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:

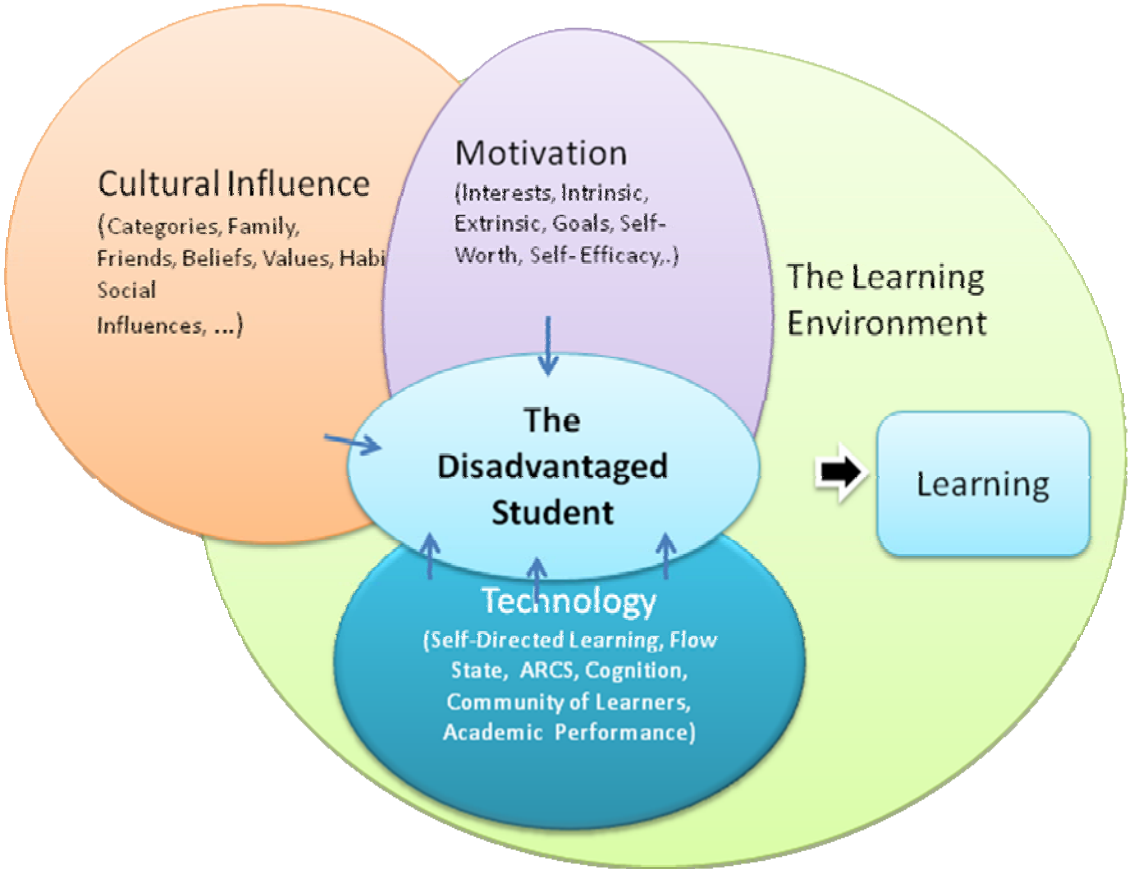
> *The role of Information and Communication Technology (ICT) in a higher education institution: with specific reference to disadvantaged students, cultural aspects and motivation*

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.