do they affect ICT use and academic performance?
- How does intrinsic motivation play a role in ICT use and academic achievement?
- How does extrinsic motivation affect ICT use and academic achievement?
- What is the role of self-efficacy in the level of ICT use and academic achievement?

3.5.4 Institutional Performance Based Research Questions

Under this general heading, I attempt to find answers to the following questions.

- How important is the role of **infrastructure** in providing an effective learning environment?
- What institutional changes are necessary to produce a learning environment that is conducive to accelerated learning as the result of cultural and motivational findings?

3.6 Summary

In this chapter, I described and explained the design and methodology that I used in this study. It was noted that this project can be categorised within the top left-hand square of Black's (1999, p. 13) quadrant because it is based on applied, real-world data. I described how the research philosophy that scaffolds the study is more aligned with interpretivism than positivism. This was followed by a description of the case study design characteristics that were chosen and the quantitative strategy that was adopted for the study. I explained the features of the questionnaire that was used to gather the research data and detailed the procedure that was used during the process of collecting the data. In the following chapter, I describe the findings from this research.

Chapter 4 – Findings

4.1 Students' ICT Use and Dependency

4.1.1 Overview

In Chapter 1, I described how my personal observation and experience with students who showed an unusually keen interest in ICTs led me to undertake this study. In Chapter 2, I described in detail what literature has to say about the topic. Chapter 3 contained a description of the research plan, the research philosophy, the research methodology and the strategy that I used to answer the main research question of this study, namely:

> ***The role of Information and Communication Technology (ICT) in a higher education institution: with specific reference to disadvantaged students, cultural aspects and motivation***

In this Chapter, I describe and analyse the responses to the questionnaire which are divided into four categories. Section 4.1 examines technology (ICT) related findings. It includes ICT use and dependency. Section 4.2 extends the ICT use and examines it against academic performance. Section 4.3 examines the cultural variables of the study and finally section 4.4 looks at the motivational variables and the associated findings. It should be noted that the sequence in which these sections are presented are in the reverse order from Chapter 2 which follows a natural progression of ideas as they unfold throughout the study. In Chapter 2, I started with asking questions about the student. First, I looked at his/her culture and how it has an influence on motivation and therefore academic performance. In Chapter 4, I first have to measure the level of technology use which will enable me to relate it to academic performance followed by culture and motivation.

Before engaging in an in-depth discussion of the issues at hand, I offer a brief summary of the profile of the students who responded to the questionnaire.

The importance of the profile emanates from the fact that attributes such as age, nationality, race, home language and study level are all significant. The Hole-in-the-Wall project of which this study is an extension focused predominantly on children younger than 18 years old. It is important therefore to ascertain the age group of the participants in this study. Variables such as nationality, race and home language are critical cultural features that constitute important variables defining the composition of the participants.

4.1.2 Students' Profile

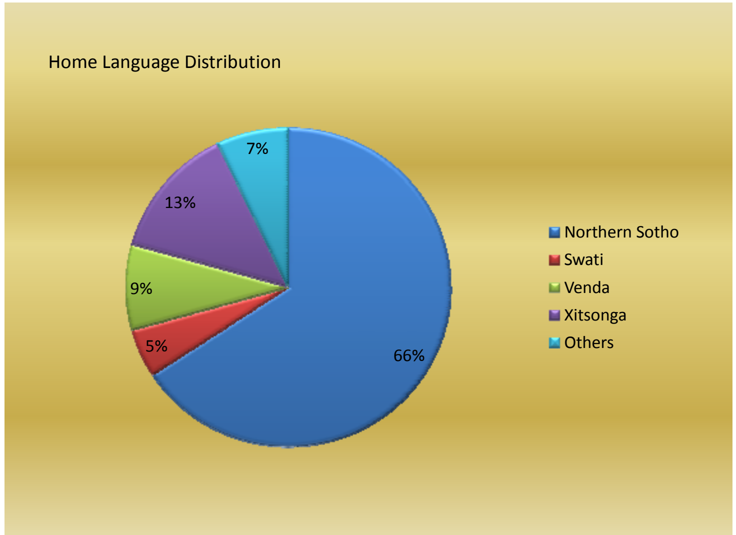
What follows in this section is an analysis of the 266 UL students who participated in the study. An analysis of the participants in terms of gender and schools' distribution has already been presented in Chapter 3, section 3.2. What follows below is a presentation of other related profile variables such as: nationality, home language, level of study, age and availability on campus.

4.1.2.1 Nationality and Home Languages

Because one of the main topics of interest in this study is culture and how a student's culture influences motivation and therefore his or her learning behaviour, this section will describe the cultural diversity represented by the participants.

Out of the 266 participants in the sample, only five reported their nationality as being non-South African, while two others gave no information about their nationality. Of the non-South Africans, one was from Zambia, one from Botswana, one from Zambia and two were from Zimbabwe. This means that 97.37% of the participants were from South Africa. What follows below is additional demographic information about the participants. Figure 4.1, below, illustrates the ethnic composition of the students in terms of their home languages. The same information is presented numerically in Table 4.1, below.

Figure 4. 1- The home language distribution of the participants (in percentages)



	#	%
Northern Sotho	175	65.7
Swati	13	4.8
Venda	23	8.4
Xitsonga	36	13.9
Others	19	7.2
	266	100.0

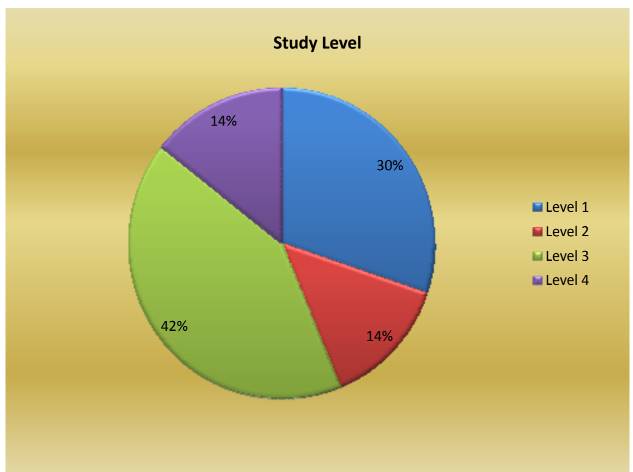
Table 4.1 - The home language distribution of the participants (Actual numbers and percentages)

Table 4.1, above, shows that the majority of the participants (175 of the total number of students or 65.7%) reported their home language as Northern Sotho. This is followed by 36 or 13.9% of the participants who reported their home language as Xitsonga. Venda-speaking students were represented by 23 or 8.4% of the total number of participants. Swati-speaking students constituted 13 or 4.8% of the participants. The remaining 19 students reported their home languages as follows: English – 1; Afrikaans – 1; Ndebele – 3; Seseto – 2; Setswana – 6; Shona – 1; Xhosa – 1; Zulu – 3. There was 1 student who did not specify his home language.

4.1.2.2 Level of Study

Of the 266 respondents only 1 did not specify his/her level of study. 80 or 30% of the students who responded were engaged in their first year of study. 36 students or 13.6% of the participants were in their second year of study, and the largest group (107 or 41.9%) were registered for their third year. 38 or 14.3% of the participants were in their fourth year of study. Figure 4.2, below, illustrates the year of study for which the participants were registered (in percentages). Table 4.2, below, presents the same information in table form (in actual numbers and percentages).

Figure 4. 2 - Year of study for which participants were registered (percentages)



	#	%
Level 1	80	30.2
2	36	13.6
3	111	41.9
4	38	14.3
	265	100.0

Table 4.2 - Participants Year of study (actual numbers and percentages)

This analysis shows that an unexpectedly high percentage of the participants, namely, 41.9%, were in their third year of study.

4.1.2.3 Age Analysis

Only one student out of the 266 participants did not report his/her age. One of the participants was less than 18 years old, and five were older than 28 years old. The oldest student was 36 years of age. Table 4.3, below, illustrates the age distribution of the students in terms of those older than 28, and those who were between 18 and 28 years old.

	#	%
Did not report	1	0.4
Less than 18	1	0.4
Between 18 and 28	259	97.4
Older than 28	5	1.9
	266	100.0

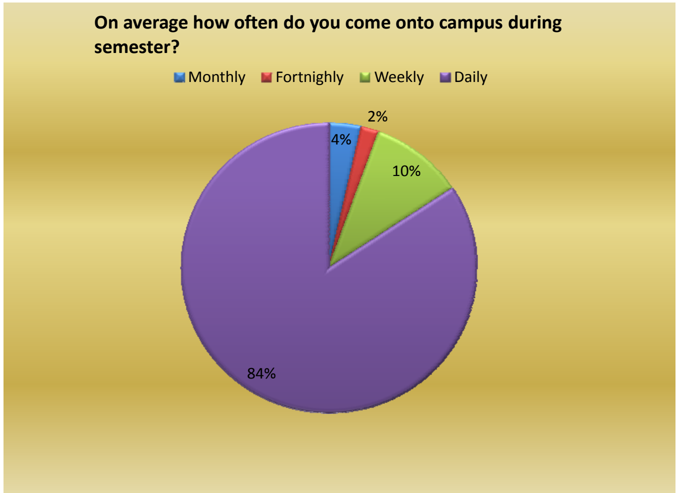
Table 4.3 - Age distribution of the participants

97.7% of the participants belonged in the 18-28 year-old age group, and only a total of 6 individuals or 2.3% were outside this range.

4.1.3 Availability on Campus (A1)

In response to the question “How often do you visit the campus?”, all of the respondents reported they visit the campus at least once a month. 84% of the 254 participants or 214 students stated that they were on campus on a daily basis. Nine students or 4% visited the campus once a month. Five students or 2% visited the campus at least fortnightly. 26 or 10% of the students from the sample reported that they visited the campus on a weekly basis. Figure 4.3 and Table 4.4, below, illustrate this information.

Figure 4. 3 - Frequency of visits to campus by participating students



	#	%
Monthly	9	3.5
Fortnightly	5	2.0
Weekly	26	10.2
Daily	214	84.3
	254	100.0

Table 4.4 - Frequency of visits to campus by participating students

The section above describes the demographic profile of the participating students. In the section that follows below, I shall describe and analyse the nature and extent of ICT usage among the participating students.

4.1.4 Extent of ICT Use and Dependency for Academic Purposes

In the sections that follow, I have attempted to identify the extent to which, the students in the sample, use ICTs and are dependent upon them. For this purpose, I have differentiated between the on-campus and off-campus availability of ICT facilities. I have also described the extent to which the participating students use ICT tools such as computers and the Internet, and how much of this use was for academic purposes.

4.1.4.1 On-Campus Computer Use (A2)

There were 261 respondents who answered the question, “What percentage of your academic time do you spend using a computer?” Their responses yielded the data illustrated in Figure 4.4, below.

Figure 4. 4 - Student academic time spent on using a computer on the campus (percentages)

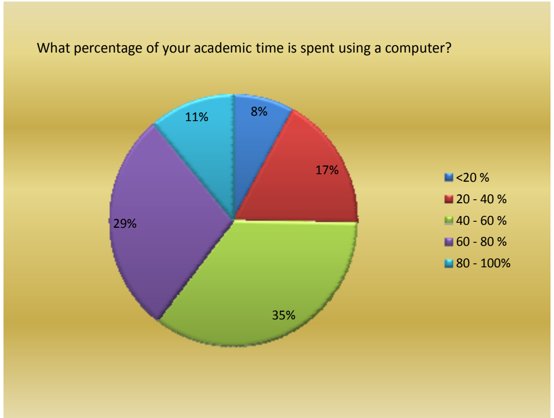


Table 4.5, below, shows the amount of academic time that the participating students spent on the computer on the campus (table shows actual numbers and percentages).

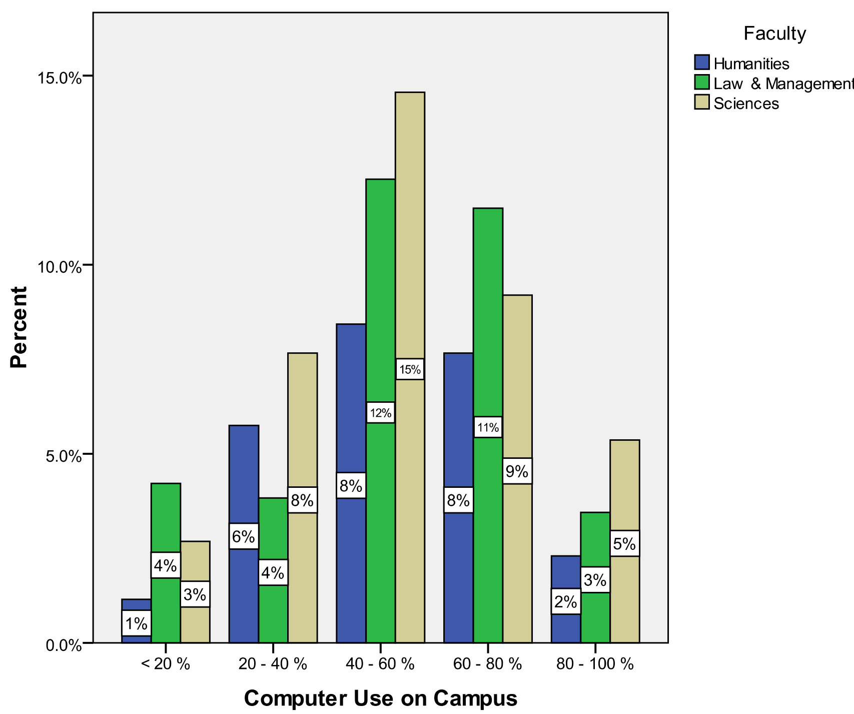
	#	%
<20 %	21	8.0
20 - 40 %	45	17.2
40 - 60 %	92	35.2
60 - 80 %	74	28.4
80 - 100%	29	11.1
	261	100.0

Table 4.5 - The amount of academic time spent by students on the computer on the campus

A number of observations need to be made. Firstly, every respondent uses a computer (this is not shown in the table directly). Secondly, a total of 92% of the respondents have reported they use more than 20% of their academic time on a computer for study-related purposes on the campus. This is surprisingly high and shows high level of dependency and interest to ICTs since most were first introduced to computers when they started at the University.

The next area of interest is to explore if there is a difference in use between the three faculties. The distribution of the amount of academic time spent using a computer across the various faculties of the university was tabulated and *statistically* tested. The distribution figures in Figure 4.5 and Table 4.6, below, illustrate the relative differences in the numbers of students using a computer for academic purposes in their academic time from different faculties of the university.

Figure 4. 5 - Computer use for academic purposes by faculties (percentages)



			Faculty			
			Humanities	Law & Management	Sciences	Total
Computer Use on Campus	< 20 %	Count	3	11	7	21
		% within Faculty	4.5%	12.0%	6.8%	8.0%
	20 - 40 %	Count	15	10	20	45
		% within Faculty	22.7%	10.9%	19.4%	17.2%
	40 - 60 %	Count	22	32	38	92
		% within Faculty	33.3%	34.8%	36.9%	35.2%
	60 - 80 %	Count	20	30	24	74
		% within Faculty	30.3%	32.6%	23.3%	28.4%
	80 - 100 %	Count	6	9	14	29
		% within Faculty	9.1%	9.8%	13.6%	11.1%
Total		Count	66	92	103	261
		% within Faculty	100.0%	100.0%	100.0%	100.0%

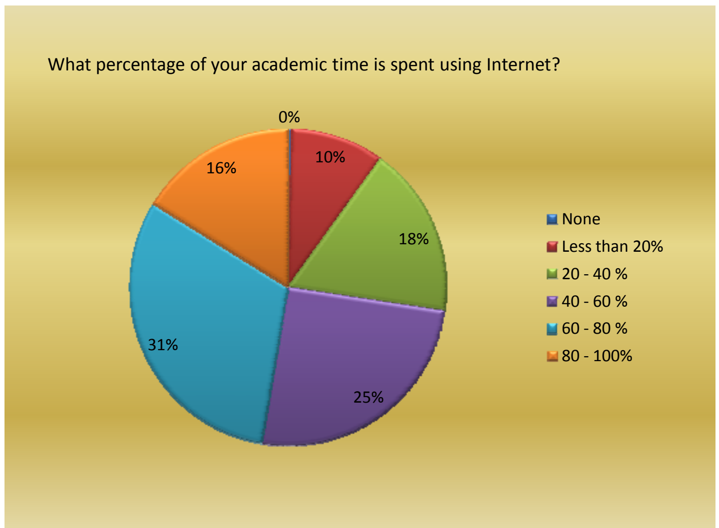
Table 4. 6 - Computer use for academic purposes by faculties

There are some differences in the percentage of students from different faculties that use a computer for academic-related purposes in their academic time on the campus. However, all three faculties have their highest relative use at 40 – 60 % category. The second highest, again, in all three faculties is the same and is at 60 - 80 % category. While some faculties might seem to show a higher level of computers use than others, a chi-square test, which is used when two categorical variables like the ones in this case are compared, gives a p-value of 0.32 indicating that there is no association between computer use and faculty. This implies that all three faculties may therefore be said to have responded in a similar fashion *statistically* to the use of computers for academic purposes on campus. Similar results were obtained based on gender with p=0.341 for male respondents and p=0.396 for female.

4.1.4.2 On-Campus Internet Use (A2)

In response to a similar question about the Internet use on campus, the following data emerged. Figure 4.6, below, illustrates the percentage of total academic time that students spend on the Internet. Table 4.7, below, shows the percentage of academic time that students spend on the Internet while on campus.

Figure 4. 6 - Student academic time spent on the Internet on campus (percentages)



	#	%
None	1	0.4
Less than 20%	23	9.5
20 - 40 %	42	17.4
40 - 60 %	61	25.3
60 - 80 %	75	31.1
80 - 100%	39	16.2
	241	100.0

Table 4. 7- Amount of academic time spent on the Internet

Compared to the previous question (computer use), fewer students (241) responded to this question. 75 respondents (or 31.1%) is the largest group and belongs to the (60%–80 %) category, followed by 61 respondents (or 25.3%) that belongs to the (40%–60%) category. This, in a way, confirms the literature's expectation that the last decade has seen a phenomenal growth in the use of the Web in university education, with various factors influencing the adoption of Web-based technology (Singh, O'Donoghue, and Worton, 2005, p. 22). This shows that UL students are part of the global village and from an Internet point of view are linked with the rest of the world.

Figure 4. 7 - Shows the distribution of academic usage of the Internet across faculties.

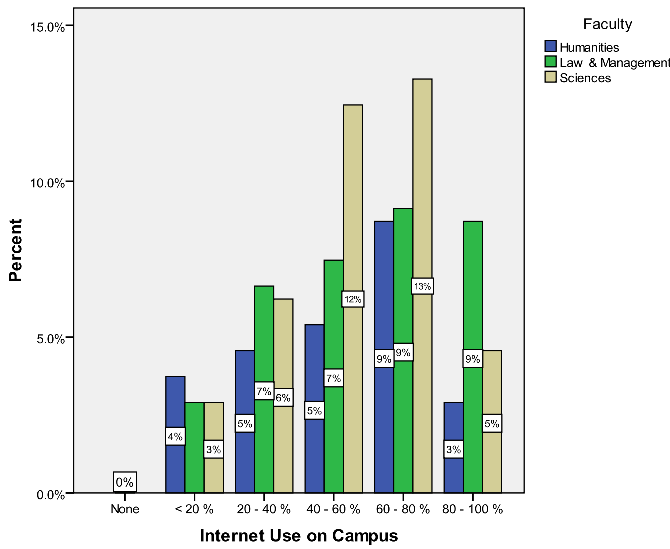


Figure 4.7 and Table 4.8 show the distribution of Internet use across faculties. A chi-square test which is used when two categorical variables are being analysed gives a p value of 0.176 indicating that there is no *statistical* association between Internet use and faculty. A similar test for each gender also did not show any level of association in use of Internet with p values of 0.340 (male) and 0.396 (female).

			Faculty			
			Humanities	Law & Management	Sciences	Total
Internet Use on Campus	None	Count	0	1	0	1
		% within Faculty	.0%	1.2%	.0%	.4%
	< 20 %	Count	9	7	7	23
		% within Faculty	14.8%	8.2%	7.4%	9.5%
	20 - 40 %	Count	11	16	15	42
		% within Faculty	18.0%	18.8%	15.8%	17.4%
	40 - 60 %	Count	13	18	30	61
		% within Faculty	21.3%	21.2%	31.6%	25.3%
	60 - 80 %	Count	21	22	32	75
		% within Faculty	34.4%	25.9%	33.7%	31.1%
	80 - 100 %	Count	7	21	11	39
		% within Faculty	11.5%	24.7%	11.6%	16.2%
Total		Count	61	85	95	241
		% within Faculty	100.0%	100.0%	100.0%	100.0%

Table 4.8 – Internet use by faculty on Campus for academic use

4.1.4.3 Venues for ICTs Access on Campus (A3)

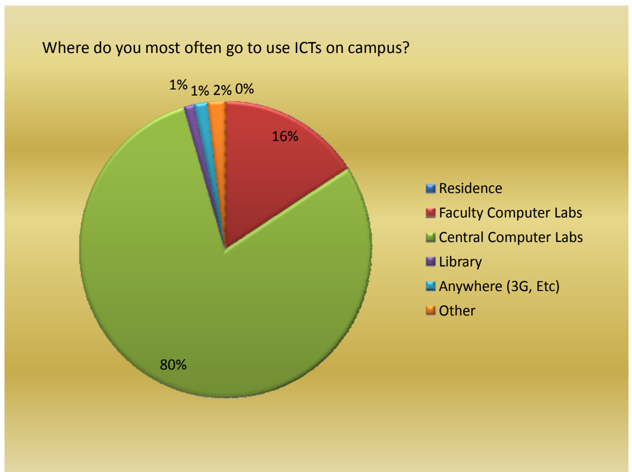
In general, there are two different types of venues that students can employ for ICT use. There are computer laboratories that are managed by ICT staff and others that are managed by various schools.

Of the first category, there are 9 such venues for general purpose ICT access. These venues host a total 600 PCs. The smallest computer laboratory has 20 PCs with the largest having 100. A typical venue is similar to a typical lecture hall with a white board and provision for a data projector. In addition, an open area in the reading section of the library hosts some 60 computers and this is available for 24 hours 7 days per week except during the Christmas break.

The second group of computer laboratories, managed by the schools, consists of a total of 400 PCs in various venues. These are scattered throughout the campuses. They could consist of only a few PCs in a room to the largest that hosts 100 PCs.

In response to the question, “Where do you most often go to use ICTs on campus?”, the following picture Figure 4.8, below, emerged.

Figure 4. 8 - Most frequently used venue for computer use



As can be seen from Table 4.9 below, a total of 265 students responded to this question 211 or 79.6% use the centrally managed Laboratories. This is followed by faculty based computer laboratories with 42 respondents or 15.8%.

	#	%
Residence	0	0.0
Faculty Computer Labs	42	15.8
Central Computer Labs	211	79.6
Library	3	1.1
Anywhere (3G, Etc)	4	1.5
Other	5	1.9
	265	100.0

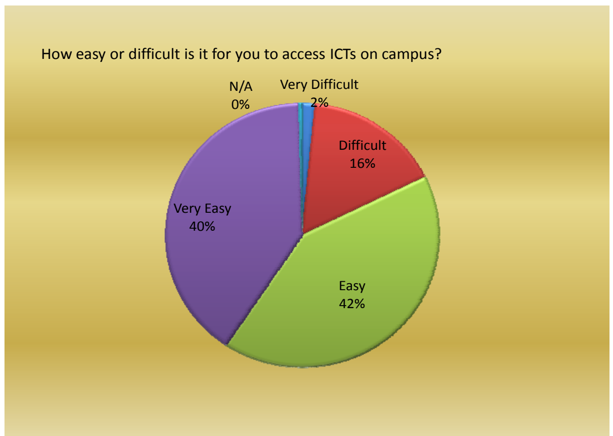
Table 4.9 – Venues used for ICT usage on campus

This clearly indicates that the computer laboratories that are managed by the faculties are utilized much less.

4.1.4.4 Ease of ICTs Access on-Campus (A5)

Figure 4.9 illustrates how the students responded to the question, “How easy or difficult is it for you to access ICTs on Campus?”

Figure 4. 9 – Student estimation of the ease or difficulty of accessing ICT facilities



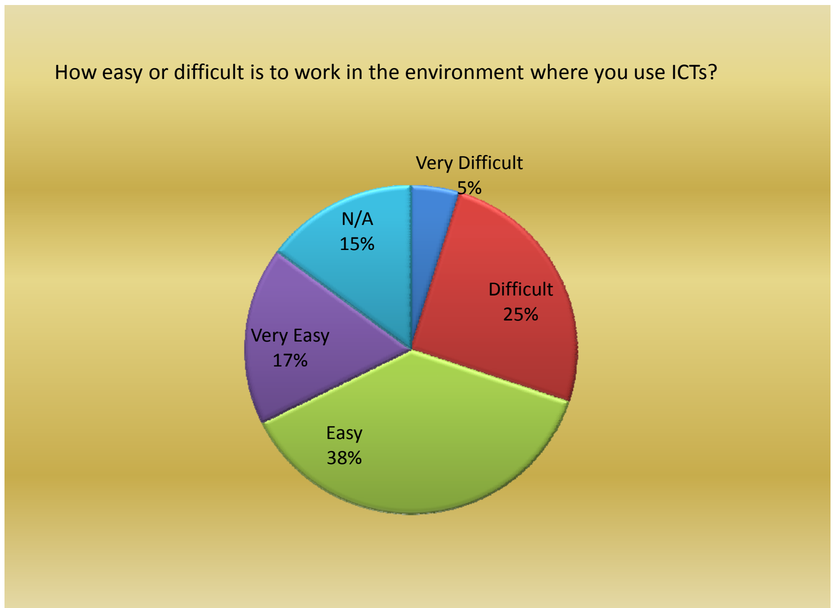
	#	%
Very Difficult	4	1.5
Difficult	42	16.2
Easy	108	41.7
Very Easy	104	40.2
N/A	1	0.4
	259	100.0

Table 4. 10 Student estimation of the ease or difficulty of accessing ICT facilities

Table 4.10, above, shows that 81.9% or 212 of the participants found the facilities either *easy* or *very easy* to use. 42 respondents or 16.2% found it difficult to access computer facilities.

In response to the question, “How easy or difficult is it to use the environment where you use ICTs?” the following picture emerged (Figure 4.10, below and Table 4.11).

Figure 4. 7 – The ease or difficulty that students experience when using the environment in which ICTs are situated



	#	%
Very Difficult	11	4.8
Difficult	58	25.3
Easy	86	37.6
Very Easy	40	17.5
N/A	34	14.8
	229	100.0

Table 4.11 - The ease or difficulty that students experience when using the environment in which ICTs are situated

69 respondents or 30.1% found the environment *difficult* or *very difficult* to use. The respondents were asked to comment on the reasons for any difficulties they may face. To this open question 179 students made some comments. Of these

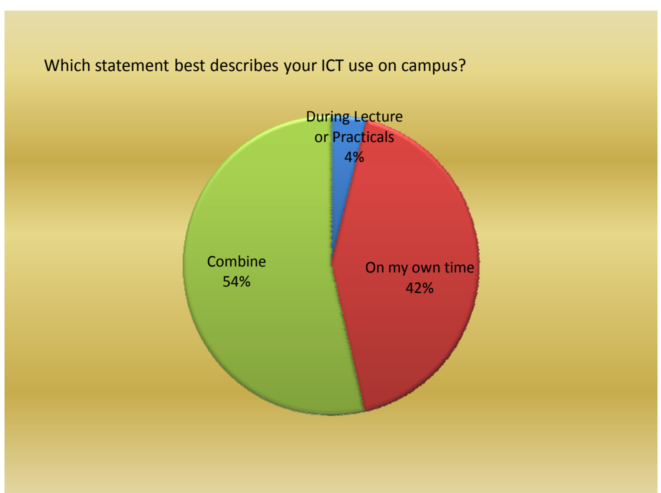
91 made generally positive comments. 24 made general comments. Of the negative comments that expressed a concern, 32 mentioned noise and another 32 complained about lack of adequate computers. There was one respondent that complained about both noise and inadequate computers.

It is interesting to note that while 80% of students reported using the centrally managed computer venues, 40% of the total number of computers were being controlled by the faculties (section 4.1.4.3). This seems to indicate that if the faculties were to make more effective use of their computers and manage their ICT environments more effectively, it is likely that more students would use faculty-managed computers, and that this would alleviate the stress caused by the reported shortage of computers.

4.1.4.5 Extent of Academically Initiated ICT Use (A4)

In this section, I aim to determine the extent to which ICT use is academically or individually driven. The respondents were asked to specify whether they use ICT tools during a formal lecture period (or practical) only or if it was initiated during their own unsupervised time or if it was a combination of both. Figure 4.11, below, demonstrates their responses.

Figure 4. 11– Extent to which ICTs were used either during formal academic periods or in the student's own time (or a combination of the two)



Computers were used	#	%
During lectures and practicals	10	3.9
On students' personal time	108	42.5
Combined	136	53.5
	254	100.0

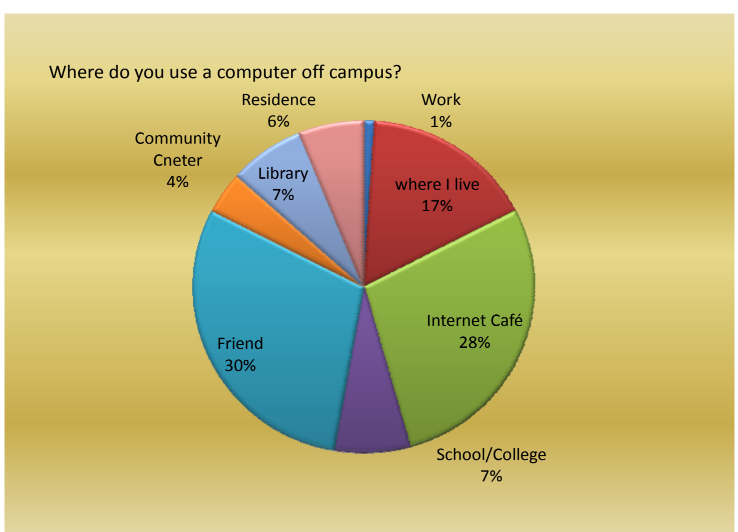
Table 4.12 – Extent to which ICT was used either during formal academic periods or in the student's own time (or a combination of the two)

Table 4.12, above, shows that only 10 respondents (or 3.9%) used ICTs during a lecture or a practical. The remaining 232 respondents or 96.1% use ICTs in their own time or in combination with an academic activity. This indicates that respondents enjoy a certain level of being self-starters and do not need to be asked to use ICTs.

4.1.5 Off-Campus ICTs Access (A9)

In this section, I aim to find whether ICTs are available to students off-campus and, if so, how and the extent to which ICTs are used and are accessible. In response to the question, "Where do you use a computer outside the campus?",

Figure 4. 12 – Venue for computer access off-campus



Access Venue	#	%
Work	2	1.0
Where I live	32	16.4
Internet Café	55	28.2
School/College	14	7.2
Friend	58	29.7
Community Centre	8	4.1
Library	14	7.2
Residence	12	6.2

Table 4.13 – Location of Computer access off-campus

Figure 4.12 and Table 4.13 were produced.109 out of 266 respondents or 41% indicated they had some sort of access to computers off-campus. This was followed by another question to establish where the access was located. 55 respondents or 29.7% of the total number of respondents have access to computers through friends outside the campus. Only two respondents or 1.0% have access to ICT tools at work.

4.1.5.1 Off-Campus Internet Access (A11)

In response to the question of whether the respondents can connect to the Internet while off-campus, Table 4.14, below, displays a summary of their responses.

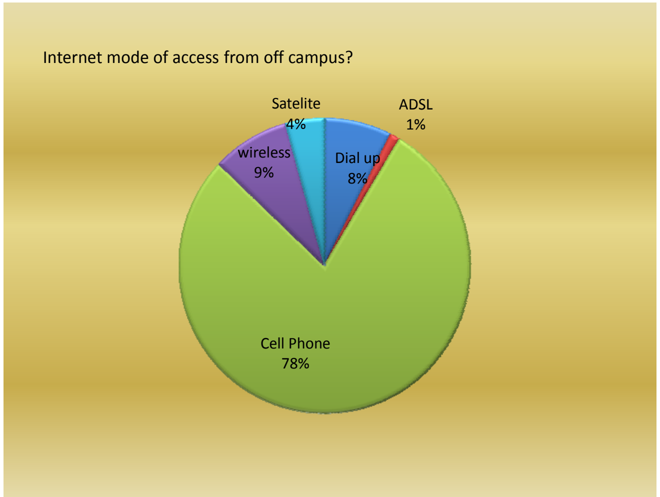
Can you connect to the Internet off-campus?	#	%
Yes	102	44.7
No	126	55.3
	228	100.0

Table 4. 14 - Respondents with Internet access off-campus

102 respondents or 44.7% out of a total of 228 students responded to this question by reporting that they enjoyed access to the Internet outside the campus.

Figure 4.13 and Table 4.15 indicate the reported mode of access that the students use.

Figure 4. 8 - Mode of Internet access



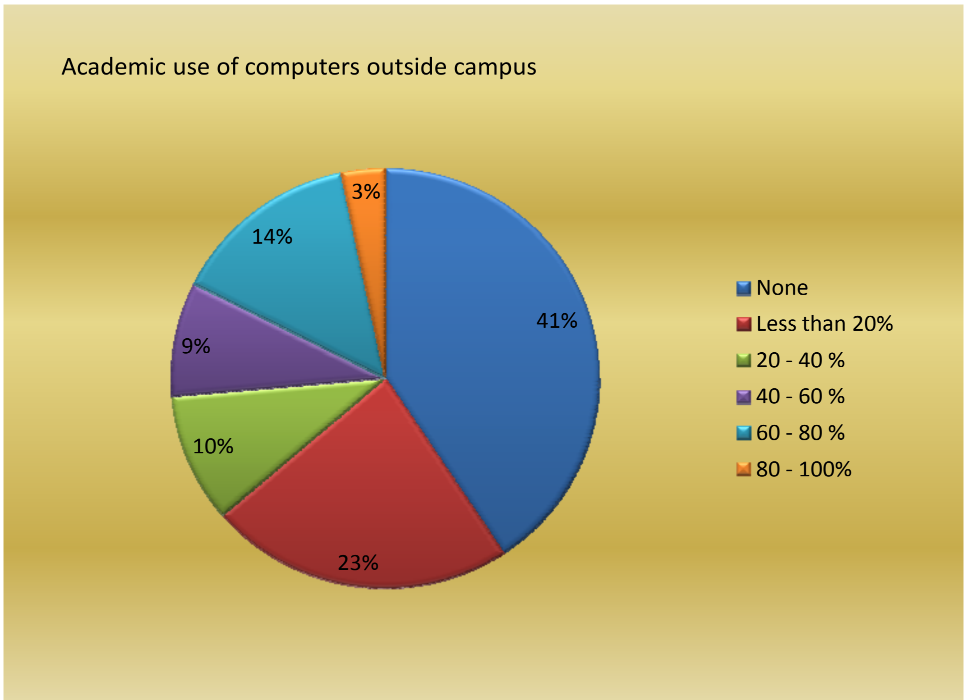
	#	%
Dial up	7	7.5
ADSL	1	1.1
Cell Phone	73	78.5
Wireless	8	8.6
Satellite	4	4.3
	93	100.0

Table 4.15 - Mode of Internet access.

Table 4.15, above shows that the most common means of Internet access is via cellular phone. This particular mode of the usage was reported by 73 respondents or 78.5% of the 93 respondents who answered this question.

Data obtained from the response to the question “Off campus, what percentage of your academic time do you spend using computers?”, is shown in Figure 4.14 and Table, 4.16, below.

Figure 4. 14 – Computer usage off campus for academic purposes



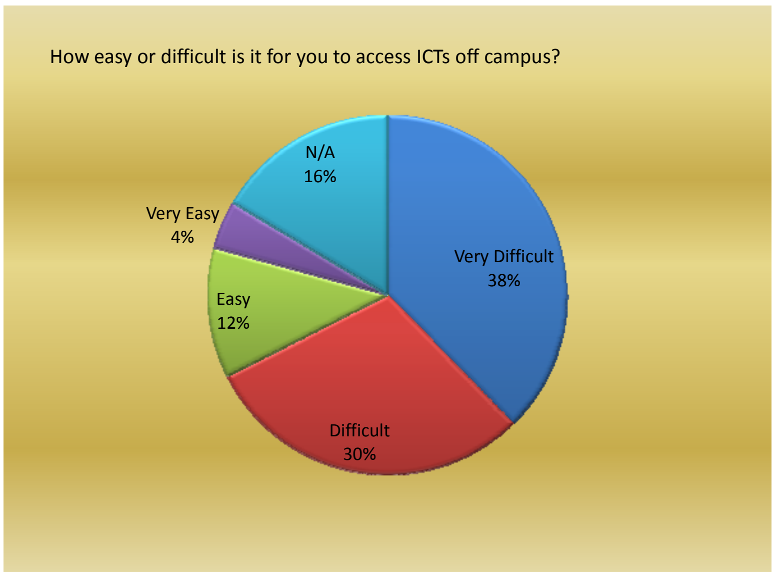
	#	%
None	37	40.7
Less than 20%	21	23.1
20 - 40 %	9	9.9
40 - 60 %	8	8.8
60 - 80 %	13	14.3
80 - 100%	3	3.3
	91	100.0

Table 4.16 - Computer usage outside the campus for academic purposes

Although only 91 respondents or 34% responded to this question, only 109 out of 266 respondents or 41% have some sort of access to computers off-campus (section 4.1.5). This reinforces the findings of the responses to an earlier question about access to ICTs outside the campus for academic purposes. ICT access off-campus is limited.

Figure 4.15 and Table 4.17, below, reveal the responses to the question, "How easy or difficult is it for you to access ICTs Off-campus?". It was either difficult or very difficult for 67.6 % of students to access computers off-campus.

Figure 4. 15 - Ease or difficulty of accessing ICTs off-campus



	#	%
Very Difficult	87	37.7
Difficult	69	29.9
Easy	27	11.7
Very Easy	10	4.3
N/A	38	16.5
	231	100.0

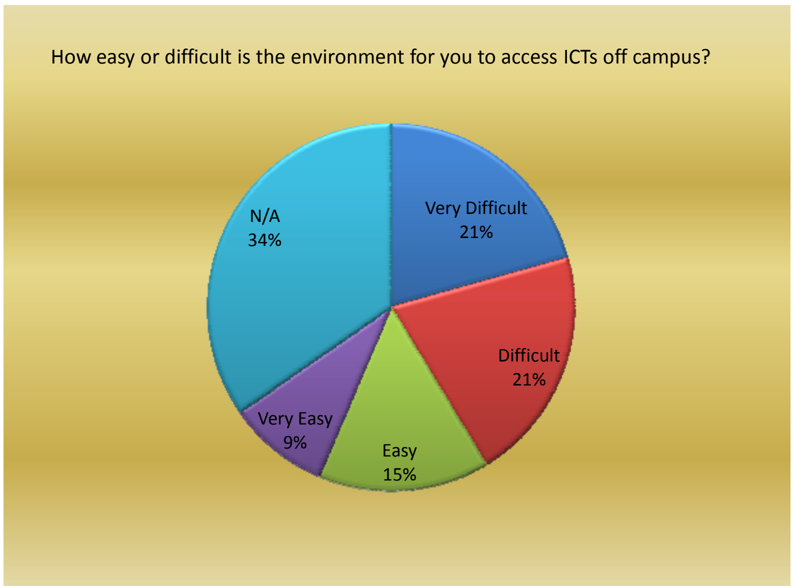
Table 4.17 – Ease or difficulty of accessing ICT tools off-campus

Only 37 or 16.0% of the respondents (out of a total of 231) who answered this question found it *easy* or *very easy* to gain access to computers off campus.

While some of the remainder of the respondents did not answer the question, those who did indicate that they found it either *difficult* or *very difficult* to access ICT tools off-campus.

The data from the response to the question “How easy/difficult is it to work in the environment where you use ICTs?” is shown in Figure 4.16 and Table 4.18.

Figure 4. 9 – Ease or difficulty of the ICT environment off campus



	#	%
Very Difficult	37	20.7
Difficult	37	20.7
Easy	27	15.1
Very Easy	16	8.9
N/A	62	34.6
	179	100.0

Table 4.18 – Ease or difficulty of ICT environment off-Campus

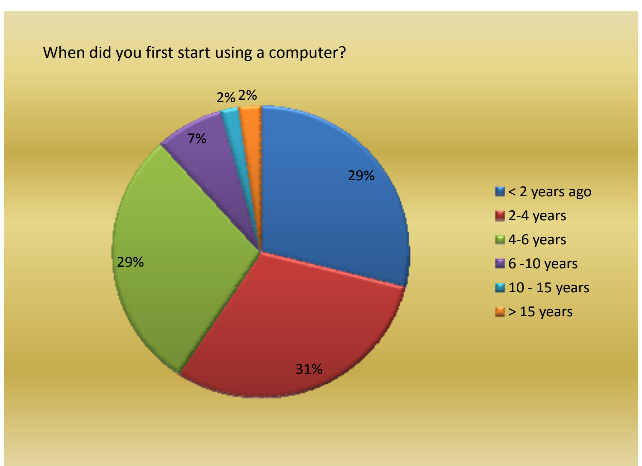
Table 4.16 reveals that, from a total of 179 respondents who responded to this question, only 43 or 24% found the ICT environment outside campus *easy* or *very easy* to operate. The remainder of the students who answered the question found the ICT environment outside the campus either *difficult* or *very difficult* to use.

The response to an open question on the reason for ICTs availability is analysed here. There were 143 respondents with many different responses. It was possible to separate the responses into five categories. 46 respondents complained about the general unavailability of access. 23 respondents attributed their lack of access to their financial situation. 25 complained about noise. It appears therefore that the main areas of concern are noise and finance. As expected in the case of students with disadvantaged background access to ICTs are mostly provided through the institution without which student becomes academically handicapped.

4.1.6 ICT Background and Academic Use (A18)

One of the critical assumptions that have been made in this study is that the students from University of Limpopo do not have computer experience when they start their education at the University. This question aims at verifying the accuracy of this statement. The respondents were asked when the first time was that they used a computer. Their responses are illustrated in Figure 4.17 and Table 4.19 below.

Figure 4. 17 – Time of students' first computer use



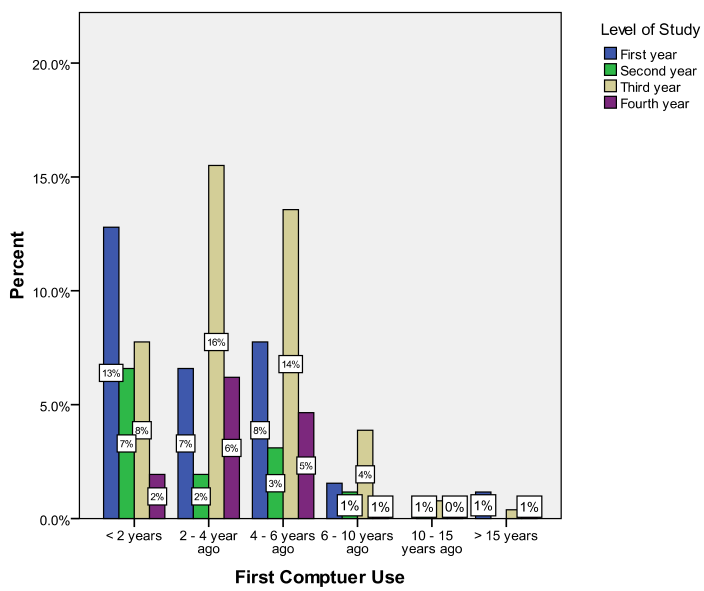
=	#	%
< 2 years ago	74	28.9
2-4 years ago	78	30.5
4-6 years ago	74	28.9
6 -10 years ago	19	7.4
10 - 15 years ago	5	2.0
> 15 years ago	6	2.3
	256	100.0

Table 4.19 – Time of students' first computer use

Table 4.19, above, indicates that out of the 256 students who answered the question, 30 or 11.7% first began to use a computer more than 6 years previously.

In order to make these figures more meaningful, I compared the first reported use of computers among the respondents with the level of study in which they found themselves. The results are demonstrated in the following figures.

Figure 4. 1810 – Respondents' first reported computer use in conjunction with current study level in percentage.



It should be noted that there are 94 respondents with student numbers ranging from 2001 to 2004 indicating when they first started at the University. This means that although a student might have registered for a particular course and at a level of study, he or she is not necessarily taking the minimum years to complete it. This also means that majority of students starting their education in UL have not been exposed to computers, even though Figure 4.18, above, does indicate that this picture is changing and that the newer students are more experienced in computer use than their predecessors.

In order to confirm these findings, I used a chi square test which is used in comparing two categorical variables to determine the relationship between year of study and computer experience. Table 4.20 shows the corresponding n values. The p value is 0.001. This implies that computer experience is positively related to number of years of study on campus. In order to have a valid test I had to combine the number of cases with more than 6 years of experience.

			Level of Study				Total
			First year	Second year	Third year	Fourth year	
First Computer Experience	< 2 years	Count	33	17	20	5	75
		% within Level of Study	42.9%	48.6%	18.5%	13.2%	29.1%
	2 - 4 year ago	Count	17	5	40	16	78
		% within Level of Study	22.1%	14.3%	37.0%	42.1%	30.2%
	4 - 6 years ago	Count	20	8	35	12	75
		% within Level of Study	26.0%	22.9%	32.4%	31.6%	29.1%
	> 6 years	Count	7	5	13	5	30
		% within Level of Study	9.1%	14.3%	12.0%	13.2%	11.6%
Total		Count	77	35	108	38	258
		% within Level of Study	100.0%	100.0%	100.0%	100.0%	100.0%

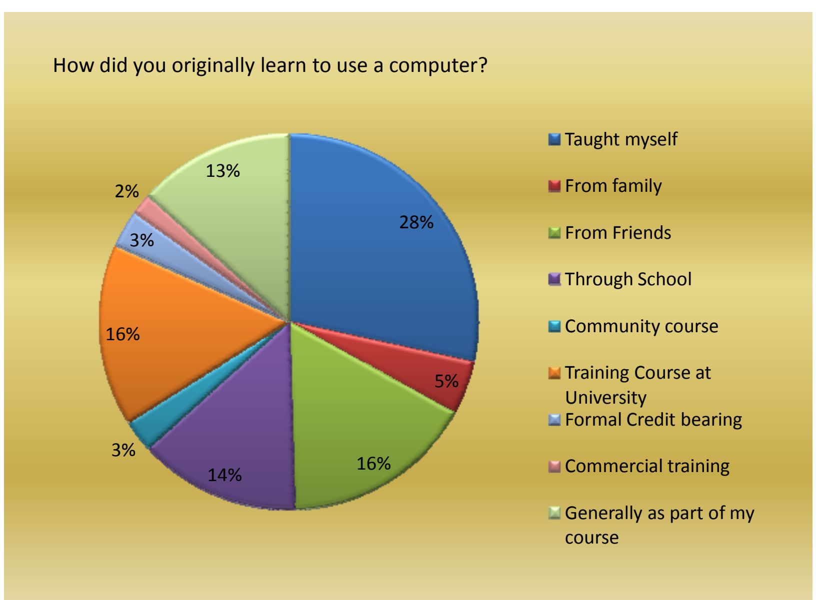
Table 4.20- Computer experience vs. year of study

Table 4.20, above, confirms the notion that most students who come to UL have not used a computer prior to their study at the University. 42.9% of the first year students and 48.6% of the second year students have stated their computer use is less than 2 years. However, 51.1% of the first year respondents have indicated that they have used computers for more than 2 years. This appears to contradict the understanding that students do not have exposure to ICTs prior to their study at the University. An examination of the student number for these students clears the puzzle. From the 77 first year respondents only 47 have a student number that starts with 2008. This means that even though a respondent might be in their first year of study, they actually started more than a year earlier. A total of 30 students were in this category. For the third and forth year study level the issue is easier to verify since close to 70% of the participants have indicated that they have between 2 – 6 years ICT experience.

4.1.7 Source of the First Computer Training (A19)

The questionnaire included a question to determine the source of students' first source of computer training. Figure 4.19 below, graphically depicts their responses, and Table 4.21 displays the same information in tabular form.

Figure 4. 19 - Source of students' first computer training



	#	%
I taught myself	62	28.4
My family	10	4.6
My Friends	36	16.5
My School	30	13.8
In a community course	6	2.8
In a training course at university	34	15.6
As part of a formal credit	7	3.2
From my commercial training	4	1.8
Generally as part of my present course	29	13.3
	218	100.0

Table 4.21 – The source for student's first computer training

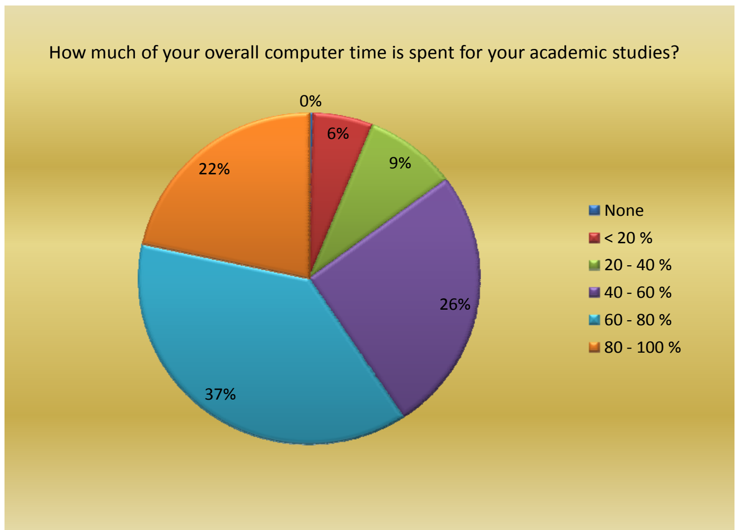
Table 4.21, above, shows that 62 of the 218 respondents or 28.4% were self-taught. 34 respondents or 15.6 % reported that they had acquired their computer skills in formal computer training courses at university. These respondents, together with those who acquired their skills as part of their course (the last category in the above table) constitute 28.9% of respondents who have been assisted by the university. Apart from the 28.4% who taught themselves, 14.4% learned their computer skills from their friends.

When examining the results from this and the last section (4.1.6), a number of conclusions can be made. Firstly, while the overwhelming majority of the participants did not use computers when they joined the university, at the time of the survey they all reported using them. Second, the University is responsible for 32.1% of this familiarization and, of the remaining, the highest percentage being the self-taught category, was made possible without any assistance from the University.

4.1.8 Extent of ICT Use for Academic Purpose (A22)

In response to the question, “How much of your overall computer use is spent for academic purposes?”, students responded in the ways depicted in Figure 4.20 and Table 4.22 below.

Figure 4. 20 – Percentage of time that computer is used for academic purposes

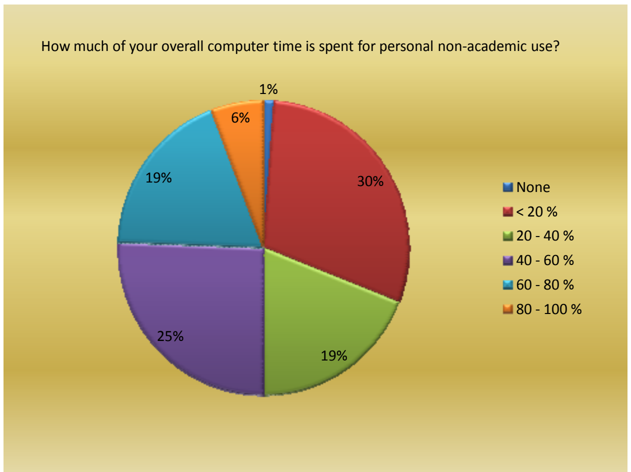


	#	%
None	1	0.4
< 20 %	15	5.7
20 - 40 %	23	8.7
40 - 60 %	68	25.9
60 - 80 %	99	37.6
80 - 100 %	57	21.7
	263	100.0

Table 4.22 – Percentage of time that computer is used for academic purposes

Table 4.20 , above, shows that only one respondent reported no time on the computer for academic purposes. 15 respondents or 5.7% reported that they used less than 20% of their time on the computer for academic purposes. The balance of the students (which constitutes 93.9% of the respondents) reported that they used more than 20% of their time on the computer for academic purposes, with more than 20% of the respondents reporting that they used 60-80% of their time on the computer for academic purposes. The amount of computer time used for personal non-academic purposes is illustrated in Figure 4.21 below and in Table 4.23.

Figure 4. 21 – The amount of computer time used for non-academic purposes.



	#	%
None	3	1.2
< 20 %	77	29.8
20 - 40 %	49	19.0
40 - 60 %	66	25.6
60 - 80 %	48	18.6
80 - 100 %	15	5.8
	258	100.0

Table 4.23 – Computer time used for non-academic purposes (percentages)

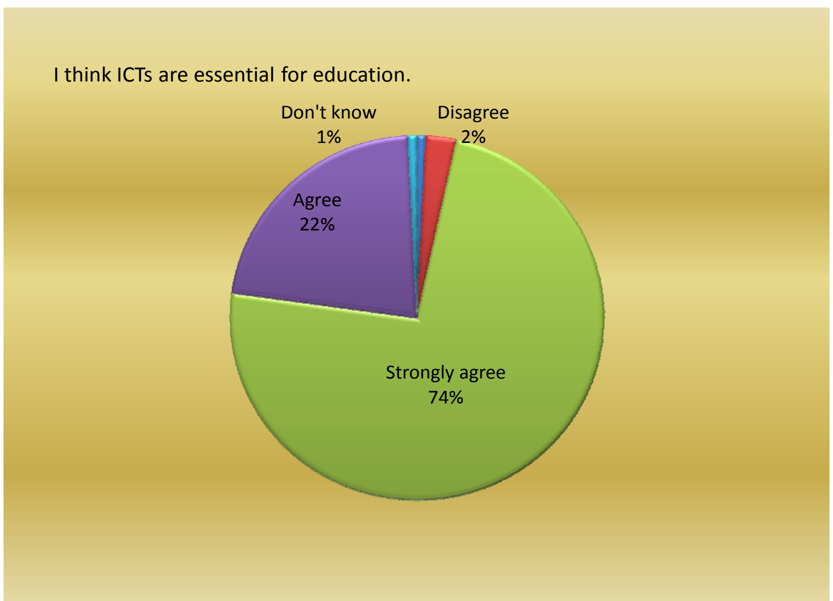
A comparison of Tables 4.22 and 4.23, above, shows a generally heavier usage towards academic use as compared to personal. It shows an almost a symmetrical usage with higher percentage of academic usage when personal usage is lower.

Based on the data presented above, a clear picture is emerging in terms of computer use and dependency for both academic and non-academic purposes. Those who responded to the survey are highly dependent to ICTs and use them heavily.

4.1.9 Attitude Towards ICTs

In this section, I aim to find what students think of ICTs. Figure 4.22 below graphically depicts the students' responses to the statement, "I think ICTs are essential for education".

Figure 4. 22 – Student's perception of the importance of ICTs for education.



As can be seen from Table 4.24, out of the 263 respondents who responded to this question, a total of 9 students or 3.5% either strongly disagreed or disagreed with the statement. Taking the 2 respondents who said they do not know, the remaining 252 or 95.7% of the respondents either agreed or strongly agreed with the statement.

"I think ICTs are essential for education."	#	%
Strongly disagree	2	0.8
Disagree	7	2.7
Strongly agree	194	73.8
Agree	58	22.1
Don't know	2	0.8
	263	100.0

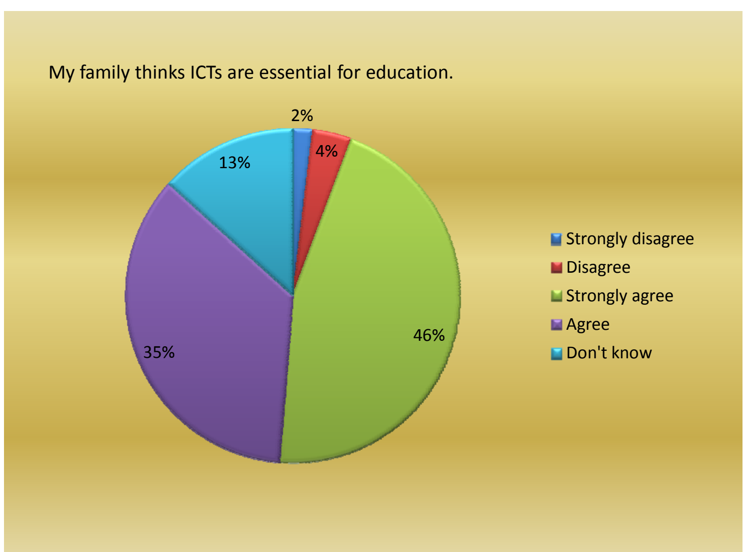
Table 4.24 - Student's perception of the importance of ICTs for education

These responses indicate a tremendous receptivity on the part of students to the role of ICT in education.

4.1.10 Respondents Views of their Family's Attitude Towards ICTs (A26)

In this section, I aim to find respondents' view of their family's attitude towards ICTs for education. Figure 4.23 and Table 4.23 below illustrate the question and their responses.

Figure 4. 23 11 – The attitudes of students' families toward the importance of ICT in education, as reported by respondents.



	#	%
Strongly disagree	5	1.9
Disagree	10	3.8
Strongly agree	120	45.6
Agree	93	35.4
Don't know	35	13.3
	263	100.0

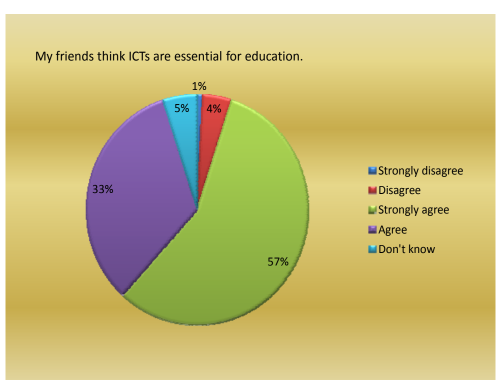
Table 4.25 – The attitudes of students' families toward the importance of ICT in education as reported by respondents

Table 4.25, above, shows a strong family support for ICT usage in education. A total of 81.0% of the respondents (or 213 of the 263 respondents), reported that their family "Strongly Agree" or "Agree" with the idea of ICTs being essential for education.

4.1.11 Respondents' View of their Friends' Attitude Towards ICTs (A26)

In this section, I aim to find the attitude of students' friends towards ICTs as perceived by respondents. Figure 4.24 and Table 4.24 illustrate the statement and respondents' view of the attitudes of the students' friends towards the importance of ICT in education.

Figure 4.24 – The attitudes of the students' friends towards the importance of ICT in education as reported by respondents



	#	%
Strongly disagree	2	0.8
Disagree	11	4.2
Strongly agree	147	56.8
Agree	86	33.2
Don't know	13	5.0
	259	100.0

Table 4.26 – The attitudes of the students' friends towards the importance of ICT in education as reported by respondents

Although the responses were not identical in the last three sections, one can detect a similarity between students' attitude towards ICTs for education, their family's (parents') and their friends'. It is interesting to note that 233 or 90% of the participants felt their friends "Agree" or "Strongly agree" with the idea that ICTs are essential for education.

4.1.12 **Relationship with Employment (A26)**

When the respondents were asked whether ICT skills are required for future employment, they responded in the following way.

	#	%
Strongly disagree	0	0.0
Disagree	4	1.5
Strongly agree	190	72.8
Agree	62	23.8
Don't know	5	1.9
	261	100.0

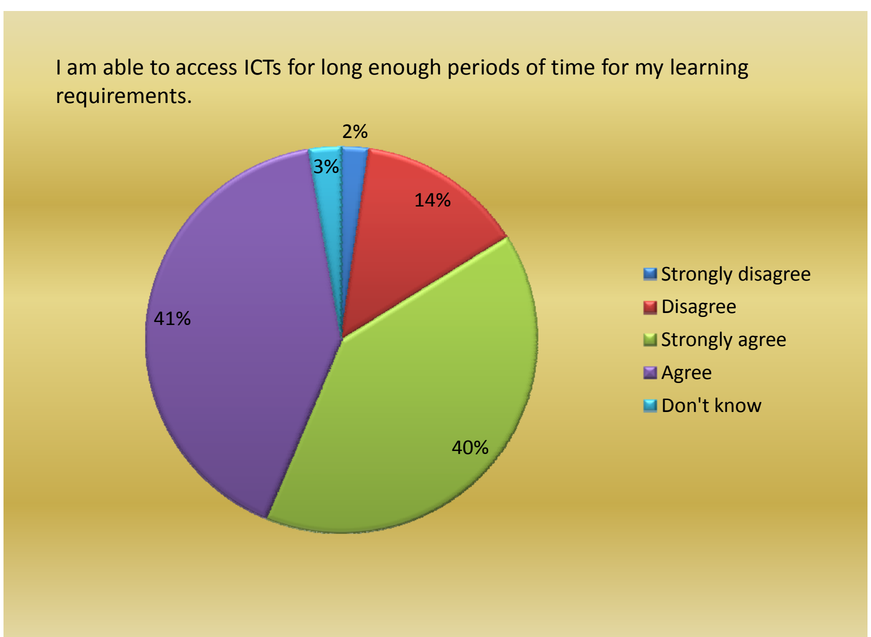
Table 4.26 – Student opinions about the importance of ICT skills for future employment

As can be seen from Table 4.27, 96.5 % of the participants agreed strongly or very strongly that ICT skills are important for future employment. Referring to ICTs, Saadé, and Molson (2003, p. 267) stated that 'perceived usefulness' was found to have a significant positive influence on intentions to use. An interesting observation can be made here. The high level of perceived usefulness, as confirmed also by the literature, could be responsible for high ICT use. The fact that the population in question comes from homogenous cultural background reaffirms this phenomenon which has resulted in such a similar response to these questions.

4.1.13 Access to ICTs for Teaching and Learning (A26)

In response to the statement, "I am able to access ICTs for long enough periods of time for my learning requirements", the students provided the following responses in Figure 4.25 and Table 4.28.

Figure 4. 25 12 – Student opinions about being able to access ICTs for long enough periods for their learning requirements



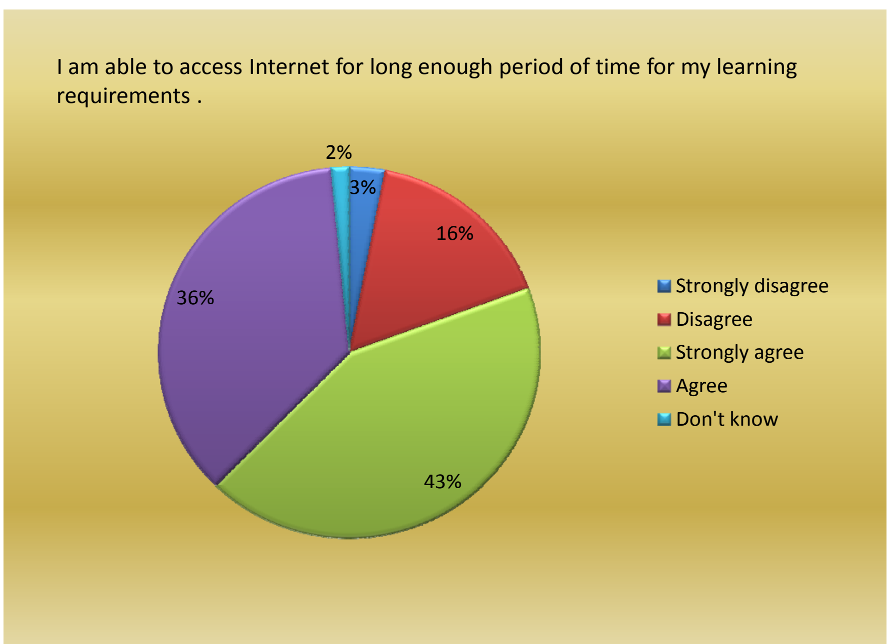
		6.0
	#	%
Strongly disagree	6	2.3
Disagree	36	13.8
Strongly agree	105	40.2
Agree	107	41.0
Don't know	7	2.7
	261	100.0

Table 4.28 – Student opinions about being able to access ICT for long enough periods for their learning requirements

212 participants or 81.2% either agree or very strongly agree with the statement that they are able to access ICTs for long enough periods for their learning requirements.

The students' responses to a similar question about the availability of the Internet produced the following results as shown in Figure 4.26 and Table 4.29.

Figure 4. 26 – Students opinions about whether they are able to access the Internet for long enough periods for their learning purposes



	#	%
		6.0
Strongly disagree	8	3.0
Disagree	43	16.3
Strongly agree	113	43.0
Agree	95	36.1
Don't know	4	1.5
	263	100.0

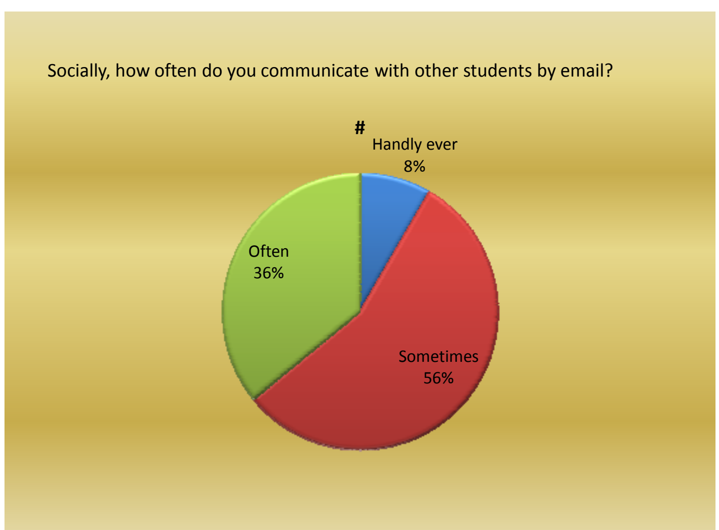
Table 4.29 – Students opinions about whether they are able to access the Internet for long enough periods for their learning purposes

79.9% of the respondents agreed or strongly agreed with the statement that they were able to access the Internet for long enough periods for their learning purposes. This clearly indicates the adequacy of access to ICTs on campus at least for close to 80% of those who responded to this question.

4.1.14 Students Social Use of ICTs (B1)

When students were asked how often they communicated with other students by email socially, they produced the following responses in Figure 4.27 and Table 4.30.

Figure 4. 27 – Frequency of student communication with fellow students by email



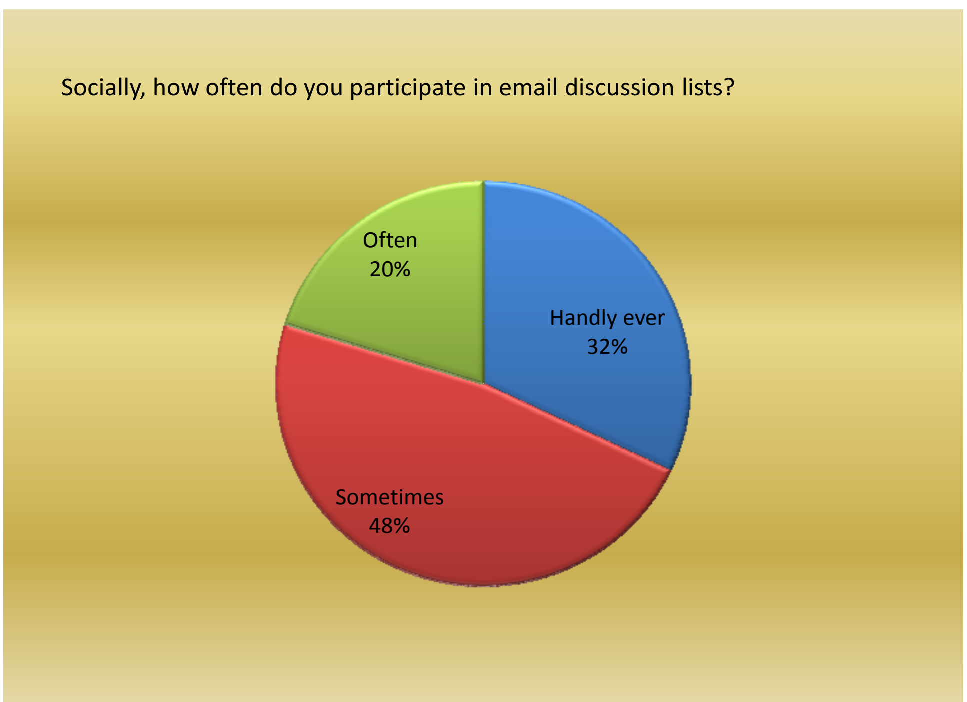
		#	%
			6.0
	Hardly ever	22	8.4
	Sometimes	146	55.7
	Often	94	35.9
		262	100.0

Table 4.30 – Frequency of student communication with fellow students by email

Only 8.6% of the respondents "*hardly ever*" use email to communicate with their fellow students. The remaining 91.6% of the respondents use e-mails to communicate with their friends either "*sometimes*" or "*often*".

When students were asked about the frequency of their use of email discussion lists, they responded as is reflected in Figure 4.28 and Table 4.31, below.

Figure 4. 28 – Frequency of participation in an email discussion socially



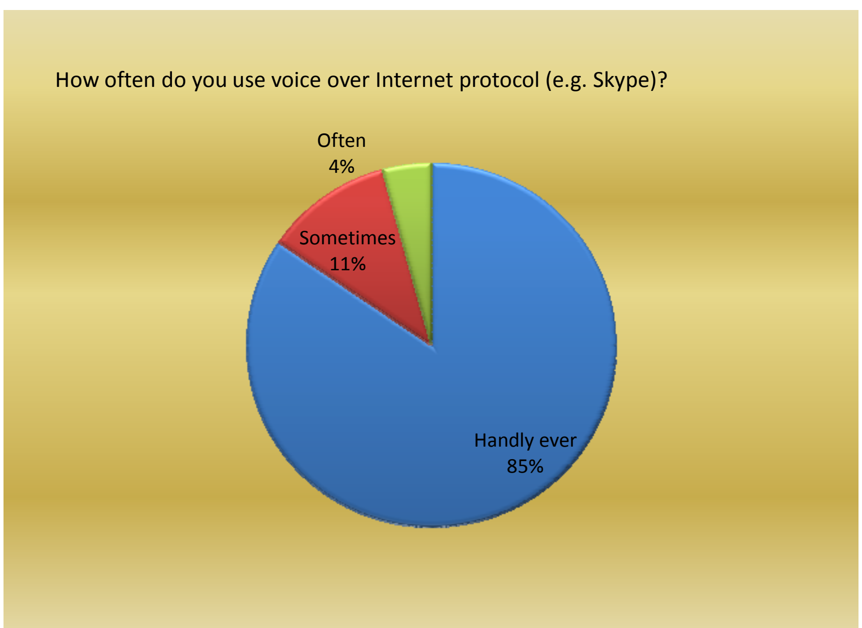
		6.0
	#	%
Hardly ever	84	32.1
Sometimes	125	47.7
Often	53	20.2
	262	100.0

Table 4.31 – Frequency of participation in an email discussion socially

32.1% of the participants reported that they "*hardly ever*" engaged in list discussions by means of e-mails. 47.7% reported that they "*sometimes*" became involved in such discussions, while 20.2% reported that they "*often"* engaged in list discussions by means of e-mails.

When the respondents were asked how they used voice-over IP protocols such as Skype, their responses were as reflected in Figure 4.29 and Table 4.32, below.

Figure 4. 29– The frequency with which students use voice-over IP protocols such as Skype



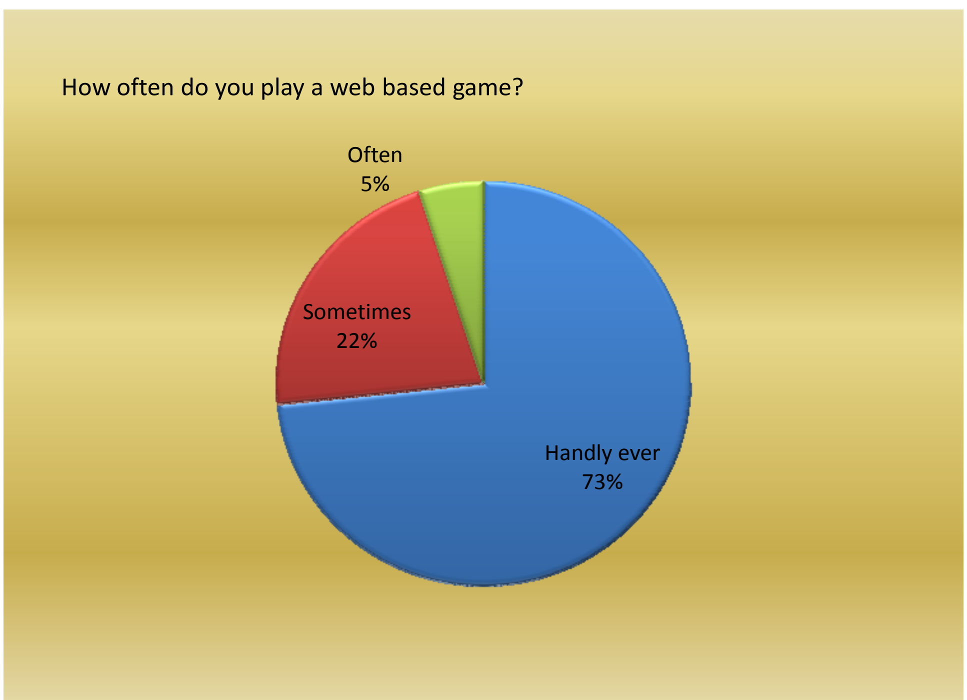
		6.0
	#	%
Hardly ever	219	84.6
Sometimes	29	11.2
Often	11	4.2
	259	100.0

Table 4.32 – The frequency with which students use voice-over IP protocols such as Skype

Figure 4.29 and Table 4.32, above, show that only very few students (4.2% of the total number of respondents) makes use of this facility on regular basis. 84.6% of the respondents use Skype *hardly ever* and 11.2% use it *sometimes*.

Responses to a question about the frequency of students use of computer games, produced the following responses in Figure 4.30 and Table 4.33, below.

Figure 4. 30 – Frequency of student use of computer games



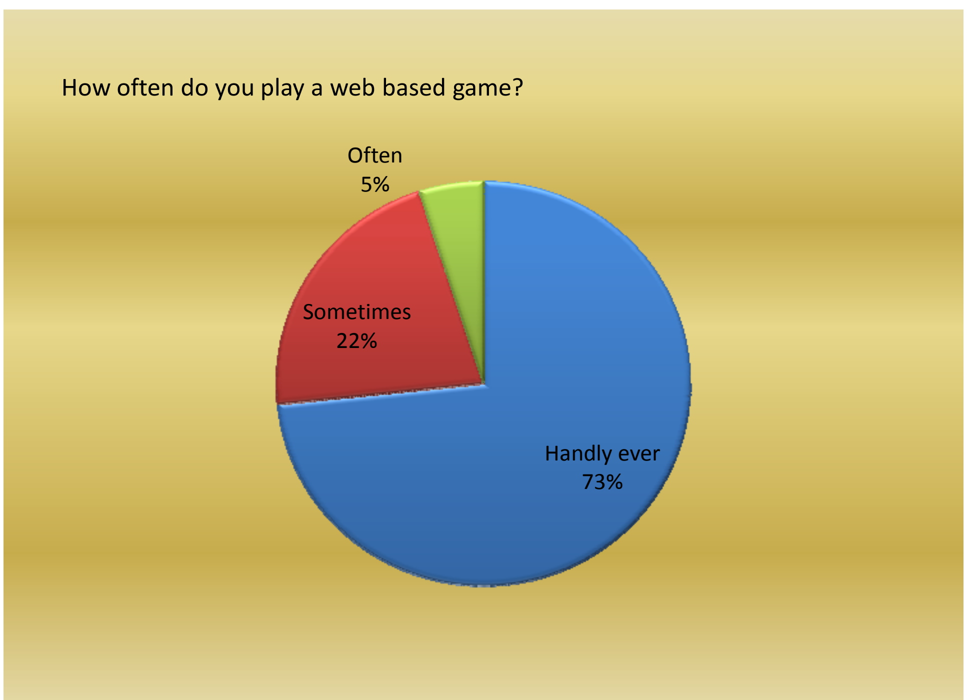
	#	%
		6.0
Hardly ever	164	63.6
Sometimes	78	30.2
Often	16	6.2
	258	100.0

Table 4. 33 – Frequency of student use of computer games

Figure 4.30 and Table 4.33 show that only 6.2% of the total number of respondents play a computer game *often*.

When students were asked about how frequently they played computer games over the Internet, they reported an even lower frequency.

Figure 4. 31 – The frequency of student use of the Internet to play computer games



		6.0
	#	%
Hardly ever	190	73.4
Sometimes	56	21.6
Often	13	5.0
	259	100.0

Table 4.34 – The frequency of student use of the Internet to play computer games

While the number of students who often use the Internet to play computer games is 5.0%, (Figure 4.31 and Table 4.34) the number of students who use the Internet to play computer games *sometimes* is 21.6% – approximately 20% less than those who merely use the computer alone (without the Internet) to play computer games.

These results indicate an interesting phenomenon. The use of ICTs is predominately limited to the academic use and as yet does not play a dominant role in their social interactions. This is true even in the case of email which could have been in higher use considering the high level of ICT use. It is even less pronounced in discussion groups, the use of skype and computer games.

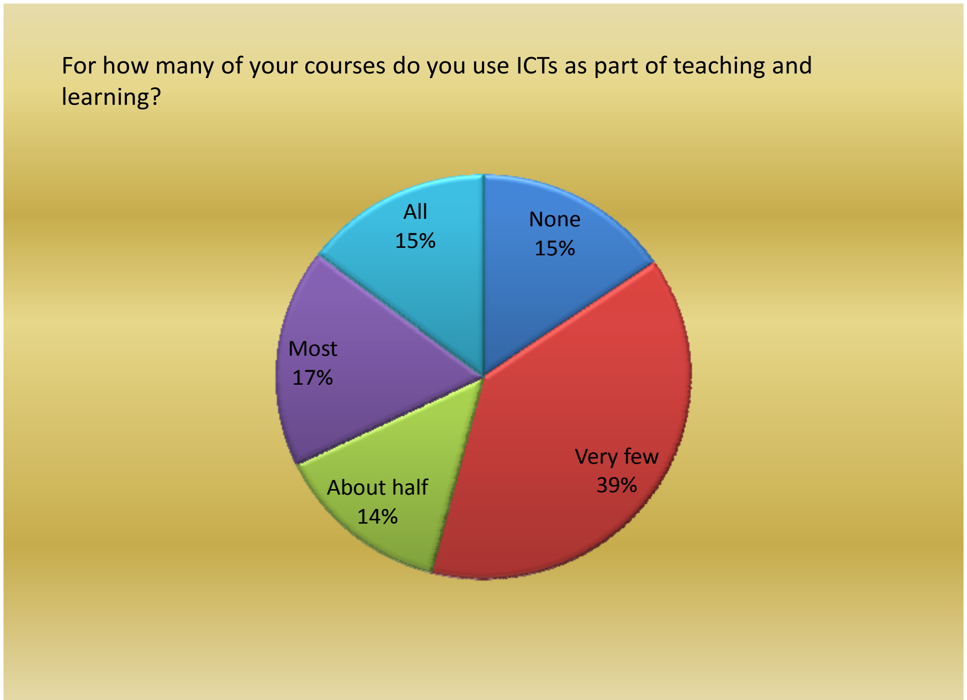
4.1.15 ICT Use as Encouraged by the Academic Community (B2)

Contemporary classrooms and lecture halls are being equipped with information and communication technology (ICT) and new media to support teaching and learning.

(Vallance and Towndro, 2007, p. 219)

In response to the question "For how many of your courses do you use ICTs as part of teaching and learning?", the following responses were recorded in Figure 4.32 and Table 4.35.

Figure 4. 132 – The number of courses in which lecturers encourage the use of ICTs



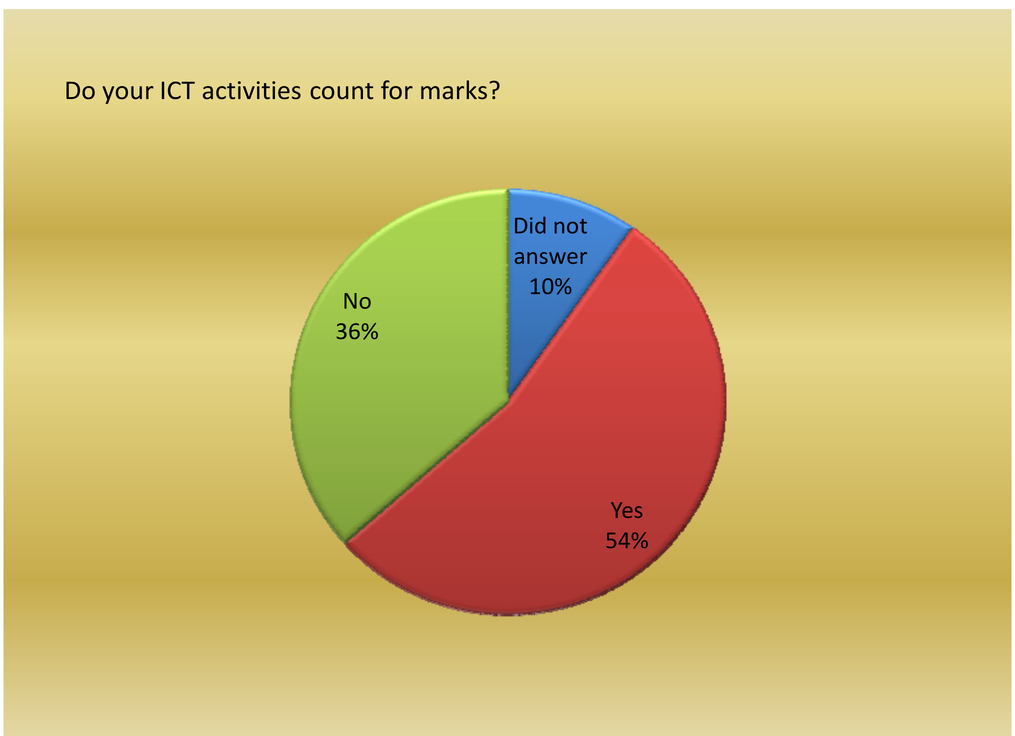
		6.0
	#	%
None	38	15.4
Very few	95	38.6
About half	34	13.8
Most	43	17.5
All	36	14.6
	246	100.0

Table 4.35 – The number of courses in which lecturers encourage the use of ICTs

15.4% reported that they did not use any ICTs in their academic courses (and were thus not encouraged by lecturers to use ICTs as part of their courses), while 38.6% reported that they used ICT in *very few* courses. 43 respondents (or 17.5%) reported that they used ICT in *most* of their courses. Alternatively, 45.9% (the sum of the last three categories in the Table 4.35) of the respondents are using ICTs as part of the teaching and learning experience. When one compares the data from this table with the responses in section 4.1.9, Table 4.24, which demonstrated that 95.9% of the student respondents either agreed or strongly agreed about the importance of ICT in education, it becomes evident that there is an enormous students' receptivity and potential for growth in the use of ICTs in academic courses – and that the students themselves would overwhelmingly welcome such an increase in usage.

In response to a question that asked whether ICT activities were awarded marks by lecturers, the students provided the following responses captured in Figure 4.33 and Table 4.36.

Figure 4. 143 – The extent to which ICT activities are awarded marks by lecturers



	#	%
		6.0
Did not answer	26	9.8
Yes	143	53.8
No	97	36.5
	266	100.0

Table 4.36 – The extent to which ICT activities are awarded marks by lecturers

The majority of the respondents (53.8%) said that lecturers did indeed award marks for ICT activities.

To explore the extent of ICT integration with the academic programmes, a series of questions were presented to the students. They examined the use of presentation tools such a Power Point, office applications such as MS Excel and application programmes such as GIS. The response is captured in Table 4.37.

How often do your lecturers explain or demonstrate concept using:

Presentation tools (Power Point)			**Excel**			**GIS**		
	#	%		#	%		#	%
Hardly ever	61	23.6	Hardly ever	84	33.2	Hardly ever	140	55.6
Sometimes	98	38	Sometimes	99	39.1	Sometimes	65	25.8
Often	99	38.4	Often	70	27.7	Often	47	18.7
	258	100		253	100		252	100

Table 4.37 – ICT tools used by the academics

Table 4.37 demonstrate the use of ICT tools as perceived by the respondents. A general comment that can be made is that they are not used very often. In the case of Power Point one expects that the usage to be higher that 38.4%. There does not seem to be an alignment between the situation in UL and the views expressed by Vallance and Towndro (2007, p. 219) who say PowerPoint, the widely-used slide-show software package, is finding increasing currency in lecture halls and classrooms as the preferred method of communicating and presenting information. Also it does not take advantage of what Adams (2006, p. 408) referred to as an excellent instrument of lecture presentation, allowing teachers to gather and organize an astonishing array of digitized materials for that purpose into a single file.

With each tool, respondents were asked to state the level of its helpfulness. Table 4.38 summarises the responses.

Presentation tools (Power Point)			**Excel**			**GIS**		
	#	%		#	%		#	%
Makes it harder	9	3.6	Makes it harder	9	3.7	Makes it harder	20	8.1
No help	12	4.7	No help	24	9.8	No help	34	13.8
Some help	53	20.9	Some help	57	23.3	Some help	54	21.9
Very helpful	157	62.1	Very helpful	121	49.4	Very helpful	75	30.4
N/A	22	8.7	N/A	34	13.9	N/A	64	25.9
	253	100		245	100		247	100

Table 4.38 – ICT tools degree of helpfulness

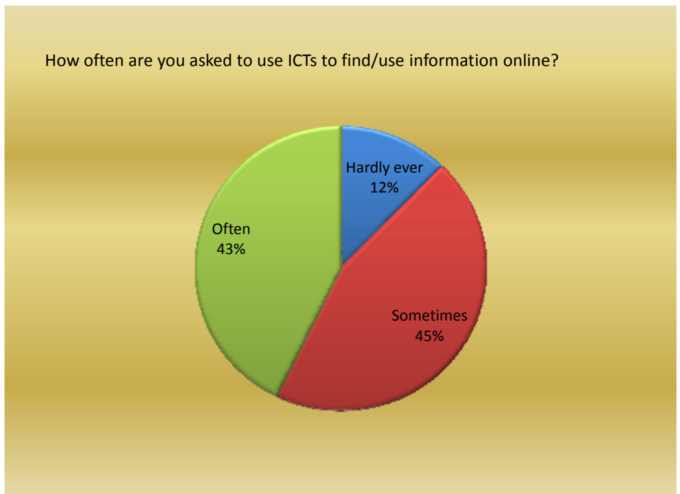
It can be seen from Table 4.38 that respondents have a positive overall response to these tools. If a tool is used by the lecturer it has a positive response from the students in the majority of the cases. In the case of Power Point where the highest number of responses is recorded, 83% of those who responded to this question found it helpful or very helpful. Once again these results demonstrate the potential and receptivity for higher level of ICT use. The feeling expressed here by respondents find justification in the literature where Admas (2004, p. 289) points out that survey data suggest students find PowerPoint a useful cognitive tool.

4.1.16 Expectations for Students' ICT use at University (B5)

In response to the question of "How often do you use ICTs to find general course information online?", the following responses are summarized in Figure 4.34 and Table 4.39 were collected.

45% or 117 of the respondents reported they "*sometimes*" used ICTs to find course information online. 42.7% or 111 respondents reported that they "*often*" used ICT to find course information online. The remaining 12.3% (32 respondents) reported they "*hardly ever* " used ICTs to find course information online.

Figure 4. 154 – Frequency of searching for online course material

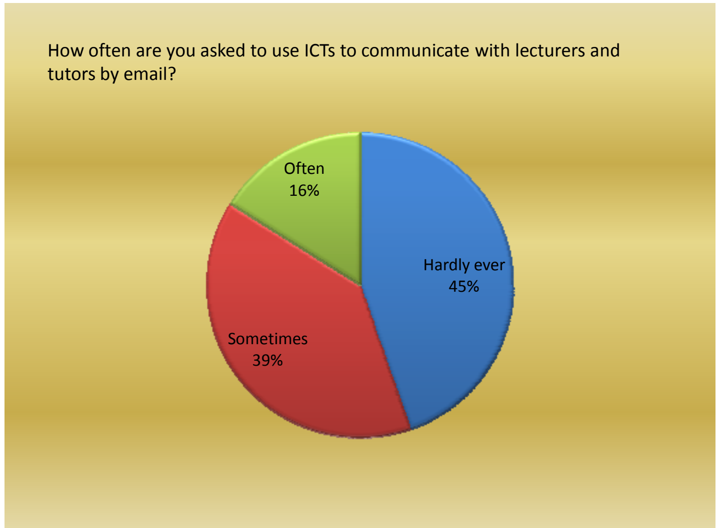


			6.0
		#	%
	Hardly ever	32	12.3
	Sometimes	117	45.0
	Often	111	42.7
		260	100.0

Table 4.39 - Frequency of searching for online course material

In response to the question, "How often are you asked to use ICTs to communicate with lecturers and tutors by email?", the following responses were noted.

Figure 4.35 – Frequency with which students engage in email interactions with their lectures and tutors



		6.0
	#	%
Hardly ever	114	44.7
Sometimes	100	39.2
Often	41	16.1
	255	100.0

Table 4.40- Frequency with which students engage in email interactions with their lectures and tutors ‘

16.1% reported that they “*often”* use email communications to correspond with their lecturers and tutors, while 39.2% use e-mail “*sometimes*” for the same purpose. 44.7% reported that they “*hardly ever*” used e-mail to communicate with their lecturers and tutors.

4.1.17 Students’ Perception of the Educational Benefits of ICTs (B16)

A number of questions in the questionnaire assessed students’ opinion regarding the usefulness of the role of ICTs in relation to their abilities to study. Students, for example, were asked if they thought ICTs helped them with their learning by improving their ability to recall facts, basic concepts and answers or understand concepts or analyse information.

Table 4.41 contains the questions and their responses. It can be seen that in all cases there is more than 69.1% positive response where respondents think that ICTs can help them to improve their abilities.

Do you think ICTs help you with your learning by improving your ability to:						
	Recall facts, basic facts and answers		Understand Concepts		Analyse Information	
	#	%	#	%	#	%
Yes	177	69.1	201	79.4	193	76
Sometimes	63	24.6	41	16.2	45	17.7
No	9	3.5	7	2.8	9	3.5
Don't know	7	2.7	4	1.6	7	2.8
	256	100	253	100	254	100

Table 4.41 – Students' opinion on the helpfulness of ICTs for improving their study capabilities

In the case of ICTs helping to understand concepts, one sees the highest support from the respondents (79.4%).

These results confirm yet again a positive and almost total support for ICTs.

Summary of the Findings - ICT Use and Dependency

In this section, I summarize the findings which focused on students' use of ICTs and their extent of dependency on ICTs for achieving their academic goals.

4.1.17.1 Dependency on ICTs

The analysis of the results painted an interesting picture. On one hand, the overwhelming majority of the respondents had not used a computer prior to their studies at the University. On the other hand, 91.9% reported they use a computer on campus for more than 20% of their time (section 4.1.4.1, Table 4.5). The fact that the University was responsible for only 32.1% of this familiarization (section 4.1.7, Table 4.21) and that of those remaining, 28.4% were self-taught is an indication of the respondents' level of interest and dependency on ICTs.

In addition, the findings reported in the following sections are indicative of a high level of dependency and receptivity towards ICTs:

- Section 4.1.4.2 (Internet use on campus) where it was shown that with one exception everyone uses the Internet.
- Section 4.1.4.5 where it was shown that most of the ICT use is self-initiated.
- Section 4.1.5, Tables 4.17 and 4.18 where inadequate off-campus access was shown to be a clear problem for the respondents.
- Section 4.16, where the extent of ICT use for academic purposes was measured and it was concluded that there was a high degree of dependency (Tables 4.22 and 4.23).
- Sections 4.1.9, 4.1.10 and 4.1.11 where attitude towards ICT was examined (Tables 4.24, 4.25, 4.26) indicating a high level of support from respondents and even from family and friends as reported by the respondents.
- Off-campus access to the Internet was shown to be more limited. Only 44.7% of respondents reported they enjoyed such access (Table 4.14). More significantly only 16.0% (section 4.1.5.1, Table 4.17) reported to have *easy* or *very easy* access to ICTs Off-campus. 78.5% of those with Internet access use their cellular phones for access to the Internet (Table 4.15). This shows the extreme urgency that students must feel towards

having Internet access since this cost is undertaken by students directly who come from financially challenged backgrounds.

- 85.2% of the respondents used more than 40% of their computer time for academic purposes (Table 4.22).
- 95.9% of the respondents (Table 4.24) agreed or strongly agreed that computers are essential for education.
- Section 5.1.15 demonstrated that the level of ICT use, e.g. tools such as Power point and Excel, by the academic community was not very high. However, Table 4.38 shows that a high percentage of respondents find them useful when they are used.
- Section 4.1.17, Table 4.41 showed how respondents think highly of ICTs as a tool that can help them improve their abilities.
- Section 4.1.12 showed respondents' opinion regarding the importance of ICT skills for future employment as being very high.

Previous research expects consequences for such a high level of perceived usefulness. Saadé and Molson (2003) reported that 'perceived usefulness' was found to have a significant positive influence on intentions to use which is confirmed in this study i.e. the perceived level of usefulness and use are both high. However these findings are in contrast to a study done by Olivier (2006) that indicates learners (at high school level who are from deprived conditions) having low levels of motivation for learning. From Olivier's study, one expects that students from disadvantaged (he uses the term deprived) background not to be motivated. In this study one sees the opposite. Students do not show any sign of lack of motivation to embrace learning or technology.

It should be noted that an exception to the high level of utilization of ICTs is in the realm of social use. This study did not find ICTs to play a dominant role in the social life of the respondents (section 4.1.14).

The picture that emerges from these findings is very interesting. There seems to be a high level of support and receptivity towards ICT use. It provides the academic structures of the University with a tremendous opportunity and at the same time a challenge to translate this receptivity into academic excellence.

4.1.17.2 Importance of Infrastructure

81.9 % of the respondents reported that they found it "easy" or "very easy" to gain access to ICTs on the campus (Table 4.10).

The situation off-campus is the exact opposite. 41% of those who responded to this question reported that they enjoyed only limited access to computers off-campus (section 4.1.5). Most of the respondents (67.6%), however, found it "difficult" or "very difficult", while 16% reported that they found it "easy" or "very easy" (section 4.1.5.1, Table 4.17). In addition, the fact that 81.2% of students either agreed or very strongly agreed with the statement that they have access to ICTs for a sufficiently long time when they need to have such access (section 4.1.13, Table 4.28), suggests a positive picture about the availability and adequacy of the infrastructure from the point of view of the respondents. It is, however, necessary to balance this positive picture with the comments collected from those students who were not satisfied. Students in this category complained about environmental issues such as insufficient number of computers and noise (section 4.1.4.4, Table 4.11).

4.1.17.3 The Features of ICTs that were of Most Interest to Students

> *"The use of technology is not about replacing learner process, but enhancement and extension of such"*
>
> (Singh, O'Donoghue and Worton, 2005, p. 22).

One sees a clear realization of the above statement in this study where ICTs are clearly seen as instrument for the acceleration of the learning process. There seemed to be a general interest among most of the respondents in the available ICT services. This is supported by the following evidence:

- Judging by the response captured earlier (section 4.1.4.1, Table 4.5) every respondent uses a computer. More significantly, 92% of the respondents use a computer more than 20% of the time for an academically related purpose. This shows that computers are a critical and indispensable component of the life of a student. Furthermore, this applies to all students irrespective of the faculty from which they come from (Figure 4.5 and Table 4.6).

- Internet (section 4.1.4.2) seems to follow a similar pattern in terms of its popularity with students with only one student reporting not using it. 91.1% of respondents use Internet for more than 20% of their academic time (Tables 4.7). Again, in terms of Internet use there is no difference between different faculties statistically (Figure 4.7 and Table 4.8).

- Next in terms of popularity is the email service. 91.6% of the respondents reported that they use the e-mail either "sometimes" or "often" (Table 4.30) while 67.9% of respondents reported that they used it "sometimes" or "often" in discussions with one another (Table 4.31).

- The responses of the students indicated that other technologies such as Skype, applications such as GIS, electronic discussion groups and computer-based games were not yet being used by the respondents extensively (Table 4.32, 4.33, 4.34).

4.1.17.4 Are Any Institutional Changes Necessary?

Integration of ICTs in the functions of any organization is a complex process that needs to be fully conceptualized and defined from the *beginning. However, this is not the case in many higher learning institutions in developing countries as most of them have embraced the ICT integration process without clear plans to guide the way. The institution ICT policy and strategic plan should be defined to provide a framework for the development and implementation of specific ICT projects* (Sife, Lwoga and Sanga, 2007, p. 6).

This section describes those areas in which the findings suggest that certain institutional changes are necessary.

- Although 40% of the computer laboratories are owned by faculties (section 4.1.4.3), only 15.8% of the respondents reported that they used the computers administered by the faculties (Table 4.9). By contrast, 79.6% indicated that they used the computer laboratories that were administered by the University's central administration. This indicates that faculty-administered computer laboratories are possibly underutilized and could therefore provide a solution to the problem of inadequate computers access mentioned under section 4.1.4.4, Table 4.11.

- Despite the high level of access (Table 4.10) and interest in computers, only 31.1% (Table 4.21) of the respondents reported that they had their ICT training from the university. This suggests that the current ICT training programmes made available by the formal academic structures of the university have room for improvements.

- In terms of ICT use in teaching and learning, 38.8% of the respondents reported “very few” of their courses (Table 4.35) used some form of ICTs. This seems to suggest that the university has not adopted an overall strategy to utilize ICTs’ potential in the realization of its teaching and learning objectives. On the other hand the intense interest in ICTs as demonstrated by the respondents suggests that with very little effort on the part of the institution, major progress could be made to turn the situation around.

> Referring to disadvantaged students Punie, Zinnbauer and Cabrera (2006, p. 16) stated that there is some evidence that ICT can give greater opportunities for accessing learning to those who need it the most.

The picture that emerges is that UL can go a long way towards embracing ICTs for teaching and learning to arrive at its fullest potential. These words from Selwyn **(**2007, p.82) provides a befitting conclusion for this section.

> *"Despite huge efforts to position information and communication technology (ICT) as a central tenet of university teaching and learning, the fact remains that many university students and faculty make only limited formal academic use of computer technology".*

4.2 ICT Use and Academic Performance

4.2.1 Introduction

In section 4.1, I documented the extent of ICT use and dependency as reflected in the students' responses. The purpose of section 4.2 is to establish whether there is a relationship between ICT use and academic performance. It should be noted that in this study academic performance is measured according to academic results. For the purpose of this exercise, I calculated the average result for each student for every year since 2006, if available. These results were then combined to produce one average mark for each student.

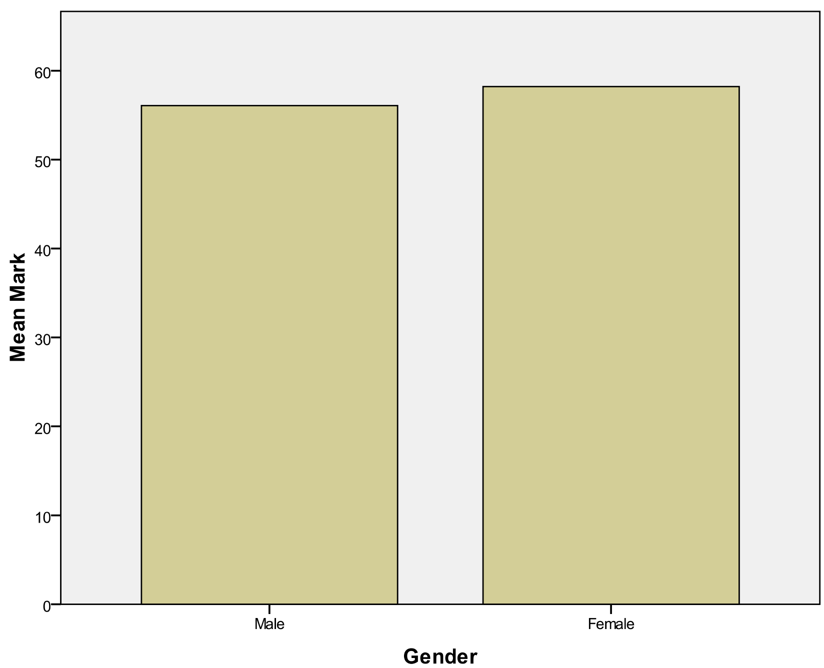
Prior to reaching any conclusion in terms of ICT influence on results, I needed to establish whether the differences in grades might be attributed to various factors such as gender, faculty or cultural background. The following section aims at addressing these possibilities.

4.2.2 Gender and Faculty based Influences

The purpose of this section is to establish whether there is an influence on the students' results that could be attributed to other factors such as gender or the faculty where the respondents came from.

Figure 4.2.1 and table 4.2.1 illustrates the academic performance of all participants on the basis of gender. The average mark for female students is slightly higher (58.22, SD = 8.094) than that of their male counterparts (56.09, SD= 7.213). The Independent-Samples t test with confidence level of 95%, produces a p-value of 0.037 and for male and female students respectively. This implies that gender has a statistically significant influence on results.

Figure 4.2. 1 – Comparison of gender and student results (campus-based analysis)



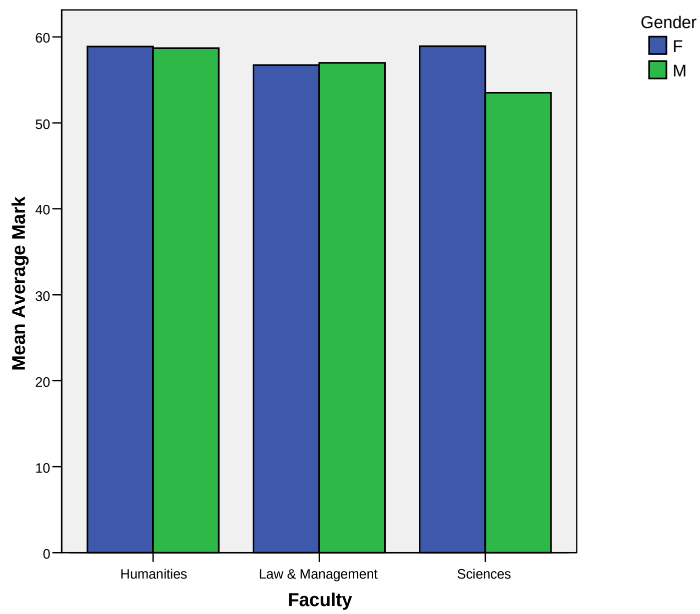
	Gender	N	Mean	Std. Deviation	Sig.(2-tailed)
Average Mark	Male	178	56.09	8.094	.037
	Female	88	58.22	7.213	

Table 4.2.1 shows gender based influences on average marks.

To further explore this analysis, I examined if this relationship also exists within each of the individual faculties.

T-tests at a 95% confidence level, within the three faculties revealed that a significant difference in the mean results of male and female students exists only in the Faculty of Sciences, with a p-value of 0.004 as shown in Figure 4.2.2 and Table 4.2.2. It therefore implies that the gender difference observed above and reflected in Table 4.2.1 occurs primarily in the faculty of Science.

Figure 4.2. 2 – Comparison of results within each faculty in terms of gender



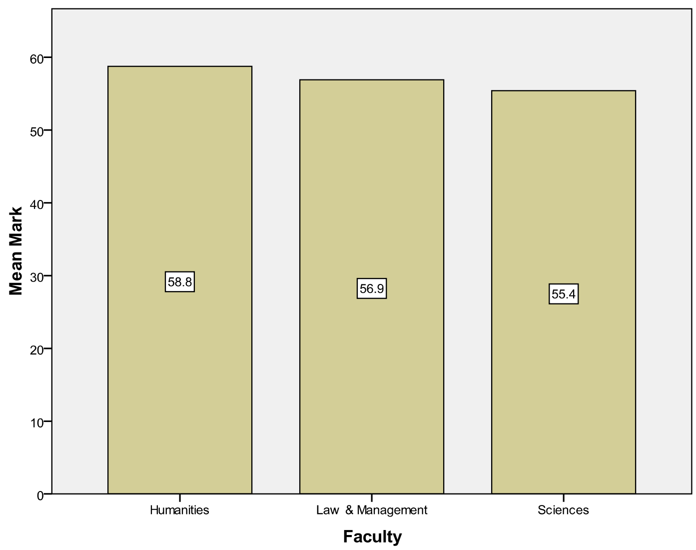
Faculty		Gender	N	Mean	Std. Deviation	Sig. (2-tailed)
Humanities	Average Mark	Male	44	58.70	7.065	.916
		Female	23	58.88	6.458	
Law & Management	Average Mark	Male	66	57.00	6.214	.852
		Female	28	56.73	6.587	
Sciences	Average Mark	Male	68	53.51	9.570	.004
		Female	37	58.93	8.073	

Table 4.2.2 – Shows in each of the faculties if gender has an influence on average marks.

Next, I explored if there is an inherent faculty based influence excluding gender.

The results are captured in Figure 4.2.3 and Table 4.2.3. An ANOVA gives a p-value of 0.024 indicating that the average marks in the three faculties are not all the same. The Bonferroni test indicates, a statistically significant difference exists in the mean scores between faculties of Science and Humanities with a p-value of 0.02 with Humanities scoring higher than Sciences.

Figure 4.2. 3 – Shows the faculty influence on results.



	N	Mean	Std. Deviation	Sig.
Humanities	67	58.76	6.814	.024
Law & Management	94	56.92	6.293	
Sciences	105	55.42	9.398	
Total	266	56.79	7.865	

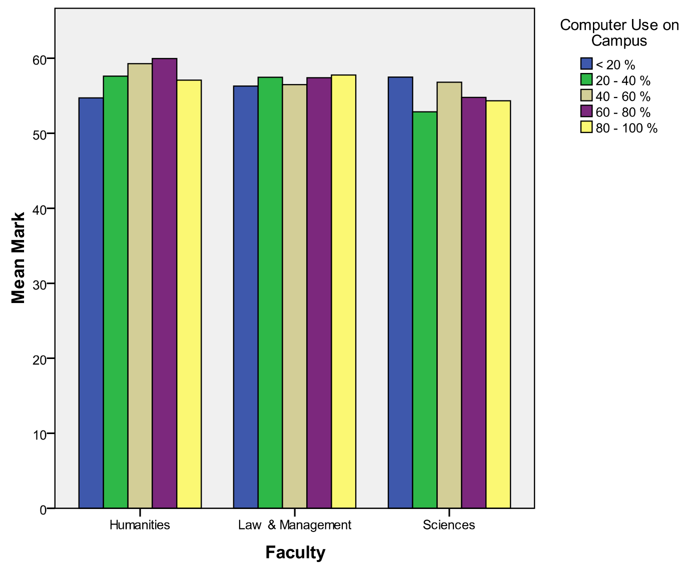
Table 4.2.3 – Shows faculty influences on results.

In summary, results are influenced by both gender and faculty. In the faculty of Sciences the gender difference is the sharpest, females scored higher than males with means of 58.9 and 53.5 respectively.

4.2.3 On-Campus Computer Use and Academic Performance (A2)

This section seeks to find whether there exists a relationship between on campus computer use and academic performance. Figure 4.2.4 and Table 4.2.4 contain the results from the responses.

Figure 4.2. 4 – Use of computers on-campus for academic purposes



Examining the findings using Figure 4.2.4, in the case of the faculty of Humanities, there appears to be a trend between computer use and academic performance for all levels except those in the 80% – 100 % category. In the faculty of Law and Management, with the exception of those in the 40% – 60% category, there seems also to be a trend, with a general improvement between the 56.30 % average and the 57.77%, as the usage increases from <20% to the heaviest usage. In the faculty of Sciences, there is no relationship between computer use and academic results.

Faculty		N	Mean	Std. Deviation	Sig.
Humanities	< 20 %	3	54.72	9.784	.647
	20 - 40 %	15	57.63	4.365	
	40 - 60 %	22	59.29	8.485	
	60 - 80 %	20	59.96	5.655	
	80 - 100 %	6	57.09	8.422	
	Total	66	58.71	6.853	
Law & Management	< 20 %	11	56.30	5.689	.960
	20 - 40 %	10	57.48	7.007	
	40 - 60 %	32	56.49	6.982	
	60 - 80 %	30	57.40	6.508	
	80 - 100 %	9	57.77	3.702	
	Total	92	57.00	6.325	
Sciences	< 20 %	7	57.50	5.175	.580
	20 - 40 %	20	52.86	9.887	
	40 - 60 %	38	56.81	10.355	
	60 - 80 %	24	54.79	7.779	
	80 - 100 %	14	54.34	10.505	
	Total	103	55.28	9.430	

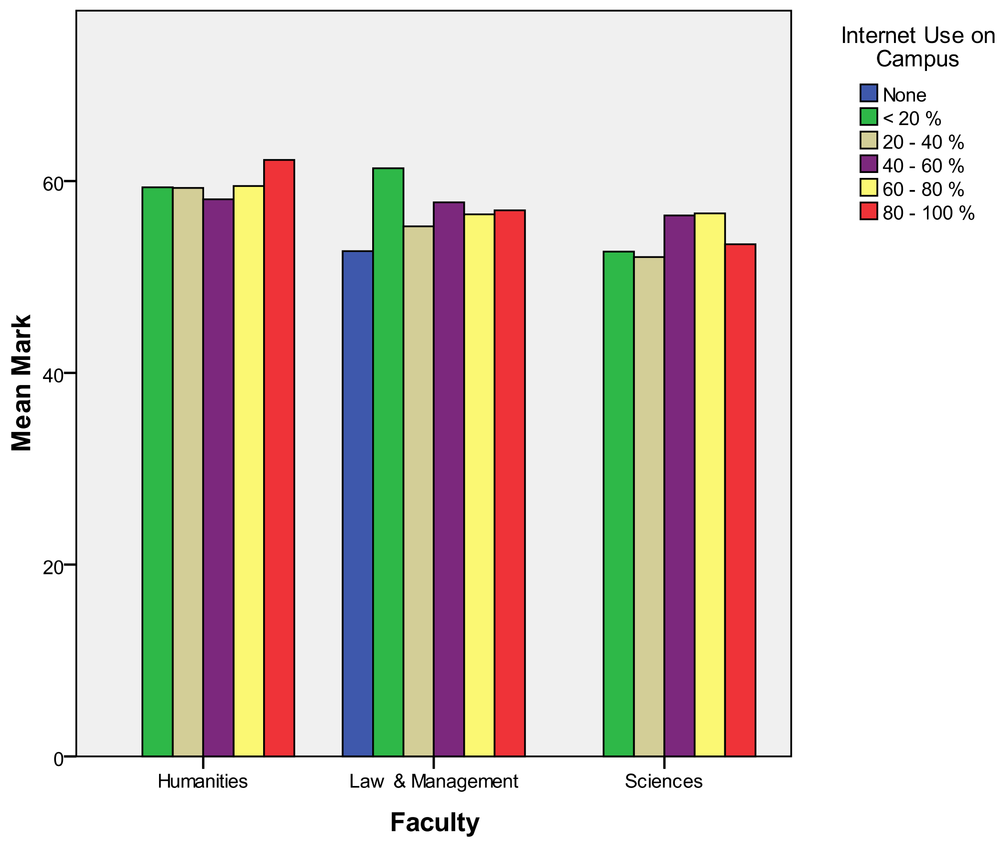
Table 4.2.4 - Use of computers on-campus for academic purposes.

However, ANOVA shows no *statistically* significant difference in mean scores between computer use on-campus and academic results for any of the three faculties based on the data collected. The p values for the three faculties in these tests were Humanities 0.647, Law and Management 0.960 and Sciences 0.580 as shown in Table 4.2.4. It could be argued that due to small n in some instances a Kruskal Wallis should be used. However, it showed very similar results with p values in all cases above 0.587.

4.2.4 On-Campus Internet Use and Academic Performance(A2)

The relationship between the amount of Internet use on-campus for academic purposes and the academic performance of students as reported by respondents, is illustrated in Figure 4.2.5 and Table 4.2.5 below.

Figure 4.2. 5 – Use of the Internet on-campus for academic purposes



Faculty		N	Mean	Std. Deviation	Sig.
Humanities	< 20 %	9	59.35	4.439	.762
	20 - 40 %	11	59.28	8.632	
	40 - 60 %	13	58.09	7.154	
	60 - 80 %	21	59.48	5.554	
	80 - 100 %	7	62.21	5.976	
	Total	61	59.44	6.359	
Law & Management	None	1	52.69	.	.364
	< 20 %	7	61.33	6.159	
	20 - 40 %	16	55.28	5.868	
	40 - 60 %	18	57.77	5.376	
	60 - 80 %	22	56.53	6.651	
	80 - 100 %	21	56.95	6.629	
	Total	85	57.01	6.226	
Sciences	< 20 %	7	52.64	5.664	.460
	20 - 40 %	15	52.08	10.904	
	40 - 60 %	30	56.41	9.698	
	60 - 80 %	32	56.63	10.422	
	80 - 100 %	11	53.41	5.877	
	Total	95	55.17	9.584	

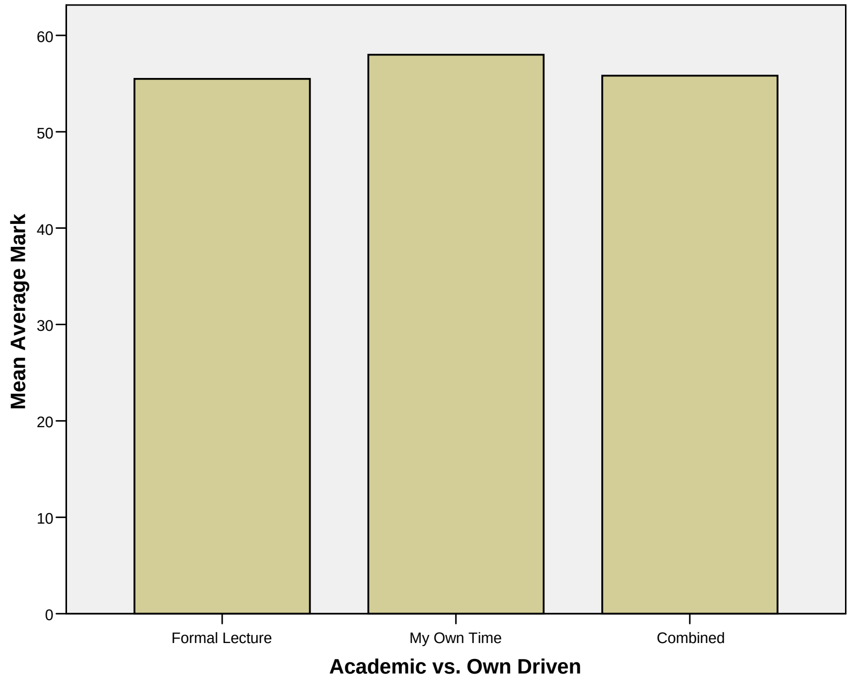
Table 4.2.5 - Use of the Internet on campus for academic purposes

A careful examination of the Table 4.2.5, above, and an ANOVA reveals that there is no statistically significant difference in mean scores between Internet usage for academic purposes and academic performance with p values of 0.762, .364 and 0.460 for the three faculties. Again due to smallness of n in some cases a Kruskal Wallis test was conducted with no significant association shown.

4.2.5 Student vs. Academic Driven-ICT Use

This section examines whether there is relationship between academic results and the manner in which students use ICT. The respondents were asked if they limit their ICT use only to periods supervised by a lecturer (or in a practical), or whether they use ICTs on their own, or whether the two modes are combined. The responses are captured in the Figure 4.2.6 below.

Figure 4.2. 6 – Student vs. Academic-Driven ICT Use



The three categories of ICT, namely “Formal lecture or practical”, “My own time” and “Combined” produce an average of 55%, 58% and 56% respectively. This shows that the highest average is reflected by the group that uses ICT in their own unsupervised time. One could explain this result by pointing out that those who prefer to use ICT in their own time are probably more highly motivated in their studies, i.e. they prefer to do things on their own initiative rather than have someone asking them to do something.

4.2.6 Length of ICT Use and Academic Performance (A18)

This section seeks to determine whether there is a relationship between the length of time (number of years) that a student has used ICTs and his/her academic performance.

The first test was ANOVA with Post Hoc option with all the participants i.e. all three faculties combined. Table 4.2.6 shows the results.

	N	Mean	Std. Deviation	Sig.
< 2 years	75	55.00	7.871	.040
2 - 4 year ago	78	59.17	7.412	
4 - 6 years ago	76	56.40	7.501	
6 - 10 years ago	19	56.27	9.431	
10 - 15 years ago	5	56.60	10.091	
> 15 years	6	58.14	3.262	
Total	259	56.86	7.827	

Table 4.2.6 – Performance difference influences by years of ICT experience.

The result shows that the mean marks for all groups are not the same with p value of 0.040. A Benferreni test indicates that the significant difference is attributed to two categories: those with < 2 years of ICT experience and 2 – 4 years.

Further analysis based on faculty differences confirms the same results for faculties of Sciences and Law and Management as shown in Figure 4.2.7 shows.

Figure 4.2. 7 – Computer experience analysis per faculty

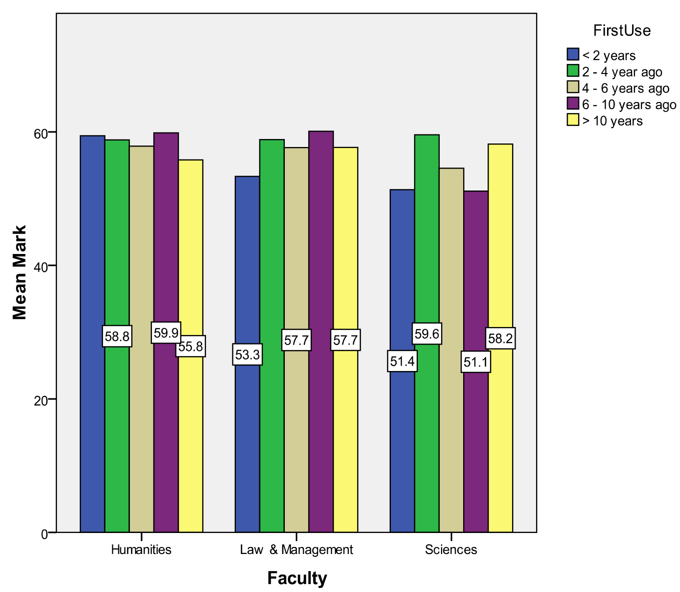


Table 4.2.7, below, shows that the difference in results are significant in the faculties of Law and Management and Sciences. Further analysis, table not shown here, indicates that this difference exist only between two gorups, that is, those with less than 2 years of experience and those between 2 – 4 years with a p value is 0.007 for Law and Management and 0.008 for Sciences.

Faculty	First Computer Use	N	Mean	Std. Deviation	Sig.
Humanities	< 2 years	27	59.42	7.622	.884
	2 - 4 year ago	17	58.81	6.153	
	4 - 6 years ago	16	57.86	7.377	
	6 - 10 years ago	4	59.87	4.473	
	> 10 years	3	55.81	2.805	
	Total	67	58.76	6.814	
Law & Management	< 2 years	28	53.33	5.728	.007
	2 - 4 year ago	26	58.85	6.469	
	4 - 6 years ago	28	57.67	6.012	
	6 - 10 years ago	7	60.09	5.044	
	> 10 years	2	57.68	6.475	
	Total	91	56.86	6.366	
Sciences	< 2 years	20	51.36	8.325	.008
	2 - 4 year ago	35	59.58	8.690	
	4 - 6 years ago	32	54.57	8.504	
	6 - 10 years ago	8	51.13	12.091	
	> 10 years	6	58.18	8.921	
	Total	101	55.61	9.325	

Table 4.2.7 - Computer experience analysis per faculty vs. results

Further analysis based on year of study is tablulted in Table 4.2.8 below. It seems the influence of ICT use is most noticable in the first year between two groups of less than 2 years and 2 – 4 years.

Level of Study		N	Mean	Std. Deviation	Sig.
First year	< 2 years	33	52.35	7.717	.021
	2 - 4 year ago	17	59.38	6.659	
	4 - 6 years ago	20	58.29	9.556	
	6 - 10 years ago	4	57.17	2.526	
	> 15 years	3	57.43	3.715	
	Total	77	55.89	8.230	
Second year	< 2 years	17	55.77	7.808	.690
	2 - 4 year ago	5	52.08	6.681	
	4 - 6 years ago	8	54.56	5.878	
	6 - 10 years ago	3	49.11	15.650	
	10 - 15 years ago	2	53.64	4.606	
	Total	35	54.27	7.766	
Third year	< 2 years	20	57.93	7.907	.260
	2 - 4 year ago	40	58.98	8.192	
	4 - 6 years ago	35	55.17	6.132	
	6 - 10 years ago	10	57.74	9.813	
	10 - 15 years ago	2	50.96	3.028	
	> 15 years	1	62.26	.	
	Total	108	57.32	7.701	
Fourth year	< 2 years	5	58.11	3.653	.121
	2 - 4 year ago	16	61.62	5.006	
	4 - 6 years ago	12	59.40	6.392	
	6 - 10 years ago	2	57.89	6.427	
	10 - 15 years ago	1	73.80	.	
	> 15 years	2	57.14	2.257	
	Total	38	60.34	5.696	

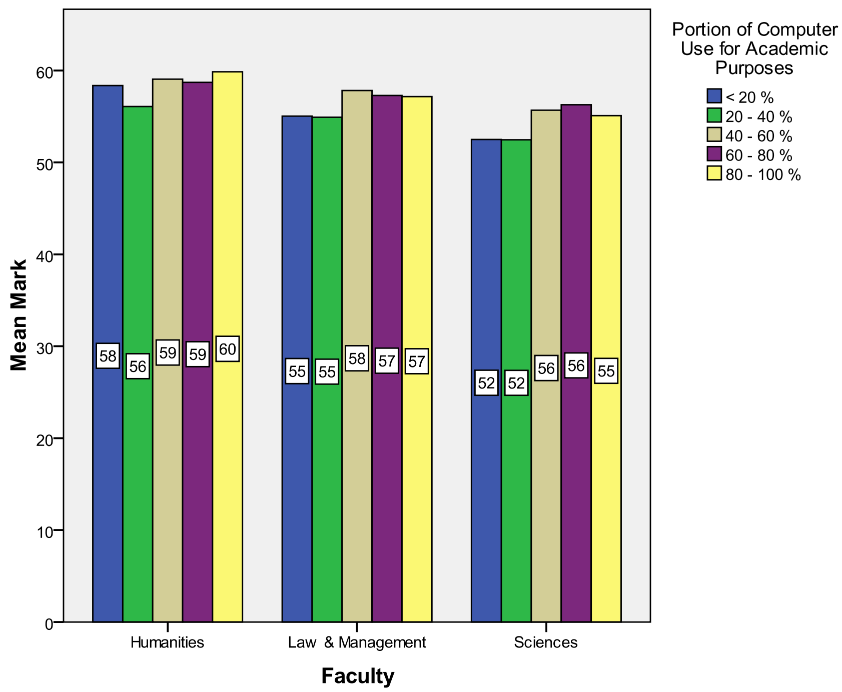
Tabel 4.2.8 – Results influenced by length of ICT used based on year of study

The implication of the above findings is that the length of ICT use does play a role in terms of its influence on results in the two groups of less than 2 years and between 2 – 4 years. This is significant for those respondents who are in their first year of study and are in faculties of Sciences and Law and Management.

4.2.7 ICT Use for Academic Purposes and Academic Performance (A22)

This section determines whether a relationship exists between ICT use for academic purposes and academic achievement. The respondents were asked "how much of their overall computer time is spent to help with their studies." Figure 4.2.8 and Table 4.2.9 , below, reveal the responses.

Figure 4.2. 8 – Comparison of academic achievement and computer usage per faculty



In faculty of Humanities, there seems to be a general upward trend in academic performance as computer usage increases. In the case of the remaining two faculties, those who reported a more moderate level of ICT usage obtained a better level of academic achievement (as is reflected in the percentages). While those who reported the highest ICT usage demonstrated better academic achievement in both cases than those who reported less usage, it is those students who reported a middle level of ICT usage who actually attained the best academic results. Statistically, using ANOVA no significant differences were found.

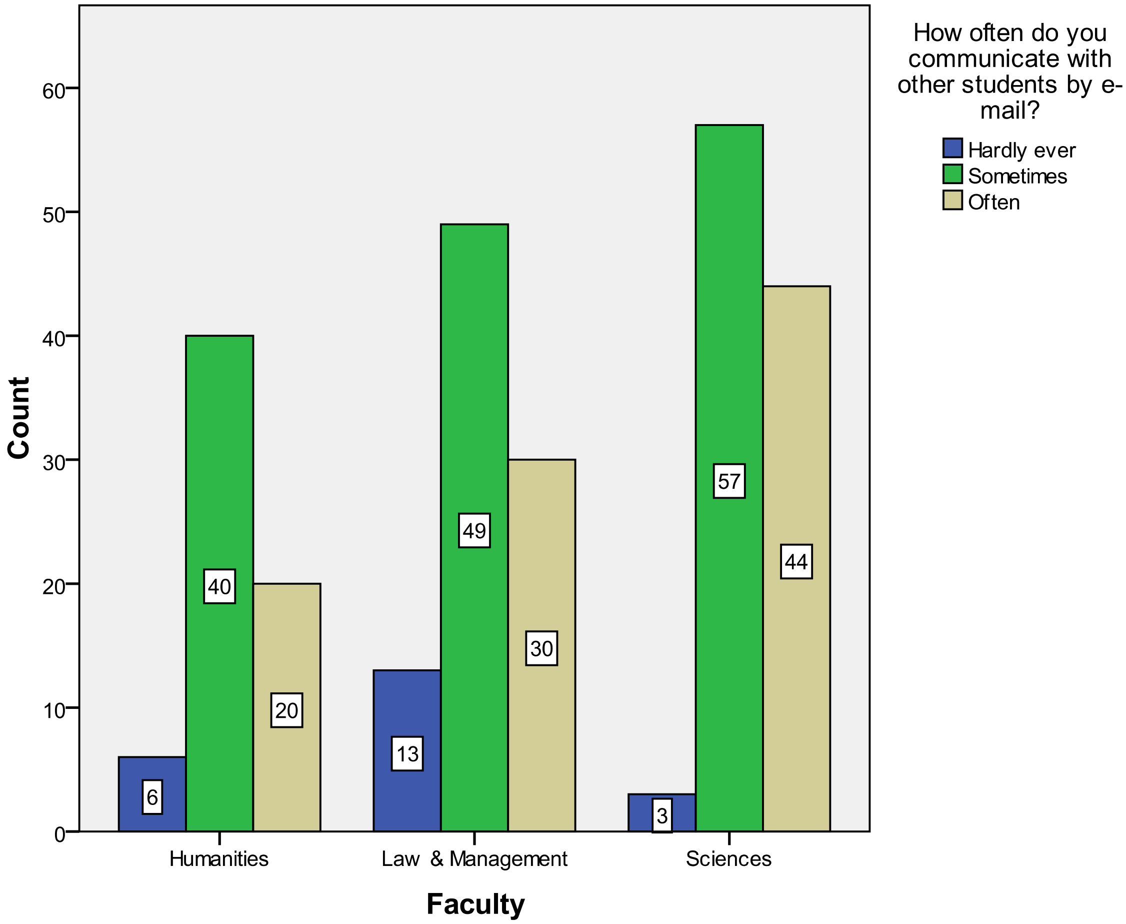
Faculty		N	Mean	Std. Deviation
Humanities	< 20 %	5	58.36	6.075
	20 - 40 %	6	56.09	3.682
	40 - 60 %	17	59.06	8.329
	60 - 80 %	26	58.71	6.825
	80 - 100 %	13	59.86	6.541
	Total	67	58.76	6.814
Law & Management	< 20 %	7	55.03	5.773
	20 - 40 %	9	54.91	4.802
	40 - 60 %	21	57.82	5.916
	60 - 80 %	36	57.29	6.990
	80 - 100 %	19	57.16	6.527
	Total	92	56.98	6.329
Sciences	< 20 %	4	52.49	9.821
	20 - 40 %	8	52.47	6.054
	40 - 60 %	30	55.69	8.526
	60 - 80 %	37	56.27	10.996
	80 - 100 %	25	55.08	9.181
	Total	104	55.38	9.433

Table 4.2.9 - Results vs. computer use analysis per faculty

4.2.8 Social Use ICTs and Academic Performance (B1)

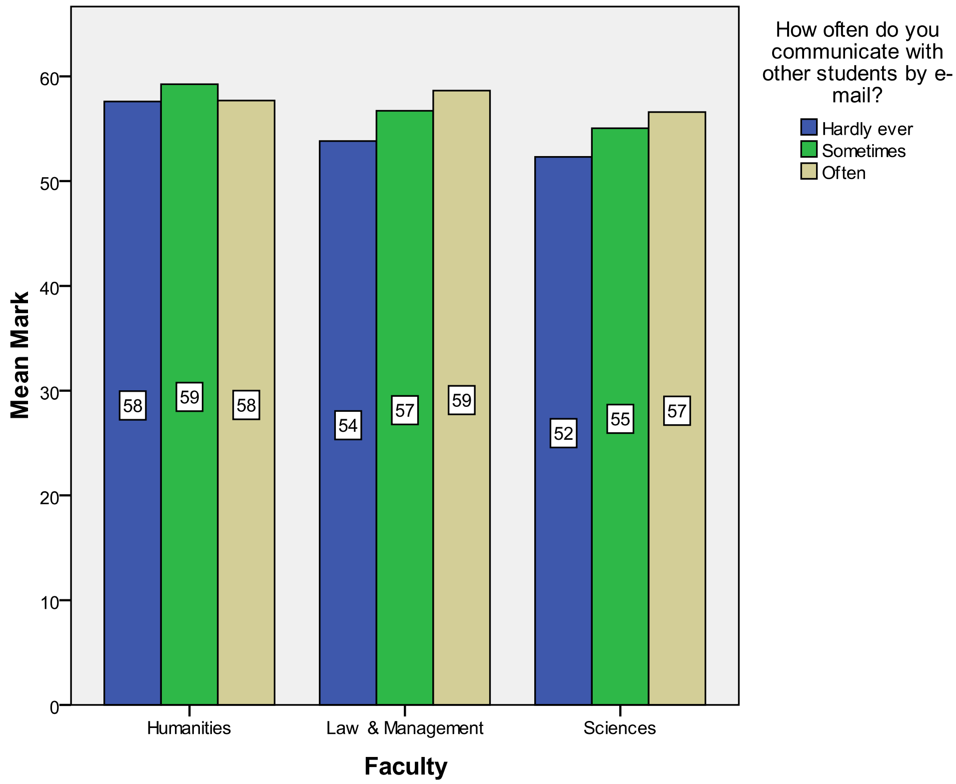
This section determines whether there is a relationship between the use of ICT tools by students for social purposes and their academic achievement. In section 4.1.14, it was noted that 91.6% of the respondents used email as means to communicate with other students either “sometimes” or “often”. Figure 4.2.9 below shows the same ratios for different faculties.

Figure 4.2. 9 – Frequency of email communication with other students (actual numbers)



Is there a relationship between extent of students communicate with other students by means of e-mail and their academic achievement? Figure 4.2.10 and Table 4.2.10 show the relationship.

Figure 4.2. 10 – Frequency of email communications with other students



At first, looking at figures in table 4.2.8, they seem to indicate a general relationship between the extent of email usage and academic performance. However, ANOVA does not indicate any significant difference in the academic performance between the three groups with lowest being p=0.070 for Law and Management - i.e. the different level of email use for social purpose does not have an influence on academic performance.

Table 4.2.10, below, reflects the responses.

Faculty		N	Mean	Std. Deviation	Sig.
Humanities	Hardly ever	6	57.60	4.581	.659
	Sometimes	40	59.24	6.754	
	Often	20	57.69	7.466	
	Total	66	58.62	6.774	
Law & Management	Hardly ever	13	53.83	6.013	.070
	Sometimes	49	56.71	5.621	
	Often	30	58.63	7.231	
	Total	92	56.93	6.360	
Sciences	Hardly ever	3	52.31	8.524	.582
	Sometimes	57	55.05	9.135	
	Often	44	56.59	9.441	
	Total	104	55.62	9.214	

Table 4.2.10 – Shows ANOVA results for academic performance and email frequency between students.

The questionnaire also explores the extent to which students used other applications such as Skype, SMS, VoIP, Web-based games, and so on. But since the number of students who responded to these questions was very low, the data obtained from them was excluded from further analysis in this section.

4.2.9 The Integration of ICTs into Academic Programmes (B2)

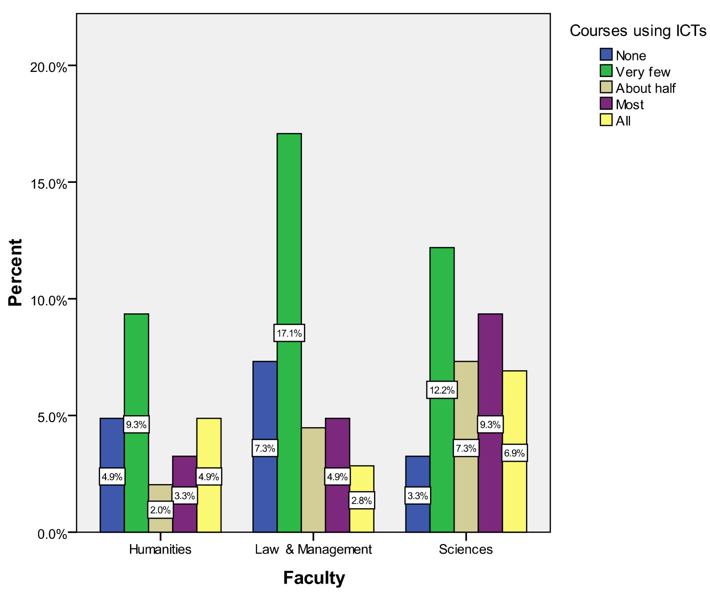
This section examines the extent to which ICTs are used by students as part of their academic programmes and whether these contribute towards their academic achievement. The students were asked to state the number of courses in which they use ICTs as part of their teaching and learning. Table 4.2.9 displays ANOVA with post hoc test results at combined faculty level.

	N	Mean	Std. Deviation	Sig.
None	38	57.03	5.617	.029
Very few	95	58.22	7.812	
About half	34	55.24	7.999	
Most	43	53.98	8.717	
All	36	56.98	6.154	
Total	246	56.70	7.599	

Table 4.2.11 – ICT integration into academic programs vs. academic performance

It can be seen that the mean marks between the groups are not all the same with a p value of 0.029. A Bonferroni test (not shown here) indicates that the significant difference lies between the “Very few” and the “Most” groups. This implies that those who have reported having very few courses using ICTs have scored higher than those who use them for most of their courses and that this data goes against expectation.

Figure 4.2. 11 – The integration of ICT into academic programs (number of respondents)



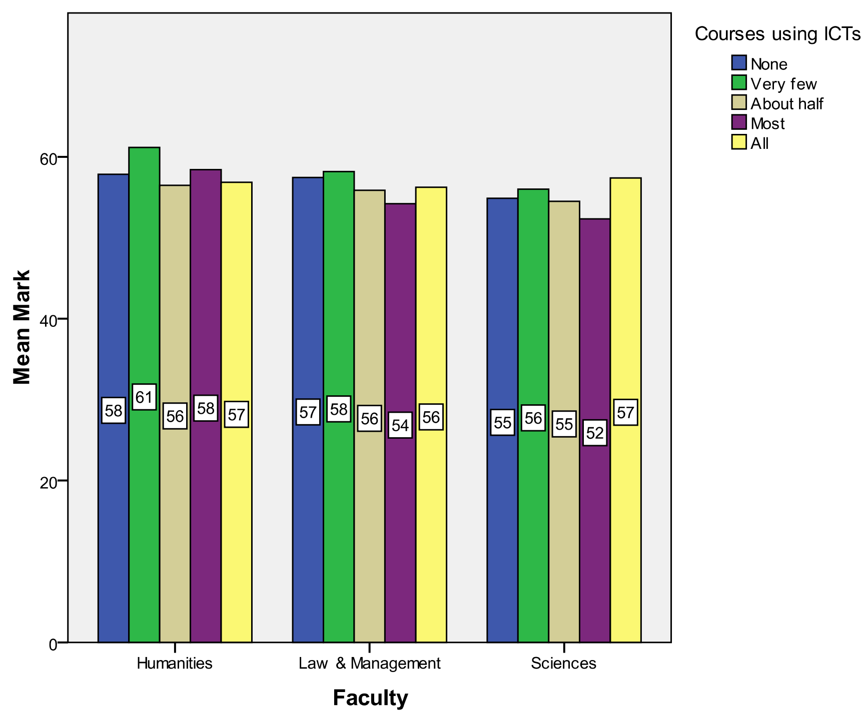
Section 4.1.15, above, documented the extent of ICT usage as an integral part of students’ academic programs. It was noted in that section that half of the

respondents were registered for academic courses in which there was either no ICT content or very little ICT content. The same analysis is carried out here, but is broken down per faculty.

Figure 4.2.11, above, illustrates the results.

The faculty that uses ICTs the most for purposes of teaching and learning is faculty of Sciences. This is followed by the faculty of Law and Management Sciences and then by the faculty of Humanities. The question to explore is to find whether a difference exists in academic performance which might be due to the extent of ICT use in academic programmes. Figure 4.2.12 below reveals the findings.

Figure 4.2. 12 – ICT integration into academic programs vs. academic performance



The picture that emerges from this data is rather interesting. At faculty level, there is no significant difference in mean marks between various groups.

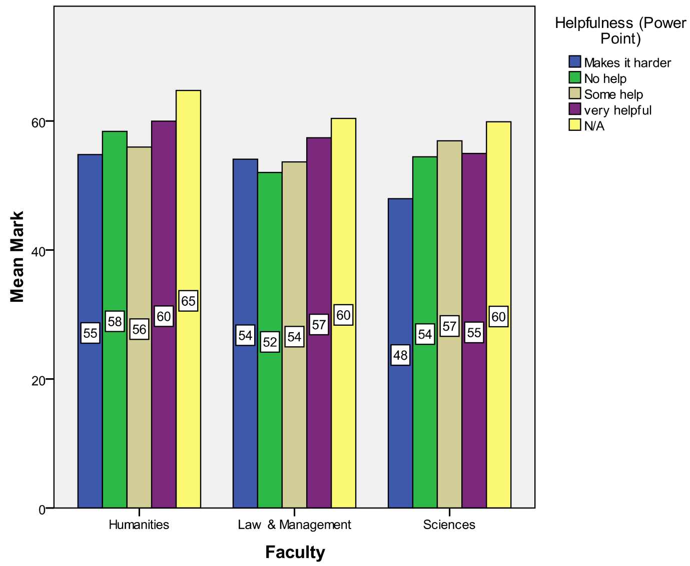
At the combined level, however, as shown above there is a difference between the "Very few" and the "Most" groups with the former group performing better academically than the latter. A number of possible observations can be made in this regard. The first possible explanation is that, in all three faculties, the highest number of participants belong to the category “Very few”. In total the number of respondents who have reported they have ICTs in a very few of their courses (95) is nearly three time higher than those who have said all of their course use ICTs (36). This means that the integration of ICTs into teaching and learning is not a common feature of their academic *modus operandi*. A second possible conclusion is that the integration of ICT into teaching and learning is not a well-planned strategy in the university, and therefore needs attention. Further research is needed to be able to arrive at definitive conclusions.

The following sections explore the relationship between the lecturer’s use of ICT tools and the possibility of a corresponding effect on the academic performance of students.

4.2.10 Presentation Software (Power Point, B4)

In section 4.1.15, I documented the extent of use of various ICT tools such as MS Power Point, Excel and GIS by the academic community, and the extent to which respondents reported that the use of such tools was helpful to them. ANOVA indicated no significant difference between the mean marks and the use of such tools. In terms of helpfulness of these tools, the closest results were attributed to MS Power Point. Figure 4.2.13 , below, reveals the findings reported about the “Helpfulness of Power Point” for all three faculties vs. average results.

Figure 4.2. 13 – Relationship between helpfulness of presentations (such as Power Point) and academic achievement per faculty



What is observable is a general upward trend in academic achievement in nearly all those cases where the respondents found the tools more helpful. It is interesting to note that in all the three faculties, “Not Applicable” responses, with n=22, for all three faculties combined, have scored higher. Table 4.2.12, below, shows the results of ANOVA for the combined faculties. It excludes those who did not respond to this question and those who selected “N/A” response. The picture that emerges indicates that those who found the tools more helpful obtained higher scores.

	N	Mean	Std. Deviation	Sig.
Makes it harder	9	53.56	6.223	.075
No help	12	55.60	5.130	
Some help	53	55.77	7.103	
very helpful	157	56.90	8.188	
N?A	22	60.71	6.561	
Total	253	56.81	7.738	

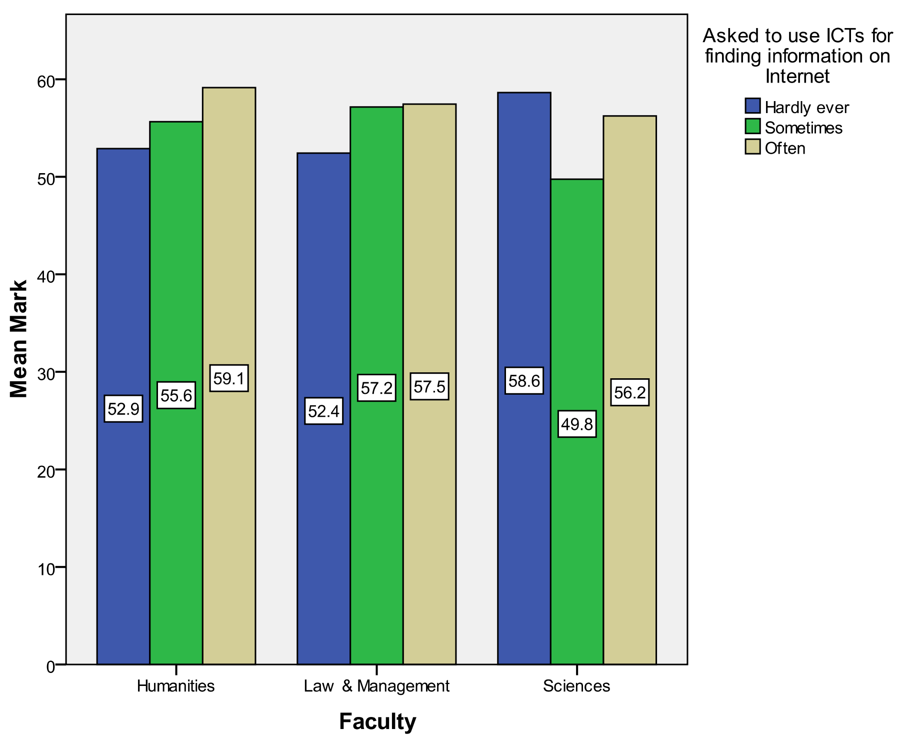
Table 4.2.12 - Comparison of helpfulness levels of ICT presentation tools (such as Power Point) and average marks for all three faculties combined.

The ANOVA between the two variables in question produced a p value of 0.075 as shown in Table 4.2.12. One may therefore conclude on the basis of the data that was collected that there is *statistically* no significant difference in the academic performance of students as the result of the presentation tools in question or their degree of helpfulness as reported by respondents.

4.2.11 An Academic Programme Initiated Use of the Internet (B5)

This section examines whether a relationship exists between the extent of Internet use, when this use is encouraged by the academic community, and students' academic achievement. Students were asked to state how often they are asked by the academic community to use Internet to search for information. Figure 4.2.14, below, reveals the results.

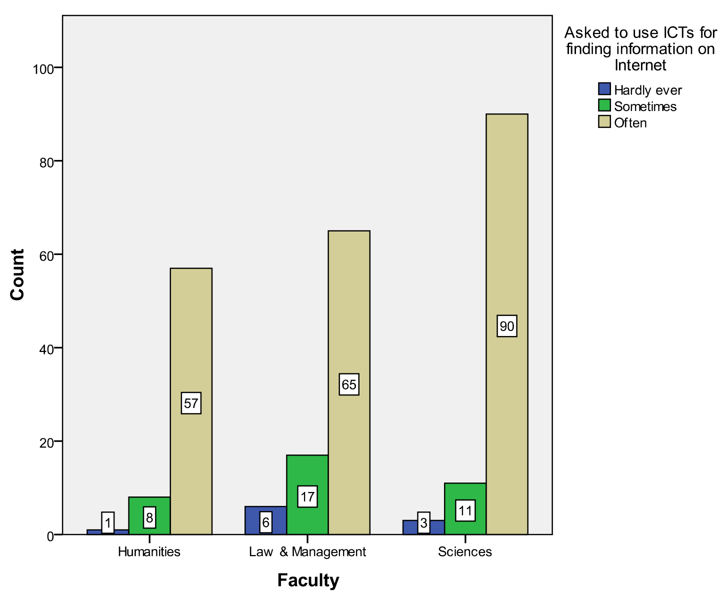
Figure 4.2. 14 – The Internet use influence on results when encouraged by an academic programme.



It shows that with the exception of the faculty of Sciences in the “Hardly ever” category, there is a relationship between the extent of the Internet use and academic performance. It should be noted that under section 4.2.5, above, the extent of Internet use was examined in general. The difference here is that the Internet use is as the result of an academic activity and that its usage is somehow encouraged by the academic community. Figure 4.2.15 shows the number of respondents in each category. It can be seen that there are very few students in the “hardly ever” and “sometimes” categories in all three of the faculties. In order to examine this relationship statistically, I have combined the first two categories and compared those who use the Internet often against the rest. Table 4.2.13 shows the results from a t-test. As can be seen, there is a statistically significant difference in academic performance based on Internet use when encouraged by the academic community with a p value of .023.

One may conclude from these results that those respondents who reported higher levels of Internet use when requested to do so by their lecturers, performed better (mean mark = 57.4 vs. 45.5) academically.

Figure 4.2. 15 - Number of respondents who were asked to find information on the Internet



	Internet Use Encouraged by Academic Community	N	Mean	Std. Deviation	Sig. (2-tailed)
Mark	Hardly Ever, Sometimes	46	54.51	5.927	0.023
	Often	212	57.39	8.056	
Gender					
Male Mark	Hardly Ever, Sometimes	35	54.7	6.103	.216
	Often	136	56.57	8.37	
Female Mark	Hardly Ever, Sometimes	11	53.93	5.56	.034
	Often	76	58.86	7.284	

Table 4.2.13 – Encouraged by academic community internet use against marks.

Further analysis using a t-test was carried out based on gender and faculty. Table 4.2.13, above, shows the differences in academic performance based on gender. It can be seen that in the case of female students who reported they are "Often" asked by their lecturers to use Internet for finding course related information have performed significantly better with p value = 0.034 (58.9 vs. 53.9).

Faculty		Internet Use Encouraged by Academic Community	N	Mean	Std. Deviation	Sig. (2-tailed)
Humanities	Mark	Hardly Ever, Sometimes	9	55.34	5.332	.118
		Often	57	59.14	6.869	
Law & Management	Mark	Hardly Ever, Sometimes	23	55.93	5.403	.322
		Often	65	57.46	6.629	
Sciences	Mark	Hardly Ever, Sometimes	14	51.66	6.476	.084
		Often	90	56.24	9.448	

Table 4.2.14 - Encouraged by academic community internet use against marks (faculty based).

T-tests were performed to examine the same relationships between the two variables in question at faculty level. The results are shown in table 4.2.14 with no significant differences in the mean marks. As can be seen in this case, the number in some instances is too small for it to be meaningful and statistically reliable.

To complete the picture, further analysis included gender (Table 4.2.15).

Faculty	Gender		Internet Use Encouraged by Academic Community	N	Mean	Std. Deviation	Sig.(2-tailed)
Humanities	Male	Mark	Hardly Ever, Sometimes	8	55.65	5.615	.208
			Often	35	59.13	7.200	
	Female	Mark	Hardly Ever, Sometimes	1	52.89	.	.355
			Often	22	59.16	6.473	
Law & Management	Male	Mark	Hardly Ever, Sometimes	17	55.45	5.742	.174
			Often	44	57.87	6.324	
	Female	Mark	Hardly Ever, Sometimes	6	57.28	4.464	.829
			Often	21	56.59	7.313	
Sciences	Male	Mark	Hardly Ever, Sometimes	10	52.67	7.151	.682
			Often	57	54.00	9.723	
	Female	Mark	Hardly Ever, Sometimes	4	49.16	4.074	.008
			Often	33	60.12	7.639	

Table 4.2.15 - Encouraged by academic community internet use Relationship with average marks (faculty and gender based).

As can be seen from the above table, female students in faculty of Sciences with a p value of 0.008 indicates significant difference in results. Once again I took note of the small n in some cases. A Kruskal Wallis which can be used when n is small produced similar results with female students in Sciences with p value of 0.010 as the only group having statistically significant results.

In summary, Internet use when encouraged by the academic community as part of an academic program seems to have a significant influence on academic performance, at combined faculty level i.e. at faculty level there is no significant difference in academic performance between the groups. Female students seem to show a closer alignment than their male counterparts in this respect, especially in Sciences, but statistically not reliable due to the small value of n.

The implication of this is far reaching. When ICTs and, in this case the Internet are used as an extension of the educational environment and their use is encouraged by the lecturer there is a clear influence on the academic performance. This is in line with findings from Passey, Rogers, Machell, McHugh(2004, p5) who found that more positive motivation resulted when ICT use was focused on both teaching and learning, than when ICT was used to support teaching alone. Here we also see that when ICTs are integrated with teaching and learning the results are visible. Further, Saadé, Weiwei, Nebebe and Molson (2008) believe that the impact of Internet technologies is significant on every aspect of people's life. This impact is felt in the ever increasing pace of transformation of the higher education sector, as more and more institutions are using the internet and web technologies in the classroom as part of the learning environment (p.1).

4.2.12 Students' Email Communication with their Lecturers (B6)

> *ICT can help to overcome two enemies of learning: "isolation and abstraction*".
>
> (Punie, Zinnbauer, and Cabrera, 2006, p. 18)

This section seeks to establish whether the extent of the respondents' email communication with their lecturers has an influence on their academic achievement.

In response to the question regarding the frequency of the communication with their lecturer, "Hardly ever", "Sometimes" or "Often" could have been selected indicating the level of their interactions.

Figure 4.2. 16 – The influence of email communication with lecturer on results.

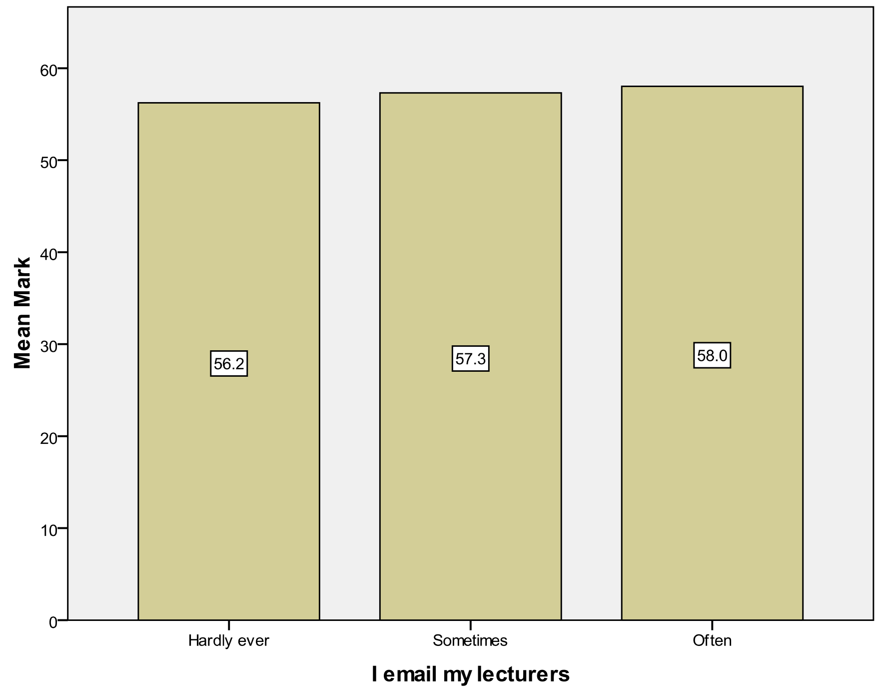


Figure 4.2.16, above, illustrates the responses graphically. Table 4.2.16 shows the results from ANOVA. While graphically there seems to be a difference in students' response based on the level of usage, statistically, results indicate no difference between the three different groups with p value being 0.371.

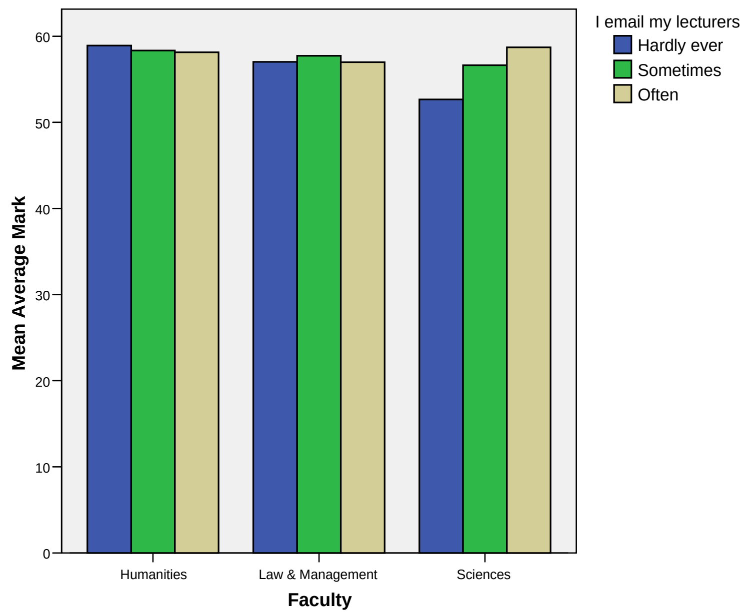
	N	Mean	Std. Deviation	Sig.
Hardly ever	114	56.23	8.238	.371
Sometimes	100	57.31	7.424	
Often	41	58.03	7.026	
Total	255	56.94	7.741	

Table 4.2.16 – The influence of email communication with lecturer on results

Further analysis that takes gender into consideration produces similar results indicating no significant difference between mean marks.

Next, I examined the faculty influence. Figure 4.2.17 shows the results if the respondents are grouped based on their faculties. It shows that the results are not the same in the three faculties. ANOVA only indicates a significant difference in the faculty of Sciences with p=.041 as shown in the table 4.2.11.

Figure 4.2. 17 – The influence of e-mail contacts with lecturers on results per faculty



Faculty		N	Mean	Std. Deviation	Sig.
Humanities	Hardly ever	35	58.93	5.584	.927
	Sometimes	21	58.34	8.374	
	Often	10	58.15	7.546	
	Total	66	58.62	6.774	
Law & Management	Hardly ever	43	57.02	6.813	.880
	Sometimes	29	57.73	5.451	
	Often	13	56.99	5.217	
	Total	85	57.26	6.093	
Sciences	Hardly ever	36	52.67	10.585	.041
	Sometimes	50	56.64	8.046	
	Often	18	58.71	8.092	

Table 4.2.17 – Faculty based marks statistical relationship

This relationship, as shown in figure 4.2.19 and Table 4.2.17, does not seem to exist equally in all faculties. While there is a significant difference between mean marks in the faculty of Sciences when considering the extent of email communication and academic achievement, this is not true for all the faculties concerned.

Further analysis of this phenomenon was carried out for each faculty with the addition of gender as a variable. ANOVA shows no differences in the group means.

In summary, the analysis of the evidence indicates a positive relationship between email usage with lecturer and academic performance in the faculty of Science.

In looking for conformity between these findings and with the findings reported in the literature one comes across similar trends. The literature does indicate a relationship between email use and academic success, especially in technology based learning (Hwang and Kim, 2007). Another evidence comes from Kim and Keller (2008, p. 37), Cifuentes and Shih (2001, p. 458) who found that emails have the potential for improving interactions between instructors and students by providing a means of sending supportive information with personal attention directly to each student. A benefit of using emails is that they enable one to overcome the time and space constraints that instructors might have.

Faculty	Gender		N	Mean	Std. Deviation	Sig.
Humanities	Male	Hardly ever	21	59.35	4.784	.599
		Sometimes	15	58.34	9.160	
		Often	7	56.21	7.934	
		Total	43	58.48	7.007	
	Female	Hardly ever	14	58.30	6.755	.575
		Sometimes	6	58.35	6.751	
		Often	3	62.67	4.853	
		Total	23	58.88	6.458	
Law & Management	Male	Hardly ever	35	57.69	6.891	.807
		Sometimes	15	57.10	4.468	
		Often	9	58.79	4.827	
		Total	59	57.71	6.012	
	Female	Hardly ever	8	54.08	5.978	.158
		Sometimes	14	58.39	6.449	
		Often	4	52.94	3.893	
		Total	26	56.23	6.267	
Sciences	Male	Hardly ever	24	50.41	10.618	.071
		Sometimes	33	55.24	7.653	
		Often	10	57.17	9.689	
		Total	67	53.80	9.349	
	Female	Hardly ever	12	57.18	9.350	.628
		Sometimes	17	59.37	8.316	
		Often	8	60.64	5.538	
		Total	37	58.93	8.073	

Table 4.2.18 – The influence of email communication with lecturer based on gender and faculty

4.2.13 Students' Email with other Students as Part of their Course

This section examines whether the extent of email communication between students has a positive effect on their academic achievement. Table 4.2.19 shows the result from ANOVA at combined faculty level. With a p value of .466

it shows no significant relationship between the level of email communications and academic performance.

	N	Mean	Std. Deviation	Sig.
Hardly ever	67	57.53	6.537	.466
Sometimes	125	56.38	7.644	
Often	63	57.65	9.256	
Total	255	56.99	7.805	

Table 4.2.19 – Influence of email communication between students on results.

In a further analysis taking into consideration the differences based on faculty and gender no statistically significant differences were found.

4.2.14 Self-Initiated Student Use of Internet for Academic Purpose (B7)

Under section 4.2.12, above, I examined the effect of Internet use on results when encouraged by the academic community as part of an academic course. In this case, the use of Internet is initiated as the result of students' own initiative. Table 4.2.20 shows the result of ANOVA.

	N	Mean	Std. Deviation	Sig.
Hardly ever	11	53.15	7.347	.005
Sometimes	50	54.33	6.243	
Often	195	57.79	8.018	
Total	256	56.92	7.812	

Table 4.2.20 – Internet use influence on results when initiated by students for academic purposes.

The result indicates that the three levels of responses are not the same. The students that have reported they use Internet “Often” scored significantly higher than the other groups with p=0.005. A Bonferroni test shows the difference of means is significant between all groups except “often” and “Sometimes”.

Next, I examine this variable, taking into consideration the faculty influence.

Figure 4.2. 18 – Student initiated Faculty based use of the Internet

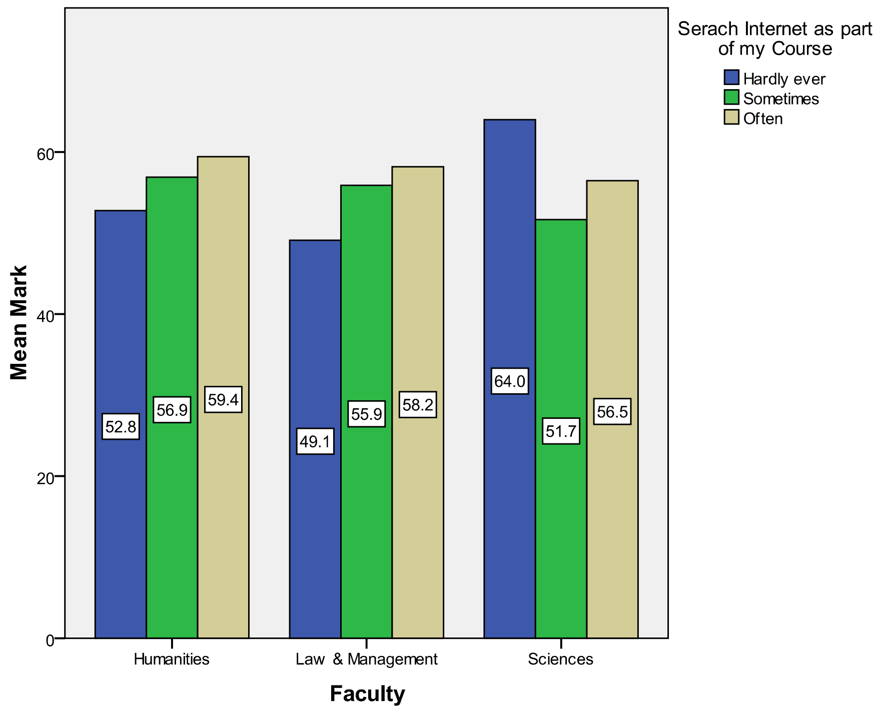


Figure 4.2.18, above, and Table 4.2.21, illustrate the relationship between students’ use of Internet for academic purposes on their own initiative and their academic performance by each faculty. It shows that those who use the Internet for academic purposes on their own initiative perform better academically. The exception is in the case of the faculty of Sciences, in which the “Hardly ever” category appears to reveal the opposite of a general trend among the faculties.

Faculty		N	Mean	Std. Deviation	Sig.
Humanities	Hardly ever	4	52.77	4.343	.113
	Sometimes	11	56.90	4.548	
	Often	50	59.43	7.160	
	Total	65	58.59	6.822	
Law & Management	Hardly ever	5	49.11	6.420	.004
	Sometimes	18	55.88	4.688	
	Often	65	58.18	6.274	
	Total	88	57.19	6.323	
Sciences	Hardly ever	2	63.99	1.197	.045
	Sometimes	21	51.66	7.292	
	Often	80	56.45	9.516	
	Total	103	55.62	9.259	

Table 4.2.21 – Faculty based self-initiated student use of Internet for academic purpose

Further analysis provides an explanation of this phenomenon. The number of the students who are in the “Hardly ever” category in the Sciences is very low with n=2, as can be seen in Table 4.2.21. Further investigation clarifies this situation. The two students who chose the ‘Hardly ever’ option from the faculty of Sciences have average academic results of 63% and 65% respectively. In response to the question, “What percentage of your academic time do you spend using the Internet (A2 – 2)?”, one of these students indicated a frequency of between 60% and 80%. Their records also show that they only began to use ICT when they registered at the university. In response to the question, “How easy/difficult is it for you the access ICT on campus (A5 – 1)?”, one of these students selected the “Easy” option and included the comment, “People are busy, there is no noise, there are security guards in the lab.”. In response to the question, “How do you feel about ICTs for teaching and learning (A27)?”, one of these students responded, “I enjoy ICT, it is valuable, I feel I have adequate skills, I am concerned about my level of skills in relation to my peers, the support I receive meets my needs, I don’t have enough training.” Based on these facts, one may make the assumption that their responses are incorrectly intended and conclude that there is a positive relationship between Internet usage and academic achievement.

Table 4.2.21, above, illustrates that only a few students have selected the “Hardly ever” option. For this test to be meaningful, the group “Hardly Ever” and “Sometimes” had to be combined. That means that the sample data was divided into two groups: those that used Internet “Often” and the rest. Since there are only now two categories and since they are being compared against a continuous variable (marks), I used a t-test to examine the relationships. Table 4.2.23 reveals the findings.

Group Statistics					
	I use Internet for my studies	N	Mean	Std. Deviation	Sig. (2-tailed)
Mark	Hardly Ever, Sometimes	61	54.12	6.406	0.001
	Often	195	57.79	8.018	

Table 4.2.22 – T test result showing the relationship between internet usage and results.

The p value of .001 shows that students who reported they use the Internet on their own initiative often scored better than the rest.

In a further analysis, I examined faculty based data. Table 4.2.23 reveals the findings.

Group Statistics					
Faculty	I use Internet for my studies	N	Mean	Std. Deviation	Sig (2-tailed)
Humanities	Hardly Ever, Sometimes	15	55.80	4.732	.070
	Often	50	59.43	7.160	
Law & Management	Hardly Ever, Sometimes	23	54.41	5.712	.013
	Often	65	58.18	6.274	
Sciences	Hardly Ever, Sometimes	23	52.73	7.812	.089
	Often	80	56.45	9.516	

Table 4.2.23 – T Test results between marks vs. student initiated Internet use.

At 5 % level of confidence only the faculty of Law and Management shows significant difference between mark means. However, at 10% all three faculties show this significance.

Next, I thought it would be interesting to examine the differences by gender. Table 4.2.24 shows the results. Here, at the combined faculty level the results are shown.

Group Statistics

Gender	I use Internet for my studies	N	Mean	Std. Deviation	Sig. (2-tailed)
Male	Hardly Ever, Sometimes	46	54.13	6.939	.034
	Often	125	57.04	8.218	
Female	Hardly Ever, Sometimes	15	54.09	4.593	.002
	Often	70	59.13	7.519	

Table 4.2.24 – Gender and self-initiated Internet access influences vs. results.

As can be seen in both cases when students readily use internet to access information in the course of their study, they perform better compared to those who use them “Hardly” or “Sometimes”.

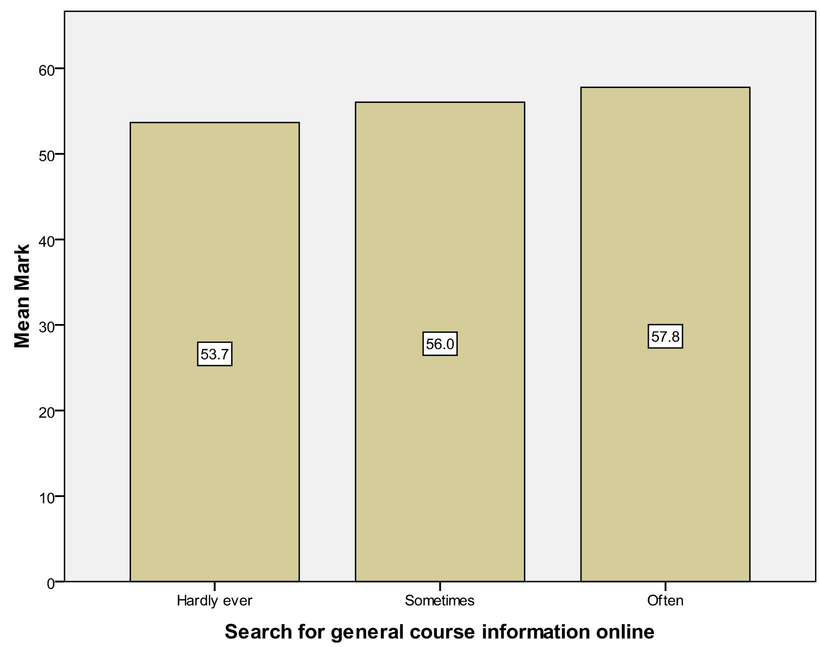
Once again, one sees a parallel between this study and the series of studies pioneered by Professor Mitra where the phenomenon of ICT as an instrument for self-directed learning was repeatedly confirmed (Mitra and Rana, 2001; Inamdar, 2004; Van Cappelle, 2004; Dangwal, JhaandKapur, 2006; Cronje and Burger, 2006; Gush, Cambridge and Smith, 2004).

Jackson, Zhao, Kolenic, Fitzgerals, Harold and Eye (2008) conducted a similar experiment with a younger group and found similar results where IT (Internet use) predicted better academic performance.

4.2.15 Online Access to Articles and Reports (Journals, B7)

This section seeks to determine whether a relationship exists between access to online information such as electronic journal articles and research reports, and academic achievement. Figure 4.2.19 illustrates the outcome pictorially and Table 4.2.25 shows the result from ANOVA. It can be seen that the three different groups are not the same with p value of 0.036 and that the higher the usage the better the academic performance.

Figure 4.2. 19 - Relationship between the use of online material and academic achievement



·	N	Mean	Std. Deviation	Sig.
Hardly ever	22	53.67	7.959	.036
Sometimes	79	56.05	6.775	
Often	150	57.78	8.203	
Total	251	56.88	7.833	

Table 4.2.25 – Search for information online influence on results

Further tests taking into consideration faculty and gender influences did not show any statistically significant changes in the results.

4.2.16 Summary - ICT Use and Academic Performance

Referring to the use of technology for the disadvantaged, Punie, Zinnbauer, and Cabrera (2006, p. 16) stated:

> *Motivation and self-esteem are important factors that can allow the less privileged to take up learning again*.

This section provides a summary of the findings about the relationship between the extent to which students use ICTs and their academic performance.

- Respondents' academic performances (results) in the three faculties were statistically different (section 4.2.2). In the case of faculty of Sciences, this difference also applied to gender.

- This study found that no statistically significant difference exists between academic performance and variables such as: extent of *computer use, extent of Internet use* and *the amount of time spent on using ICTs* for non-academic purposes and ICT usage for social purposes.

- The extent of ICT integration into academic programs (section 4.2.10) showed a negative correlation in some areas. Although this requires further investigation, one possible explanation is that the involvement of ICTs in education for purposes of teaching and learning is not well planned and executed. Further investigation needs to be carried out if improvements are to be made in this area.

- On the other hand, the use of the Internet as part of an academic program (sections 4.2.12) and when it is encouraged by the lecturer was found to relate positively to academic performance. The strongest evidence for this occurred in the faculty of Sciences and more so amongst the female students. It is interesting to note that the findings in this study follows a different emphasis where usually it is the male students that have responded more positively to technology as found in a study by Passey, Rogers, Machell, McHugh (2004, p.6).

- The extent to which students correspond with their lecturers by means of e-mail (section 4.2.13) shows a positive relationship graphically with academic achievement for all faculties and statistically only with faculty of Sciences.

- The length of ICT use (section 4.2.7) does play a role in terms of its influence on results between two groups. Those who reported having used computers for between 2-4 years generally scored higher than those who used them for less than two years. This is more noticeable for those respondents who are in their first year of study and are in Faculties of Sciences and Law and Management.

- Student self-initiated internet access (section 4.2.14) showed the strongest influence on results. With a p value of 0.001 it showed a clear association between Internet friendly respondents and the rest. This relationship exists in all faculties but was strongest in Management and Law and in female students.

- A significant difference was also found in results of students who use online information such as journals often.

The picture that is emerging is rather interesting. Clearly, when students use ICTs as a tool and as an integral part of their studies, in nearly all cases, it influences their results positively. However, there is a clear sign that this potential is not recognized within the academic structures of the University.

Indeed the literature has provided ample warnings and examples that this has happened elsewhere.

Alexander and McKenzie (1998, p. 3) put the emphasis on the way a project is integrated into the learning experience and argue that it must be well thought through and implemented. On the problem of commitment the same authors stress that the individual members of the project team need to be committed to the project and have adequate time to carry out their roles and responsibilities in the project.

Bradbrook, Alvi, Fisher and Lloyd (2008, p. 50), following the detailed analysis of a series of research papers that had positive and negative comments about ICT, conclude that the crucial component in the use of ICT within education is the teacher and his or her pedagogical approaches.

As can be seen from the above, the successful implementation of technology in the academic program is a complex and involved process that necessitates a well-planned integration at all management levels. Education (using technology) is a way to overcome disadvantage, though this is complex to achieve (Bradbrook, Alvi, Fisher and Lloyd, 2008, p. 89).

In concluding this section and reflecting on the results, one is reminded of the similarities between these findings and those experiments conducted by Professor S. Mitra, where the role of instructor was minimal while the learners on their own accord took the interest and played a key role in the learning process. To some extent a similar pattern is observed here in that students take the larger share of the responsibility in the learning process and the results show that they succeeded.

4.3 The Cultural Influence

So far in Chapter 4, section 4.1, I examined technology and its usage. In section 4.2, I documented how ICT use affected academic performance. In this, section 4.3, I examine the role of culture and its influence on technology use, motivation and academic performance.

There are a number of variables in the questionnaire that aim at measuring motivational or cognitive intentions. Statements such as “I think ICTs are essential for education”, in paragraph A26 of the questionnaire, aimed at measuring what students think of ICTs in terms of their value for education. Other similar statements were aimed at discovering what family and friends think of ICTs and their importance for education and future employment. The last two variables could also be regarded as important variables that measure cultural influence, since both parents and friends constitute an important part of the cultural domain of influence.

4.3.1 Introduction

The focus of this section is culture, one of the key variables in this study. Its degree of influence on ICT use and academic performance are examined. Hwang and Kim (2007, p.232), Alavi, Kayworth and Leidner(2006, p.192), regard knowledge sharing as an important variable in the technology mediated learning (TML) and knowledge management (KM) literature incorporating social and cultural factors. Similarly Diamant, Fussell, and Fen-ly (2008, p. 389), point out that culture and technology interact not only in shaping communication but also in shaping how people think about their collaborative performance. One explanation for the reason for such influence is forwarded by Moos and Azevedo (2009. P. 587) when they state “Observing other people sustaining effort to achieve goals allows the observer to believe that he or she also possesses the capabilities to achieve a similar performance level. Social persuasion also assumes an important role in developing self-efficacy”.

Section 4.1.2.1, above, documented the differences in the nationalities and language groups of the students who participated in this study. Since 97.37% of the participants in the research were South Africans, it can safely be assumed that differentiation in nationality as a cultural variable could not have influenced the results in any significant way.

Another cultural variable that was examined for significance was between average results and home languages. Section 4.1.2.1, above, detailed the differences in the home language among the respondents. Here again, due to vast difference between the number of students that use any of these languages, i.e. 175 vs. 36 or 23, it is not practical to use a valid statistical test to measure result differences which could be attributed to difference in home languages.

Two other possible variables that were explored were responses to the statements “What does my family think of ICT?” and “What do my friends think of ICT?”. Here the notion that members of the family or friends as, perceived by the participants, might hold certain opinions about ICT was tested as a cultural variable to see whether it has any influence on academic performance. However, since more than 95 % of the participants have agreed or strongly agreed that ICTs are essential for education (Tables 4.22 and 4.23) it can be concluded that there is strong relationship between family and friends thinking that ICTs are essential for education. The conclusion is that the participants do indeed come from culturally similar backgrounds and that these will have similar influences and they therefore cannot be compared with each other in terms of different cultural groups.

Ideally such questions would have been asked directly from the family members and friends. However, this was not within the scope of the project and is regarded as one of the limitations of this study.

4.3.2 Students’ Perception of ICTs

In Chapter 4, section 4.1.9, students’ responses to the statement, “I think ICTs are essential for education.”, were documented. Here the same statement is examined from a motivational or, more precisely, a cognitive perspective, i.e., when students think very positively about ICTs, do they make more effective use of them? What sort of ICTs do they use? Ultimately, what relationship can be found between this attitude and academic performance? More significantly, what students think to what extent is colored by their parents, friends and the larger society which will be a measure of the cultural influence.

The first variable that is examined is academic performance i.e. how does the variable in question relate to results. Table 4.3.1, below tabulates the analysis of the different groups.

It can be seen that from the total of 263 participants, only 7 disagreed and 2 strongly disagreed. Taking into consideration that the overwhelming majority of the participants come from similar cultural background, with a collective rather than individualistic approach, it is not surprising that they think alike in terms of the importance of ICTs in education.

I think ICTs are essential for education.			
	N	Mean	Std. Deviation
S Disagree	2	61.58	1.436
Disagree	7	58.43	9.121
S Agree	194	57.58	7.680
Agree	58	54.50	7.581
Don't Know	2	45.85	.678
Total	263	56.87	7.787

Table 4.3.1 – Response to the statement “I think ICTs are essential for education”.

However, since there are only a few students that think differently, we cannot conduct a statistical test to compare results between different groups. But, it is possible to examine the effect of the influence of what they think of ICTs according to their use. Here I used crosstab which is used when two categorical variables are being compared. Tables 4.3.2 and 4.3.3 tabulate the responses to “I think ICTs are Essential for Education” against Internet and computer use. Both tables have one thing in common. Students who think ICTs are important tend to use them more often i.e. the respondents that either agree or strongly agree with the statement have reported to use ICTs 40 – 60% of their time in all three tables. In this analysis, a use of over 80% is assumed to be too high and not necessarily productive academically.

		I Think ICTs are Essential for Education					Total
		S Disagree	Disagree	S Agree	Agree	Don't Know	
Internet Use on Campus	None	0	0	1	0	0	1
	< 20 %	0	2	13	8	0	23
	20 - 40 %	1	0	30	10	0	41
	40 - 60 %	0	1	45	13	2	61
	60 - 80 %	1	3	60	9	0	73
	80 - 100 %	0	1	30	8	0	39
Total		2	7	179	48	2	238

Table 4.3.2 – Shows the relationship of regards for ICTs with Internet use on campus.

		I Think ICTs are Essential for Education					Total
		S Disagree	Disagree	S Agree	Agree	Don't Know	
Extent of Computer Use	None	0	0	1	0	0	1
	< 20 %	1	0	8	5	1	15
	20 - 40 %	0	1	15	5	1	22
	40 - 60 %	0	3	46	18	0	67
	60 - 80 %	0	2	78	19	0	99
	80 - 100 %	1	1	45	10	0	57
Total		2	7	193	57	2	261

Table 4.3.3 – Relationship of regards for ICTs with the Extent of Computer Use.

Further analysis is provided in Tables 4.3.4, 4.3.5, 4.3.6 and 4.3.7 where this variable is compared against other variables in this study. These include: Search for general information online, search on the Internet as part of a course, self-initiated Internet search and email to the lecturer. As can be seen in each case the highest number of students who use ICTs "Often" are also in the "Strongly Agree" category. The implication is that when students think ICTs are essential for education they use them more often. It should be noted that in the case of these categories there was a statistically significant relationship with results. Section 4.2.12 discussed the use of the Internet when it is encouraged by the academic community. Section 4.2.14 discussed Internet search as part of an academic course when the use is based on students' initiative. Section 4.2.15 discussed the online search for course information. In all of these cases the higher frequency of ICT use resulted in better performance.

		I Think ICTs are Essential for Education				Total
		S Disagree	Disagree	S Agree	Agree	
Search for general course information online	Hardly ever	1	1	17	3	22
	Sometimes	0	3	51	24	79
	Often	1	2	118	28	149
Total		2	6	186	55	250

Table 4.3.4 – Relationship between regards for ICTs and search for general course information online.

		I Think ICTs are Essential for Education					Total
		S Disagree	Disagree	S Agree	Agree	Don't Know	
Search Internet as part of my Course	Hardly ever	0	0	7	4	0	11
	Sometimes	1	1	33	15	0	50
	Often	1	6	150	36	1	194
Total		2	7	190	55	1	255

Table 4.3.5 –Relationship between regards for ICTs and Internet search as part of a course

		I Think ICTs are Essential for Education					Total
		S Disagree	Disagree	S Agree	Agree	Don't Know	
I use Internet for my studies	Hardly Ever, Sometimes	1	1	40	19	0	61
	Often	1	6	150	36	1	194
	Total	2	7	190	55	1	255

Table 4.3.6 –Relationship betweeb regards for ICTs and Internet for studies

It can therefore be argued that the positive approach to ICTs have had an indirect but positive effect on performance.

		I Think ICTs are Essential for Education					Total
		S Disagree	Disagree	S Agree	Agree	Don't Know	
I email my lecturers	Hardly ever	0	3	84	25	1	113
	Sometimes	2	4	69	25	0	100
	Often	0	0	34	7	0	41
Total		2	7	187	57	1	254

Table 4.3.7 –Relationship between regards for ICTs with email communication with lecturers

An exception is the case of email with the lecturer. Section 4.2.12 discussed the “I email my lecturer” statement. It was shown that students who reported they email their lectures for academic purposes scored higher and in the case of the faculty of Sciences it was statistically significantly higher as well. The information in Table 4.3.7, however, appears to be contradicting the pattern of the rest i.e. the “Often” category is the lowest (34) whereas it should have been the highest. It could be argued that email communication with lecturer is not always possible for students do not have the ultimate choice. The willingness and the lecturers’ approach play the dominant influence. In other words, a student who thinks ICT is essential does not always have a chance to communicate via email with the lecturer, if the lecturer is not willing.

Therefore, there is clear evidence that those respondents who think highly of ICTs, when the opportunities avail themselves, whether it is in the form of Internet as encouraged by the lecturer, email communication with the lecturer or merely Internet research as the result of an academic goal, it does have an influence on their academic performance.

A number of other variables in this study were investigated in a similar manner. These were:

- My family thinks ICTs are essential for ICTs.
- My friends think ICTs are essential for ICTs.

In this study these variables are categorized as cultural variables and are used to measure the degree of influence from family and friends and their effect on academic performance.

Tables 4.3.8 to 4.3.15 show the results. As can be seen a very similar pattern as the one above has emerged. That is, there is a close relationship between the two statements. A crosstab test to compare the three statements produced a p value of 0.001 showing very close relationship between the three variables. Firstly, there is direct relationship between what respondents think of ICTs and what their family and their friends think of ICTs. This collective approach is an institutional phenomenon that is not necessarily the same in all cultures i.e. in some cultures the views of parents and children may not be so closely aligned. Secondly, when the respondents report that their family and friends think ICTs are essential for education, the respondents use ICTs more effectively and more frequently. Again, it should be noted that the 80-100% category is not regarded as productive and is an exception. A student that reports that he/she is using ICTs 100% of his/her time is bound to miss on other essential elements or is not being accurate unless he/she is a distance learner which is not the case for the respondents in this study.

Thirdly, in cases where respondents use ICTs "often", their use is encouraged culturally. Provided it is also encouraged academically, whether self-initiated or institutionally based, it leads to better performance.

		My Family Thinks ICTs are Essential for Education					Total
		S Disagree	Disagree	S Agree	Agree	Don't Know	
Computer Use on Campus	< 20 %	0	1	14	4	2	21
	20 - 40 %	1	3	14	20	6	44
	40 - 60 %	2	2	42	29	15	90
	60 - 80 %	2	3	30	30	9	74
	80 - 100 %	0	1	17	9	2	29
Total		5	10	117	92	34	258

Table 4.3.8 – Relationship of the family's regard for ICTs with computer use on campus.

		My Family Thinks ICTs are Essential for Education					Total
		S Disagree	Disagree	S Agree	Agree	Don't Know	
Internet Use on Campus	None	0	0	1	0	0	1
	< 20 %	0	1	12	9	1	23
	20 - 40 %	2	2	22	10	5	41
	40 - 60 %	0	1	24	27	9	61
	60 - 80 %	2	5	32	22	12	73
	80 - 100 %	0	1	17	17	4	39
Total		4	10	108	85	31	238

Table 4.3.9 – Relationship of the family's regard with Internet use on campus.

		My Family Thinks ICTs are Essential for Education					Total
		S Disagree	Disagree	S Agree	Agree	Don't Know	
Search for general course information online	Hardly ever	2	2	10	5	3	22
	Sometimes	0	4	32	33	10	79
	Often	3	2	73	51	20	149
Total		5	8	115	89	33	250

Table 4.3.10 – Shows the relationship of the family's regard with search for general course information online

		My Family Thinks ICTs are Essential for Education					Total
		S Disagree	Disagree	S Agree	Agree	Don't Know	
I email my lecturers	Hardly ever	3	5	47	38	20	113
	Sometimes	2	4	43	41	10	100
	Often	0	0	26	11	4	41
Total		5	9	116	90	34	254

Table 4.3.11 – Relationship of the family's regard with email communication with the lecturer.

A very similar pattern emerges in the respondents to "My Friends Think ICTs are Essential for Education", as can be seen in Tables 4.3.12 – 4.3.15.

		My Friends Think ICTs are Essential for Education					Total
		S Disagree	Disagree	S Agree	Agree	Don't Know	
Computer Use on Campus	< 20 %	0	1	15	4	1	21
	20 - 40 %	0	4	20	16	3	43
	40 - 60 %	0	4	55	24	6	89
	60 - 80 %	2	2	36	32	2	74
	80 - 100 %	0	0	18	8	1	27
Total		2	11	144	84	13	254

Table 4.3.12 – Relationship of friends regard of ICTs with computer use on campus.

		My Friends Think ICTs are Essential for Education					Total
		S Disagree	Disagree	S Agree	Agree	Don't Know	
Internet Use on Campus	None	0	0	1	0	0	1
	< 20 %	0	3	13	6	1	23
	20 - 40 %	0	2	26	9	3	40
	40 - 60 %	0	2	32	24	3	61
	60 - 80 %	1	2	39	24	4	70
	80 - 100 %	1	1	22	14	1	39
Total		2	10	133	77	12	234

Table 4.3.13 – Shows the relationship of friends regard of ICTs with Internet use on campus.

		My Friends Think ICTs are Essential for Education					Total
		S Disagree	Disagree	S Agree	Agree	Don't Know	
I email my lecturers	Hardly ever	0	6	58	42	5	111
	Sometimes	2	5	55	32	4	98
	Often	0	0	29	9	3	41
Total		2	11	142	83	12	250

Table 4.3.14 – Shows the relationship of friends regard of ICTs with email communication with the lecturer.

		My Friends Think ICTs are Essential for Education					Total
		S Disagree	Disagree	S Agree	Agree	Don't Know	
Search for general course information online	Hardly ever	0	2	9	8	2	21
	Sometimes	0	4	37	32	6	79
	Often	2	4	96	40	4	146
Total		2	10	142	80	12	246

Table 4.3.15 – Shows the relationship of friends regard of ICTs with search for general course information online

A number of conclusions can be drawn from these findings:

- The UL student community follows a predominantly collectivist approach and is mostly homogenous culturally.
- ICT receives highest levels of support culturally which leads to higher ICT use.
- The cognitive and motivational variables of this study are influenced by student culture.
- When the use of ICTs is encouraged through some sort of academic program, whether self-initiated or institutionally, it influences academic results positively.

These remarks are further elaborated in the concluding part of this chapter.

4.4 The Motivational Influences

> *There is some evidence that ICT can give greater opportunities for accessing learning to those who need it the most. Motivation and self-esteem are important factors that can allow the less privileged to take up learning again.*
>
> (Punie, Zinnbauerand, Cabrera 2006, *p.16).*

4.4.1 Introduction

In Chapter 2, the literature review, I illustrated how the three pillars in this study, namely, culture, motivation and technology, were investigated for their influence on the educational environment. In section 4.1, I documented the findings that focused on the technology variable, i.e., students' extent of ICT use and their dependency on ICTs, for achieving their academic goals. In section 4.2, I examined the relationship between students' ICT use and its effect on their academic performance. In section 4.3, I examined the cultural influences on technology use and academic performance. In this, section 4.4, I examine motivation and its influence over technology use or academic performance. In particular, there are three motivational variables that will be the focus of this examination. These are intrinsic, extrinsic and self-efficacy motivational orientation. In subsequent sections, I cover each of these motivational components separately.

4.4.2 Intrinsic Motivation

In this section, I examine intrinsic motivation and its influence on other variables of this study. Of particular interest is the association with academic results.

In Chapter 2, I documented the general expectation from the literature that research indicates that students show the most positive achievement patterns when they are focused on mastery goals (or intrinsically motivated) (Meece, Anderman and Anderman 2006, p.491).

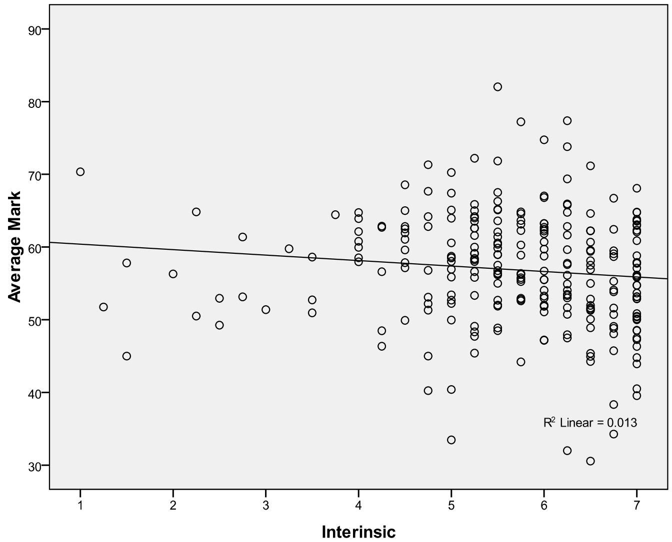
Before I start with this analysis, I would like to examine the associated data. Table 4.3.16, below, is the intrinsic score frequency distribution to the nearest digit. It shows the mean mark against each intrinsic group from 1–7. A number of observations can be made. Firstly, there seems to be no relationship between academic results and intrinsic motivation i.e. as intrinsic values increase there is no corresponding increase in results. In fact, when the intrinsic value is 7, the highest possible score, the corresponding mark average is 54.10 which is much lower than when the intrinsic value is 6.

	N	Mean	Std. Deviation
1	2	61.05	13.151
2	5	54.89	7.523
3	6	54.64	4.826
4	16	58.24	5.784
5	59	57.93	7.833
6	87	58.67	7.816
7	79	54.10	7.740
Total	254	56.90	7.845

Table 4.3.16 – Shows the results' frequency distribution for each intrinsic category.

Secondly, it is seems from the table that the respondents in this study are highly motivated intrinsically. Only 13 out of 254 respondents scored 3 or less in terms of the intrinsic motivation scale. This makes the group highly motivated and therefore it is difficult to determine the association between groups of differing levels of intrinsic motivation and academic performance. It could be argued that this could have been expected as the group was shown to be culturally homogenous and therefore is expected to be motivated in a similar degree. In order to examine the data statistically, I performed the correlation between average intrinsic score and results. It produced a Pearson correlation value of -0.104. The graphic representation of the data is shown in Figure 4.3.1 below.

Figure 4.3. 1 – Graphic representation of intrinsic values results.



It can be seen that there no relationship between intrinsic motivation and results. For a given intrinsic value a wide range of results are scored indicating no association between the variables in question. Similar correlation by gender, faculty and other variables in the study were obtained. However, since the culturally homogeneous group responded in similar manner to the questions they all more or less belong to the same group and the variation in results therefore must be attributed to other factors. This observation is not totally unprecedented in literature. "One intriguing anomaly in achievement goal research is the lack of strong relations between mastery goals and student achievement. Students who are master oriented report a desire to learn and to improve their abilities, yet this personal and classroom goal focus is generally unrelated to measures of academic performance, such as grades and test scores, when prior ability is controlled" (Meece, Anderman and Anderman 2006, p.499).

This suggests to an interesting conclusion. MSLQ typically expects that those with higher scores for intrinsic values would produce higher academic results. This is not shown to be the case in this study.

4.4.3 Extrinsic Motivation

In this section, I examine extrinsic motivation and its influence on other variables of this study. Of particular interest is the association with academic results.

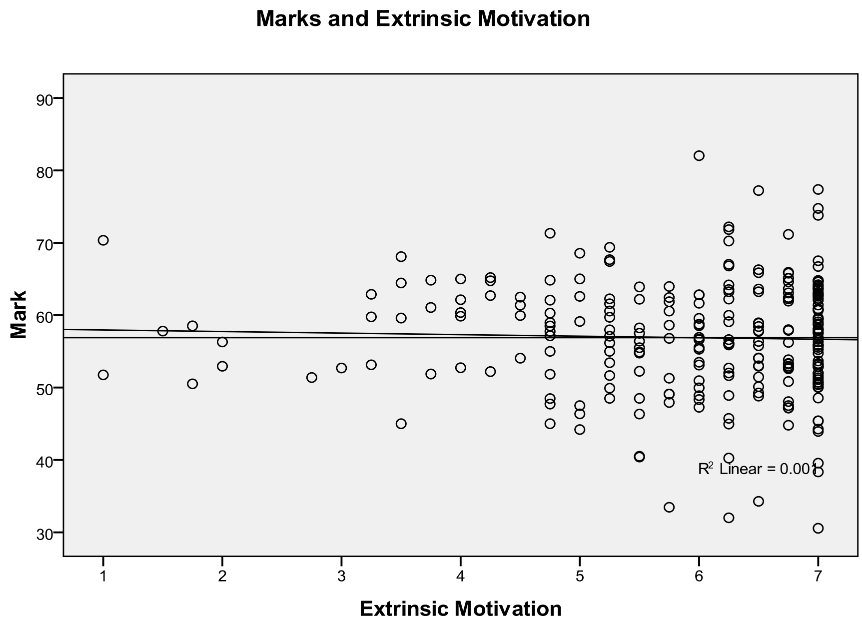
Table 4.3.17 reveals the findings for academic performance. As can be seen, it seems that there is no clear correlation between academic results and extrinsic motivation. Again, in a similar manner to the intrinsic motivation values discussed above, a majority of participants fall in the higher scales in their extrinsic orientation value.

Extrinsic Value	N	Mean	Std. Deviation
1	2	61.05	13.151
2	5	55.21	3.394
3	5	55.97	5.045
4	16	59.99	6.330
5	39	57.65	7.085
6	68	55.79	8.689
7	119	56.91	7.904
Total	254	56.90	7.845

Table 4.3.17 – Result against the corresponding extrinsic value.

The correlation between intrinsic values and results gave a Pearson correlation coefficient of -0.034. The graphic representation is shown in figure 4.3.2 below. As can be seen there is no relationship between marks and extrinsic motivation. Other tests for other ICT variables are not applicable for the same reason.

Figure 4.3. 2 – Mark vs. Extrinsic Motivation



Again as can be seen a wide range of marks are applicable for a particular extrinsic value indicating no correlation between the two variables.

4.4.4 Self-Efficacy

In this section, I examined self-efficacy and how it relates to results and other variables in this study.

In Chapter 2, ample and clear evidence was noted in the literature about self-efficacy and its relation with academic performance. Based on extensive previous research, it is clear that students' perceptions of their capabilities to meet situational demands are related to their performance, persistence, and choice. A vast body of research has focused on the relationship between self-efficacy and performance in various academic activities (Moos and Azevedo, 2009. p. 578). On the other hand Yi and Hwang (2003) in their research linked self-efficacy with technology. They make reference to a concept called general computer self-efficacy (CSE) which is defined as an individual judgment of efficacy across multiple computer domains and application-specific. Self-efficacy is defined as an individual perception of efficacy in using a specific application or system within the domain of general computing (p. 434). In their research they talked about application-specific self-efficacy that exerts a significant effect on system use (p. 443). Is there an evidence to support what is expected in the literature with the findings in this study?

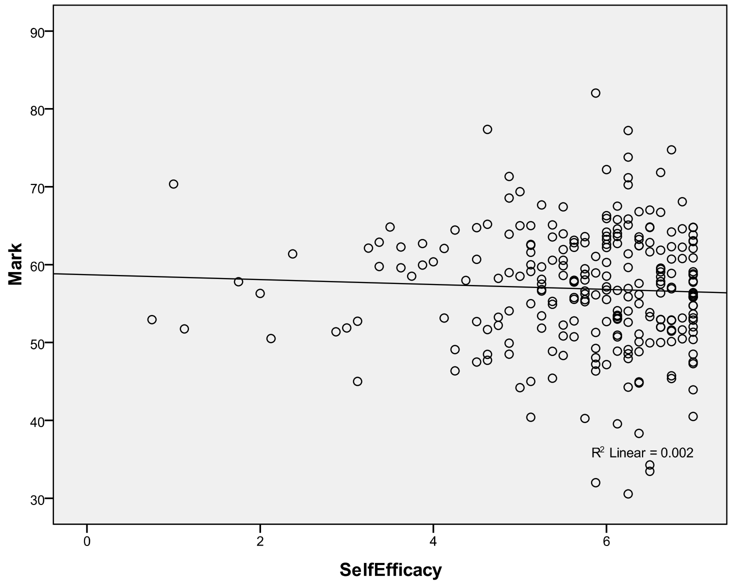
Table 4.3.18 shows the corresponding data regarding self-efficacy. As can be seen, it seems that there is no clear correlation that can be ascertained graphically between academic results and self-efficacy. Again, the majority of the participants scored towards the higher side of the efficacy scale i.e. 180 of the 254 of the participants or 70% belong to the 6 or 7 groups. This means that statistically there are no different groups that can be compared. It could be argued that the cultural influence is so dominant that it has created a homogenous group whose members all feel similar to one another and therefore could not be compared. In terms of correlation the Pearson correlation coefficient is -0.047 indicating no correlation between results and self-efficacy as represented in this study.

Self-Efficacy	N	Mean	Std. Deviation
1	3	58.35	10.411
2	4	56.50	4.526
3	7	55.11	6.626
4	13	58.56	5.713
5	47	57.42	7.887
6	102	57.04	8.627
7	78	56.25	7.338
Total	254	56.90	7.845

Table 4.3.18 Self-Efficacy and results

Graphically, the representation is shown in Figure 4.3.3. As can be seen, for a given self-efficacy value, a wide range of results are obtained indicating no possible correlation between the two variables.

Figure 4.3. 3 - Self-efficacy vs. marks graphical representation



The finding is similar to that of Cretchley (2007, p. 35) who found no evidence at all that computer confidence related to achievement on a wide range of course tasks, not even those that specifically required the use of technology. He therefore concluded that computer confidence may be a poor predictor of students' performance on course tasks (p.26).

4.4.5 Summary

In this section, the findings related to two pivotal variables of this study namely, culture and motivation as documented under sections 4.3 and 4.4 are summarized

- Section 4.3 demonstrated how students' attitude towards a series of questions such as "I think ICTs are essential for education" and "My family (friends) thinks ICTs are essential for ICTs" are closely aligned. It was noted that the former statement is a cognitive variable while the latter is a motivational one. Both of these are assumed to be influenced by the culture from which the student comes. The finding confirms Bandura's assertion (1977, p VII) that human behaviour (learning) is explained in terms of a continuous reciprocal interaction between cognitive, behavioural (motivation) and environmental (socio-cultural) determinants.

- This makes culture a very powerful force that must be taken into account when aiming to have effective and positive influence. At the outset of this study, culture was suspected to play a critical role in shaping the values, attitudes, thinking and ultimately the observable behavior (learning) of the students. The study has confirmed this fact and shown that the underlying current that shapes student behavior is indeed culture. This echoes the literature's finding such as Mansfield's where he explains that social goals, such as relationships, responsibility and status, have been shown to influence students' motivation and engagement in learning contexts (2007, p. 2). Bread and Senior (1980, p. 4) record similar findings with a special influence contributed from mothers, fathers and families in determining the levels of need for achievement motivation.

- A number of variables were identified as culturally oriented variables with the aim of examining their influence over the results and ICT usage. These included nationality and the language groups. In additions, responses to statements such as "what my family (or friends) think of ICTs for education (or employment)", were treated as cultural or social orientated variables. However, the examination of these variables and their associated responses demonstrated (section 4.2.3 above) a homogenous environment such that no meaningful differentiation could be established other than the fact that they predominantly responded in a very similar manner to all of such questions. In terms of cultural influence on results therefore no differentiation could be found that influenced results or ICT usage. However, it was shown how these ideas have consequences in terms of level of usage, its quality and ultimately on academic performance. It was demonstrated that when a student feels strongly about ICTs, he/she uses it more frequently, more effectively and as such it is more likely to have an influence in terms of academic performance.

- More significantly, it was also demonstrated that strong support for ICTs has an indirect influence over the academic performance. This is supported by Wang and Newlin (2002, p. 160) who demonstrated the correlation that exists between self-efficacy for technology use and academic performance, i.e., students that showed confidence in their abilities to use technology also did well in their exams. Learner perceptions of personal efficacy, therefore, have a reciprocal relationship with the self-regulatory processes that affect motivation and performance (Lynch and Dembo, 2004)..

- In all areas where ICT use showed to have influence on results, the cultural variables also showed great support.

- Responses to the motivational questions such as intrinsic, extrinsic and self-efficacy were primarily scattered towards the higher end of the motivational scale (7) in the MSQL questionnaire. This could be yet another indication of the high level of cultural influence. As such these variables therefore could not be accurate predicators for academic performance or ICT usage. I therefore see evidence for a similar conclusion to that made by Kennedy (2002, p. 434) who found in his study in China. “Western ways of categorizing motivation … do not travel well, at least not to the Orient”.

- This high level of motivation for ICT use, for a student population that predominantly was not experienced with it, contradicts the finding from Bates and Khasawneh (2007, p. 188) who concluded that previous success with online learning systems may be a critical factor in the development of self-efficacy and attitudes about online learning system use. In contrast, this study found the respondents very confident to use the ICTs even though mostly inexperienced at first.

- Fortunately, therefore, there was no evidence in this study to support the concern expressed by Covington (1998, p. 44–47) that the main contributor to low academic performance and high dropout rates amongst some ethnic groups is their cultural background that inculcates values that are not conducive to high achievement in the minds and hearts of children. Indeed, the study recorded a high level of motivation that is influenced heavily by the cultural background which in turn affects positively the use of technology with a positive influence on academic performance.

- The cultural influence, is therefore by far is the most dominant variable and has a penetrating influence on all other variables. This confirms many assertions captured in this study such as McInerney, Hinkley and Dowson's (1998, p. 622) that academic achievement may be influenced by a complex array of motivational determinants related not only to students' mastery and performance goal orientation but also to their social goal orientation. In this study there is ample evidence that culture does provide such a predictable influence on motivation, ICT use, the learning process and therefore academic performance.

- The study also provides evidence for what the literature refers to as the "flow state". It was shown in psychological terms why students might be attracted to use computers. The challenge therefore, for an educational technologist, must be to facilitate a learning environment that takes advantage of this phenomenon.

- The study therefore provides evidence that ICTs can act as a motivational tool to accelerate learning in a disadvantaged student environment of higher learning.

Chapter 5 – Conclusions and Recommendations

5.1 Introduction

Chapter 5 summarizes the conclusions and recommendations emanating from this study. It begins by looking at a summary of the initial aims and objectives, its rationale, and a synopsis of the literature findings. It then includes a brief discussion presented according to each of the main research questions followed by the outcomes of this study. The lessons learned, the strengths, the weaknesses and the special contributions of this study are covered in this section. It concludes with a list of recommendations.

5.2 Summary

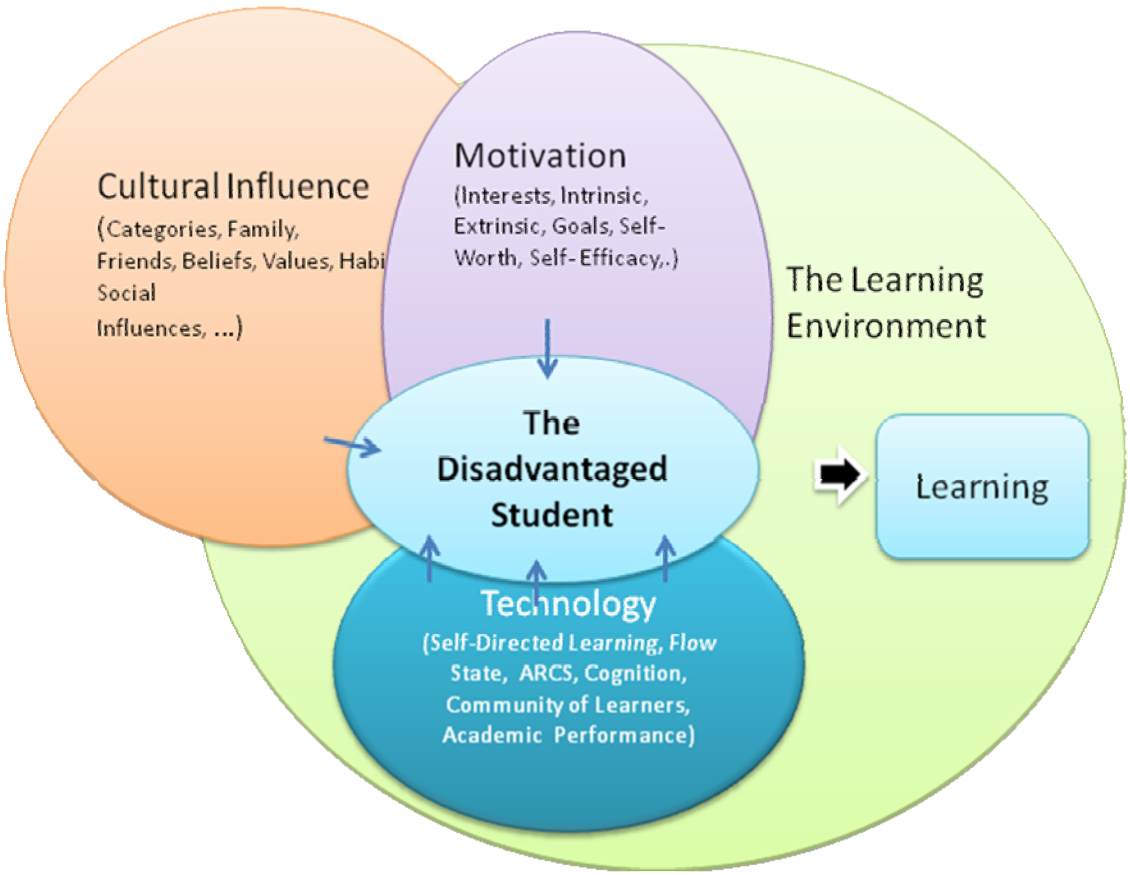
The research topic for this study is:

> *The role of Information and Communication Technology (ICT) in a higher education institution: with specific reference to disadvantaged students, cultural aspects and motivation*

It was explained in Chapter 1 that the motivation for the study came from many years of experience in ICT management in institutions of higher learning and the witnessing of an undeniable and keen interest in ICTs shown by the majority of the students. A typical student is easily attracted to computers and, if given the opportunity, spends long periods using them. There were many questions. How deep is this interest? Does it have a bearing on academic performance? What is the source of this interest? Why is there such a similar reaction in such a large number of the students? Is this reaction perhaps culturally influenced?

It was very clear from the outset that the students that come from the disadvantaged communities have most probably, not been exposed to computers prior to their study at the University. It seemed that they find the new toy fascinating and are more than willing to explore it. The formalized summary of the research questions is documented in Chapter 3. There were three critical variables affecting the student in his/her learning environment that were considered. These were student’s **culture** that in turn influences **motivation** for learning and finally determines the level of interest towards the use of **technology**. Figure 5.1 which was repeated several times in various chapters of this study, illustrates the relationship between the main variables and how they influence a student’s learning environment.

Figure - 5. 1 – Student’s learning environment is influenced by cultural, motivational and technological elements.



It was not difficult to find a parallel phenomenon elsewhere in the literature. My initial investigation led me to the "Hole-in-the-Wall" project that had many similarities to this study. Here the initial excitement about technology created the necessary motivation for the learners from mostly poor backgrounds to use computers without supervisionp which proved to be effective in their subsequent learning opportunities. Similarly, in this study, in a disadvantaged-student setting with minimal or no supervision, learners coming from a background (culture) that encourages the use of ICTs come to the University already more than ready to use it. The cultural habit of collectivism facilitates an easier transition since the overcoming of initial technical difficulties is learnt from other students and this process is relatively painless.

5.2.1 Literature Findings on the Nurturing Role of Culture

It was clear from the beginning that a common denominator in all the students was their particular cultural background. I found that a similar phenomenon had been experienced and confirmed by McClelland who spent considerable time on the subject and found that the root cause for economic prosperity is in the religious and moral values that the individual members of a society uphold and that this is developed and nurtured in the bosom of the culture where the individual grows up and thus the individual ultimately manifests the same attitude and attributes (McClelland, 1961, p. 406). This clearly showed that this cultural factor must be considered as part of the research. Much of the research in the field (Beneke, 1999; Oblinger, Barone and Hawkins, 2001) recommended, and others in their own unique ways, that, for the educational environment to fulfil its role, there must be a better understanding of the students' background, which to me meant a better understanding of the students' culture.

Others focused on the nucleus of a society (or culture) and talked about the influence exerted by family and friends. They believed that family members and friends have considerable influence in determining the levels of motivation and the value system of the learners (Bread and Senior, 1980; Bandura, Bakbaranelli, Capraba and Pastorelli, 1996; McClelland, Atkinson, Clark and Lowell, 1976; Covington, 1998; Bandura, 1997; Weaver, 2000). Some believed that this is particularly true in the case of disadvantaged students.

The main implication of the cultural influence, for the learning environment, was that it does effect the learning environment with its own expectations and opportunities that must be taken into consideration for an effective realization of student academic potential.

5.2.2 Literature finding on Students' Source of Motivation and Technology Use

Having established the importance of understanding students' culture in order to facilitate an effective educational environment, the next series of questions dealt with understanding why and how students are interested in technology and how this interest could be maintained as an effective educational tool. In the search for an answer, my journey led me to determine motivation to be the second critical variable of this study. I found that education begins and ends with motivation. I came across a statement that is attributed to the former United States' Secretary of Education, T. H. Bell, that is arguably the most quoted statement in educational literature. He said, "There are three things that are important in education. The first is motivation. The second is motivation. The third is motivation" (Ames, 1990; Covington, 2000, p. 171; Maehr and Meyer,1997, p. 372).

In trying to understand student motivation for learning and technology, I came across Maslow's ideas that have particular relevance for disadvantaged students. For students to remain interested in technology and education, their basic psychological and safety needs must be met before meaningful learning can take place. Maslow's contribution was significant due to the special and unique circumstances in which this study took place. In conditions where basic security, privacy and the physical arrangement of the educational facilities are less than ideal then, according to Maslow, the likelihood is minimal, that students will, of their own accord, become interested in their studies or become intrinsically motivated.

Once the importance of the essentials such as security, shelter and food, that must be in place before a student is motivated to learn, were established, I had to understand what motivation is and, other than culture that has some influence over it, I had to find how it is developed further and maintained. I found that this is referred to in the literature as **motivational goal theory,** which emphasizes the reasons why students engage in achievement-related behaviour and takes into account both environmental and individual influences on student motivation (Mansfield, 2007, p. 2). Rather than focusing on the content of what people are attempting to achieve (i.e., objectives, specific standards, etc.), goal orientations define *why* and *how* people are trying to achieve various objectives (Anderman and Maehr, 1994, p. 294) and refer to overarching purposes of achievement behaviour (Kaplan and Maehr, 2007, p. 142; Mansfield, 2007, p. 2). In this school of thought, differences of behaviour are attributed to a complex set of goals that a learner pursues (Mansfield, 2007, p. 2). Closely linked concepts were intrinsic and extrinsic motivation that were parallel to mastery and performance goals, which aimed at giving quality to motivation. If students are interested in learning because the task itself is interesting, they are motivated intrinsically (Biggs and Telfer, 1987, p. 96). When other motives or separate outcomes are intended, it is extrinsic motivation that is being practiced (Ryan and Deci, 2000, p. 55). It was found that the literature is mostly critical of extrinsic motivation or performance-orientation goals (Blumenfeld and Mefgendoller, 1992, p. 208) and very supportive of intrinsic (Feldman, Csikszentmihalyi and Gardner, 1994) or mastery goals (Ames, 1992, p. 262; Elliot, McGregor and Gable, 1999; Mansfield, 2007, p. 3). There were a few exceptions that justified mix motives under special circumstances (Ryan and Deci, 2000, p. 60).

If motivation is based on a set of inter-related goals that individuals develop in their course of interaction with their environment, how is it maintained and developed? An interesting and relevant contribution is the idea that "motivation is a dynamic, multifaceted phenomenon" that can be managed, directed and developed. The assumption that students are grouped as "motivated" or "not motivated" in some global fashion no longer holds. Rather, "students can be motivated in multiple ways and the important issue is the understanding of how and why students are motivated for school achievement" (Linnenbrink and Pintrich, 2002, p. 1). This has far-reaching implications for teachers as well as administrators whose jobs entail development of the learner. Appreciating the importance of motivation as the key element in learning, the task of the educator is to keep the student motivated. It could be asked what the variables, in the educational environment, are that could reduce or diminish student motivation.

Another variable that the literature uses to explain students' behaviour is self-directed learning, which is defined as any form of learning in which the individual is primarily responsible for the planning, implementation and evaluation of learning (de Bruin, 2007, p. 231; Knowles, 1975, p. 18). The extreme example of this is provided by the "Hole-in-the-Wall" experiment, where students without supervision began to learn basic concepts primarily on their own initiative. Thus, another explanation was provided for how self-directed learning, motivation and cognition join hands to assist in learning. Students first become motivated to learn, and, as they gain satisfaction in using ICTs as tools, they become encouraged to continue and control and manage their self-directed learning environment. The two elements of motivation and cognition work hand in hand in this process. Literature's motivational variable in self-directed learning is referred to as self-efficacy. It is not just the individual's cultural, demographic or personality characteristics that influence motivation and achievement directly but rather the individual's active regulation of his or her motivation, thinking and behaviour that mediates the relationships between the person, context and eventual achievement (Linnenbrink and Pintrich, 2002. p. 2).

This makes the role of the individual student indispensable. Culture and the educational environment can create the initial excitement, but it is the individual student that must take the next step and carry on. One explanation for technology's popularity could be due to its ability to attract and excite. Students who have more positive self-efficacy beliefs (i.e., they believe they can do the task) are more likely to work harder, persist further and eventually achieve at higher levels (Linnenbrink and Pintrich, 2002, p. 3). I found Albert Bundura's explanation the best fit for my puzzle. He identifies four sources that contribute towards the formation of peoples' belief about their efficacy (1997, p. 3–5). First, people are the most effective through their mastery experiences. Success builds robust belief in one's personal efficacy. This could explain why technology is so welcomed by so many students. This could be because it provides different levels of solutions depending on one's level of sophistication and intelligence.

The second influential way of creating and strengthening efficacy belief is through the vicarious experiences provided by social models. Seeing those similar to themselves succeed by perseverant effort raises the observer's beliefs that they too posses the capabilities for comparable activities (Bandura, 1997, p. 3). This observation is particularly relevant to UL's environment, where students take a collective approach to learning and often learn from each other. Most of the basic ICT tools are learnt from one another in the student computer laboratories. Social persuasion is the third way of strengthening people's beliefs that they have what it takes to succeed. Technology-assisted learning involves growing social relationships and allows students to find their voice in these relationships (Lankshear, Peters and Knobel, 2000, p. 20; Greyling and Wentzel 2007, p. 655). Another explanation for students' interest in computers is suggested by Csikszentmihalyi who refers to this state as "flow". When a person's skill is just right to cope with the demands of a situation—and when this is compared to the entirety of everyday life, the demands are above average—the quality of experience improves noticeably (Csikszentmihalyi and Csikszentmihalyi, 1988, p. 32). This also explains why every individual that associates with computers has his/her own special approach . This could also explain why, in a teamwork exercise, everyone can contribute towards a solution in his/her own way. Technology, with its many paths for solutions, allows individuals with different capacities to feel accomplished since they all, in some way, feel that they have achieved something. The implication of this fact is that technology, with its natural motivational power, can, provided it is used appropriately, enhance motivation and therefore accelerate learning. Perhaps it is technology's ability to fascinate and therefore motivate that has given it its penetrative power in education. Finally, I found John Keller's ARCS model of the analysis of technology for education the most accurately expressive of the phenomenon in question. Once a disadvantaged student's **attention** is drawn to computers for the first time on campus, then he/she is eager to use them, having heard very positive things about ICTs. Once they test their capabilities against a computer and find that they can, in fact, use it, they gain **confidence** to continue using the new “toy”. It is in such a motivationally charged environment that learning experience and cognition take place. Since, in a university environment, the experience of success is relevant to the student’s goal, it is likely that a certain level of **satisfaction** is maintained which leads to a process in which learning will continue and will, therefore, be accelerated.

5.2.3 Methodology

First, I was looking for a tool to measure motivation and additionally one that is used in relation to technology use. Measuring motivation had its own challenges since it had to be a tool that is reliable and proven in the academic world. The Motivated Strategies for Learning Questionnaire (MSLQ) provided the solution. It measures motivational variables such as intrinsic, extrinsic and self-efficacy in many institutions of higher learning (see Chapter 3, section 3.3.3).

Since one of the goals of the study was to find a correlation between various variables and academic results, the size of the sample had to be large enough in order to be able to establish if there was a trend between various variables and academic results. This led to a quantitative research strategy. For the ICT-related questions, I had to look for an instrument that was reliable and well-thought of that covered areas that are of interest in the study. For this, I used what has been developed by C. Brown and L. Czemiewicz of the University of Cape Town as part of a national initiative to measure access and use of ICT for teaching and learning in higher education in South Africa, which was funded by NRF. This proved to be a very effective and relevant tool. A copy of the questionnaire can be found in Appendix A.

5.3 Discussions

This section discusses, in summary, the lessons that can be learned from this study. It has three focus areas. The methodological reflection looks at the methods used and how these could have been improved. The section of substantive reflection compares results from this research with other studies. Finally the scientific reflection examines the findings of this study and how they have contributed to the body of knowledge.

5.3.1 Methodological Reflection

MSLQ-related questions, for some reason, in this study, did not show the expected results - i.e., students' responses mostly tended towards higher scores, which resulted in there being no correspondence between results and motivational level as was expected. There could have been a number of reasons for this. It could be said that the overall questionnaire was too long and towards the end, the students got tired and did not answer accurately. On the other hand, it could be argued that a cultural phenomenon is being expressed and that the responses are more emotionally based than logically based. Further investigation is necessary to arrive at the reason for this unanticipated response.

An element of qualitative strategy would have added to the quality of conclusions. There were a number of cases where the results could have been further investigated by arranging interviews with the students concerned. Such a qualitative process would have enriched the quality of the results.

A majority of students used the online system to respond to the questionnaire. A larger paper based sample would have added to the value and quality of responses.

5.3.2 Substantive Reflection

In comparing this study with other similar work one comes across a number of observations.

The “Hole-in-the-Wall” project looked at younger group of 14-18 years of age. In this study, the focus group was older and ranged predominantly between the ages of 18 and 28 (section 4.1.2.3). Another difference is that in Professor Mitra’s experiments they typically excluded a formal academic environment whereas this study took place in a university with predominately disadvantaged students. The results were similar in that ICT exposure assisted in better performance. However, this difference only showed itself when the ICT use was directed towards an academic goal.

The findings in this study are, on the other hand, in contrast to a study done by Olivier (2006) indicating learners (at high school level from deprived conditions) having low levels of motivation for learning. From Olivier’s study one expects that students from disadvantaged (he uses the term deprived) backgrounds not to be motivated. In this study one sees the opposite. Students do not show any sign of lack of motivation to embrace learning or technology.

Another major area of differentiation in this study is gender related, with female students generally performing better and making use of ICTs more effectively. Examples of these were documented in section 4.2.2 (Table 4.2.13, Table 4.2.24). This phenomenon was strongest in the faculty of Sciences. Much of what literature has recorded is in contrast to the findings in this study - e.g. a study by Passey, Rogers, Machell, McHugh (2004, p.6) who reported that it is usually the male students who have shown more positive interest to the use of technology.

The other example of variation in this study is that the level of motivation is rated as very low in disadvantaged students in other studies. Fortunately, therefore, there was no evidence in this study to support the concern expressed by Covincton (1998, p. 44–47) that the main contributor to low academic performance and high dropout rates in some ethnic groups is their cultural background that inculcates values that are not conducive to high achievement in the minds and hearts of children. Indeed, the study recorded a high level of motivation that is coloured heavily by the cultural background that affects positively the use of technology which in turn has a positive influence on academic performance.

5.3.3 Scientific Reflection

In this section the main findings are summarized. In Chapter 3, I documented a series of research questions which formed the basis for this research. The answers to these questions, which were covered in Chapter 4, made it possible to address a number of key questions. The first key question in this research aimed at ascertaining the origin, nature and extent of ICT use and whether this interest (motivation to use ICTs) has any influence on academic performance. The second key question was the degree of cultural influence on student motivation and ICT use. And finally whether there were lessons that can be learnt in creating a more effective learning environment though an appropriate use of ICTs.

5.3.3.1 The Nature of Interest in ICT

In order to establish the nature of the interest in ICTs, two unknown elements had to be investigated. First, through a series of questions, students' extent of ICT use was established. These questions examined details such as: the frequency that students are on campus, the percentage of ICT use for academic purposes, the most likely venue that ICT activities take place on campus and the ease or difficulty of using ICTs with regard to access and environment on campus as well as off campus. The responses to these questions were documented in section 4.1.

Second, the research had to ascertain the nature and the depth of interest and the extent to which this interest has a bearing on academic performance. To this end a series of questions examined the attitude of students, their friends and their families as perceived by students. These findings were documented in sections 4.1.9 – 4.1.12.

The study shows an extraordinarily high level of interest in technology as reported in sections (4.1.4.1) as 91.9% of the respondents reported they use more than 20% of their academic time on a computer for study-related purposes. Furthermore, such a high level of usage is universal and is not particular to a specific faculty. There was also evidence that in a similar manner to the “Hole-in-the-Wall” experiment, there is an element of self-initiated interest in the use of technology since students did not have to be asked to use ICTs (section 5.1.4.5).

Off campus access is limited. Unless lack of access is compensated for by the institution, it will retard the academic progress of the student (see section 4.1.5 for access level). It was also confirmed that the overwhelming majority of the students who responded to the questionnaire had no experience with ICTs prior to joining the University but had mostly taught themselves or had learnt through friends and family (section 4.1.7). Yet the study showed a high level of dependency on ICTs (section 4.1.8) for academic purposes. This interest is supported by family and friends with no opposition in that there is a universal approval for use of technology (sections 4.1.9 -12). Referring to ICTs, Saadé, and Molson (2003, p. 267) stated that ‘perceived usefulness’ was found to have a significant positive influence on intention to use. An interesting observation can be made here. With the perceived usefulness being so high, as confirmed also by literature, this could be responsible for high ICT use. The fact that the population in question comes from homogenous cultural background reaffirms this phenomenon which has resulted in such a similar response to these questions.

The research found that every respondent uses a computer (section 4.1.4.1, Table 4.5). This shows that computers are a critical and indispensable component of the life of a student. Furthermore, this applies to all students, irrespective of the faculty from which they come (Figure 4.5 and Table 4.6). Internet use (section 4.1.4.2) seems to follow a similar pattern in terms of its popularity with students with only one student reporting not using it. 91.1% of respondents use the Internet more than 20% of their academic time (Tables 4.7).

Again, in terms of Internet use there is no difference between faculties statistically (Figure 4.7 and Table 4.8). Next in terms of popularity, is the email service. 91.6% of the respondents reported that they use e-mail either “sometimes” or “often” (Table 4.30) while 67.9% of respondents reported that they used it “sometimes” or “often” in discussions with one another (Table 4.31).

5.3.3.2 The influence of ICT use on academic performance

One of the fundamental questions that this research aimed at answering was to ascertain if the apparent interest in technology has a bearing on academic performance.

In terms of ICT integration with academic programs no evidence for a comprehensive plan was found. It is rather ad hoc and appears to have been left to the discretion of the individual lecturer concerned. The study shows two contrasting occurrences that are often experienced in academic institutions where students are ahead of their teachers in embracing technology. On one hand there is evidence for a keen interest in technology by the students while on the other only 45.9% of the respondents reported they use ICTs as part of their learning experience (section 4.1.15 Table 4.8). When one compares this with the responses in section 4.1.9, Table 4.24, where 95.9% of the respondents either “agreed” or “strongly agreed” with the importance of ICT in education, it becomes evident that there is an enormous student receptivity and potential for growth in the use of ICTs in academic courses – and that the students themselves would overwhelmingly welcome such an increase in usage. For example, 83% of respondents found Power Point “helpful” or “very helpful” (section 4.1.15). This is similar to findings reported by Adams (2006, p. 389) who pointed out that, in his survey, students found PowerPoint a useful cognitive tool. However, only 38.4% (Table 4.37) of the respondents in this study reported that their lecturer was using Power Point “often”.

Once again these results demonstrate students’ receptivity for higher levels of ICT use. UL can go a long way towards embracing ICTs for teaching and learning to arrive at its fullest potential. The words from Selwyn **(**2007, p.82) are accurately descriptive of the UL environment. *"Despite huge efforts to position information and communication technology (ICT) as a central tenet of university teaching and learning, the fact remains that many university students and faculties make only limited formal academic use of computer technology".* In addition, the study found that a negative relationship exists between ICT use by the academic community as part of teaching and learning and academic performance. That is, higher usage levels do not correspond to higher levels of academic performance (section 4.2.9). One possible explanation could be that the integration of ICTs into teaching and learning does not follow a well-planned strategy at the university, and therefore needs attention. Further research is needed to be able to make definite conclusions. As can be seen from the above, the successful implementation of technology in an academic program is a complex and involved process that necessitates a well-planned integration at all management levels. Education (using technology) is a way to overcome disadvantage, though this is complex to achieve (Bradbrook, Alvi, Fisher and Lloyd, 2008, p. 89).

The study found that no relationship exists between general students' ICT use and academic performance. This finding is in harmony with Fuchs and Woessmann's (2004, p. 2) findings that the mere availability of computers does not show a positive relationship with student achievement since a positive relationship was only found when computers were used for educational purposes. Although Fuchs and Woessmann's research was performed in the context of the availability of home computers, it does illustrate the same conclusion that it is not just the presence of a tool that creates results, but rather that results are dependent on the tools being used for learning purposes as part of an academic program. Conlon and Simpson (2003) also documents cases where the introduction of technology has not shown any "clear and substantial evidence of students increasing their academic achievement as a result of using IT".

On the other hand, when the use of ICTs was somehow encouraged by an academic activity there were a number of cases where there was clear evidence of improved academic results. For example, the use of the Internet as part of an academic program (sections 4.2.12) when encouraged by the lecturer was found to relate positively to academic performance. The strongest evidence for this occurred in the faculty of Sciences and more so in the female students. It is interesting to note that the finding in this case is different to other studies where usually it is the male students who have responded more positively to technology - e.g. the study by Passey, Rogers, Machell, McHugh (2004, p.6). Another example of a positive relationship was found in the case of students who reported having email correspondence with their lecturers for academic purposes (section 4.2.12) which showed a positive relationship graphically with academic achievement for all faculties and statistically only with faculty of Sciences.

The length of ICT use (section 4.2.7) does play a role in terms of its influence on results. However, those who reported having used computers between 2 and 4 years generally scored higher than those who had used computers for less than 2 years. This is more noticeable for those respondents who are in their first year of study and are in the Faculties of Sciences and of Law and Management. Student's self-initiated use of the Internet showed (section 4.2.14) the strongest influence on results. With a p value of 0.001 it showed a clear association between Internet friendly respondents and the rest. This applied in all faculties but was strongest in Management and Law and in female students. Significant differences were also found in results for students who reported they use online information such as journals "often".

The picture that is emerging is rather interesting. When students use ICTs as a tool and as an integral part of their studies, in nearly all cases, it influences their results positively. On the other hand there is a clear indication that this potential is not recognized within the academic structures of the University.

In aiming to find a befitting role for ICTs, one can therefore conclude that this study suggests two interrelated principles. First, access to ICTs and their multi-faceted features must be available to all students. This means that basic tools such as computers, the Internet, and email must be readily available without any security risk or environmental problems such as noise. Second, it was shown that access by itself is not sufficient. There also must be encouragement from the academic community to channel this interest in technology into academic goals. It is in this way that ICT can effectively be used in the service of education. It should be mentioned that this integration of ICTs in education needs to be such that no feeling of compulsion for technology use needs to be exerted. Otherwise the initial interest may dissipate.

The environments in which ICT services are provided, the university's computer laboratories, deserve some attention. It was reported in section 4.1.4.4 that only 55.1% of the 229 who responded to this question found the environment "easy" or "very easy" to use. This is a major cause for concern in the light of the other findings in this study that suggest access to ICTs is a priority for student development. In the same section lack of adequate computers and excessive noise were mentioned. These issues need to be attended to so that the level of frustration experienced by students is reduced and the creation and maintenance of an environment that is conducive for effective learning is promoted.

In conclusion and in consideration of the results, one is reminded of the similarities with experiments conducted by Professor S. Mitra (Mitra and Rana, 2001; Inamdar, 2004; Van Cappelle, 2004; Dangwal, JhaandKapur, 2006; Cronje and Burger, 2006; Gush, Cambridge and Smith, 2004), where the role of the instructor was minimal while the learners, on their own accord, took an interest and played a key role in the learning process. To some extent, a similar pattern is observed here although some level of encouragement from the academic community proved to make the difference in this study.

5.3.3.3 Cultural influence

In this section, the major findings that are related to the cultural variable of this study are discussed. In section 4.1, I documented the findings related to variables such as: nationality, home language (section 4.1.2.1), source of first computer training (section 4.1.7), family and friends' attitude towards ICTs (section 4.1.9 - 4.1.12) and students' social use of ICTs (section 4.1.14). In section 4.2, some of these variables were analysed in the light of their correlation with both academic performance and motivational and cognitive orientations. In section 4.3 I examined the influence of culture on other variables in this study.

The research question on culture examined whether culture has an influence on ICT use and student motivation and considered, therefore, how it affects academic performance.

The overall findings and conclusion are summarized as follows.

McInerney, Hinkley and Dowson (1998, p. 622) found that academic achievement may be influenced by a complex array of motivational determinants related not only to students' mastery and performance goal orientation but also to their social goal (cultural) orientation. Similarly, in this study there was ample evidence that culture does provide a powerful influence on student motivation, ICT use, the learning process and therefore academic performance.

In terms of the attributes of this culture, the UL student population was found to be a homogenous group that typically adopts a collective approach to deal with its challenges. All the cognitive and motivational variables of this study were found to be influenced by this cultural element.

The study did find elements of the collectivist approach to solving problems. One recalls that collectivism pertain to societies in which people are integrated from birth into strong, cohesive "in-groups", which, throughout people's lifetimes, 'continue to protect them in exchange for unquestioned loyalty' (Hofstede, 1991, p. 51). It could be argued that the findings in section 4.1.7, where the main source of the first ICT learning was 'self-taught' followed by family and friends are not clear enough evidence for a collectivist approach. Nevertheless, one's daily observation of the fact that UL students typically adopt a collective approach to solve problems bears ample testimony to the collective orientated nature of the culture from which they come.

The prevailing culture regards ICT as an essential tool for education (section 4.1.9) and employment (section 4.1.12). When the use of ICTs is also encouraged through some sort of academic program, whether this encouragement is self-initiated or institutionally initiated, it influences academic results positively.

A number of variables were identified as culturally oriented variables with the aim of examining their influence on the results and ICT usage. These variables included nationality and language. In addition, responses to statements such as "what my family (or friends) think of ICTs for education (or employment)", were treated as cultural and social orientated variables. However, the examination of these variables and their associated responses demonstrated (section 4.2.3 above) a homogenous environment such that no meaningful differentiation could be established other than the fact that they predominantly responded in a very similar manner to all of these questions. In terms of cultural influence on results therefore, no differentiation could be found that influenced results or ICT usage. However, it was shown how these ideas have consequences in terms of level of usage, the quality of the usage and ultimately on academic performance. It was demonstrated that when a student feels strongly about ICTs, he/she uses it more frequently, more effectively and as such, it is more likely to have an influence in terms of academic performance (section 4.3.2).

Section 4.3 demonstrated how students' attitude towards a series of questions such as "I think ICTs are essential for education" and "My family (friends) thinks ICTs are essential for ICTs" are closely aligned. It was noted that the former statement is a cognitive variable while the latter is a motivational one and both are assumed to be influenced by the culture from which the student comes. The finding confirms Bandura's assertion(1977, p VII) that human behaviour (learning) is explained in terms of a continuous reciprocal interaction between cognitive, behavioural (motivation) and environmental (socio-cultural) determinants.

This makes culture a very powerful force that must be taken into account when aiming to have effective and positive influence on technology use and academic performance. At the outset of this study, culture was suspected to play a critical role in shaping the values, attitude, thinking and ultimately the observable behaviour (learning) of the students. The study has confirmed this suspicion and shown that the underlying current that shapes student behaviour is indeed culture. This echoes other findings in the literature such as Mansfield's where he explains that social goals, such as relationships, responsibility and status, have been shown to influence students' motivation and engagement in learning contexts (2007, p. 2). Bread and Senior (1980, p. 4) record similar findings with a special influence being noted from mothers, fathers and families in determining the levels of need for achievement motivation.

More significantly, it was also demonstrated that strong support for ICTs has an indirect influence on academic performance. This is supported by the literature where Wang and Newlin (2002, p. 160) demonstrated the correlation that exists between self-efficacy for technology use and academic performance - i.e., students that showed confidence in their abilities to use technology also did well in their exams. Learner perceptions of personal efficacy, therefore, have a reciprocal relationship with the self-regulatory processes that affect motivation and performance (Lynch and Dembo, 2004).

5.3.3.4 Motivational Influence

In this section, findings based on student motivation are discussed. The study focused on a number of key motivation-related questions.

Why are students interested in technology? Is there evidence for self-directed learning, and, if so, how does this affect ICT use and academic performance? How do intrinsic, extrinsic and self-efficacy as motivational constructs play a role in ICT use and academic achievement?

This research found that the students being studied were highly motivated to use ICTs. A large portion of section 4.1 was dedicated to the extent of ICT use which showed the high level of usage which indicated the degree of interest and motivation towards ICTs. This impression was consolidated in sections 4.1.9 – 4.1.12 which showed what students think and feel about ICTs. This motivation is encouraged by the prevailing culture from which the student comes. Another indication for the high level of interest in ICTs is demonstrated by the fact that despite a lack of a formal processes to familiarize the students with computers (section 4.17), students adopted self-initiated mechanisms to learn how to use a computer.

This is in contrast to other studies that found students from disadvantaged communities are not motivated. Fortunately, therefore, there was no evidence in this study to support the concern expressed by Covington (1998, p. 44–47) that the main contributor to low academic performance and high dropout rates in some ethnic groups is their cultural backgrounds that inculcate values that are not conducive to high achievement in the minds and hearts of children. Indeed, the study recorded a high level of motivation that is heavily influenced by the cultural background that affects positively the use of technology which in turn has a positive influence on academic performance.

In relation to the motivational level of disadvantaged students, a typical picture is painted in literature by Masita (2006) who assessed the motivational level of township learners in Grade 12 and found that, “in spite of student potential, as well as resources and facilities, students were not inspired to learn and study” (p. 486). Thus, one could deduce that, since most UL students come from similar backgrounds, their original levels of motivation could also be low. Another study by Carr (2001) indicates a lack of excitement to use technology in education. It is interesting that, in this study, no such disinterest was found.

I also found no evidence for Maslow's contributions (section 2.4.3) in this study. The environmental concerns that were raised in section 4.1. and 4.4, together with other issues such as security, health and shelter, which one might expect to exist in a disadvantaged setting, did not affect the level of motivation of the students.

Why are students interested in technology?

So far in this study I have documented the level of interest and motivation that students have demonstrated towards technology. Here I summarize the findings while explaining the reasons for this interest.

Perhaps it is technology's ability to fascinate and therefore motivate that has given it its penetrative power in education. An example of a theory that explains the reason for students' interest in technology was provided by Keller in his ARCS model. He recognized the value of curiosity as a motivational sense and used it to attract attention. Indeed, in a disadvantaged student setting, this could be a prime motivator for the initial attraction to technology. A student that comes to the University is often curious to experience ICTs having heard a lot about them but has typically never used them. This may not be the same for a more privileged student who is, typically, more familiar with technology. Provided this attention is sustained, ICTs become a new way of life and an essential tool for learning.

Another possible explanation for the interest in technology was provided through a concept referred to as "flow state" which occurs when a person's skill is just right to cope with the demands of a situation—and when compared to the entirety of everyday life the demands are above average—the quality of experience improves noticeably (Csikszentmihalyi and Csikszentmihalyi, 1988, p. 32). This also explains why every individual that associates with computers has his/her own special approach to find solutions. This could also explain why, in a teamwork exercise, everyone can contribute to a solution in their own way. Technology, with its many paths to solutions, allows individuals with different capacities to feel accomplished since they all, in some way, feel they have achieved something. This provides an explanation in psychological terms to the puzzle of why students may be attracted to use computers. The challenge therefore, for an educational technologist, must be to facilitate a learning environment that takes advantage of this phenomenon.

Another justification for the interest in technology is forwarded by proponents of relevance as an effective motivational force. In a study conducted by Bonk (2002, p. 11), 88% of the respondents found relevance to be the highest motivational factor for using Web-based material. This conforms with Hodges' (2004, p. 5) statement that indicates that "Relevance is by far the most reported successful motivator."

Thus, the relevance of technology to the disadvantaged students' needs becomes another factor that encourages students to continue to use it. They first became attracted to it because of the curiosity discussed in the previous section. Once attracted, interest can be maintained provided it is relevant to overall student goals and objectives.

A general feature that has been attributed to computers is their ability to provide multiple paths with varying degrees of sophistication to solve problems. That is why so many people from different backgrounds, young and old, rich or poor, clever and not so clever find them attractive. The implication for the disadvantaged student is that, having become attracted to the new tool and finding it relevant, he/she continues using it in an ever-increasing manner, since his/her sense of self-confidence is increased as he/she faces challenging but not too difficult problems to address. Culturally, in a disadvantaged student setting, the main source of acquiring knowledge and support are other students and friends. Technology facilitates this. This sense of gaining confidence is accelerated, which is the reason why technology plays a critical component in the life of a disadvantaged student.

Is there evidence for self-directed learning, and, if so, how does it affect ICT use and academic performance?

De Bruin(2007, p. 231) defined self-directed learning as "any form of learning in which the individual is primarily responsible for the planning, implementation and evaluation of learning". There were a number of instances where clear evidence of self-directed learning exists. Section 4.1.4.5 and Table 4.12 tabulated the findings. Only 3.9% of students stated that their use of computers is limited to lectures or practicals. This shows a reasonable level of independence as students clearly do use computers on their own initiative. The fact that a large percentage of students learnt ICTs through their own processes (section 4.1.7) is another example. The level of ICT use that was shown to be so high without any academically driven initiative is yet another piece of evidence for students' level of self-directedness.

This high level of motivation for ICT use, for a student population that predominantly was not experienced with computers, contradicts the finding from Bates and Khasawneh (2007, p. 188) who concluded that previous success with online learning systems may be a critical factor in the development of self-efficacy and attitudes about online learning system use - i.e. this study found the respondents were very confident about their ability to use ICTs even though most were inexperienced at first.

This reminds one of an interesting extension of the concept of self-regulated learning that is given by Simons (1993, p. 291), who looked at constructive learning with attributes that include active, constructive, cumulative and goal orientations. He then took this idea further by finding a relationship between constructive learning and self-directed learning. Thus, an explanation is provided for how self-directed learning, motivation and cognition join hands to assist in learning. Students first become motivated to learn. This takes place through social and cultural influences of the students' background and life style. While students get satisfaction in using ICTs as tools, they become encouraged to continue, control and manage their self-directed learning environment. The elements of motivation and cognition act as an essential vehicle through which self-directed learning takes place.

How do intrinsic, extrinsic and self-efficacy as motivational constructs play a role in ICT use and academic achievement?

Responses to the motivational questions regarding intrinsic, extrinsic and self-efficacy were primarily distributed towards the higher end of the motivational scale (7) in the MSQL questionnaire. This could be yet another indication of the high level of cultural influence. As such, these variables could not be accurate predictors of academic performance or ICT usage. I therefore see evidence for a similar conclusion to that of Kennedy (2002, p. 434) who found in his study in China that, "Western ways of categorizing motivation … do not travel well, at least not to the Orient".

These findings indicate similarities with a series of studies pioneered by Professor Mitra where ICTs as an effective instrument for self-directed learning were repeatedly confirmed (Mitra and Rana, 2001; Inamdar, 2004; Van Cappelle, 2004; Dangwal, Jha and Kapur, 2006; Cronje and Burger, 2006; Gush, Cambridge and Smith, 2004). However, in this study, the scope was extended to an older age range of 18 upwards and improved academic performance was seen when technology use was encouraged by the academic community.

The study therefore provides evidence that ICTs can act as a motivational tool to accelerate learning in a disadvantaged student environment of higher learning.

5.3.4 Limitations of the Study

In this section some of the limitations of the study are discussed.

The findings in the study were based on students' self-reporting. Ideally additional verification thorough various means such as triangulation, focus groups or follow up interviews of some the respondents would have been done. This was left to subsequent phases and should be regarded as one of the limitations of the study.

Marks were used as the primary indication for students' academic performance. It is acknowledged that this may not necessarily be an ideal means of measurement. Other additional indicators could have added to the accuracy of the findings.

Some interactions with students and even lecturers would have added to the quality of the findings.

In some areas of MSLQ, motivation orientations did not predict academic results. This could be due to the way the questionnaire was implemented - i.e., the questionnaire may have been too long.

More effort should have been made to ensure more random samples. Data included only 50 participants from the residences - the rest were volunteers from the computer laboratories.

5.4 Recommendations

In this section, the recommendations inspired by this study are documented.

5.4.1 ICTs Integration into the Academic Programmes

"For colleges and universities trying to stay in this competition, the main question these days does not seem to be whether they should adopt ICT in

> *their study programs, nor the many consequences this might have for higher education, but rather how fast they can realise in practice the opportunities the new technology is offering."*
>
> (Stensaker, Maassen, Borgan, Ofterbo and Karseth, 2007, p.418)

This section examines the results from this study in instances where the institution is making use of ICTs in its learning and teaching practices. In terms of the influence on results, this study has demonstrated that there has not been a positive outcome as far as this is concerned. The responses are reported in section 4.1.15 and Tables 4.35, 4.36, 4.37, 4.38 and more specifically 4.2.9. On the other hand there are clear indications of instances where the use of ICTs mostly through students' initiative but with some encouragement from the lecturer, has been successful in terms of its influence on results. This section recommends the introduction of a process where the academic community becomes more organized in use of ICTs and takes advantage of this potential for ICT use that exists in students.

According to the findings in Table 4.35, 54% of the participants reported that their lecturers either do not use ICTs as part of teaching and learning or do so in very few cases. When one compares the data from this table with the responses in section 4.1.9, Table 4.24, which demonstrated that 95.9% of the student respondents either agreed or strongly agreed about the importance of ICT in education, it becomes evident that there is an enormous potential for growth in the use of ICTs in academic courses and that the students themselves would overwhelmingly welcome such an increase in usage. The responses obtained from the questionnaire show that only 45.9% (the total of the last three categories in Table 4.35) of the respondents are using ICTs as part of the teaching and learning experience. 53.8% of the respondents reported that their ICT activities are awarded marks by their lecturers (Table 4.36, section 4.1.15). Tools such as MS PowerPoint are more readily used by lecturers (76.4%, Table 4.37). 23.6% of the respondents reported that their lecturers "*hardly ever*" make use of such tools. Similarly, MS Excel is used by lecturers as a presentation tool even though a little less than 67.8% of the respondents have reported using them sometimes or often (Table 4.37). The use of application packages such as GIS is understandably less, with 55.6% having reported that they are hardly ever being used (Table 4.37).

In terms of the academic community and their encouragement of students to use ICTs as part of the academic programs, the findings are tabulated in section 4.1.16, Table 4.39 for online material and Table 4.40 for email communication. 87.7% of the respondents have reported that they are asked to use online material as part of their course, and other than 44.7% that "*hardly ever*" communicate with their lecturers. The remaining 55.3% have some level of email communication with their lecturers.

One interpretation of the above information is that the lecturers, like their students, are aware of the value of ICTs and therefore do encourage their students to make use of them. That is why 87.7% of the respondents were asked by their lecturers to find information online as part of their course. However, when it comes to using it as part of the teaching and learning process, the responses have not been as positive. This was demonstrated by the level of ICT use in the teaching and learning process (Table 4.35) and the fact that this integration does not improve academic results (section 4.2.9).

This demonstrates that the University has no overall strategy to encourage the use technology in its teaching and learning plans. The intense interest in ICTs demonstrated by the students suggests, however, that, with very little effort on the part of the institution, major progress could be made to turn the situation around. Referring to disadvantaged students, Punie, Zinnbauer and Cabrera (2006, p. 16) stated that there is some evidence that ICT can give greater opportunities for accessing learning to those who need it the most.

On the other hand, in Chapter 4 there were several examples of positive integration. Section 4.2.12, (the use of the Internet as part of an academic program), section 4.2.13 (the extent to which students correspond with their lecturers by means of e-mail), section 4.2.14 (student self-initiated internet access) and section 4.2.15 (use online information) were reports of successful ICT use.

Recommendation 1 – Develop an Institutional Strategy for Integration of ICTs into Academic Programs

The University needs to develop a comprehensive strategic plan for the integration of ICTs into its academic programs as part of its basic teaching and learning function.

The participating students have demonstrated the highest level of receptivity towards using ICTs for education. This attitude is shared by their family and friends. This offers UL a unique opportunity, which, if utilized, will enable its students to make significant academic improvements. However, the essential ingredient for such a solution is not in provision of more technology—even though that also seems to be currently not of critical importance — but in the careful integration of ICTs into academic programs so that students are encouraged by their lecturers to use ICTs naturally as part of their studies.

Spencer warns that progressive change in education requires that emphasis be placed upon the technology *of* education rather than the provision of technology *in* education (Conlon and Simpson, 2003, p. 149). This implies adherence to fundamental educational principles when ICTs are introduced into the academic programs.

Integration of ICTs in the functions of any organization is a complex process that needs to be fully conceptualized and defined from the beginning. However, this is not the case in many higher learning institutions in developing countries as most of them have embraced the ICT integration process without clear plans to guide *the way. The institution ICT policy and strategic plan should be defined to provide a framework for the development and implementation of specific ICT projects* (Sife, Lwoga and Sanga, 2007, p. 6).

A prerequisite for the success of such a plan is the availability of financial and skill resources to the academic community. This entails a complete reorientation of the academic operation and adjustment of priorities.

Recommendation 2 – More effective Use of Computer Laboratories.

Although 40% of the computer laboratories are owned by faculties (section 4.1.4.3), only 15.8% of the respondents reported that they used the computers administered by the faculties (Table 4.9). By contrast, 79.6% indicated that they used the computer laboratories that were administered by the University's central administration. This indicates that faculty-administered computer laboratories are possibly underutilized and could therefore provide a solution to the problem of inadequate computers mentioned in section 4.1.4.4, Table 4.11.

Recommendation 3 – Acceleration of Computer Literacy

The assumption in this study had been that the overwhelming majority of students have not used a computer prior to their study at University. Section 4.1.6 shed more light on this assumption and confirmed that the majority of students had not been exposed to computers prior to starting their undergraduate studies at university. Section 4.1.7, Table 4.21, tabulates the findings in relation to the source of first computer training. It is interesting to observe that the highest source of training is “I taught myself” with 28.4%. This is followed by the “My friends” percentage. The next highest category for the source of the first computer training, at 15.6%, is attributed to formal training from the University. Only 32.1% (Table 4.21) of the respondents reported that they obtained their ICT literacy training from the formal academic structures of the University. However, there is ample evidence that suggests enormous student interest in acquiring ICT skills. This suggests that the current ICT training programs made available by formal academic structures of the University are severely inadequate and an initiative on the part of the University to improve students' ICT skills is bound to be widely supported.

On the other hand, ICTs will only enhance learning of students who already have basic literacy habits, although it can enhance the process of such skills as writing, revising and reflecting (Blackmore, Hardcastle, Bamblett and Owens, 2003, p. vii). At the same time, it is clear that, should there be provision made for students to take a basic computer literacy course, the level of interest is such that it will be welcomed by most students. The natural conclusion of this line of argument is that the provision of computer literacy programs for all students with particular incentive for first-time entry students is essential.

It is believed that if such a course is not offered on a voluntary basis, the level of self-directed learning might drop. Because mandatory involvement requirements may not intrinsically motivate learners to achieve high-quality learning, social factors under commitment are especially important determinants of TML (Technology Mediated Learning) success (Hwang and Kim, 2007, p. 232). Strategies must therefore be devised so that it should be easily possible for students to take computer literacy courses.

The strategic plan of the University must include a facilitation of high level training for all students in need of computer literacy training. This will make subsequent use of ICTs less painful.

5.4.2 Critical Importance of Infrastructure

81.9 % of the respondents reported that they found it was "easy" or "very easy" to gain access to ICTs on the campus (Table 4.10). The situation off campus is the exact opposite. 41% of those who responded to this question reported that they enjoyed only limited access to computers off-campus (section 4.1.5). Most of the respondents (67.6%), however, found it "difficult" or "very difficult" while 16%

reported that they found it “easy” or “very easy” (section 4.1.5.1, Table 4.17). In addition, the fact that 81.2% of students either agreed or very strongly agreed with the statement that they have access to ICTs for a sufficiently long time when they need to have such access (section 4.1.13, Table 4.28), suggests a positive picture regarding the availability and adequacy of the infrastructure from the point of view of the respondents. It is, however, necessary to balance this positive picture with the comments collected from those students who were not satisfied. Students in this category complained about environmental issues such as insufficient number of computers and excessive noise (section 4.1.4.4, Table 4.11).

In a number of instances, the evidences for a collectivist approach was evident. Bailey and Dua (1999) explain that collectivism emphasizes cooperation, interdependence and conformity, rather than distinguishing oneself from others and relying on social support. In section 4.1.7, it was found that 21.1% of the respondents declared their friends or family as their first source of computer training. This, after the category of respondents that taught themselves, was the highest percentage. Similarly, 58 respondents, or 29.7% of the total number of respondents, have access to computers through friends off campus. These findings imply that the main contributors to computer training and access off campus are family and friends. These findings, which confirm the collectivist approach amongst students, also have implications for the importance of infrastructure. They indicate that, provided the infrastructure is available and reliable, students, through their own collaboration with each other, can carry a major component of their academic responsibility. The “Hole-in-the-Wall” project made similar conclusions to this study. Owing to the characteristics of grouping that come from the cultural backgrounds of the participants, the level of collaboration and cooperation is such that it becomes the main source of training. This phenomenon can be utilized positively for educational purposes. Provided infrastructure and some minimal assistance is available, either through assistance or through e-learning material, students can, through collaboration with each other, overcome some of their educational challenges. These findings demonstrate the critical importance of availability of technology for the healthy development of a learning environment.

Another factor that the study revealed is related to students' sense of self-efficacy that is encouraged when access is readily provided and environmental factors such security and noise are not a hindrance.

In Chapter 2 it was noted that Bundura found that an influential way of creating and strengthening efficacy belief is through the vicarious experiences provided by social models. Seeing those similar to themselves succeed by perseverant effort raises the observer's beliefs that they too posses the capabilities in comparable activities (Bandura, 1997, p. 3). This observation is particularly relevant to UL's environment where students take a collective approach and often learn from each other. Most of the basic ICT tools are learnt from one another in the student computer laboratories.

Implications for Lack of Access Off-Campus

Off campus ICT access, despite its importance for learning, is often missed in studies of this nature. If computers are essential for learning and there is a class of students who do not have access to them off-campus, such a gap will have a bearing on students' academic progress.

109 out of 266 respondents, or 41%, indicated that they had some sort of access to computers off campus (section 4.1.5). This appears, at first, to be a relatively high ratio in a disadvantaged student setting. However, further analysis provides a different picture. The highest number of students indicating the location where access is provided, in Table 4.13, is 58 and it is reported to come from *friends*, which is not necessarily a very practical or sustainable option. Similarly, only 102 respondents have access to the Internet (section 4.1.5.1, Table 4.14). However, 78.5% of these respondents have reported that this is facilitated through their cellular phones (Table 4.15), which is also not a practical way to access the

Internet for academic use in a meaningful manner owing to its high cost. This difficulty is reflected in their responses, where only 16.5% (Table 4.17) indicated that access to ICTs off campus is easy (11.7%) or very easy (4.3%). This finding shows major limitations in students' academic life since lack of access often means not having access to knowledge and critical information which could result in a decline in academic performance. To compensate for this handicap, the relevant institutions must ensure the provision of adequate infrastructure and computers. This view finds justification in the literature - "An additional concern in disadvantaged and developing countries is availability and effective delivery of e-learning service. From a technical side, personal computers and computer facilities have to be available and accessible. Crucially, links to the Internet also have to be guaranteed and regularly upgraded to enable acceptable levels of communication and collaboration between teachers and students" (Marchado, 2007).

Ease of ICTs Off-Campus Access

Taking this analysis further by examining what emerged from the students' comments in terms of the environmental issues that are a cause for concern off-campus (section 4.1.4.4), one finds that the most common complaints were an insufficient number of computers and excessive noise. 69 respondents or 30.1% found it very difficult (4.8%) or difficult (25.3%) to use computers off-campus. Even though there seems to be a general satisfaction from students regarding access to computers on campus, when one considers this as the provisioning of an essential academic tool, this is not a satisfactory situation. In Chapter 2, section 2.6.1, a study conducted by Carr(2001) was analyzed. It showed how the availability of access to computers off-campus plays a role in improved academic performance. In the UL situation where most students stay on campus this means having access on campus outside the normal working hours. A critical finding from a study by Blackmore, Hardcastle, Bamblett and Owens illustrates this point: Home computer use significantly and positively impacts on the capacity of ICT to improve the learning outcomes for all students. Home access is a key element in whether and how students integrate ICT into their learning in school (2004, p. ix). This puts extra responsibility on the institutions to compensate for this deficiency if their disadvantaged students must compete nationally with students from other educational institutions who have access to computers at home. It is this dimension of ICTs that concern Muller, Hernandez, Giro and Bosco (2007, p.1177) who indicated that rather than providing a reliable relief from injustice (inadequate ICT access) tends to reinforce existing social structures and inequalities.

Recommendation 4 – Provision of Adequate Infrastructure

Institutions of higher learning with disadvantage students must, through a carefully worked out strategy, ensure appropriate and universal ICT access (7 days a week 24 hours a day for all students when and where they need it). This entails access to a computer, email and Internet which are the minimum that must be provided.

Over the past decade the structure of higher educational institutions has changed, partly due to the introduction of technological initiatives (Singh, O'Donoghue and Worton, 2005, p. 14). It is the institutional responsiveness to these opportunities that determines the success of these initiatives.

There were a number of indications, as shown above, that point to the careful balance that exists in terms of the physical infrastructure that is in place (section 4.1.13). Although the majority of students have stated that they have adequate access to computers and the Internet on campus, there are several indications that, owing to the increased interest in ICTs by students, the present state of equilibrium will not last long.

Universities in South Africa appreciate that access to computers and the Internet are part of the basic and indispensable tools for all students and this is also confirmed by this study. In the case of students from disadvantaged communities, there is typically no access to computers off campus when a student often needs to spend a considerable amount of time using ICTs. Unless compensatory measures are taken on campus, the disadvantaged students' full academic potential will remain unrealized. Thus, there is a need for a monitoring system to be in place to alert management of waiting periods for computer and Internet access. The aim of such a monitoring system is to ensure the provision of adequate access to computers and the Internet, 24 hours a day, 7 days a week, for all students, with minimal waiting periods.

In order to compensate for the lack of adequate access to ICTs off campus, institutions of higher education with disadvantaged students must ensure that they have above-average facilities on campus. This means that the limitations of security and the inadequate number of computers that have been reported, even though only come from a few students, must not be allowed to persist.

5.4.3 Recommendation for Further Research

Recommendations based for further research are documented in this section.

Female Students' Use of ICTs

This section documents the findings based on gender in terms of academic performance and ICT use. An investigation on gender differences was not part of the initial plan, but a difference emerged as the research process unfolded. Other studies have found differences between the genders with different results. "Numerous studies conducted over the period from the 1950s to well into the 1970s suggest that males tend to exceed females in the need to achieve at practically all age levels" (Kolesnik, 1978, p. 130). In this study the opposite was found. The study shows a difference of academic performance in terms of average marks between the two genders, with female students generally performing better. This was tested at the campus level as well as at faculty level. In the faculty of Sciences, this difference is statistically significant (section 4.2.2).

The use of the Internet by students as part of an academic program (sections 4.2.10.2 and 4.2.12) correlates positively with academic performance. The strongest positive correlation occurred in the faculty of Sciences for female students.

In a study conducted by Weaver (2000, p. 129), it was found that average computer use was statistically significantly lower for females than for males. He further found that there is a significant correlation between frequency of computer use and academic results. In this study, there is evidence that when female students use ICTs, they make better use of them in terms of the correlation of their use of ICTs with their academic results (section 4.2.12).

Recommendation 5 – Reasons for Female Students' Better Performance

There seems to be a positive and better correlation between female students' results and technology use when this is as the result of an academic program. Further study needs to be done to determine areas in which female students are not active, in terms of technology use, so that they can be encouraged to become active.

Recommendation 6 - Tailoring the Educational Environment Based on Cultural Sensitivities

This study has shown the critical importance of culture and how it acts like a mine full of resources that, if tapped appropriately, can produce plentiful results. As an example, Keller and Kopp (1987, p. 293) recommended the use of concrete language, examples and concepts that are related to the learner's experience and values.

Further research needs to be done to find the particularities of these cultural attributes so that the educational environment can be tailored to best suit students' needs. For example, this study has shown the interest in technology is such that, if channelled properly, it can assist with academic performance. As an example, attempts could be made to explore the effect of having some of the initial instructions for computer literacy made available in local languages. It must be determined to what extent the availability of the initial instructions, if available in the local language, would assist the students. It is universally acknowledged that when students first start at university, in a disadvantaged student setting, English is not as easy as it is perhaps towards the end of the educational experience.

Recommendation 7 - Investigation in Other Institutions of Higher Learning

This research has initiated a process that measures ICT use and compares it with academic results. This process should continue to see if the same pattern of results continues to emerge. In South Africa most universities use similar database technologies. Most use Oracle. The same questionnaire could be distributed in other universities and the results compared over many years. This could provide an invaluable source of information that could shape how ICTs are made available in institutions of higher learning and in particular to the disadvantaged students.

Recommendation 8 - Research based on Culture and Motivation

MSLQ in this study did not work in that it did not show any evidence for being able to predict results. Attempts could be made to find a different and suitable tool or to determine why it did not work in this situation. Also the cultural questions were not directly designed to measure cultural orientation. Attempts could be made to improve in this area and use a suitable tool that is designed for measuring cultural orientation.

Recommendation 9 - ICT Integration into the Learning Process

While this research has shown positive results in certain cases where ICTs have been successfully used, the manner and educational principles that such integration entails were not dealt with. This requires further investigation in which emphasis is placed upon the technology *of* education rather than the provision of technology *in* education (Conlon and Simpson, 2003, p. 149). The result would be a set of guidelines that an institution will have to note when implementing technology in institutions of higher learning with disadvantaged students.

5.5 Conclusion

The study provided evidence to respond to the research topic which states:

> ***The role of Information and Communication Technology (ICT) in a higher education institution: with specific reference to disadvantaged students, cultural aspects and motivation.***

It showed that the students who come from disadvantaged backgrounds, mostly, have had no exposure to ICT tools when they first come to the University. Yet, they are highly motivated to acquire the required skills and use them when needed. Thus, a university strategy to utilize this opportunity and provide computer literacy to all its students will bear much fruit. The study showed that off campus access remains problematic, and, unless special provisions are made to compensate for this lack of access, disadvantaged students' full academic potential will remain unrealized. The remedy is in the domain of the University management, which needs to ensure that compensatory measures are in place and that its ICT facilities are available to all students 24 hours a day and 7 days a week. This implies looking for unique solutions that are relevant to the disadvantaged situation.

The fundamental prerequisite for academic achievement, however, was not found to be more access, essential as it may be, but is rather seen in the careful integration of ICTs into academic programs. The study showed that it is not the length of use of ICT tools, such as computers and the Internet, that make a difference, but it is in the manner that they are used. In other words, only when these tools are used through an academic program, such as emails to a lecturer in order to exchange course-related information, that academic performance is positively affected.

Thus, the University needs to formulate a comprehensive strategy that would engage all of its key players in the academic community, management and students to take an active part in bringing about the required transformation. The main goal of such a strategy would be to encourage an increase in the integration of technology, in its manifold aspects, in the teaching and learning practices of the University.

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