Gender Issues in Access, Application and Attitudes Toward Information Communication Technology in Higher Education Institutions in Papua New Guinea

Iwona Kolodziejczyk

The thesis submitted in fulfilment of the requirements for the degree of Doctor of Philosophy

Faculty of Arts
Divine Word University, Madang
Papua New Guinea

2012
STATEMENT OF AUTHORSHIP AND SOURCES

I hereby declare that the work herein now submitted as a thesis for the degree of Doctor of Philosophy of Divine Word University is the result of my own investigations. This thesis contains no material which has been accepted for the award of any degree or diploma in any university. To the best of my knowledge and belief, this thesis contain no material previously published by any other person except where due acknowledgement has been made.

Signature:                                               Date: November 7, 2012

Iwona Kolodziejczyk
STATEMENT OF ACCESS

I, the undersigned, author of this work, understand that Divine Word University will make this thesis available for use within the University Library and, via Digital Theses network, for use elsewhere.

I understand that, as an unpublished work, a thesis has significant protection under the Copyright Act.

Signature:  Date: November 7, 2012

Iwona Kolodziejczyk
ACKNOWLEDGMENTS

This thesis would have not been completed without the support and assistance of a number of people to whom I am and will remain grateful.

I give thanks and praise to God for making Papua New Guinea my very own “Promised Land,” for the strength and perseverance, and joy all the way through this journey.

To my family: To my parents who are no longer here to celebrate with me the completion of this important part of my life, but who live in me and are my strength. I thank also my sister, who has assisted and encouraged me every step of this journey. Dziekuje.

To many at Divine Word University: To Fr. Jan Czuba, SVD, President, I am grateful for the inspiration and challenge to commence this study. To Dr Maretta Kula-Semos, Vice President - Research and Postgraduate Studies, I am grateful for guidance and assistance. To colleagues in the Information Systems Department for support given to me in so many different ways. To all of these I offer my deepest gratitude.

To participants of the study: All those who gave their time and shared their stories, I am grateful for sharing with me your insights and experiences and becoming part of my own story. Tank yu tru olgeta.

To many who assisted me with knowledge and experience in times when the next step on the journey seemed unachievable: Prof Roger Vallance, Dr Anastasia Sai, Dr Luddy Salonda, Prof Catherine Frerichs, Dr Catherine Nongkas, Assoc Prof Cecilia Nembou, Prof Terry Mills. To all of these I offer my heartfelt appreciation for your assistance and guidance.

Very special words of appreciation to my supervisors: Assoc Prof Linda Crowl and Dr Peter Anderson. I thank you for your patience, encouragement, assistance, and guidance and for being very good friends. Without both, I would never come this far. I am grateful forever.

A very special thank you to Jurek for a wonderful friendship, and to the community of Polish missionaries in Papua New Guinea — to every one of you — for being my sisters and brothers, for your prayers, your interest in my study, your support and encouragement. Dziekuje.
ABSTRACT

Papua New Guinea (PNG), as other developing countries, is joining global trends in education. In the context of education, Information Communication Technology (ICT) is widely acclaimed to be a driver and a vehicle of change. Among other heralded potentials, ICT is anticipated to assist women in their equal access to education and consequently to equal participation with men in the knowledge society.

The leading research question was ‘Does ICT through higher education contribute to women’s empowerment in PNG society?’ In relation to Papua New Guinea, sub-questions focused the content: What is an ICT profile of the higher education sector? What are gender related issues in access, application, and attitudes to ICT in higher education institutions? What role does ICT play in contemporary higher education? How do ICT and education contribute to the empowerment of women? Social constructivism, feminism, and postcolonialism illuminated different aspects and contributed to the understanding of issues involved in gendered interaction of tertiary staff and students with technology and the adaptation of technology within the context of postcolonial education.

Concurrent analyses of qualitative and quantitative data produced a comprehensive staff and student gender profile of access, application, and attitudes to ICT in higher education institutions in Papua New Guinea. The entire higher education sector has not been adapting to the challenges of a knowledge society at a rate which might be expected. Noticeable differences existed between universities and other institutions of higher education (OIHEs). Although statistical analyses showed very little significant differences between female and male participants in their access to technology, qualitative data revealed important gender issues that are strongly affecting women’s access and use of ICT in tertiary institutions. Women are disadvantaged in their access to computers due to socio-cultural and economic implications.

Despite the enthusiastic acceptance of ICT, the application of ICT for teaching and learning remains in initial stages, often just replacing what used to be done in the past with paper and pen. The more successful and wider adaptation of technology into curricula and to teaching/learning scholarship will require adequate training and ongoing technical and methodological support.

Finally, ICT through higher education has the potential to empower PNG women. Women’s traditional subordination to men affects the higher education environment, and such subordination is socially acceptable despite the existing government gender equality policy. Nevertheless, PNG women have made some initiatives to utilise the opportunities created by ICT. Of concern is the huge disparity between urban and rural regions in ICT proliferation that often excludes rural women from ICT’s possible benefits. Collective action by government, non-governmental organisations, and private businesses is required to diminish current hindrances that limit ICT proliferation throughout the country and to utilise the transformative power of ICT for empowering women.
<table>
<thead>
<tr>
<th>ACRONYMS</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANOVA</td>
</tr>
<tr>
<td>ARPANet</td>
</tr>
<tr>
<td>AT&amp;T</td>
</tr>
<tr>
<td>AusAID</td>
</tr>
<tr>
<td>CFA</td>
</tr>
<tr>
<td>CIA</td>
</tr>
<tr>
<td>CMC</td>
</tr>
<tr>
<td>DWU</td>
</tr>
<tr>
<td>ESOMAR</td>
</tr>
<tr>
<td>GDP</td>
</tr>
<tr>
<td>GII</td>
</tr>
<tr>
<td>GUI</td>
</tr>
<tr>
<td>HDI</td>
</tr>
<tr>
<td>HTML</td>
</tr>
<tr>
<td>ICT</td>
</tr>
<tr>
<td>IHE</td>
</tr>
<tr>
<td>ISP</td>
</tr>
<tr>
<td>LDC</td>
</tr>
<tr>
<td>NCC</td>
</tr>
<tr>
<td>NGO</td>
</tr>
<tr>
<td>OECD</td>
</tr>
<tr>
<td>OIHE</td>
</tr>
<tr>
<td>PAU</td>
</tr>
<tr>
<td>PCA</td>
</tr>
<tr>
<td>PNG</td>
</tr>
<tr>
<td>PNGARNet</td>
</tr>
<tr>
<td>SCOT</td>
</tr>
<tr>
<td>SPSS</td>
</tr>
</tbody>
</table>
GLOSSARY

Big-man Leader
Development
Slit wooden drum used for communication and music
House of Ancestors
Wooden hand drum used mainly for music
Cultural performance
TABLE OF CONTENTS

STATEMENT OF AUTHORSHIP AND SOURCES .............................................................................................................. I

STATEMENT OF ACCESS ............................................................................................................................................... II

ACKNOWLEDGMENTS ..................................................................................................................................................... III

ABSTRACT ....................................................................................................................................................................... IV

ACRONYMS ....................................................................................................................................................................... V

GLOSSARY ....................................................................................................................................................................... VI

TABLE OF CONTENTS .................................................................................................................................................... VII

LIST OF FIGURES .......................................................................................................................................................... XII

LIST OF TABLES ............................................................................................................................................................. XVI

MAP OF PAPUA NEW GUINEA ..................................................................................................................................... XVII

CHAPTER ONE INTRODUCTION TO THE STUDY ........................................................................................................... 1

1.1 AUTOBIOGRAPHICAL NOTE ...................................................................................................................................... 1

1.2 SOCIAL, ECONOMICAL AND CULTURAL CONTEXTS ............................................................................................... 1

1.2.1 PNG social and economical considerations ......................................................................................................... 2

1.2.2 Cultural considerations ........................................................................................................................................... 3

1.3 THE AIM OF THE STUDY ............................................................................................................................................ 7

1.4 OUTLINE OF THESIS ................................................................................................................................................. 8

1.5 SIGNIFICANCE OF THE RESEARCH ........................................................................................................................ 9

CHAPTER TWO RESEARCH PROBLEM DEFINED ........................................................................................................ 10

2.1 GENDER ISSUES IN PAPUA NEW GUINEA ............................................................................................................... 10

2.1.1 Patriarchy, masculinities and PNG hybrid masculinities ......................................................................................... 10

2.1.2 Traditional status of women in Papua New Guinea ................................................................................................. 12

2.1.3 Women in contemporary PNG society .................................................................................................................... 14

2.2 TERTIARY EDUCATION IN PAPUA NEW GUINEA .................................................................................................. 18

2.2.1 Development of education .................................................................................................................................... 18

2.2.2 Contemporary higher education ............................................................................................................................ 21

2.2.3 Women in higher education ................................................................................................................................ 24

2.3 INFORMATION COMMUNICATION TECHNOLOGY .............................................................................................. 28
CHAPTER SIX  RESEARCH FINDINGS......................................................................................................... 115

6.1 ICT PROFILE OF INSTITUTIONS OF HIGHER EDUCATION IN PAPUA NEW GUINEA ................................. 115
  6.1.1 Research sites........................................................................................................................................ 115
  6.1.2 Access and application of computers among students........................................................................... 116
  6.1.3 Access and application of computers among faculty members................................................................. 121
  6.1.4 Access and use of the Internet by students............................................................................................... 124
  6.1.5 Access and usage of the Internet by academic staff members................................................................. 129
  6.1.6 Attitudes toward technology .................................................................................................................... 131
  6.1.7 Attitude toward ICT among students ....................................................................................................... 131
  6.1.8 Attitude toward ICT among academic staff .............................................................................................. 134
  6.1.9 ICT for education...................................................................................................................................... 138

6.2 GENDER ISSUES IN ACCESS TO ICT IN INSTITUTIONS OF HIGHER EDUCATION ........................................ 145
  6.2.1 Access to ICT within institutions of higher education........................................................................... 146
  6.2.2 Gender differences in access to the Internet............................................................................................... 147
  6.2.3 A gender digital gap in access to technology............................................................................................ 152
  6.2.4 A societal digital gap in access to technology.......................................................................................... 152

6.3 GENDER-RELATED DIFFERENCES AND SIMILARITIES IN THE APPLICATION OF ICT .................................. 156
  6.3.1 Gender issues in the application of ICT in higher education....................................................................... 156
  6.3.2 ICT as a new “digital garamut” ................................................................................................................ 163

6.4. GENDER ISSUES IN ATTITUDES TOWARDS ICT ....................................................................................... 167
  6.4.1 Gender differences in students’ attitudes toward technology – results of the attitude scale .... 167
  6.4.2 Gender differences in staffs’ attitudes toward technology – results of the attitude scale ............ 169
  6.4.3 Attitudes towards technology – concurrent analyses ............................................................................. 171

6.5 ICT AND WOMEN’S ISSUES ..................................................................................................................... 180
9.3.1 What is an ICT profile of higher education institutions in Papua New Guinea? ........................................ 257
9.3.2 What are the gender issues in access, application, and attitudes towards ICT among students and staff of higher education institutions in Papua New Guinea? .................................................. 259
9.3.3 What role does ICT play in education in Papua New Guinea? .......................................................... 262
9.3.4 What is the role of ICT in women’s empowerment? ........................................................................... 263
9.4 Conclusions of the Study ....................................................................................................................... 264
9.5 Contributions of the Study to the Body of Theory .............................................................................. 266
9.6 Implications of the Research Findings .................................................................................................. 268
    9.6.1 Recommendations for theory development ................................................................................ 268
    9.6.2 Recommendation for practice ..................................................................................................... 269
9.7 Epilogue ................................................................................................................................................ 271

LIST OF REFERENCES .................................................................................................................................. 272

APPENDICES ............................................................................................................................................... 304

Appendix 1 Survey Questionnaires ............................................................................................................. 305
Appendix 2 Interview Protocol .................................................................................................................... 320
Appendix 3 Narrative listing of items for a computer attitude scale: ......................................................... 322
Appendix 4 Informed Consent Form ........................................................................................................... 325
Appendix 5 Sample of Letter Sent to IHEs ............................................................................................... 327
LIST OF FIGURES

Figure 3.1 Conceptual framework of the literature review ............................................................. 33
Figure 5.1 Parallel simultaneous multiple mixed methods applied in the research ......................... 85
Figure 5.2 Overview of data analysis approaches ........................................................................ 101
Figure 5.3 Qualitative data analysis framework ......................................................................... 104
Figure 5.4 Stages and steps in the qualitative analysis employing thematic networks ................... 105
Figure 5.5 Parent nodes containing codes in the NVivo application ............................................ 106
Figure 5.6 Reduction and breakdown of text: excerpt from codes to themes step ...................... 107
Figure 5.7 Reduction and breakdown of text: excerpt from Basic to Global themes step ............. 107
Figure 5.8 Thematic network for the Global theme ICT and women’s issues .............................. 108
Figure 5.9 Overview of coherence of the study ........................................................................... 110
Figure 6.1 Student participants’ response to the question ‘Do you own a computer?’ .................. 117
Figure 6.2 Student participants’ response to the question ‘How often do you use a computer?’ .... 117
Figure 6.3 Student participants’ response to the question ‘On an average day, how much time do you spend using computers?’ ................................................................. 118
Figure 6.4 Student participants’ response to the question ‘On an average day, what is your main purpose of using computers?’ ................................................................. 118
Figure 6.5 Boxplot showing the distribution of Factor 1 (Computers used mainly for academic purposes) among students at universities and OIHEs .............................................. 120
Figure 6.6 Boxplot showing the distribution of Factor 2 (Computers used mainly for entertainment purposes) among students at universities and OIHEs .............................................. 120
Figure 6.7 Student participants’ response to the question ‘What is your favorite software category?’ ............................................................................................................................ 120
Figure 6.8 Academic staff response to the question ‘How often do you use a computer?’ .......... 122
Figure 6.9 Academic staff response to the question ‘On an average day, how much time do you spend using computers?’ ................................................................. 122
Figure 6.10 Academic staff purpose of a computer usage ............................................................ 123
Figure 6.11 Academic staff use of computers for research related activities................................ 123
Figure 6.12 Students’ exposure to the Internet at different institutions of higher education ...... 124
Figure 6.13 Students’ Internet exposure at the institutional level ............................................. 125
Figure 6.14 Students’ answer to the question ‘Are you required to pay a fee for using the Internet?’ ........................................................................................................................................ 125
Figure 6.15 Frequency of Internet access by students at different types of institutions of higher education ....................................................................................................................................... 126
Figure 6.16 The amount of time students at different types of institutions spent using the Internet on an average day ..................................................................................................................................................................................... 126
Figure 6.17 The students’ use of the Internet emailing at different types of institutions of higher education ..................................................................................................................................................................................... 127
Figure 6.18 Frequency of daily usage of an email application by students at different types of higher education institutions ..................................................................................................................................................................................... 128
Figure 6.19 Content of students’ email at different types of higher education institutions........... 128
Figure 6.20 Frequency of Internet access by academic staff at institutions of higher education . 129
Figure 6.21 The amount of time spent using the Internet on an average day by academic staff at institutions of higher education ..................................................................................................................................................................................... 129
Figure 6.22 Frequency of email application usage on an average day by the academic staff at institutions of higher education ..................................................................................................................................................................................... 130
Figure 6.23 Boxplot showing the distribution of Factor 1 (Computers are superior to humans) among students at universities and at OIHEs ..................................................................................................................................................................................... 133
Figure 6.24 Boxplot showing the distribution of Factor 5 (Technology becomes an integral part of daily life) among students at universities and at OIHEs ..................................................................................................................................................................................... 133
Figure 6.25 Boxplot showing the distribution of Factor 1 (Computers are superior to humans) among academic staff at universities and OIHEs ..................................................................................................................................................................................... 137
Figure 6.26 Boxplot showing the distribution of Factor 9 (People no longer control work done on a computer) among academic staff at universities and OIHEs ..................................................................................................................................................................................... 137
Figure 6.27 Female and male students’ answer to the question: “How often do you use a computer?” ........................................................................................................................................................................................................ 146
Figure 6.28 Time spent using computers on an average day by female and male students at tertiary institutions .......................................................... 146

Figure 6.29 Female and male lecturers’ answer to the question: “How often do you use a computer?” ........................................................................................................................ 147

Figure 6.30 Time spent using computers on an average day by female and male lecturers at tertiary institutions. ....................................................................................................................... 147

Figure 6.31 Female and male students’ exposure to the Internet at institutions of higher education ........................................................................................................................ 148

Figure 6.32 Female and male students’ frequency of Internet access .......................................................... 148

Figure 6.33 Time spent using the Internet on an average day by female and male tertiary students ........................................................................................................................................ 148

Figure 6.34 Frequency of the Internet access among female and male faculty members at tertiary institutions ....................................................................................................................................... 149

Figure 6.35 Time spent using the Internet on an average day by female and male faculty members at tertiary institutions ........................................................................................................................................ 149

Figure 6.37 Female and male tertiary institution students’ response to the question ‘Do you own a computer?’ ........................................................................................................................................ 151

Figure 6.36 Female and male tertiary institution staff member’s response to the question ‘Do you own a computer?’ ........................................................................................................................................ 151

Figure 6.39 Students’ answer to the question: “Do you think you spend more time using computers for professional purposes or more for entertainment purposes?” .......................................................... 156

Figure 6.38 Students’ answer to the question: “Do you think you spend more time using computers for professional purposes or more for entertainment purposes?” ........................................................................................................................................ 156

Figure 6.40 Boxplot showing the distribution of Factor 1 (Computers used mainly for academic purposes) among female and male students at tertiary institutions .......................................................... 157

Figure 6.41 Boxplot showing the distribution of Factor 2 (Computers used mainly for entertaining purposes) among female and male students at tertiary institutions ........................................................................................................................................ 157

Figure 6.42 Frequency of email access by female and male academics at institutions of higher education ........................................................................................................................................ 158

Figure 6.43 Content of female and male academic staff’s emails ........................................................................................................................................ 158
Figure 6.44 Frequency of email access by female and male students at institutions of higher education ................................................................. 160

Figure 6.45 Content of female and male academic staff’s emails ................................. 160

Figure 6.46 Boxplot showing the distribution of Factor 3 (The Internet is fascinating) among female and male students in institutions of higher education ................................................................. 168

Figure 6.47 Error bar for female and male students showing clear divergence of the 95% confidence interval Factor 3 (The Internet is fascinating) scores for each group. ......................... 168

Figure 6.48 Boxplot showing the distribution of Factor 9 (Computers make learning more fun) among female and male students in institutions of higher education ........................................ 169

Figure 6.49 Error bar for female and male students showing clear divergence of the 95% confidence interval Factor 9 (Computers make learning more fun) scores for each group .......... 169

Figure 6.50 Boxplot showing the distribution of Factor 1 (Computers superior to humans) among female and male faculty members in institutions of higher education ........................................ 170

Figure 6.51 Error bar for female and male faculty members showing clear divergence of the 95% confidence interval Factor 1 (Computers are superior to humans) scores for each group .......... 170

Figure 6.52 Boxplot showing the distribution of Factor 10 (Technology is fascinating and easy to learn) among female and male faculty members in institutions of higher education ............ 170

Figure 6.53 Error bar for the female and male faculty members showing clear divergence of the 95% confidence interval Factor 10 (Technology is fascinating and easy to learn) scores for each group ................................................................................................................................. 170

Figure 6.54 Attitudes towards technology held by students and staff in higher education institutions as identified in thematic network for ‘Attitudes towards technology’ ......................... 171
LIST OF TABLES

Table 2.1 Nationwide student enrolment in all types of tertiary institutions in Papua New Guinea in 2004........................................................................................................................................23

Table 5.1 Quadripartite design of research ...........................................................................................................83

Table 5.2 Overview of the sampling design in the quantitative strand of the study .................89

Table 5.3 Overview of the sampling design in the qualitative strand of the study ....................91

Table 5.4 Overview of the research design ................................................................................114

Table 6.1 Three main components resulting from a PCA test that depict students’ main activities when using a computer ........................................................................................................................................119

Table 6.2 Summary of results of PCA tests run on the attitude scales for students and staff in higher education institutions in Papua New Guinea ........................................................167
CHAPTER ONE
INTRODUCTION TO THE STUDY

1.1 Autobiographical Note

The context of this study has also been a context of the researcher’s life interests for more than a decade: she has been working in the education sector in her home country, Poland, and in Papua New Guinea from primary school to secondary and tertiary levels. She has been teaching in an Information Systems program since 2002. Women’s issues have always been close to her heart, especially since her arrival in Papua New Guinea in 2000. The first three years spent in the Highlands region introduced her to the PNG way of life and socio-cultural restrictions experienced by PNG women.

The disparities in women’s social status between Poland and Papua New Guinea have been too obvious. She realised that one positive aspect of her upbringing in communist Poland was that she believed equality to be a basic human right. The communist government popularised gender equality and women’s emancipation in family life and professional careers. The government’s policies made participation in the economic development of the country appealing for Polish women. In addition, traditional Polish culture, although assigning specific gender roles to men and women, at the same time put women on a pedestal.

All these personal experiences made it rather difficult to accept and understand the restrictions experienced as a single woman living in male dominated PNG society and became a driving force to explore more about the culture, the origins of the current situation, the dynamics of social changes in the country in the last decades and their consequences for women’s lives. This very personal interest in women’s issues affected her professional interests as a lecturer in Information Systems at one of the PNG universities. Daily observations of how ICT is finding its way into society and changing it, initiated a deeper motivation to find out how this tool could be used to improve the lives of PNG women, how it could empower them to realise their own potential and stand up for it.

1.2. Social, Economical and Cultural Contexts

This section provides an overview of research relevant social, economical, and cultural contexts. It is divided into two parts: the first part introduces social and economic considerations; the second
part introduces cultural considerations that might assist the reader with an appreciation for PNG culture.

1.2.1 PNG social and economical considerations

Papua New Guinea is one of the largest island nations in the South Pacific with a total land area of 462,840 square kilometres. It is also one of the most diverse countries in the world – geographically, biologically, linguistically, and culturally. Papua New Guinea gained independence from Australia in 1975. It is a constitutional parliamentary democracy with a unicameral National Parliament, referred to as the House of Assembly, with 109 members elected by universal adult suffrage for a period of five years (CIA, 2011).

Along with the largest land mass, Papua New Guinea has the largest population of the Pacific Island countries with an estimated population of 6.9 million (World Bank, 2011). It has grown rapidly since independence in 1975 and continues to grow at an average rate of 2.7% per annum (Asian Development Bank, 2006a, p. 106). Approximately half of the population is under 19 years of age (EU, 2004).

Papua New Guinea has many paradoxes. By world standards, it is a rich nation with abundant natural resources, and its population is still reasonably small relative to its land area and potential growth (McMurray, 2002). When compared with its Pacific Islands neighbours for many indicators of well-being, however, the country performs very poorly. According to the United Nations Development Programme’s (UNDP) Human Development Index (HDI), which examines different measures of poverty by including information on life expectancy at birth, adult literacy, combined primary, secondary, and tertiary gross enrolment, and gross domestic product (GDP) per capita, in a single composite index, Papua New Guinea ranked 152 of 187 countries globally (UNESCO Institute for Statistics, 2011) and the absolute lowest in the Pacific Region (Pacific Islands Forum Secretariat, 2010). Life expectancy is also the lowest in the Pacific. The adult literacy rates vary throughout the country, being considerably lower in the Highlands provinces. The literacy rate is low (56.2%) with a noticeably lower rate for females (51%) than for males (61%) (Asian Development Bank, 2006b). Thirty per cent of children never enrol in school, and of the children who enter primary education, the attrition rate before reaching grade six is in the vicinity of 50% (Feeny, 2003).
1.2.2 Cultural considerations

The PNG cultural landscape is highly complex. This culturally and linguistically fragmented society is made up of hundreds of distinct groups. The following sections provide a brief overview of different aspects of traditional and in-transition PNG culture so that the reader may better appreciate the broader PNG context of the study.

1.2.2.1 Diversities and commonalities of culture

The newly created, rapidly modernising Melanesian nation state of Papua New Guinea is composed of hundreds of diverse ethnolinguistic groups. Because of the huge fragmentation of PNG societies, “customs, beliefs and practices, descent and kinship systems and patterns of residence differ widely” (Banks, 1993, p. 4). However, despite such diversity, certain commonalities are shared across different societies.

Traditionally, the individual family has been the basic unit for gardening and care of children, but a wider kinship grouping has regulated every aspect of traditional life. The significant aspects of traditional Melanesian society have been communal living and common rituals that draw people together. People depended on each other for support, especially during traditional ceremonies like bride price, funerals, and other cultural activities (Vali, 2010). Although the kinship patterns vary throughout Papua New Guinea (Ford, 1973), kinship bonds are vital for healthy living as observed by Crocombe (2008), who claimed that “psychiatric stress was most evident among urban Melanesians who lost those contact [kinship bonds]” (p. 94).

1.2.2.2 Patriarchy and matriarchy

Matrilineal descent systems are typically found in societies that reside on fertile land that has the capacity to support small, stable groups of people. Women hold control over clan affairs and its resources. Lack of competition over resources has resulted in a mostly stable and cooperative economic environment. Patrilineal descent systems are found in less fertile land. Therefore, competition over available resources is a necessary condition for group survival. Men control production and allocation of resources (Banks, 1993, p. 5).

Power distribution and the gender roles played in both kinship systems are discussed more deeply in Chapter Two of the dissertation where gender relations are presented as the context of the research problem.
1.2.2.3 Languages

The linguistic landscape of Papua New Guinea is made up of 820 languages (Crocombe, 2008) with English, Tok Pisin and Motu privileged by the government’s policy as official languages of Parliament (Stella, 2007). In his discussion about language as the means of self representation, Stella explicated the complexity of issues involved in language use in the PNG context: “Coupled with the high illiteracy rate and the absence of a strong culture of reading among the educated elite, writing in a language other than English means writing to a very small readership” (p. 166). Stella presented the dilemma that PNG writers are facing. According to him, the choice of language in writing is seen either as a political issue because of the lack of other than English options for writers, or as a means to incorporate local languages into writing: “it’s not as if English is playing a dominant role, it plays an accommodating role, perhaps diffusing other languages” (p. 166).

While English remains the main language of literature writing and national service, Tok Pisin remains the main spoken language. In line with Hasting’s argument (1973) that “all pidgins arise from the same basic need to create a mutually comprehensive language between people speaking different and unrelated languages” (p. 13), Sumbuk (1993) argued that the great linguistic diversity contributed to the development and spread of Tok Pisin and since its introduction, it has been “the most neutral medium of communication among Papua New Guinea’s different ethnolinguistic groups” (p. 309). Rommaine (1992) added that through Tok Pisin illiterate people have exposure to news reports, parliamentary debates, sporting events and written registers all radio broadcasted in this language, with radio being available in remote areas. “It is also an important source of exposure for the rural population to the anglicized Tok Pisin used by some of the urban announcers” (p. 52).

1.2.2.4 Economic development in PNG perspective and its social impact

Although it is far beyond the scope of this introductory section to discuss all issues involved in the economic development in Papua New Guinea, it is important to mention it to supply background information about the social changes that are taking place. In the common understanding development is associated with a progression from some inferior or backward state of existence to “a Western-style economic and political system” (Jacka, 2007, p. 34). Despite existing potential to be a vital, thriving entity based on mineral, agricultural and marine commodities and supplemented by tourism, the PNG economy is considered dysfunctional, “with a dysfunctional business environment where few industries survive” (Bowman, 2005, p. 2). Jacka (2007)
undertook a challenge to explore the reasons for development failure. He argued with the view that traditional culture is inhibiting development, instead acknowledging Stella’s (2003) position that “tradition and modernity are not necessarily antagonistic” (as quoted in Jacka, 2007, p. 34). On the occasions when indigenous people resist development, “it is not always impelled by traditional culture. Sometimes it is because development callously tries to ignore ethical and social blind spots” (Jacka, 2007, p. 34). Thus, there is a need for new strategies that will ensure that all citizens will benefit from economic development.

In his observation of the impact of mining activities in the Lihir group of islands in Papua New Guinea, Bainton (2010) discerned that “local contexts, cultural complexities and histories decisively shape the nature of mining operations and the ways in which communities respond to the change, but these factors can also determine the types of impacts and changes that might be experienced” (p. 5). With the help of Sahlins’s (1992) concept of ‘development man’ [original emphasis], which captures “that particular moment when indigenous peoples use Western goods (and institutions like those of capitalism and Christianity) to enhance their own ideas about life” (as quoted in Bainton, 2010, p. 10), Bainton argued that “the first commercial impulse of indigenous people is not to become just like Westerners, but more like themselves: to build their own culture on a bigger and better scale than ever before” (Bainton, 2010, p. 11). In this spirit, Lihir people domesticate modern commodities, like rice and other goods, and convert them into cultural gifts used during exchange ceremonies.

In the same vein, Zimmer-Tamakoshi (1998) argued that despite controversy and adverse social impact, people want development. She believed that income from development is used to satisfy the dynamic and demanding traditional exchange systems by “creating and recreating extensive series of reciprocities linking village and town, rich and poor” (p. 85).

Commercial activities, urbanisation, monetisation and mobility cause changes in traditional social practices and social organisation. Standish (1994) identified elders’ frustration caused by their inability to control youth as one of the deepest cleavages in PNG society. In the past, the aged were the source of accumulated wisdom. Depending on the way they were treated on earth, they became either good or bad spirits after death. “Both forms of leverage are gone, and the aged live longer, making them a burden on families” (as quoted in Crocombe, 2008, p. 94). Similarly, Crocombe outlined the impact of modernity on family life with new trends of lowering family obligations. Traditional links “are activated for weddings and funerals and sometimes for projects, ... but become shallower as people spread further and interact more with non-relatives” (p. 94).
### 1.2.2.5 Urban versus rural

King (1998) argued that the urban-rural disparity is exemplified by “urban diversity and rural homogeneity” (p. 183). While in the rural areas housing styles and housing materials are relatively uniform, in urban areas prestigious elite houses coexist alongside small shabby squatter settlements. Although the rural sector is changing rapidly as well, the urban sector remains the image of modern Papua New Guinea. Cities and towns offer “all that is new and exciting as well as that which is dangerous, negative, and squalid” (p. 183). Alongside new shopping centres, high-rise office buildings, a mobile lifestyle, television, and entertainment centres, city life creates “high crime rates, and a chronic shortage of housing that results in high occupancy rates, overcrowding, squatter settlements, and domestic violence” (p. 183).

The urban-rural divide is reflected at the cultural level. Although as a whole, PNG society is still dominated by a diversity of cultures, at the same time a new metropolitan culture has developed around elites in cities and towns throughout the country. This new metropolitan culture “provides a context of experience and forms of interaction which create the basis for development of a culture with national resonances” (Hirsch, 1990, p. 21).

### 1.2.2.6 Preserving the cultural heritage

The Director of Cultural Affairs and first Director of the National Cultural Council, John Haugie, said in 1977:

Culture is a continuing process of change. Culture is not changed. It is, in itself, change. The word ‘Culture’ has many meanings in Papua New Guinea. People often think of old carvings, traditional dancing and the customs of the past. These elements are a part of our culture. But culture is not a thing of the past. It is an on-going thing. Other cultures are now invading our ways and bringing about change. We have now recognised this and since culture is part of every part of life, we also recognise that this invasion cannot be stopped. We do not seek to put a stop to these influences but we seek to place emphasis on our own unique culture, so that the new ways blend with ours. We must not lose our own identity in the pace of modernisation. We cannot hope to preserve our ways in museums or at institutes of the arts because culture is inseparable from everyday aspects of our life. It is a part of our village, city, home and community life. (as quoted in Blacking, 2004, pp. 164-165)

The importance of preserving culture and tradition was recognised by the first Papua New Guinea House of Assembly elected in 1964. Formed by the Assembly, the Tertiary Students Federation lobbied the Australian colonial administration and its Department of Education to recognise Melanesian ways and values. As a result, a directive was issued to all schools in 1967 “that
traditional dances and cultural activities were to be accepted as an integral part of art and craft lessons” (Voi, 1994, p. 87). Although the directive was met with resistance from expatriate as well as some indigenous teachers, the promotion of cultural activities was sponsored until 1972. In the years leading to independence, 1973-1975, national authors and emerging leaders advocated goals of national identity and unity. At the same time, in 1973, in preparation for PNG independence, the Cultural Development Act was passed, thus creating a National Cultural Council (NCC). The functions of the council included preservation of all aspects of the arts of Papua New Guinea; establishment and coordination of cultural institutions and cultural centres; promotion of the knowledge and appreciation of PNG culture within the country and in other countries; and fostering the expression of a national identity by means of the arts. The National Cultural Council was vested with statutory powers in 1975 and continued its functions under the aegis of the Ministry of Culture, later the Ministry of Culture and Tourism. Government policies and the statements of influential people involved in cultural affairs, as earlier quoted in Haugie, advocated not only preserving and promoting every different cultural system that had been present in the country, but also aimed at forging a new national unity out of the multiplicity of cultures. They suggested not only that cultural organization is a vital part of the infrastructure of any society, but also that “cultural development is the first, and crucial, step in national development, especially when most political and economic decisions are subject to external pressures” (Blacking, 2004, p. 165).

1.3 The Aim of the Study

The aim of the study reported in this thesis is to explore whether ICT through higher education can contribute to the empowerment of women in Papua New Guinea. The study is situated within the nexus of gender issues, information communication technology (ICT), and higher education. Thus to explore the problem of the study, it commences with issues pertaining to the research problem. The study examines the provision of ICT services in the higher education sector in Papua New Guinea. It makes enquiries into gender related issues in terms of access, application, and attitudes towards ICT. The study then explores what role ICT plays within higher education and through higher education whether it may empower PNG women. The following section provides a detailed outline of the study.
1.4 Outline of Thesis

Chapter One provides a general overview of the study and contextual information that might facilitate understanding of the research issues. To this end, it places the study within the broader context of PNG socio-cultural considerations.

Chapter Two defines the research problem. It provides contextual information about issues pertaining to the research problem: gender issues, tertiary education, and ICT in the context of Papua New Guinea.

Chapter Three provides a review of the research literature that informs the study. It discusses issues of ICT for education and the role of ICT in educating and empowering women. It also explores gender issues in ICT.

Chapter Four discusses the theoretical framework adopted for the study. The theories that comprise the theoretical approach are social constructivism, feminism, and postcolonialism.

Chapter Five describes and justifies the research design. Because the study employs mixed methods, different considerations pertaining to the qualitative and quantitative strands of the study are discussed.

Chapter Six presents the research findings. It offers a comprehensive ICT profile of the PNG higher education sector. It demonstrates gender issues as they relate to access, application and attitudes towards ICT among staff and students at tertiary institutions. It also presents women’s issues in ICT.

Chapter Seven discusses the findings of this research through the lens of relevant research literature. It identifies similarities and differences in access, application, and attitudes towards ICT between genders in Papua New Guinea and worldwide. It analyses the role of ICT in PNG higher education. Furthermore, it explores the possibilities of women’s empowerment through ICT.

Chapter Eight discusses the research findings through the lens of the study’s theoretical framework. The social construction of technology assists in the development and comprehension of PNG-specific technology constructs. Postcolonialism assists the discussion of postcolonial higher education in Papua New Guinea as well as issues in technology adaptation in the postcolonial reality of a developing country. Feminism provides a theoretical perspective for discussing gender issues in ICT and women’s empowerment through education and technology.
Chapter Nine concludes with a synthesis of research findings, the conclusions drawn from the study and offers recommendations for future research. Theoretical and practical implications are provided for further research as well as for institutional change.

### 1.5 Significance of the Research

The study is important for several reasons. First, it fills an information gap in the literature. Although there have been a few attempts to discuss the use of computers in educational contexts in Papua New Guinea (Kelegai & Middleton, 2002; Simeon, 2005; Vaa, 2003), none of them presented the gender profile of ICT access, application and attitudes in higher education.

Even more important, the study introduces the possibility of opening Papua New Guinea to new opportunities in academic computing. The computing world is changing at incredible speed and so is academic computing, with the shift from a focus on software and hardware to a focus on the interrelationship between technology and humans. “Today’s computing is not your father’s computing. Interaction design, empirical studies of user experience, project management, understanding social impacts of technology, and much more are the new faces of academic computing” (Nardi, as quoted in Klawe et al., 2009, p. 71). With the focus of the study on the range of issues related to the interaction between an individual and technology including attitudes towards technology, the use of it, the role technology plays in an academic career and in society, the research findings put a PNG academic discussion on the developing platform of new academic computing.

The study is believed to be the first of its kind in Papua New Guinea to apply a three-pronged theoretical framework to studying the interrelationship between ICT and computer end-users. PNG-specific technology constructs developed in the study are the first attempts to understand the dynamics of the complexity of human and technology interaction and its meaning within the PNG social and cultural context.

An important part of the study is dedicated to women and gender related issues in applying technology. Thus, it is believed that the study contributes to an awareness of the importance of ICT in women’s empowerment in developing countries like Papua New Guinea.

Finally, the study results might serve as premises for future ICT policy with a special focus on gender issues in ICT application in the education context. The study might also provide a suitable starting point for further research in the areas of gender, ICT, and higher education.
CHAPTER TWO
RESEARCH PROBLEM DEFINED

Comprehending the issues pertinent to the study is a prerequisite to fully appreciate the research problem presented in the closing section of this discussion. This chapter provides contextual information about issues pertinent to the research problem: whether ICT through higher education can empower women in Papua New Guinea. The presentation commences with traditional and contemporary gender issues which have a special focus on women in PNG society. Higher education development in Papua New Guinea is recorded with an emphasis on the presence of women in the higher education sector. Further, the background information includes a brief report of current Information Communication Technology (ICT) policy and ICT use in PNG.

2.1 Gender Issues in Papua New Guinea

The term gender “encompasses the behaviours, socially constructed roles, and psychological attributes commonly associated with being male or female” (Crooks & Baur, 2011, p. 112). Innate biological differences between women and men are interpreted and elaborated in a specific way by different cultures which shape gender roles and gender-related expectations with historical, economic, religious, cultural, and ethnic factors (King & Mason, 2001). Thus, to supply a pertinent background to the study of gender issues in the context of ICT and higher education in Papua New Guinea, an assessment of women’s position in PNG society from historical, economic, cultural and religious points of view is presented in the broad discussion of patriarchy, masculinities and PNG hybrid masculinities.

2.1.1 Patriarchy, masculinities and PNG hybrid masculinities

Gerda Lerner (1986), in her overview of the historical development of patriarchy, observed that its historical creation, initiated nearly 2500 years ago, continues in different forms as it occurs in different times and places. Different approaches are used to define patriarchy. The traditionalist approach is built on an assumption that “male dominance is universal and natural” (p. 16). Thus, different roles and tasks assigned to men and women in all human societies evidence their position by providing proof of naturalness of male domination. Within the boundaries of the traditionalist approach, Weber (1922) defined patriarchy as “a form of domination characteristic of the household group or clan organized on kinship and economic terms” (as cited in Sydie, 1995, p. 56). He further asserted that “the woman is dependent because of the normal superiority of
the physical and intellectual energies of the man” (as quoted in Adams, 2005, p. 239). The dominant position of men over women is safeguarded by various means devised over time: “gender socialization, denial of education and knowledge of women’s history, or by discrimination in terms of limited access to political and economic resources” (Majstrović & Lassen, 2011, p. 2).

A society is patriarchal to the degree that it “promotes male privilege by being male dominated, male identified, and male centered”, as observed by Johnson (2005, p. 5, original emphasis). Male dominated means that the cultural institutions of a given society, like governments, educational institutions, businesses and the like, are overrepresented by men; they are dominated by men and controlled by them. While contemporary women are entering and reshaping such institutions more than ever before in history, they still remain underrepresented (Kahn, 2009). Male identified patriarchal cultures utilize male norms to determine the value or worthiness of human behaviour. Within male identification, what men do is viewed as good and what others do is wrong; men are objective while women are subjective; men are rational and logical while women are emotional and irrational; men are strong while women are weak. What is meant by these constructs “has largely been dominated by men who portray women as substandard and inferior” (p. 25). Male centered culture focuses its attention on men through cultural institutions that are dominated by men and advocating for men’s perspectives.

Kasser (2008) observed that although different societies uphold different patriarchal patterns, they all share formalized rules that carry a patriarchal concept. The various constellations of “inheritance rules, child obedience, marriage arrangements, residence at marriage, the presence or absence of institutionalized sexual asymmetry such as polygamy, or obedience of women” (p. 33) all constitute different patriarchal models.

Patriarchy, as discussed here, provides a framework for discussion of masculinity, or rather masculinities, as affirmed by Connell (1995) who popularized the idea of plural masculinities (as quoted in Synnott, 2009). Some models of masculinity which are drawn from an assumption that masculinity is power, view patriarchy not just “as the context in which men struggle with making sense of masculinities, but as equivalent to masculinity” (Kahn, 2009, p. 67).

Masculinities exercised within social structures and daily interaction, and produced within the institutions of society refer to the social roles, behaviours, and meanings prescribed for men in any given society at any one time (Kimmel & Aronson. 2004). Connell (2000) further noted that “the patterns of conduct our society defines as masculine may be seen in the lives of individuals,
but they also have an existence beyond the individuals. Masculinities are defined in culture and sustained in institutions” (as cited in Doucet, 2007, p. 99).

As discussed earlier, patriarchy and masculinities denote male power. However, it should also be noted that the organization and experience of patriarchy and masculinities are different historically and cross-culturally, as observed by Sydie (1995).

PNG contemporary masculinity was explored and explained by Sai (2007) who claimed that Papua New Guinea has created its own hybrid masculinity “structured on the legacy of colonial masculinity, blended with traditional, indigenous gender markers” (p. 128). The colonial model of patriarchy with its gendered social and cultural institutions introduced new roles by which men exercised and experienced their masculinity. The government institutions, business and educational institutions replaced tribal locations of the village and became new space where contemporary men practice and negotiate their masculinity and define their own version of it in the process.

Hegemonic models of patriarchy and masculinities, discussed here, are the background that will assist in comprehension of traditional and contemporary status of PNG women.

2.1.2 Traditional status of women in Papua New Guinea

Given the fact that the majority of women in contemporary PNG society are severely disadvantaged in comparison with men (Flaherty, 1998), it is often presumed that women have always had a lower status than men (Brouwer et al., 1998). However, the history of different parts of Papua New Guinea reveals different pictures of the traditional status among women.

As noted in the previous chapter, Papua New Guinea is made up of both patrilineal and matrilineal societies. Although the polarity between matrilineal and patrilineal systems makes it very difficult to discuss women and men as homogenous groups, the relationship between sexes in the social systems has been in place for centuries and is related to Melanesians traditionally being horticulturalists (Banks, 1993). Despite differences in women’s position in society, there were clearly defined social roles for women and men as well as a general division of labour that defined tasks according to sex-roles. In her observation and discussion about gender and power relations in one of the PNG island societies, Vanatinai, Lepowsky (2005) concluded that “an overview of the life course and the sexual division of labor on Vanatinai reveals a striking lack of cultural restrictions upon the autonomy of women as well as men and the openness of island society to a wide variety of lifestyles” (p. 223). Flaherty (1998) further asserted, “Although there
was a general division of labour along gender lines and they shared an equal work load with men, women were not totally responsible for, nor confined entirely to the domestic sphere” (p. 4). In the same vein, Moms (2000) added that although in traditional Papua New Guinea society, men and women have distinct roles and responsibilities, responsibilities were complementary and women’s contribution was recognised and valued.

There were more evident differences between different parts of Papua New Guinea in regard to the social and political roles of women. In matrilineal societies, traditional land ownership safeguarded women’s high status and decisive role in land management as well as property rights and inter-lineage disputes (Stege et al., 2008). Women in the Milne Bay area, for example, assumed decision-making responsibilities normally reserved for chiefs (Macintyre, 1985, as cited by Flaherty, 1998), and women even became chiefs (Aitsi, 1985; Chao, 1984). Although the status, authority and power of women varied across areas of matrilineal influence, “in some places, matriliny [sic] is synonymous with gender equality and women holding leadership positions” (Stege et al., 2008, p. viii).

In contrast, male-female relationships in patrilineal societies, which encompass the majority of the population of the country, have been described as antagonistic. Women were considered very dangerous and polluting to men (Chao, 1984). With land ownership in the hands of men, women’s social and political status was very low. However, women were respected for their role as producers (of children, pigs, and gardens) and enjoyed power, although their identity, status, and authority were tied to that of their husband (Bebin, 1990). Kyakas (2002) described male-female relations as “being characterized by men playing an active role in public matters and women’s influence being largely restricted to the private” (p. 177). Although women were not able to represent their own interests in public and consequently were excluded from any decisions regarding intergroup relations, they were valued “because of their complementary social and economic role. Man found his role in arranging exchange relationships cementing community bonds and woman found hers in providing the pigs and food needed for this” (Flaherty, 1998, p. 5).

During the colonial era, men’s advancement was encouraged by outsiders, whether colonial administrators, missionaries, or entrepreneurs, who were also usually men. They made their initial contact with male community leaders and warriors, and later women were usually employed in domestic services. Because women were perceived as less public personae, it was concluded that they had relatively little influence in family and community decision-making (Brouwer et al., 1998). In the years leading up to independence in 1975, women, especially in the
urban elite, believed that the past inequities would be done away with and they would be engaged in the formation and leadership of the new nation. These hopes were emboldened by the fact that the intention to promote equal participation of women in all forms of political, economic, social, and religious activities were included in the Eight Point Improvement Plan for Papua New Guinea in 1972 (Zimmer-Tamakoshi, 1993).

In giving special attention to women, the National Goals and Directive Principles (1975) lifted hopes for equal participation. The Second Goal emphasised equality of participation in the benefits (profits) flowing from resources, equality of participation in decision-making, and equal access to information and conflict resolution (Brunton, 1994). However, despite the call for equal participation of women and men in building the nation, national leaders struggled with the idea of giving women too much latitude. Paul Langro, a former member of parliament for West Sepik, claimed, “As far as Papua New Guinea is concerned, women are always regarded as the lowest in the family. I do not want the concept of Western civilization to give equal rights to women as are given to men. Men must get first priority in the society and not women” (as quoted in Zimmer-Tamakoshi, 1993, p. 70).

Bernard Narokobi, creator and spokesman of the Melanesian Way, stood firmly on the side of the dominance of men. He affirmed, “Women are not inferior to men but different.... Within the family, the women’s authority is as important as the man’s. However, at the clan and village level, the woman cannot be head” (1983, pp. 35-36). With politicians and other prominent social stakeholders using the idea of a shared set of core traditions, or what has been termed the Melanesian Way, to lessen disunity and sex bias in Papua New Guinea society, has been difficult for women as they strive to combat the problem and succeed in their struggle for equity.

2.1.3 Women in contemporary PNG society

In contemporary PNG society, women’s roles and status have been questioned. The increasing number of women exposed to Western values through formal education and overseas travel, mass media, and integration into the international framework, has created much controversy over women’s roles in PNG society.

Some social scientists have amassed cogent evidence that PNG society discriminates against women (Gibson & Rozelle, 2000). Although traditional socially acceptable male-female relations are changing, these changes make indistinct the responsibilities of women and men, and lead towards strengthening male dominance (Avalos, 1994). Reaffirmation of men’s dominance over
women manifests itself in practices of big-man culture, which manipulates social, political and economic activities and put into hands of men control over land and other resources (Gibson & Rozelle, 2000). Consequently, insufficient attention and resources are committed by households and by the government to women’s matters. Fox (1999) reported:

There is a greater investment in the health of boys compared with that of girls. Moreover, the physical well-being of girls and women is seriously threatened by increase in domestic violence, in child abuse, and in the fear and experience of sexual assault and violence in schools, further education, workplaces, and public places. Each of these factors tends to militate against the equal participation of women in education and employment. (p. 35)

Such discriminatory practices against girls result in a high mortality rate among girls and lower educational attainment for women. The more detailed situation of women in education is discussed in section 2.2.3 Women in higher education.

Another way of exercising male dominance over women is through wife beating, which is a serious problem. The Report on the Situation of Children and Women in Papua New Guinea estimated that 67% of rural wives, 56% of urban low-income wives, and 62% of urban elite wives were beaten one or more times a year by their husbands (Avalos, 1994), with women living in urban areas suffering a higher level of violence than rural women. An accepted rationale behind this contentious issue of wife beating is the assumption that it is way of traditional family life and “husbands acquire the right to physically punish wives by virtue of bride wealth payment” (Macintyre, 2000, p. 146). In addition, modern urban life styles that include alcohol abuse and reduced social support networks “adversely affect male-female relations. .... Men in town fear their wives’ potential independence and their own uncertain situations” (Zimmer-Tamakoshi, 2003, p. 240).

One factor contributing to the subordinate status and welfare of women is the institution of marriage. Based on Kopkop’s analysis of the status of women (1992), Fox (1999) described marriage in kinship-based societies “as a contractual arrangement between two clans that establishes networks of reciprocal rights and duties” (p. 36). The husband and his clan gain the right to the woman’s reproductive capacity and her labour because they have paid bride price to the woman’s family. Agnes Kewa (2007), an educated woman, shared her experience of bride price:

For too long, women in Papua New Guinea have had price tag put around their necks and on their foreheads. The ‘price tag system’ or commonly known as ‘PNG law of bride price’ has degraded women in the past, is continuing to undermine the real value of women in
today’s 21st century and will continue to devalue women in PNG for centuries to come as long as society and the mentality of average-educated Papua New Guinean men to own and possess a woman remains unchanged. Culture has always demanded that a man pays bride price, and once he’s done, he owns and possesses her – so is the mentality and accepted norm. (p. 46)

Male dominance in all aspects of social life contributes to very slow acknowledgement of the role of women by civil and political authorities. There were some attempts to legalize women’s position in the society, including: the establishment of the Women’s Affairs Unit within the Office of Home Affairs in 1974, the National Council of Women under an Act of Parliament in 1979, the National Women’s Development Program in 1984, and the National Women’s Policy in 1990. The PNG government also ratified the United Nations (UN) Convention (1979) on the Elimination of all forms of Discrimination Against Women in 1994 (Brouwer et al., 1998).

UN agencies and conferences have pressured Papua New Guinea to address gender and women’s issues. Preparing for the United Nations Conference on Women in Beijing (1995), the National Steering Committee prepared in document Platform for Action: A Decade of Action for Women towards National Unity and Sustainability 1995-2000 (Vali, 2010). The document recommended strategies for addressing the critical areas of concerns for women; however, “very little of it appears to have been implemented” (Brouwer et al., 1998, p. 36). In the same critical spirit, Dickson-Waiko (2009) observed “a high level of activity by both government and civil society groups tends to follow world conferences on women, lapsing into inactivity between conferences. Empowerment of women’s organizations in Papua New Guinea has been a fractured process” (p. 284).

Successive government policies have not been consistent enough to maintain gender equity and have resulted in overall stagnation in the development of women. Women have even experienced suppression of their activities in pursuit of development, thus continuing the poor quality of life for women in Papua New Guinea and their under-representation in both economic and political life (South Pacific Commission, 1995).

The economic role of women, although essential to a subsistence economy, is both underestimated and devalued by contemporary men and by economic observers. Though “60% of PNG women are ‘economically active’ due to women’s role in traditional subsistence and increasingly cash agriculture” (Hess & Imbun, 2003, p. 294), only 35% of women are wage-employed in non-agricultural sectors (Asian Development Bank, 2006a), and those are areas considered female, such as community and social services and the retail trade. In the workplace,
they are often discriminated against and do not have access to information and support to ensure that their rights are respected and that they have equal access to services (Brouwer et al., 1998). Such a contemporary employment scene not only contributes to “a disempowerment of urban women to their position in village societies, but it also neglects what has been traditionally the most economically productive labour source” (Hess & Imbun, 2003, p. 295).

In most public spheres of activity, women have very little access to top decision-making positions. Women find it difficult to devote their time and energy outside the family circles due to either family commitments or family problems. Avalos (1994) pointed out husbands’ opposition to women’s work and domestic violence as significant impediments to women’s professional development. In addition, as the author observed, the organisational system itself tended to restrain women’s confidence in being able to beat the odds against them. Women found it difficult to engage in new opportunities or to suggest new ways of doing things to those above their rank, especially to men who feared that their own status might be undermined.

As far as political participation by women is concerned, the situation remains very poor (South Pacific Commission, 1995). Since 1975, PNG has elected only eight female national parliamentarians (Brouwer et al., 1998). Currently, there is one nationalised expatriate female MP. Although the reasons why women are not elected are complex and far beyond the scope of this discussion, it should be noted that women themselves see their losses in a manner less related to male dominance and more linked to the expectations and especially the financial commitments that the electorate appears to want from those they elect (Avalos, 1994). However, those contesting for public office admit experiencing great hostility from men. Three of the eight PNG women who have served as parliamentarians admitted that they avoided being labelled as only women’s candidate. For example, despite her commitment to women’s issues, Nahau Rooney avoided “taking up women’s issues on the floor of Parliament in order to weaken the perception of male colleagues that, as the only female Member of Parliament, she was bound first and foremost to represent women” (Commonwealth Secretariat, 1999, p. 104).

The situation of women as described above leads to the conclusion that conditions for women to participate equally with men in development are very poor. A major portion of the female population, although strongly contributing to the livelihood of people through their roles in agriculture and other economic activities, has little opportunity to express their needs in order to improve the quality of their lives and work; receives little attention in relation to their basic health and education needs; and more importantly, plays only a little role in decision-making process in regard to the country’s development (Avalos, 1994).
2.2 Tertiary Education in Papua New Guinea

An overview of the development of education in Papua New Guinea is now provided. A brief history of higher education leads to discussion of issues in contemporary higher education. The situation of women in tertiary education will also be discussed.

2.2.1 Development of education

Clearly schools are only one of the agents of education society provides. As Smith (1975) stated, “The education of a person involves acquiring information, developing skills and forming attitudes related to the values and beliefs of society. The study of education is thus concerned with the way in which knowledge is communicated with groups such as the family, clan, village and nation, and in the different settings of home, community and school” (p. 1).

In traditional societies, such as Papua New Guinean’s, the most prominent function of traditional education was introducing the next generation to the roles played in society (Thomas, 1993). Because gender roles and behaviours were clearly defined within socio-cultural context of society, thus each gender received the education considered incumbent for its place in life (Geissinger, 1997). True knowledge was always of a ritual character, and it was imparted when the learner needed to use it. Because there were no schools as we know them today, all learning was attained through participation in every day family and community life, and more formally, through rites initiating the young into adulthood (Thomas, 1993).

First and minimal contact with Westerners was in the 1500s. Contact with explorers and traders continued sporadically for centuries. Sustained but area-limited contact came with missions from the 1870s and colonial government from the 1880s. Contact with Highlands people began only in the 1930s. Even at Independence in 1975, not all tribes had had contact with Westerners (Thomas, 1993).

Contemporary school-based education in Papua New Guinea is a product of approaches to education taken by its colonial rulers. Before the Pacific War, New Guinea was first ruled by Germany (1884-1914) as the monopoly of a chartered company, then as an imperial protectorate, and then by Australia (until Independence in 1975) as a United Nations Trusteeship. The Territory of Papua was ruled first by Britain (1883-1906) and later by Australia. In 1949 Australia combined “what had been separate administrations, and from then on tried to make policy to give effect to nation-building and state creation” (Hawksley, 2006, p. 162).
When discussing school-based education, some authors identify three phases in the development of education in Papua New Guinea: phase one (1870s – 1950s), phase two (1950s – around 1970) and phase three (since around 1970) (Pomponio & Lancy, 1986).

Phase one, the Mission Phase commenced in the 1870s and lasted until the late 1950s (Pomponio & Lancy, 1986). The first permanent school was established in 1873 by four pastor-teachers from the South Pacific who settled near Port Moresby (Smith, 1975). During this time, rudimentary education was delivered in schools run almost exclusively by various missions. It was intended primarily for boys with the curriculum designed to prepare them for employment as soldiers, mine and plantation labourers, and clerks (Pomponio & Lancy, 1986). Education for girls was limited to Bible studies and housekeeping skills so that they could labour at home and for the missions. The curriculum was narrow, and schools were part of an evangelising process introducing literacy so that converts could read the Bible in their village setting or be trained to become pastors or catechists. Mission education has often been criticised for being purely moral and rudimentary (Smith, 1975). Fife (2001) argued, that “education by missionaries became ... technologies of power for imposing particular forms of social discipline upon individuals so that they might want to become part of institutional relationships that favoured Christianity and colonialism at the expense of local forms of life” (p. 251).

During this first phase of the development of education, schools were also established by colonial governing powers. German New Guinea was administered by the New Guinea Company that was formed to rule the territory as a commercial venture. Although guided by the notion that missions’ presence could help to pacify the local people and make them more amenable to the colonial purposes, the Company allowed both Catholic and Protestant missionaries access to the Protectorate but took no interest in any direct educational efforts to the point that its annual reports did not mention education at all. The first details about schools run by missions were given in the annual report after the New Guinea Company’s political and administrative responsibilities were surrendered to the Imperial German Government in 1899 (Smith, 1987). German government colonial policy was to establish its own government schools as soon as possible for teaching the German language and patriotic duty. The first school for native boys was opened in 1907 with an enrolment of 27 (Cleverley, 2007). At this time attempts had been made by the Imperial Governor, Dr. Hahl, to unify educational efforts in civil and mission schools. The immediate aims of education were seen “in furthering of original native cultures and the promotion of the German language in trade and commerce and communications with the people” (Smith, 1987, p. 32). All schools were instructed to follow a syllabus which paid attention
to teaching of German. Mission schools were offered grant-in-aid for the promotion of the German language. Post-elementary education was established in 1907 with vocational schools to train young men in printing, carpentry, metal work and book binding (Cleverley, 2007).

After 1906, when the Australian Government accepted responsibility for what had been the colony of British New Guinea and renamed it Papua, building new schools became more widespread. However, the secular system did not expand easily due to the fact that the colonial administration absorbed the mission schools, which continued in pursuing their own interests in relation to the education they provided. A report written by Camilla Wedgwood, who travelled extensively in the Territory inspecting education work, depicted limitations and failures of the school system in relation to village life:

Above all, after they have left school the natives had nothing to read either in English or the vernacular except the Bible and their old school books, so that they lacked the incentive and the opportunity to practice the skill which they had acquired in childhood. I have seen little sign, except among some native village teachers, of any understanding that what is taught at school or even in the technical schools can be or should be applied for the welfare of the native community. (Wedgwood, as quoted in Smith, 1975, p. 25)

During the second phase of the development of education, the Australian Minister for Territories focused on primary education. Defining educational policy in 1955, the goal of education was identified as to teach “all children in controlled areas to read and write in English” (Smith, 1975, p. 35). The development of secondary education was excluded even from broad objectives. It followed the existing official opinion on the feasibility of development of higher education which maintained that “the vast majority of the indigenous people have not yet reached the necessary educational standards” (Howie-Willis, 1980, p. 31) and therefore some more years must elapse before the development of higher education institutions may be justified.

Phase two of educational development in the late 1950s resulted from international political pressure on Australia to accelerate Papua New Guinea toward independence (Pomponio & Lancy, 1986). In 1958, the Director of Education launched a plan for development of universal education in the Territory, within 10 to 15 years (Smith, 1975). Even so, a UN mission under Sir Hugh Foot in 1962 found that the provision of education in the country was at an unsatisfactory level (Geissinger, 1997) and criticised official policy in Papua and New Guinea. Stressing greater urgency in political and economic development, the Foot Report recommended an accelerated program to train indigenous leadership for future effective self-government. The most radical recommendation of the Foot Report was its insistence that secondary education should be expanded and that planning for a university should commence immediately. Following these
recommendations, a Commission on Higher Education was established in 1964. On 19 March 1965, a Ministerial press statement announced the Cabinet’s decision to establish a University and an Institute of Higher Technical Education (Howie-Willis, 1980). In 1966, the University of Papua New Guinea (UPNG) and the Higher Institute of Technology commenced a preliminary intake of students (Smith, 1975).

This phase of educational development was marked with concomitant economic and political changes which enabled graduates from every level of the system finding “immediate, high-paid employment and opportunities for further study and upward mobility” (Pomponio & Lancy, 1986, p. 42). However, it did not last more than 15 years. By the 1970s, the economy had not expanded quickly enough to continue providing satisfactory occupational opportunities to the growing number of graduates. A number of factors contributed to increasing cost of the system: the large number of expatriates employed with salaries similar to those paid in their home countries; an intensive building program aimed at providing elementary education to all the population and secondary education to at least 35% of the population.

Facing such issues, the third phase of educational development began in the 1970s as policy shifted to emphasise rural development, and school fees were introduced to compensate for dramatic cutbacks in support for existing schools. The curriculum was reformulated to equip students with skills which, upon their return to villages, might assist them in initiating various small-scale businesses (Pomponio & Lancy, 1986). Despite the changes in government policy for education the majority of PNG society has retained positive connotation of schooling with economic development. Many educational researchers noted and supported “the contention that private demand for education in Papua New Guinea was and is still inspired primarily by pecuniary motives” (Conroy, 1970, as cited in Pomponio & Lancy, 1986, p. 42).

2.2.2 Contemporary higher education


Of the 26 institutions of higher education (Rooney, 2004), six are universities: University of Papua New Guinea (established 1965) in Port Moresby, University of Technology (now UNITECH, 1966) in Lae, University of Goroka (UOG, 1997) in Goroka, University of Vudal (UOV, 1997) in Rabaul, Divine Word University (DWU, 1996) in Madang, and Pacific Adventist University (PAU, 1997) in
Port Moresby. Four universities are public, and two are private institutions run by different churches. In 2004, a total number of 14,714 students enrolled into all types of tertiary institution (Asian Development Bank, 2006b). In 2010, the Office of Higher Education reported that “enrolment has remained stagnant at 2% of the estimated 600,000 of the college age population of 17-24 year” (Tagis, 2010, para. 2).

The higher education sector is seen at present as mixed and disorganised in structure with each of six universities based on separate enabling legislation (Papoutsaki & Rooney, 2006). The National Higher Education Plan (1990) depicted higher education as characterised by an unacceptably high unit cost of producing graduates, high student attrition rates, and much wastage and underutilisation of resources (Commission for Higher Education, 1990, Executive Summary). The recent (2010) university review reported, “Papua New Guinea’s universities made a significant contribution to the nation in its early years. They can do so again but, right now, the quantity and quality of graduates is far short of what is needed – due to inadequate resources and a range of governance and general service quality issues” (Garnaut & Namaliu, 2010, p. 1).

Two factors that contribute to the present poor state of higher education are “late-development effect” and “diploma disease” (Weeks, 1993, p. 261). The late development effect concept was postulated by Dore (1976), who linked three propositions: “The later development start (that is the later the point in world history that a country starts on a modernization drive): 1) the more widely education certificates are used for occupational selection; 2) the faster the rate of qualification inflation; and 3) the more examination-oriented schooling becomes at the expense of genuine education” (as quoted in Weeks, 1993, p. 263).

Associated with the late development effect is Dore’s concept of diploma disease. He argued that a focus on examination and certificates has a backwash effect that leads to teachers teaching only to examinations and students studying only for exam success (Weeks, 1993). A rapid expansion of secondary and tertiary education, as part of qualification spiral, “then leads to the over production of graduates who cannot find employment” (p. 263).

Expansion of formal education does not result in an expanded formal economy to absorb the increased number of graduates (Reymer, 1999). Thus, although desired, widespread application of education puts also a great demand on the contemporary economy to create a market able to accommodate the large number of semiskilled workers who constitute the majority of secondary and tertiary graduates.
One of the major dilemmas faced by the education system is access and equality. In its ideological meaning, “equality is related to the right of every individual (regardless of social status, gender or religion) to an education that frees him or her from ignorance and, hence, from oppression and domination in order to take active part in the wider society” (Avalos, 1993, p. 276). As such, equality became a guiding theme for decisions regarding higher education. The National Higher Education Plan recommended:

More equitable participation in higher education between categories (for example, ‘females’ and ‘males’, ‘rural students’ and ‘urban students’) should occur. Causes of inequity should be examined and addressed; such diverse factors as the unavailability of accommodation and traditional attitudes of parents, for example, hold back the numbers of females proceeding to colleges. Where appropriate, and where quality is maintained, affirmative action should be taken in favour of disadvantaged groups. (Commission for Higher Education, 1990, p. 60)

As indicated above, access and participation seem to go hand in hand with equality. However, although included in policies, participation is difficult in practical implementation, mainly because of unequal development opportunities (Avalos, 1993). PNG women are still far from achieving equal participation in all types of social and economic activities. In the higher education sector, as presented in Table 2.1, the percentage of women enrolled in public universities was 33%, in private universities was 50%, and in other institutions of higher education was 42% (Asian Development Bank, 2006b).

<table>
<thead>
<tr>
<th>Universities/Institutions of Higher Learning</th>
<th>Student Enrolment</th>
<th>Females No.</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total No.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A. Public Universities</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>University of Papua New Guinea</td>
<td>3,375</td>
<td>1,205</td>
<td>36</td>
</tr>
<tr>
<td>University of Technology</td>
<td>1,846</td>
<td>479</td>
<td>26</td>
</tr>
<tr>
<td>University of Goroka</td>
<td>1245</td>
<td>468</td>
<td>38</td>
</tr>
<tr>
<td>University of Vudal</td>
<td>294</td>
<td>103</td>
<td>35</td>
</tr>
<tr>
<td>Subtotal (A)</td>
<td>6,760</td>
<td>2,255</td>
<td>33</td>
</tr>
<tr>
<td>B. Private Universities</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pacific Adventist University</td>
<td>431</td>
<td>206</td>
<td>48</td>
</tr>
<tr>
<td>Divine Word University</td>
<td>846</td>
<td>427</td>
<td>50</td>
</tr>
<tr>
<td>Subtotal (B)</td>
<td>1,277</td>
<td>633</td>
<td>50</td>
</tr>
<tr>
<td>Subtotal (A+B)</td>
<td>8,037</td>
<td>2,888</td>
<td>36</td>
</tr>
</tbody>
</table>

Table 2.1 Nationwide student enrolment in all types of tertiary institutions in Papua New Guinea in 2004
2.2.3 Women in higher education

The importance of women’s education in the developing countries is widely acknowledged in the literature (Chen, 2004; Flaherty, 1998; Kanbur, 2002; Primo, 2003; Shambare, 2011; Vimale, 2010). Turner (1990) argued that education is “universally perceived as a major vehicle for women’s advancement, and in PNG it has been educated women who have been its staunchest advocates” (as cited in Flaherty, 1998, p. 12). Despite this understanding, there is evidence of negligence by lawmakers to ensure equal access to education for female and male students. Only 209 in 100,000 PNG women were enrolled in tertiary education, as reported by the 2001 AusAID report (as quoted in Spark, 2011).

Reflection upon the historical development of education, which now follows, brings to light some significant phases in the progress of the modern education of PNG women. It is further followed with an account of women in the contemporary higher education sector.

Traditional women’s subjectivity was reflected in the education during pre-contact and during colonial times. Before contact with Western cultures, societal roles were clearly defined. From the age of 6 to 8 years, girls were prepared to care for younger siblings. With age, as they learnt new skills, girls were entrusted with more household duties and were working alongside women in the family. All the skills that a young women was expected to master, she acquired “at home from older women without the need for the extended apprenticeship required of a novice builder” (Thomas, 1993, p. 236).

Formal education in colonial times reinforced disparities between genders. “Colonial schools were either all girls or all boys and the school curriculum and subjects were designed accordingly” (Cox & Aitsi, 1988, p. 25). Again, the main focus of girls’ education was to equip them with housekeeping skills. Girls were taught to accept that their identity as a woman would be defined by being a wife and a mother (Fox, 1999). Although girls were officially allowed to partake in...
educational opportunities, in reality, their participation was limited by cultural social obligations. Parents, when given a choice to educate a daughter or a son, were more likely to provide family resources for a son’s education (Mandie-Filer, 1988). At marriageable age, the majority of girls were destined to be exchanged for a bride price (Kewa, 2007).

However, it should be noted that although the curriculum of the first Christian mission schools focused on the education of boys, there were some examples of promoting the education of women by refusing to enrol boys unless girls were also sent to school. Such compromise was partly related to the widespread belief that educated Christian men needed educated Christian wives and mothers if they were to remain faithful to their new beliefs. At the beginning of the 1900s, at least in Papua, one-third of the missionary force was female, and many of these women were committed to raising local women’s status and quality of life (Zimmer-Tamakoshi, 1993).

Shortly after the Second World War, the newly created Department of Education included a Female Education Division with its own Education Officer-in-Charge. The decision followed Camilla Wedgewood’s *Memorandum on Native Women Teachers and Their Training*, in which she listed three reasons for setting up a government centre for training women teachers. She went on to report that “most schools had remained open during the war, that girls appeared better teachers of primary aged children and since there were fewer options for women the general quality of women to take up teaching would be higher than of men” (Roakeina, 1988, p. 16).

In the 1950s, a selected group of girls and boys were sent to secondary boarding schools in Australia. At the same time, young women were trained as teachers in Popondetta, nurses in Port Moresby, welfare officers in Port Moresby, and preschool teachers in Port Moresby, Rabaul, and Lae. Despite these improvements for women’s education, the United Nations Mission Report in 1968 still emphasised the importance of giving girls equal opportunities in the full field of education. The Mission Report recommended that all appropriate steps be taken to ensure that parents send their daughters to school (Roakeina, 1988).

For a short period of time prior to Independence, women’s education received deserved attention. Developed in 1972 the Eight Point Improvement Plan emphasised rural development, self-reliance, and more equitable share in economic benefits and services. The plan’s seventh point focused attention on women and promulgated that there should be “a rapid increase in the equal and active participation of women in all forms of economic and social activity” (Government pamphlet, as cited in Geissinger, 1997, p. 427).
However, an avenue for women’s equal participation in all aspects of economic and social activities betokened by the Eight Point Improvement Plan did not last long. The National Goals and Directive Principles in the preamble to the Constitution (1976) incorporated seven points of the Eight Point Improvement Plan but excluded that regarding women’s equal and active participation. Instead, such inclusive terms as ‘everyone’ and ‘citizens’ were used, as in the Second Goal:

We declare in the Second Goal to be for all citizens to have an equal opportunity to participate in, and benefit from, the development of our country. We accordingly call for an equal opportunity for every citizen to take part in the political, economic, social, religious and cultural life of the country. (Constitution of the Independent State of Papua New Guinea: National Goals and Directive Principles, as cited in Brunton, 1994, p. 22)

The faceless language of the National Goals diminished women’s recognition as equal participants in the economic and social life of this country. The number of women holding posts in the government has decreased, and the Office of Women’s Affairs has retreated into the “back cubicles in the office block” (Kekedo, as cited in Geissinger, 1997, p. 427). These backward shifts have contributed to the unfavourable social status of women, which has added to inequality in education from the very first years of universities in Papua New Guinea.

Women’s presence in the higher education sector has been marked with a continuous struggle to overcome numerous gender-related barriers: social, economical, cultural, and political. In her study of challenges to gender equity in higher education in Papua New Guinea, Tuaru (2008) observed the underlying factor at the roots of gender inequity as “the existence of pervasive, deeply entrenched cultural beliefs held by decision-makers and those in authority that positioned women as secondary, which marginalised and consequently impeded the progress of women” (abstract).

Women’s safety remains an important issue in all levels of educational institutions and in rural as well as urban settings. Male aggression towards women and women’s constant fear of being physically or psychologically harassed was recognised as a main problem of female students in the 1970s at UPNG (Howie-Willis, 1980). Two decades later, safety of women at institutions of higher education remained problematic: several faculty members and students were murdered at UPNG and a murder occurred at the University of Technology in 1995-1996; the crimes remained unsolved (Geissinger, 1997).

As previously noted, other factors that create a barrier in girls’ access to education are psycho-social. Being mainly patrilineal, PNG society views women as gardeners, child-bearers, and
homemakers. Research revealed that some parents fear that the effect of a girl’s education “on village life, values, and parental control, together with the financial risks involved would not be worth the effort” (Yeoman, as cited in Flaherty, 1998, p. 56). If the family is of the view that attending school spoils the girl and makes her unfit for village life and therefore unmarriageable or not able to attract much bride price, they keep her at home or remove her from school after only a few years.

An important determinant of the greater enrolment of boys is cultural perception of the acceptable relationship between the sexes. Traditional patriarchal beliefs about masculinity and femininity and the properness of men’s dominant role and women’s submissive role seem deeply entrenched in the society (Howie-Willis, 1980). It influences the perception of educational benefits for women. Because education promotes interaction with a larger world, it is considered as a threat to accepted gender ideology (Johnson, 1993).

Economic factors play an important role because the majority of parents see the sole objective of schooling as preparing children for wage employment (Pomponio & Lancy, 1986). Considering widespread practices in occupational landscape of the country where, even with similar positions, females are more likely to earn lower salaries and are deemed to be more temporary employees, it seems wiser to invest in male education.

Contemporary Papua New Guinea witnesses a gendered political landscape in the composition of the elite class as the effect of history and uneven development combined with extreme cultural diversity (Zimmer-Tamakoshi, 1993). Zimmer-Tamakoshi claimed that “most educated women are from matrilineal societies on the coast and islands and from families with long involvement in Western education and urban employment. The opposite is true of many educated men, who come from the less developed and more recently contacted patrilineal societies” (pp. 61-62).

There are some current attempts at the governmental policy level to embrace issues facing women in education and to embody equity in all levels of the educational system. In 2003, the Department of Education launched its Gender Equity in Education Policy, which declared that “gender equity should be fundamental to all educational policies and practices so no students in the education system of Papua New Guinea are disadvantaged on the basis of gender” (Department of Education, 2009b, p. 2). Following the policy, the Gender Equity in Education Strategic Plan 2009-2014 acknowledged existing PNG gender stereotypes that “are drivers of unequal access to education for girl children, sexual and reproductive health problems, including HIV and AIDS and gender-based violence” (Department of Education, 2009a, p. 9). The plan
identified the strategic outcomes and indicators that seek to lower barriers in women’s education. Consequently its purpose was to ensure that “more women are represented in decision making, are able to be employed, trained and promoted in managerial and technical positions. The plan identifies the entry points to ensure that learning environments are socially and culturally appropriate, supportive and physically comfortable for both girls and boys” (p. 78). The authors of the plan believe that it is achievable although they admit that the implementation process will be slow.

2.3 Information Communication Technology

Information Communication Technology (ICT) is relatively new to Papua New Guinea. Current ICT policies and praxis are now discussed. The term ICT is defined to provide clear understanding of the concept as used throughout this study.

2.3.1 ICT term defined

There are different ways to consider the concept of Information communication technologies (ICT). Marcelle (2000) defined ICT comprehensively:

Information and communication technologies (ICTs) comprise a complex and heterogeneous set of goods, applications and services used to produce, distribute, process and transform information. They include the outputs of industries as diverse as telecommunications, television and radio broadcasting, computer hardware and software, computer services and electronic media (e.g. the Internet, electronic mail, electronic commerce and computer games. (as cited in Farrell, 2003, p. 1)

Other authors distinguished between old and new information and communication technologies (Curtain, 2003; Farrell, 2003). The items listed by Marcelle, such as telecommunication, television, and radio broadcasting are categorised as old information and communication technologies, while computers, the Internet, and Internet-related services are considered as a new information communication technologies.

For the purpose of this study, ICT is used in the context of new information communication technologies and is limited to use of computers and the Internet. The limitation was determined by the scope of ICT utilisation within the higher education sector at the time the study was commenced in 2007.
2.3.2 ICT policy and current state of ICT in Papua New Guinea

This section provides an overview of the development of ICT policy and the current state of ICT in Papua New Guinea. The state of affairs at the time the research was initiated is presented along with an update – how the policy and praxis has adapted to fast changing technology in the country.

2.3.2.1 ICT policy and state of ICT at the time of research commencement

The “most appropriate technology for any country is the one that makes optimal use of existing resources” – human, financial, and material, as observed by Jones et al. (1994, p. 129). The PNG Government has understood that command and control of ICT is one of the keys to global success in the 21st century. Thus, to ensure that through improved information and communication systems the majority of Papua New Guineans benefit from Government programs and services, the National Parliament established a Department of Information and Communication in mid-1992. Soon, the first National Policy on Information and Communication of Papua New Guinea was launched in 1993. The Policy acknowledged the role of computers, telecommunications, and other information processing technologies in the effective and efficient operation and management of private and public enterprises. Consequently, the Government set as one of its highest priorities the successful implementation and exploitation of ICT (Department of Information and Communication Services, 1993, as cited in Evans, 2000). Since then, there have been several attempts to implement ICT policy in the country. These attempts have been ineffective due, in part, “to the ad hoc way of mounting projects”, resulting in “incompatible appliances and applications being installed” (Vaa, 2003, p. 204). There were other huge barriers to information technology development as outlined by the Secretary of the Department of State Enterprises and Information, Henao Iduhu (2004):

The diversity of culture/languages, scattered villages, the rural based population and the rugged terrain of the country is a major hurdle to the development of the Telecommunications in PNG. Natural disasters and theft also have a part to play in the already very difficult area. The rural populations do not really see the need to own a phone and even if they are in the vicinity of an access point will not afford a phone. (p. 2)

Notwithstanding these hindrances, many critics stressed the urgent need for appropriate ICT policy to acknowledge the current state of ICT use, high demand for people with ICT skills, the level of computer development, absence of formal computing curriculum in the schools, and the ad hoc manner in which ICT education and training has been conducted in Papua New Guinea (Sinebare, 1998).
Digital convergence has increasingly tied computer technology to telecommunications and broadcasting. There have been some initiatives taken in Papua New Guinea to boost the ICT industry. One was a measure to privatise the state-owned entities, including PNG Telikom. The main objectives of this exercise were to promote economic efficiency and to encourage competition as well as to improve the performance of state-owned enterprises (Iduhu, 2004).

In 2004, the telecommunication network was still owned by the Government and operated by its statutory organisation, PNG Telikom. It had a monopoly on telecommunication services; there were 12 main telephone lines per 1,000 people. For comparison, at the same time, the low-income group of countries had 33 main lines, and the East Asia and Pacific Region had 194 main lines (World Bank, 2004). Telecommunication infrastructure was limited to major urban centres, such as Port Moresby, Lae, Rabaul, Goroka, Mt. Hagen, and Madang. The Telikom network consisted of microwave links and about 100 repeater stations in the country. In many areas, the final link was provided by high frequency radio, which is sometimes unreliable for data transmission (Long & Ng Lee-Hoon, 1999).

The Internet was accessed at the University of Technology in Lae in June 1990. Email service was offered to staff and some other research organisations within Papua New Guinea. At this time, there were 250 Internet users in the country (Khademazad, 1997). Internet use was publicly launched in Papua New Guinea in June 1997. In 2002, there were several Internet Service Providers (ISPs): Daltron Electronics, Datec, Global, Online South Pacific and High Tech Industries. However, PNG Telikom still monopolised licensing of ISPs. Tiare, a subsidiary of PNG Telikom, was licensed to operate Papua New Guinea’s only Internet gateway, which was linked by satellite to AT&T in Sydney (Long & Ng Lee-Hoon, 1999).

In 2004, Papua New Guinea had 18 Internet users per 1,000 people. At the same time, other low-income countries had 20 Internet users per 1,000 people, and East Asia and the Pacific Region had 75 users per 1,000 people (World Bank, 2004). From the beginning of the Internet presence in Papua New Guinea, the tertiary education sector has been one of the largest potential user communities (Long & Ng Lee-Hoon, 1999). UPNG, UNITECH, and DWU set up fibre-optic campus networks that support Internet/Intranet services.

2.3.2.2 ICT update
The growing importance of ICT for economic and social development has been acknowledged in the Medium Term Development Strategy. The document advocated the development of a nationwide telecommunication network that would support broad-band and satellite technology. It
recommended the expansion of a range of e-services to facilitate needs of urban and rural communities (Singh, 2009).

To provide a policy framework for the projected engagement and wide application of ICT, a number of policies were developed. In 2005, the Government launched the policy that allowed competition in the mobile phone sector. The liberalised PNG telecommunications market opened its door to foreign investment and ownership to enter and consequently to rapid improvement of mobile phone services country-wide (Singh, 2009).

The next step in the development of regulatory policy took place in 2007, when the Government launched the Policy Committee 2007 and Papua New Guinea Telecommunications Deregulation Blueprint as Government Policy (the ICT Policy 2007); however, the ICT Policy 2007 was never implemented (Duncan, 2011).

The Government’s efforts in reforming the ICT sector reached the culmination in the National ICT Policy launched in 2008. The policy’s vision aimed to bridge the digital divide between rural and urban areas and to provide efficient ICT services across the country. It stipulated the necessary development of efficient ICT infrastructure that would secure the social and economic benefits of the ICT sector (Department of Communication and Information, 2008).

Although liberalisation of the telecommunications sector has been a politically difficult process, the benefits of it in terms of the mobile telephone “are already large and likely to become much larger in the future” (Duncan, 2011, p. 442). Among many benefits, Duncan reported the fast growing mobile proliferation reaching remote communities, assisting people in personal communications as well as assisting in social interactions and business activities.

The higher education sector is one of the biggest beneficiaries of the recent ICT developments. In 2006 under the sponsorship of the vice-chancellors of the PNG universities, a new Papua New Guinea Academic Research Network (PNGARNet) was constructed. It is forecasted that the network will eventually be used by an estimated 27,000 staff and students at universities, other institutions of higher education (OIHEs), and research institutions across the country. It is anticipated that the advantages of PNGARNet to participating institutions will include “access to databases at reduced cost as consortium members, shared research projects and inter-institution partnerships, increased professional communications both within PNG and internationally, reduced costs to each institution and increased facility for PNG academics to be represented and active internationally” (Anderson, 2009, p. 17).
2.4 The Research Problem

PNG societies generally share the notion of male dominance. As noted here, women were identified by their household roles as wife, child bearer, and family carer. The majority of traditional societies assigned no public functions to women.

School education, which is a relatively new phenomenon in PNG society, reinforces traditional social division. The educational system of missions and the colonial governments provided few opportunities for women’s advancement through education. Numerous socio-cultural implications also disadvantaged girls from entering and succeeding in education. The establishment of higher education prior to Independence reinforced existing gender disparities. Consequently, at the beginning of the 21st century, the general status of PNG women is very low. However, the research literature supports the argument that education, especially higher education, holds potential to empower women’s advancement in society.

Another widely recognised and acclaimed means of women’s empowerment in contemporary society is ICT. ICT is an even newer social phenomenon in Papua New Guinea than education. The research literature provides numerous examples of successful application of ICT for women’s empowerment in other parts of the world. This study of women’s engagement with modern technology in Papua New Guinea is believed to be the first of its kind in this country.

The research combines arguments that education and ICT could contribute to women’s empowerment and investigates to what extent ICT through higher education empowers women in Papua New Guinea. The study considers the perspectives of female and male staff and students and their access, application, and attitudes towards ICT.

2.5 The Purpose of the Research

In view of the research problem as articulated above, the purpose of the study is to explore whether ICT through higher education contributes to women’s empowerment in PNG society and how its potential could be realised and utilised in the future.
CHAPTER THREE
LITERATURE REVIEW: THE BODY OF RESEARCH LITERATURE

The purpose of the study is to explore how ICT through higher education could contribute to empowering women in Papua New Guinea. To this end, Chapters Three and Four systematically review and critique literature pertaining to this empowerment of women. Figure 3.1 offers a diagrammatic overview of the conceptual framework of the literature review. The investigation of the problem is negotiated at the nexus of three contributing factors: ICT, higher education, and gender. The interconnectedness and overlapping of all these factors determine the leading themes discussed in these two chapters.

![Conceptual framework of the literature review](image)

It should be noted that the literature reviewed in Chapters Three and Four is primarily which informed the research questions and guided the study design at the time it was developed in 2007. The sources have been updated in places of particular importance. Current literature in the field is considered more thoroughly in discussion chapters.
3.1 ICT and Education in Developing Countries

The beginning of the 21st century has been witnessing the emergence of a new global knowledge and information society. Information is being collected, processed and disseminated at exponential rate so that “more new information has been produced within the last three decades than in the last five millennia” (Haddah & Draxler, 2003, para. 1). Knowledge has become a new commodity on the global market. To become a part of the knowledge society is to participate in knowledge development and information sharing; it is to acquire “the skills to productively transform knowledge and information into innovative products and services” (Hawkins, 2002, p. 38). This creates a challenge for developing countries, which for decades have remained on the peripheries of global knowledge production, to focus on developing their human capital. One way to embrace the challenge is to increase access to quality higher education. The President of Rice University, Malcolm Gillis (1999), observed, “Today, more than ever before in human history, the wealth – or poverty – of nations depends on the quality of higher education. Those with a larger repertoire of skills and a greater capacity for learning can look forward to lifetimes of unprecedented economic fulfilment. But in the coming decades the poorly educated face little better than the dreary prospects of lives of quiet desperation” (as quoted in World Bank Task Force on Higher Education, 2000, p. 15). In this context, the importance of higher education for the future of the developing world is greater than ever. “It cannot guarantee rapid economic development – but sustained progress is impossible without it” (World Bank Task Force on Higher Education, 2000, p. 19).

Advances in information technologies have greatly changed the nature of many human activities in the world, especially in developed countries. ICT affects economic activities, education, entertainment, communication and many other aspects of our lives. ICT has also been seen as the prime determinant of economic advancement, prosperity and the power of industrialised nations such as the United States and the United Kingdom (Davidson et al., 2000).

Although ICT is recognised as one of the major factors contributing to the economic advancement of developed countries, the current impact of ICT on the economy of developing countries has been marginal (Kodakanchi et al., 2006). In order to grow and prosper, and “break the bounds of isolation and bring remote communities in with the rest of the world, developing countries need to recognize the potential of ICT and use it” (Tarjanne, 1998, as cited in Davidson et al., 2000, p. 1).
ICT plays a dominant role in this new global society in the changes that reshape our daily activities which are becoming technologically dependent. The following sections will scrutinise the transformative potential of ICT in education and for the empowerment of women with a special section allocated to the discussion of the Internet phenomenon and its role in the contemporary world.

3.2 ICT in Education

Information Communication Technology used in an educational context is described in the literature as educational technology. The United States Presidential Commission on Instructional Technology provided two definitions of the field. The first one emphasises hardware and software as “the media born of the communications revolution which can be used for instructional purposes alongside the teacher, textbook and blackboard … the pieces that make up instructional technology: television, films, overhead projectors, computers and the other items of ‘hardware’ and ‘software’” (Tickton, as cited in Ely & Plomp, 1986, p. 233). The second definition comprehensively supplements the first and defines educational technology as “a systematic way of designing, carrying out, and evaluating the total process of learning and teaching in terms of specific objectives, based on research in human learning and communication and employing a combination of human and nonhuman resources to bring about more effective instruction” (p. 233).

The application of educational technology has been in place for decades. In 1972, the Carnegie Commission (USA) emphasised the transformative influence of technology in stating that “now we face the first great technological revolution in five centuries in the potential impact of the new electronics” (Carnegie Commission on Higher Education, as cited in Douglass, 2005, p. 5). The presence of technology within the educational environment has been accelerated by the popularisation of computers and the Internet. At the same time their role has been changing, reflecting the abilities of technological innovations as well as perceptions of technology and social expectations. Volman & van Eck (2001) outlined different roles computers have played through past decades. In the 1980s, they were used more for drill and practice, and such general programs as word processing, databases, and spreadsheets were used as learning or work tools. In the 1990s, the use of ICT developed rapidly with an increasingly broadening range of computer software applications utilised for educational purposes. From learning about computers in the 1980s, the practitioner’s focus shifted to computer-aided instruction. The beginning of the new millennium, marked with easy access to the Internet, offered possibilities of new models of
technology and their involvement in teaching processes – “new forms of learning and teaching (transformation) in which students deal with knowledge in an active, self-directed and constructive way, leading to learning results that are more transferable to situations outside school than are the results of traditional teaching methods” (p. 614).

The following sections continue the discussion of the transformative power of ICT in education with a special focus on its role in the teacher – student nexus. The discussion includes the debate over the gap between the rhetoric and reality of ICT in education.

3.2.1 Transformative power of ICT in education

ICT in the educational context has been discussed in the literature from two concurrent perspectives as both a cause and a driver for change within higher education (Clegg et al., 2003). The argument for ICT being a cause for change within education has refocused the discussion to the rapid development of ICT during recent decades. Alongside technological advances, a fundamental shift has emerged from the industrial to a newly formed knowledge and information society, spanning all regions. Introduced by Peter Drucker (1969), a “knowledge-based economy” (as cited in Bates, 2010, p. 17) drew a powerful line between those who produce with their hands and those who produce with their heads. Contemporary typical knowledge-based occupations are those that rely heavily on information and communication technologies for the creation, storage, transmission, analysis, and application of information. Knowledge created with ICT is seen as “being both process and product, with economic value” (p. 17).

In the new global knowledge society, knowledge and information have become increasingly important determinants of the wealth of nations. Hans d’Orville, the Director, IT for Development Programme, UNDP, observed that “access to knowledge and the ability to disseminate it has become a major source of competitive advantage” (D’Orville, 2002, para. 1). Being generic, information and communication technologies, which drive these processes, impact virtually all human and societal activities. The workforce of the future will require graduates prepared to deal with technology and the globalisation of knowledge.

To continue their important role within a new environment of contemporary societies, higher education is exhorted to adapt to the new challenges and provide graduates with a “flair for enterprise” (Clegg et al., 2003, p. 41). As for ICT’s impact on education, Tony Blair, the former Prime Minister of the United Kingdom, stated, “Technology has revolutionized the way we work
and is now set to transform education. Future children cannot be effective in tomorrow’s world if they are trained in yesterday’s skills” (as cited in Oh, 2003, p. 138).

The significance of ICT in higher education seems to be of special importance in relation to developing countries – traditionally in peripheries of global knowledge and development. The World Bank Task Force on Higher Education report (2000) acknowledged the potential of computer-based technologies to transform higher education in the developing world. Technology reduces “intellectual isolation while providing increased (and ever-faster) access to the very latest scientific information – serving as ‘learning commons’” (p. 75). The report also indicated the significance of the Internet in research and its ability to assist lecturers in developing countries in collaborating and cooperating with academics worldwide.

However, the discussions about the advantages of ICT in education in developing countries often focus on the significant limitations that higher education in these areas are facing and consequently how it affects the harnessing of ICT potential. Osin (1998) included such problems as lack of appropriate infrastructure, lack of professional credentialed teaching staff, and overpopulated classes. In her study of motivation to use ICT by faculty in Nigerian universities, Agbonlahor (2006) observed that an important factor that limited the use of technology, especially the Internet, in a developing country was the cost involved. Even though the Internet connection was provided for lecturers, the unaffordability of the Internet connection for students was a significant limitation. The speed, ease, and quality of access to the Internet were also significantly lower than in developed countries. To negotiate both the potential of ICT and the limitations within developing countries, Jaffer et al. (2007) observed that the potential of ICTs “is sandwiched between increasing pressure on higher education institutions from government to meet the social transformation and skills needs of South Africa, and the varying student academic preparedness, large class sizes and multilingualism currently experienced in these teaching and learning contexts” (p. 131). Osin (1998), Jaffer et al. (2007), and Mobombo (2007) postulated that technology, although important for higher education functions and success in developing countries, requires special consideration when introduced and utilised, such as preparing a cadre of instructors who are able to provide adequate training for teachers, ongoing support for users, and support from surrounding communities.

**3.2.2 ICT at the teacher - student nexus**

There has been general consensus of the potential of ICT to stimulate and realise students’ human capital (Loxley & Julien, 2004). Different forms of learning and teaching have been
explored to investigate how students can engage technology in learning processes in more active and constructive ways. Volman and van Eck (2001) expounded potential applications of educational technologies and their impact in teaching and learning activities. With the use of multimedia and simulation programs, students can learn to solve problems encountered in daily life. ICT provides learning tools for visualising complicated abstract concepts and relationships, thus assisting students in learning how to solve problems. Embedded in technology, the principles of collaborative and cooperative learning make ICT a tool for teacher-student feedback and student-student feedback, thus encouraging reflection over learning processes. Finally, ICT provides links between learning institutions and the outside world of information and enables interaction and communication with other institutions worldwide.

Other authors have contributed to these categories. Haddah (n.d.) pointed out that ICT allows materials to be presented in multiple media for multi-channel learning. This method can accommodate different learning styles and different concepts can be acquired through different paths of learning. Loxley and Julien (2004) argued that traditional sources of information for students, teachers, labs, and books are supplemented with new technology through which students and teachers interact with each other in new and compelling ways.

Haddach and Jurich (2003) identified another way in which ICT can contribute to education by creating problem-solving environments related to real life. An abundance of multimedia programs and simulations that combine text, images, sound, animation, and video used to solve real life problems make facing the challenges an adventure. Computer simulations are also becoming essential tools in situations that are too risky, costly, or time-consuming to sanction real-life experiments. With the assumption that to make students active “builders of knowledge” (p. 34) the teaching-learning process should encourage intellectual curiosity and enjoyment, the authors argued that ICT offers an effective instructional aid to make students active participants in the learning process.

ICT contributes in the new learning process by facilitating the connection between the school and outside world. It provides access to an extensive amount of information; the use of the Internet makes it possible to access learning materials anywhere, at any time. Additionally, the physical network enables collaboration between students and teachers and facilitates different aspects of their professional relationship (Hernes, 2003).

As argued earlier, information and communication technologies have brought new possibilities to negotiate teaching-learning processes. However, they have also placed more demands on
teachers. There has been a tension in the literature between those who believe that computers may help teachers to perform their present professional roles better, and those who see computers redefining teachers’ roles (Twining, 2002). On one end of this continuum are those who herald the use of computer technology directly in the teaching process (Boylan, 2004; Farrell, 2003; Fletcher, n.d.; Loxley & Julien, 2004). On the other end are those who perceive ICT transferring responsibility in the learning process to students (Duderstadt, 2001; Morrison & Staurch, 1999; Twining, 2002).

Steketee (2005) concurred with the opinion that teachers’ ability and willingness to engage technology into the teaching process results from their personal philosophy of teaching: “teaching with computers requires a shift from traditional teaching practices” and therefore “teachers who hold teacher-centered beliefs of teaching and learning will be less likely to view technology as an integral learning tool” (p. 105).

In the new, evolving computer-mediated teaching environment, teachers’ roles are changing; teachers are expected to play the role of moderators of independent student learning, collaborators in the process. Many teachers are not ready to undertake the task (Pagliarello, 2007). Pagliarello (2007) indicated a number of reasons why numerous faculty members remain reluctant to incorporate new technologies into their teaching practice: “age and lack of time; lack of competences; no patience for unproven technologies; lack of resources, fear of the unknown” (p. 71). In the same vein, Steketee (2005) evaluated the lack of readiness within the Australian teaching profession environment, where most practising teachers had limited or no exposure to technology in their own education and consequently their ICT skills were still developing. Her conclusion — “Where lecturers and teachers are in a skills-developing situation themselves, the role of ICT in teaching is likely to remain at the level of presenting old teaching in new ways” (p. 105) — may have a special implication for lecturers in developing countries, where ICT in the educational context is a relatively new phenomenon and where teachers are learning ICT skills on the job.

Segrave et al. (2005) called for ongoing professional development to help academic teachers to learn not only technological skills but more importantly how practical integration of technology into the teaching process may enhance teaching and learning processes. Sooknanan et al. (2002) added that “computer training for teachers should emphasize the individual and national beliefs of computer literacy in order to retain a positive awareness” (p. 567). Their research of the role of teacher attitudes and perceptions towards employing computers in the teaching process among faculty in Trinidad and Tobago, revealed that although teachers perceived computers as a
powerful educational tool, they “need to be assured that computers do not pose a threat to their teaching skills” (p. 567).

In the same vein, there has been a postulate for a new paradigm to replace training with lifelong professional development of teachers (Clegg et al., 2003; Hernes, 2003; Oh, 2003). Mason et al. (2000) argued that “if technology is truly to impact both pedagogical competence, as well as increase content knowledge in the social studies, the apex of the instructional delivery system – the instructor – must be the continual focus of these beliefs. As such, both professional development and research efforts must be at the forefront of infusing these principles, if instructional efforts involving technology and the social studies are to truly reform classrooms” (p. 114).

In conclusion, it may be said that there are many optimistic theories about ICT’s role in higher education. However, at the same time many authors warn us that the technology must not “compromise one of the fundamental aims of higher education institutions: to offer high-quality teaching and learning opportunities to students” (Huyer & Sikoska, 2003, p. 4). Utilising technology in academic courses does not guarantee quality teaching and learning; technology is not a panacea for lack of competency on the teachers’ side, lack of motivation and personal involvement on the side of students, or the lack of good policy.

### 3.2.3 ICT in education: rhetoric vs. reality

Although the extensive literature has acknowledged the changing power of technology and predicted a shift from traditional to technology-assisted program delivery modes, many authors have remained sceptical, expecting slow paradigm shifts and that “the change would come slowly, costing more money and adding to rather than replacing older approaches” (Douglass, 2005, p. 5). In the same vein, Ely and Plomp (1986) pointed out that despite hopes for technology’s effects on the educational sector, there has not been much evidence of using numerous communication and information technologies in education in revolutionary ways. Isolated and much publicised use of educational technology in different areas of the world can be observed, “but the major educational innovation or movements that promise to bring about the desperately needed changes are still to come” (as quoted in Kolodziejczyk, 2009, p. 29).

This argument from the 1980s still holds validity 30 years later. Oh (2003) argued that the transformative potential in ICT for education can sometimes be exaggerated. The observed developments of the past few decades might not demonstrate the anticipated revolution of
educational methods. Trend et al. (1999) described this mismatch between aspirations and achievements of ICT in education as the “reality-rhetoric gap” (as cited in Twining, 2002, p. 103). Dillon (1996) undertook the challenge to denote misconceptions of information use and the electronic media. In relation to learning, he questioned the rhetoric that “rapid access to a large manipulable mass of information will lead to better use and learning” with an argument that “mere exposure to information is not enough for learning to occur” (p. 31). He also claimed that “where the medium fails to produce the effect that was required, too little emphasis is placed on relating the assumptions behind the design of the information presentation medium to the psychological activities of the learner” (p. 32).

In the same vein, Sarker and Nicholson (2005) cited other numerous misconceptions relating to the potential of technology in education with a special focus on online education in Information Systems. Among other myths, they impugned an oft-appearing argument that “technological connectivity implies interaction among participants in online IS courses” (p. 62). Based on their research findings, Sarker and Nicholson argued, “ICTs can act as potential enablers of productive and satisfying interactions, but such interactions depend on the participants’ behaviour and can only ‘emerge’ when the appropriate social enablers and interventions ‘fit’ with the technological platform for the courses” (p. 63).

Despite limitations and rhetorical misconceptions of the potential of technology for higher education (as discussed here), the higher education sector remains highly dependent on technology if it is to fulfil its task of preparing graduates for the reality of a knowledge-based society. Technology-based challenges and opportunities are driving the changes within the educational environment. In this context, Duderstadt (2001) argued that “higher education must define its relationship with these emerging possibilities in order to create a compelling vision for its future as it enters the next millennium” (p. 71).

**3.3 Gender Issues in ICT**

The discussion of gender issues in ICT focuses on two aspects: women’s and men’s access and application of ICT and women’s and men’s attitudes towards ICT. Although the definition of ICT as it is used in this study includes computers and the Internet, some papers referred to in the following section report research that examined either the access and application of computers, or the access and application to the Internet only.
3.3.1 Gender issues in access and application of ICT

Gender issues in access and application of ICT relate to numerous factors that impact women’s access and use of technology “including the ICT infrastructures, social norms, time budget allocation, education, employment, and available content and cultural constraints” (OECD, 2007, p. 26). They are discussed in the following section.

With the advent of new technology, differences typically occur between initial users and later users, when the technology is well established. Researchers noted that initial adopters of a wide range of telecommunication technologies and the Internet are more likely to be white, male, and urban residents with access to education, income, and other resources (DiMaggio & Hargittai, 2001).

Researchers generally have agreed about an existing gender imbalance in access and use of ICT from early school years through the different levels of educational systems, in the workplace, and in private use. Colley and Comber (2003) examined possible changes in the computer experience and attitudes of secondary school students in the United Kingdom. In comparison with similar studies conducted in the 1990s, they found that although the initial gender gap has narrowed, there was still clear evidence of gender differences. Young women used computers less frequently than young men. Broos (2005) also indicated that that boys and men used computers more than girls and women, and had more interest in computer-related activities.

Reviewing two decades of studies in higher education, Kay and Lauricella (2011) observed emerging gender parity: in the 1990s, “there was a clear measurement concern regarding the assessment of gender differences in computer ability, attitude and use” (p. 362), but in the mid-2000s, “differences between males and females may be lessening somewhat, although male dominance is still prevalent with respect to attitude, ability, and use, particularly in higher education” (p. 362). In the context of developing countries, women’s access to computers has been restricted by socio-cultural and economic influences. Hardware and software developed in developed countries has been expensive and computer ownership has reflected personal economic realities. In the majority of cases, women, traditionally disadvantaged in education, have occupied lower wage positions that restricted them from acquiring private computers. In addition, reinforced by ICT, social stratification of male-dominated societies “relegates females in the workplaces to secretarial skills and to the use of typewriters” (Irwin, 2000, p. 197). Irwin concluded that “equal gender access to technological resources in traditional societies is more the exception than the norm” (p. 198).
Arguably, the Internet has the potential to enable all — even those traditionally disadvantaged, like women and developing countries — to take advantage of new technological media and to fully participate in the knowledge society. However, as Steyaert (2002) argued, instead of bridging the digital divide within societies and between societies, ICT (and especially the Internet) reinforces the existing social stratification and creates new forms of social exclusion. Although Internet access is increasing rapidly, “this diffusion is not equally spread across all layers of the population” (p. 2).

Ono and Zavodny (2002) examined the extent of gender differences in several measures of Internet usage in the period 1997-2001 in the United States. Their results indicated that men were significantly more likely than women to use the Internet at all in the late 1990s. However, with the increased presence of women on the Internet the gap disappeared by 2000 and since then gender proportions seem parallel. Similar gender balance in Internet use was reported in Canada. Notwithstanding the evidence of gender parity in Internet accessibility in developed countries, the proportion of women Internet users in developing countries remained very low. In Asia, where women represented nearly 50% of the labour force and owned more than 33% of small and medium businesses, women accounted for only 22% of Internet users. In Africa, women’s participation in the Internet also remained low, with use ranging from 12% in Senegal to 38% in Zambia (Dholakia et al., 2003).

Despite evidence of a closing gender gap in accessibility of the Internet, other disparities persist in relation to Internet use. These relate to the quality of access and the ability to use the Internet effectively (Liff & Shepherd, 2004) or, in other words, the breadth and depth of Internet adoption (Dholakia et al., 2003). Studies of Internet adoption reported significant gender bias even in countries where the total ratio of Internet users has become gender-neutral. In Canada, men remained heavier users of the Internet than women; they spent 16% more time online than women, viewing more pages and going online more often. Similar evidence was collected in the United States, where in 2000 men went online 20 times, spent 10 hours and 24 minutes and viewed 760 pages per month, while women went online 18 times, spent eight hours and 56 minutes, and viewed 580 pages (Nua Internet Survey, 2001, as cited in Dholakia et al., 2003). Gender bias was also reported in studies of the functional depth of Internet adoption. In the United States, online shoppers were more likely to be men than women, and men dominated all shopping categories except health and apparel. Broos (2005) reported that women used the Internet more to look things up and to email, while men used it more to follow news, listen to and copy music, play online videogames, and visit newsgroups and pornographic sites.
3.3.2 Gender issues in attitudes towards ICT

Studies on gender disparities in ICT application and attitudes are set against more general technophobia research. North and Noyes (2002) portrayed technophobes as “people that have held especially negative attitudes towards technology” (as cited in Broos, 2005, p. 22). Some studies have indicated technophobic differences between men and women, noticeable in gender differences in attitudes toward ICT. Women were found to hold less favourable attitudes towards computers than men (Broos, 2005; Colley & Comber, 2003; Gefen & Straub, 1997; Teo & Lim, 2000). Women were reported to feel more helpless around computers, but men were less anxious about computers and more confident in their use.

In an attempt to elucidate gender bias in attitudes toward ICT and the Internet, Turkle (1988) pointed out that the issue was not computerphobia, understood as staying away from computers due to anxiety; rather, it was computer reticence – “staying away from computers because the computer has become a personal and cultural symbol of what a woman is not” (as cited in Teo & Lim, 2000, p. 285). Other evidence showed that computer reticence deters women from deeper involvement with ICT. Herring (1993) observed men and women partaking in two academic electronic lists. She reported gender differences among academic professionals in their engagement in computer-mediated-communication (CMC). She reported male dominance and female resistance to participating in Internet-based activities. “A small male minority dominates the discourse both in terms of amount of talk, and rhetorically, through self-promotional and adversarial strategies. Moreover, when women do attempt to participate on a more equal basis, they risk being actively censored by the reactions of men who either ignore them or attempt to delegitimize their contribution” (as cited in Shade, 1993, pp. 4-5).

Kleif and Faulkner (2003) attempted to explain disparities in female and male attitudes towards technology by unravelling the depth of men’s attraction to technology among technology hobbyists and engineering professionals, such as “robot builders” and software professionals involved in creating technologies. They argued that the existing social stereotype portrays men’s attraction to technology as “a matter of fact that needs no further explanation” while female technologists “remain exotic” (p. 297). They further unveiled three threads of men’s pleasure in technology: “the joy of creativity, the pride and pleasure in knowing technology and in using technical skills and expertise, and the comfort and intimacy experienced with and around technology” (p. 320). Massey (1998) found that “high-technology workplaces both reflect and reinforce a particular form of masculinity” (as cited in Longhurst, 2000, p. 442). While men in these workplaces devoted themselves to the celebration and production of knowledge, the
workplaces were designed to isolate them and celebrate their activities. In consequence, this exclusive status was a source of power and reinforced males’ powerful association to technology in social stereotypes.

Studies set in the context of education show inconclusive results. In his extensive studies of staff and students’ attitudes towards computers at the University of Jordan, Waleed (2006) observed that though generally all participants held positive attitudes towards computers, male students held more positive attitudes than their female counterparts. However, Inoue (2007) found different results among students at the University of Guam. Generally, participating students perceived technology as contributing towards a positive learning experience. They were comfortable with using a personal computer and relied on it to complete academic work. The analyses of the study revealed no gender differences in the attitudes towards technology. Inoue claimed that in the case of students’ perception of technology, disparities occurred on a personal level, “not influenced by demographic factors” (p. 135). Among female pre-service teachers’ online activities in a public university in Malaysia, Wong et al. (2005) found that participants manifested positive feelings towards the Internet and perceived it as useful for their study despite rather limited access to Internet facilities. Among students who were issued their own laptops (therefore access to technology was not an issue), research by McCoy et al. (2001) revealed no gender disparities in attitudes towards computers. Female and male students held generally positive perceptions. However, male students rated their computer expertise higher than the female students.

3.4 Empowerment and ICT

Discussion in the areas of ICT, women, and the benefits of technology for women, often includes such terms as gender equality, gender equity, and empowerment of women. The following sections interrogate these terms and discuss them in the context of ICT.

3.4.1 Equality, equity and empowerment

Sophia Huyer (2006) has provided comprehensive clarification of these terms. She explained gender equality as the equal status for women and men that results in “equal choice, control and opportunities around the resources and benefits of development” (p. 18). A way to achieve gender equality is gender equity that ensures fairness for both genders. Gender equity aims “to help less advantaged to reach the level of the more advantaged” (p 18). Finally, empowerment is a much broader term than the former two; it is an umbrella term that consists of a number of
concepts, such as options, choice, control, and power. “These pertain to women’s ability to make decisions and affect events and circumstances around them; benefit from resources and opportunities; exercise power over their own life, body and resources and have a say in public life and decision making, all with the results of increasing or achieving autonomy and improving health and well-being” (p. 19).

The concept of empowerment evolved in the context of such movements as civil rights, women’s rights, gay rights, disability rights and other community-based actions in the United States in the 1960s and 1970s (Hage & Lorensen, 2005). The historical and ideological roots of the term could be traced to Paul Freire, the Brazilian humanitarian and educator, and his *Pedagogy of the oppressed* (1970). The core concept of Freire’s pedagogy of oppressed is the notion that both the oppressed and the oppressor are dehumanized objects. The social reality, which is the product of human activity, cannot be changed by chance but in the liberation process of the oppressed.

In order for the oppressed to be able to wage the struggle for their liberation, they must perceive their reality of oppression not as a closed world from which there is no exit, but as a limiting situation which they can transform. This perception is a necessary but not a sufficient condition for liberation; it must become the motivating force for liberating action. (Freire, 2006, p. 49)

Freire claimed that liberation was possible only when the oppressed identified and comprehended the potential for change and utilized that to transform their environment. He believed that “the principle of social justice: liberation, equal access, and empowerment were necessary to help individuals and communities address the larger socioeconomic causes of oppression” (Ickes, 2011, p. 18).

Drawing from Freire’s work, Hur (2006) concluded that empowerment is a multidimensional process occurring within sociological, psychological, economic, political and other dimensions, in which people gain the control over their lives. He identified a number of issues pertinent to the comprehension of empowerment: “it occurs at various levels, such as individual, group, and community; ... it is a social process because it occurs in relation to others; ... it is an outcome that can be enhanced and evaluated” (p. 524). Complexity and multidimensionality of the empowerment process in the context of gender studies has been affirmed in academia and by practitioners (Alsop, et al., 2006; Greany, 2008; Kabeer, 2011). Alsop, et al. (2006) established criteria to measure three degrees of empowerment: “Existence of choice: There is an opportunity to make a choice; Use of choice: A person or a group takes the opportunity to make a choice;
Achievement of choice: The choice is transformed into desired outcomes” (p. 34, original emphasis).

Research literature provides numerous examples of how empowerment of women influences different facets of women’s lives. Kabeer (2011) examined the impact of the strategies adopted by development NGOs committed to social change of women’s lives in rural Bangladesh. She concluded that empowering processes touched on private and public aspects of the lives of those involved: their sense of self-esteem and social identity; their readiness and capacity to question their subordinate status in society and to constitute themselves as a countervailing force to different violent manifestations of gender injustice; their ability to take control over their own lives and to negotiate better terms in their relationship with others; and finally, “their ability to participate on equal terms with men in reshaping society to better accord with their vision of social justice” (p. 499).

Women participating in a small community-based participatory research project that took place in the city of Moncton, eastern Canada, admitted that their level of empowerment increased noticeably in the two years of the study. The participants defined their experience of empowerment as:

- Having more control over our lives;
- Having confidence in ourselves-knowing our strengths and weaknesses;
- Recognizing life has purpose and using our gifts and talents for our own independence;
- Reaching out to others so that life becomes richer and more meaningful. (Duffy, 2011, p. 109)

It is maintained in this study that although the dynamics of women’s empowerment are complex and influenced by different factors in different places around the world, it demonstrates itself on personal, economic, social, psychological, and political levels. On all these levels, ICT holds the potential to contribute to the advancement of women in a meaningful way.

### 3.4.2 ICT for empowering women

The unique characteristics of ICT that have enabled it to be a successful tool for economic development also have made it an effective means through which empowerment of women can be enhanced. Empowering women “embodies challenging patriarchy at all its levels of expression: social structures and relationships, moral and cultural values and norms, and institutions and power structures” (United Nations, 1979, as cited in Taysir, 2000, p. 6). It is understood as a process that guides women to recognise themselves as capable of gaining access to decision-making processes that in turn require a sufficient level of self-confidence and assertiveness.
The past few decades have seen ongoing discussion on the importance of ICT for empowering women. The 1979 United Nations Conference on Science and Technology for Development called for unbiased distribution of the benefits of scientific and technological development. The conference resolution called on member states to create such a political and economic environment that can facilitate women’s engagement in decision-making related to science and technology, and can enable women’s equal with men access to scientific and technological education and to professional careers (Primo, 2003).

The full understanding of ICT as a powerful tool that women could use for mobilisation, exchange of information, and empowerment was expressed at the Fourth World Conference on Women (Beijing, 1995). Results of comprehensive studies on the relationships between gender, science, and technology for development carried out by the United Nations Commission on Science and Technology for Development (UNCSTD) were a significant contribution to the Beijing conference and international awareness of the issues since that conference. The studies produced evidence of notable gender disparities in the level of access to, control of, and benefits resulting from a many technological developments. In relation to ICT, Hafkin (2002) observed that “the information revolution appeared to be bypassing women, that information society literature was silent on gender issues, and that neither research nor practical projects in the information technology field had addressed the particular circumstances of women” (p. 3).

In the years after the Beijing conference, advocacy for gender issues in ICT has gained an international foothold. At the major international conference Global Knowledge 97, women participants played an instrumental role in drawing up the Canon on Gender and Partnership and ICT Development, which focused the attention to equal participation by women and men, and gender-aware assessment and evaluation of ICT use. The next year saw the establishment of the Task Force on Gender Issues as the result of a resolution adopted at the World Telecommunications Development Conference in 1998 (Gurumurthy, 2008). Its main objective was to ensure that in the emerging information society women and men will benefit from ICT on an equal basis. In the following years, the World Telecommunication Development Conference of 2002, Expert Group Meeting of the UN Division on the Advancement of Women in 2002, and the World Summit on the Information Society during 2003 all advocated the potential of ICT in development and social transformation, and its role in promoting empowerment of women as well as “enormous opportunities for women in the information society” (Gajjala, 2002, as cited in Huyer & Sikoska, 2003, pp. 11-12).
Although the role of ICT in fostering development and social transformation has been increasingly acknowledged, it has also become evident that the access to and benefits of applying ICT do not accrue equitably to women and men. There have been many reasons for prevailing disparities. Some have argued that in order to make ICT a powerful tool for women's empowerment, the social context of technology and its relationship with women must be explored and better understood. Huyer and Sikoska (2003) argued that both gender and technology are determined by the particular social context in which they are constructed and they should be seen as processes that evolve and change. This line of thinking consequently allows us to “firstly, understand how gender perceptions shape technology design; and secondly, understand how the environments in which the technologies are being placed determine the way men and women would access and use these technologies” (p. 12).

Technologies are not gender-neutral. The use of ICT by both genders “reflects to a large extent the wider socio-cultural and economic context within which the technologies are produced and used” (The African Information Society - Gender Working Group, 1999, as cited in Hafkin, 2002, p. 10). The African Information Society – Gender Working Group defined ICT as a primarily a male domain:

Since science and technology are domains historically ascribed to males, women and girls tend to find technology intimidating and alienating. We tend to see the ICT sector as a reality of society that is unfriendly and dominated by men. We associate technology with men and assume that its production, application and maintenance are areas that fall more easily into the male domain. In these ways we ourselves sometimes play an unconscious role in reproducing the gendered nature of our society and the ICT sector at large. (Huyer & Sikoska, 2003, pp. 12-13)

This cultural and historical perception of ICT has been identified as one of the reasons for the lack of visibility of women in the ICT industry and as users of these new technologies. The other reason has been the problem of reality: the actual number of women in the ICT industry has been substantially lower than that of men. Chad (2002) revealed that, compared with boys, “girls still report less experience with computers, less confidence in their computer abilities, and less interest in the technology” (p. 2). International studies demonstrated similar trends worldwide; they evidenced that women’s representation in engineering degree programs was much lower than in natural science programs. The most distinct differences in participation rates represented cultural and social differences, with Zambia providing only 1% female engineering students, Kuwait 39% and north Europe 21% (Alha & Gibson, 2003).
Similar results were found by Wentling and Thomas (2004). They argued that the shortage of women in IT fields has made it more difficult for them to reach management positions; e.g., in 2002, women held only 8% of executive positions at major technology companies. The authors found that women received lower salaries than men even though their employment level and education were like those of men. Wentling and Thomas concluded that the IT field was not immune to gender discrimination.

In order to fully comprehend the described relationship of women to technology and their lower than men’s representation in technology-related academic programs, it is important to identify the factors and barriers that contribute to such a relationship, as well as possible ways to overcome them so all women around the world can participate in ICT benefits. Such a task was undertaken in 2002, in four virtual seminars organised as an email-based discussion, where 325 participants from more than 50 countries worldwide pointed out four main obstacles to women’s access to and use of ICT. They were: lower levels of literacy and education; less time available as a result of women’s domestic, professional and community engagement roles; less access to economic sources to finance the cost of equipment and access; more difficult access to IT centres due to geographical location (in developing countries women more than men tend to live in rural areas); and cultural reasons (Huyer & Sikoska, 2003).

In order to secure ICT benefits for girls and women, ICT policies must address gender-related issues. It seems that the ICT sector remains one of the last to enhance a gender perspective. Primo (2003) claimed that the analysis of existing policies demonstrated that, even if policies have been gender-aware, the implementation process failed to consider and accommodate the needs of women and girls. Of hundreds of development projects with substantial ICT components, Hafkin (2002) found that more than 33% of all projects were highly aware of gender issues, but only 10% carried over gender sensitivity into the ICT components. Successful incorporation of gender issues into ICT policy lies in effective campaigns which integrate sensitising policymakers to gender issues and sensitising gender advocates to ICT issues (Primo, 2003).

The promotion of ICT potential for women’s empowerment has a special meaning in the context of underdeveloped countries. The discussion about the issue often unfolds in the context of socio-economic development and the role of women in the process. Though women are half of the total world population, 70% of the world’s disadvantaged people are women (Moghadam, 2005). Their disadvantaged position is multifaceted: subordinate traditional social status and consequently lower level of educational achievement and lower job status that lead to limited social and economic mobility. Empowerment is identified as one of the most significant elements
of poverty reduction and sustainable development (Alsop et al., 2006). Thus, Laizu et al. (2010) argued that “it is important to empower women to change their lives through eradicating poverty and enabling their contribution to society” (p. 219). ICT is recognised as an instrument of women’s empowerment and a remarkable tool “to achieve vision of inclusive development strategies which along with an expanded understanding of the power of knowledge have the potential to transform our rhetoric into reality” (Huyer & Sikoska, 2003, p. 6).

The research literature has provided numerous examples of ICT empowering women. Hafkin and Huyer (2008) reported the role of technology for promoting gender equity through “easing workloads; increasing knowledge of rights and possibilities; increasing self-esteem, social status, and confidence; and contributing to increased income” (p. 36). Arun et al. (2006) described changes that took place in the lives of women living under the poverty line in Kerala State in South India as a consequence of ICT-based intervention-driven initiatives and projects. The authors found that women participating in the projects experienced a change that was integrally empowering. They concluded, “it has been empowerment of accessing new assets: new skills, new income, new physical assets, new contacts. But to the same extent this has been a story of psychological empowerment, involving new attitudes, new confidence, new status, new roles, and new identity” (p. 160). Laizu et al. (2010) observed that women who underwent ICT training and participated in the ICT-based project had “a higher confidence level, more self-esteem, self-awareness and dignity, and they feel freed and much more independent than non-ICT participants” (p. 227). As head of ASAFE Knowledge Academy – a vocational centre providing ICT training in Douala, Cameroon, Yitamben (2006) observed that “women have started to profit from the opportunities of the digital revolution. They acquire new competences; they find more fulfilling employment that gives them more visibility” (p. 8).

As presented, women experienced and realised empowerment at different levels: psychological and physical, personal and communal. Maier and Nair-Reichert (2007) credited successful empowerment through ICT for comprehensive development, poverty eradication, and the empowerment of disadvantaged in the Global South. Examining ICT-based business initiatives and projects in South Asia, Africa and South America, they concluded that the practices determining successful empowerment include “strong initial and continued training, access to necessary resources, help in expanding the market, government and societal support, good networks in the community and an open and participatory management style” (p. 53).
3.5 Notes on the Internet

In the discussion about the transformative power of ICT and its role in educating and empowering women, very special attention should be focused on the Internet, which has been widely seen as “having the potential to break the bounds of isolation and bring remote communities in with the rest of the world” (Terjane, 1998, as cited in Davidson et al., 2000, p. 1). The Internet refers to a global web of interconnected computer networks (Sheldon, 2001), allowing personal communication and information retrieval. Although short, the history of the Internet is fascinating and its growth has been accelerating. The Internet has its roots in ARPANET, the networking project started by the Advanced Research Projects Agency (ARPA), which is an agency of the U.S. Department of Defence. The project became functional in September 1969 and effectively linked scientific and academic researchers in the United States. Soon universities outside the United States were connected and started to use it to send messages (Hernes, 2003). However, the Internet did not emerge until January 1, 1983 when all connected networks were necessary to run the new TCP/IP protocol suite; from this day all the configuration of complex networks and hosts became known as the Internet (Sheldon, 2001).

The Internet began its rapid growth in the 1990s, when the World Wide Web using Hypertext Markup Language (HTML) and graphical user interface (GUI) become available. This transformed the ability to retrieve information over the Internet in a convenient way (Nanthikesan, 2000). Since then, the number of Internet users has grown at an astounding pace. At the end of 2011, there were an estimated 2.2 billion users around the world (33% penetration of world population) with practically all countries worldwide online (Internet World Stats, 2011).

Although the Internet has transformed the way people work, spend their leisure time, and do business in a few short years, for many in developing countries and civil society, these rapid changes have been perceived as a threat (Brown, 2000). Even within countries with high Internet penetration, observers noted that some groups of people were more likely to use the Internet than others. They found that the groups with a higher level of access to the Internet were the same groups that had greater access to education, income, and other resources that help people to succeed (DiMaggio & Hargittai, 2001). This raised concern that the new technology might prove to exacerbate existing inequities rather than resolve them. Analysts described these inequities as a ‘digital divide’ (DiMaggio & Hargittai, 2001; Spennemann, 2004; Steyaert, 2002; United Nations Economic and Social Council, 2006). The digital divide refers to various

---

1 Transition Control Protocol/Internet Protocol (TCP/IP) is the Internet Protocol suite that is a set of internetworking protocols (Sheldon, 2001, p. 1220).
dichotomies between developed and developing countries, but also within countries, such as urban versus rural, gender, age, racial or ethnic composition, cultural attitudes, level of education, and others.

Basically, different studies have demonstrated that no single factor causes a digital divide; rather, a series of enablers, when combined, create various types of digital divide (Spennemann, 2004). Davidson et al. (2001) attributed the differences in the access and use of ICT between countries to “perceived incompatibilities between cultures and technologies, an idealistic preference for self-reliance and simple lack of economic or human resources to acquire and utilize the technology” (p. 1). In addition, the use of ICT is biased by gender, race and location.

Notwithstanding the outlined digital divide, there has been a general agreement that the Internet is changing our society (DiMaggio & Hargittai, 2001; Hernes, 2003; Livingstone, 2005; Spennemann, 2004). DiMaggio and Hargittai (2001) summarised impacts of the Internet on society. They point to the division within a developed country, such as the United States, and the global digital divide. Reports of the National Telecommunications and Information Administration (NTIA, 2000, 2010) showed differences in Internet access. The group that has had the highest Internet access consisted of college educated, wealthy, white, people under the age of 55, and especially in earlier years, male and urban (DiMaggio et al., 2001). Although virtually all demographic groups have increased adoption of Internet access in 2000-2010 period of time, historic disparities among demographic groups remain unchanged as reported by NTIA (2011). Steyaert (2002) indicated that the Internet diffusion patterns “follow the ‘normal’ faultiness in social stratification: young more than old, well-educated more than low-educated, high-income more than low-income” (p. 200). Similar pattern was reported by Park (2007) who observed that a persisting digital divide not only reflects the disparity of socio-economic status, but also amplifies such a disparity. The studies’ results seemed to contradict some of the social projects in which technology, and particularly the Internet, was used to give disadvantaged groups a new, better start.

In terms of the global divide, statistics showed unbalanced distribution. Nanthikesan (2000) reported that the 15 countries with the highest number of users and the fastest rate of penetration accounted for 25% of the world population yet accounted for 78% of the world’s Internet users. The cost of 20-hour Internet service was roughly twice as high in a low-income country than in a high-income country – over 2.5 times the average monthly income. Internet affordability relative to income was more than 50 times better in a high-income country than in a low-income country (United Nations Economic and Social Council, 2006).
Impacts of the Internet on society can be gauged by a range of activities the Internet users engage themselves in, to what extent their private lives are affected by the Internet, and how the Internet exerts influence over communities. Initially, Internet enthusiasts anticipated that the Internet would stimulate productivity, making people more effective and enabling the accomplishing of such online tasks as banking, shopping, and even socialising, which could lead to less stress, more time, and new online contacts. Later, they suggested that the Internet might instigate anonymity and devalue the importance of social relations by enabling users to operate in artificial worlds. Some studies showed contradictory results. They found no intrinsic effect of the Internet on social interaction. However, studies found that although the Internet did not create propensity for greater sociability or community involvement, it tended to intensify existing inclinations. Internet users maintained social relationships through computer-mediated communication as well as face-to-face interaction. In other words, the Internet preserved communal relationships by complementing, not superseding other means of interaction (DiMaggio et al., 2001).

This chapter has summarised literature that has investigated the potential of ICT in the knowledge society of the 21st century and how it affects higher education. It has also discussed issues related to the technological gender divide and the potential of ICT in empowering women. Though the majority of research presented in the chapter was conducted in the developed world, it remains relevant to this research by providing understanding of technology's potential, as well as outlining conditions for such potential.

It has been established that ICT plays an important role in higher education, the mission of which is to prepare citizens to participate in knowledge generation, dissemination, and sharing. Technology can assist such a mission in many different ways, not only with infrastructure, but also with concepts, such as new educational paradigms.

The chapter has also presented the ICT gender profile and has established that ICT has the potential to assist women worldwide in their struggle to bridge the gender divide. More equal participation of women in ICT benefits may stimulate and facilitate empowerment of women in contemporary society. This research investigates how technology through higher education could contribute to empowering women in Papua New Guinea’s male-dominated society.
CHAPTER FOUR
LITERATURE REVIEW: THEORETICAL FRAMEWORK

This chapter presents the theoretical framework of the study. The term theory may take on many different meanings. A Dictionary of Sociology defines it as “an account of the world which goes beyond what we can see and measure. It embraces a set of interrelated definitions and relationships that organizes our concepts of an understanding of the empirical world in a systematic way” (Scott & Marshall, 2009, p. 760). From among different existing conceptions of theory in sociology, this chapter will follow the approach that argues that “theory should explain phenomena, identifying causal mechanisms and processes which although they cannot be observed directly, can be seen in their effects” (p. 761).

To provide a sophisticated understanding of the purpose of the thesis with principles that enable explanation of embedded phenomena, the following theories are incorporated into the theoretical framework: social constructivism, feminism, and postcolonialism. These will now be discussed.

4.1. Social Constructivism

The basic assumption of constructivism, as the term suggests, is that there is neither objective reality nor objective truth. The physical world exists but is not accessible to human endeavour. Reality is constructed as the meaning is constructed by those who interpret the world. Constructivism is about the world and relationships (Sarantakos, 2005). Constructivists believe that each of us creates meanings of external reality differently, based upon our distinctive set of experiences with the world and our perceptions of them (Jonassen et al., 2008). However, such constructionist understanding of humans as engaging with the outside world and making sense of it might be misleading if not set in social perspectives. Crotty (1998) argued that we all are born into a world of meaning; thus, every individual does make sense of the phenomena he or she encounters on her or his own. An individual’s construction of meaning is assisted by cultural mechanisms in the social milieu of the one who constructs the meaning. Such understanding of the role of culture and society in the construction of meaning is the foundation of social constructivism. As Sarantakos (2005) explained, “Subjects do not assign new names and give new meanings to objects; meanings are generated collectively, are readily available, already constructed by and conveyed through the culture, and are shared and socially constructed, and also sustained and reconstructed through interaction” (p. 39). Crotty (1998) clarified social in
social constructivism: the term indicates “the mode of meaning generation” and not “the object that has meaning” (p. 55). Thus, “the object involved in the social constructionist understanding of meaning formation need not involve persons at all. Accordingly, we would describe the object of the interaction as natural or social, the basic generation of meaning is always social” (p. 55). Because this research focuses on the interaction of female and male end users with technology in the context of higher education institutions, the discussion of social constructivism turns to the social construction of technology.

4.1.1. Social construction of technology

Social construction of technology emerged in the field of social studies in explicit opposition to technological determinism, which dominated earlier social, historical, and philosophical analyses (Landstrom, 2007). From the standpoint of technological determinism, technology remains distinct from social life, although it holds the potential to change people lives radically. It perceives technology as a determinant or even a cause of development of social structures. Technological determinists’ vocabulary contained in its view of technology includes “‘autonomy’, ‘internal dynamics’ and ‘being beyond control’” (Lohan, 2000, p. 898). Social construction of technology rejects such a standpoint and argues that technology, being embedded in society, is “always shaped in complex processes that involve social and cultural factors, as well as material and technical elements” (Landstrom, 2007, p. 8). Thus, while presented as a significant corrective to technological determinism, social construction of technology views technology “as completely open to interpretation” (Flyverbom, 2005, p. 225).

The term social construction of technology (SCOT) was developed by Pinch and Bijker in 1980s and it remains one of the central theories for technological studies (Sterne & Leach, 2005, p. 190). Paradigmatically useful for modeling technology and society, SCOT depicts the society-technology relationship and its constantly changing character (Hunsinger, 2005). Furthermore, embedded in the social shaping of technology scholarship, SCOT is useful for sociological analysis of technology – how technologies are shaped, how they are being used, and “how the interaction between technological and social might be guided and shaped in the future” (Khoo, 2005, p. 285). Building on the canonical work of Pinch and Bijker, Klein and Kleimian (2002) outline four major components of SCOT theory: flexibility, relevant social groups, closure and stabilization, and wider context.

Grounded in the empirical program of relativism, the notion of interpretative flexibility assumes that “technology design is an open process and can produce different outcomes depending on
social circumstances of development” (Klein & Kleinman, 2002, p. 29). The perspective holds that technological artefacts have “the property of interpretative flexibility” (Bruun & Hukkinen, 2003, p. 101). Thus, they may be understood in different ways by different groups of people engaged with a technology. Furthermore, users can change “the meaning and deployment of technologies” (Wajcman, 2000, p. 450).

The relevant social groups in the SCOT framework are referred to “as the actors that participate in the negotiations or controversies around a specific technology” (p. 451). Based on the assumption that technological interpretations are socially and culturally constructed, it is believed that those who work in the same context tend to use the same technological frame to interpret technological artefacts. The technological frame “comprises all elements that influence the interactions within relevant social groups and lead to the attribution of meanings to technological artefacts” (Bruun & Hukkinen, 2003, p. 102). Khoo (2005) suggested that “the technological frames held by various relevant social groups may be in large part ontological and thus also incommensurate across groups” (p. 284, original emphasis). Consequently, these two dimensions of the technological frame suggest that when a technology is widely described and accepted within a certain relevant group, the members of other relevant social groups might not adopt this frame because it has no meaning for them at the ontological level. Although for the purpose of technological development, the negotiations over definitions of working technology continue with different social groups until they accept that technology works for them (Klein & Kleinman, 2002), the polysemic character of technological artefacts allows “for the prevailing technological frame to be disrupted when occasion allows” (Khoo, 2005, p. 285).

Another element of the SCOT framework is the notion of closure and stabilization. The term closure as used in this context refers to “the streamlining of interpretations, and consequently to the fading away of controversy” (Bruun & Hukkinen, 2003, p. 101). This standpoint differentiates between interpretative flexibility as a theoretical notion and the practical closure of artefact designs. In theory, all artefacts have the property of interpretative flexibility and are open for new interpretations; in practice, the phenomenon of closure implies domination of some interpretations and technological trajectories are initiated. There are two possible closure mechanisms: rhetorical closure and closure by redefinition. Rhetorical closure occurs with the declaration that no additional design is necessary because no further problem exists. Closure by redefinition occurs when “unresolved problems are redefined so that they no longer pose problems to social groups” (Klein & Kleinman, 2002, p. 30). As long as technology is used, the process of redefining continues as the results of changing contexts and cultural interpretations.
The fourth component of the SCOT approach is wider context. It refers to “the wider sociocultural and political milieu in which artifact [sic] development takes place” (p. 30). Although this concept appeared less important in the original conception of the SCOT framework, it is important for this research. Technology developed in the sociocultural context of Western countries needs reassessment of its meaning when employed in Papua New Guinea’s cultural and social context. This reinterpretation of technology builds on the assumption that technology is “shaped in complex processes that involve social and cultural factors, as well as material and technical elements” (Landstrom, 2007, p. 8).

One of the most significant limitations of the approach to technology discussed here is that it views society as a composition of groups, all equal and present in the design process. It fails to acknowledge that some groups may be prevented from participating in the design process at all (Klein & Kleinman, 2002). As feminists point out, the SCOT focus on relevant social groups does not accommodate the account of those who are routinely marginalised or excluded from a network (Wajcman, 2000). Thus, the feminist approach is included within the theoretical framework to accommodate the limitations of the theory presented above. It also provides additional theoretical tools for discussion of gender-related issues in the application of ICT in the context of higher education institutions in Papua New Guinea.

### 4.2. Feminism and Feminist Research

The *Encyclopaedia of Feminist Theories* indicates that feminism can be understood as “systems of concepts, propositions and analysis that describe and explain women’s situations and experiences and support recommendations about how to improve them” (Frye, 2000, p. 195). What differentiates feminism from other paradigms that discuss women and gender is its recognition and inclusion of women’s own voices and authority as well as “its persistent attention to the workings of power structures which privilege men” (p. 195). There are many feminist theories with different emphases and aims; yet, they are all united by “the sense of accountability to a movement that is best conceived as a changing and contested discourse” (DeVault, 1996, p. 31).

One way to classify feminist theories is in accordance with the historical development of feminist thought as first-wave, second-wave, and third-wave feminism. From the very beginning, feminism (also called first-wave feminism) criticised the position of women in Western societies and called for economic and political rights. In dualistic societies of the male-dominated public sphere and the female-dominated private one, it advocated single standards for men and women, equal legal rights, political enfranchisement, and higher education for women (McPherson, 2000).
Although the public/private dichotomy remained significant in second-wave feminism, it differed from its predecessor in many ways. Among others, second-wave feminism demanded greater sexual freedom for women, access to non-traditional areas of employment and recognition for work conventionally done by women. Second-wave feminism saw the establishment of women’s studies academic programs (McPherson, 2000) and assumed the universalisation of feminist theories as women’s experience. Feminist movements in different parts of the world brought to light demands of women of colour and/or Third-World women to be recognised and their specific needs accommodated. They argued that “their social locations provided them with different vantage points and different conceptions of themselves other than those being articulated by white, middle-class feminists” (Mack-Canty, 2004, p. 158).

Asserting differences rather than commonalities of women’s experiences were the signs that the second-wave feminism was over and third-wave feminism had begun. One of the important themes of third-wave feminist thought has been the need for “more inclusiveness, flexibility, and practicality in feminist theories and definitions of who could be a feminist and how” (Starr, 2000, p. 474). Third-wave feminists have repudiated hierarchical dichotomies so important to previous feminisms, and turned to acknowledge the complexity of socio-cultural realities that constitute gender identities and relations. Assuming the existence of multiplicities, contemporary feminists engage themselves in further development of theories from women’s situated and embodied perspectives (Mack-Canty, 2004). One of the important strains in third-wave feminism is postcolonial feminism, which addresses “feminist preoccupations with race and gender that focus on the formerly colonised societies of Africa, Asia and the Caribbean” and examines “the academic and cultural hegemony of western feminism” (Mehta, 2000, p. 395). Considering its special relevance to the content of this research, postcolonial feminism is further discussed in section 4.2.2 Feminism and women in developing countries.

Feminist literature distinguishes feminist research from feminist methodology. Feminist research is used for “any empirical study that incorporates or develops the insights of feminism,” while feminist methodology is applied to “explicitly methodological discussion that emerges from the feminist critique” (DeVault, 1996, p. 31). The fundamental assumption of feminist research is that it is conducted by “women on women” (Pease, 2000, p. 171). If the main goal of feminism is equality between men and women (Singh, 2007), “central to feminist research are goals of social change and improved representation” (Webb & Young, 2005, p. 89). Feminists argue that, in addition to contributing to the creation of knowledge, the value of feminist research lies in its ability to fight women’s oppression and take action to stop their exploitation. Furthermore, many
feminists refute the traditional value of neutrality and call for researchers’ rapport and familiarity with the research participants. While feminist researchers argue that the use of qualitative methods enables the researcher to explore each woman’s distinct perspective, many feminists accept the use of other methods, being either mainstream quantitative methods or multiple methods that include both quantitative and qualitative in research projects (DeVault, 1996; O’Neill, 2000).

Lohan (2000), whose research interest lies in feminist men’s studies, claimed that feminist-informed men’s studies are concomitant with developments in feminist studies and have the potential to broaden these studies. Lohan pointed out important factors that emerged from her studies of masculinities and informed the research on gender and technology. Feminist-informed men’s studies have argued “that opening up the way men create and sustain gendered selves is an important way of examining how gender is implicated in power relationships” (p. 896). Hence, the studies have described not men as the self-proclaimed epitome of humanity but ways in which men have been able to attain this status. The term “gender sticks more easily to women; yet, it is precisely men’s status as ungendered representatives of humanity that is the key to their hegemony or the ruse to hold on to power” (p. 896).

This section presented a brief overview of feminism and introduced the assumptions of feminist research. The following parts of this chapter will continue a feminist discussion of issues paramount to this research: gender, postcolonial feminism, and feminist technology studies.

4.2.1. Feminist scholarship on gender

The New Fontana Dictionary of Modern Thought has defined gender as the “social construction of male/female identity which is distinguished from sex, the biologically based distinction between men and women. Gender is an integral part of the process of social classification and organisation. It is both a set of ideas (a way of thinking about relations, of influencing behaviour, a set of symbols) and a principle of social organization” (Bullock & Trombley, 2000, p. 353).

The contemporary feminist use of gender has originated from Beauvoir’s (1949) phrase, “One is not born but rather becomes a woman” and her argument that “humanity is male and man defines woman not in herself but as relative to him... He is the Subject, he is the Absolute – she is the Other” (as cited in Owen, 2000, p. 220). Thus, gender has to be understood as socially constructed. Epstein (1999) argued that “the social construction of gender is achieved by obvious and subtle control that assigns females and males to social roles and social spheres where it is
believed they should be” (p. 46). Feminist research has explored how the social construction of women’s roles leads to the discovery of women’s sense of self. Gender has been seen as a system trait that informs the study of the power imbalance between women and men.

With her theory of gender as a social structure, Risman (2004) outlined four distinct social scientific theoretical traditions that embrace virtually unlimited ways in which gender has been expounded in contemporary social science: the first tradition focuses on the origin of gender differences, the second tradition centres the social structure in creating gendered behaviour, the third examines how “doing gender” (p. 430) creates and reproduces inequality, and the fourth views gender as a socially constructed stratification system.

The first tradition focuses on the origins of individual sex differences being either biological or social. Assuming inborn differences between women and men and their unequal intellectual, emotional, and moral capacities, first-tradition sociologists proclaim men’s social superiority and women’s perfectly natural suitability for family and domestic life (Saltzman Chafetz, 1999).

The second tradition explores how social structure creates gendered behaviour. All known human societies have clearly different roles for females and males. As gender differentiation leads to differentiation in the division of labour, in different types of societies (hunting, gathering, horticultural, herding, and agrarian), men as the producers of valuable resources in their societies have more power and prestige than women, who are seen as consumers. Though women contribute to subsistence, they do not exercise power over the distribution of valued goods (Huber, 1999). Gender differentiation in social roles is accompanied by gender stereotypes. These stereotypes baselessly overestimate actual differences between both genders to be much greater than they in fact are and attribute them to biological differences between sexes. “Although it is logically possible for the two sexes to be separate [different] but equal, the degree of gender role differentiation in a society is strongly related to the degree of gender inequality. ‘Different’ usually means unequal, since the roles filled by the two sexes do not bring the same power and privilege” (Marini, 1990, p. 105).

The third tradition focuses on “social interaction and accountability to other’s expectations, with emphasis on how ‘doing gender’ creates and reproduces inequality” (Risman, 2004, p.430). Doing gender is understood as the way the hegemonic cultural gender beliefs and stereotypes affect and bias the defining of self and behaviour in gender-consistent directions. Social interaction takes place in social relational contexts that “comprise of any situation in which individuals define themselves in relation to others in order to act” (Ridgeway & Correll, 2004, p. 511). With gender
beliefs being in the background of a whole repertoire of social behaviours, gender is more of something one “does” rather than “is” (p. 516). In such a context of gender in social interaction, gender beliefs sustain the gender hierarchy system with their core assumption that men have more power and authority than women. Furthermore,

...as gender beliefs write gender hierarchy into the interpersonal relations through which people create new social forms, the people in effect rewrite gender hierarchy into the new social practices that develop to define the new occupation or industry. In this way, gender beliefs and social relational contexts conserve gender hierarchy in the structure of society and cultural beliefs themselves despite ongoing economic and technological change (p. 523).

Finally, the fourth, integrative approach treats gender as a socially constructed stratification system. Social stratification can be defined as the result of institutional processes that based on “gender, race/ethnicity, wealth and class”, partition “society into advantaged and disadvantaged socially constructed groups” (Robinson et al., 2007, p. 133). As the consequence of such division, people are advantaged or disadvantaged because of their group membership. Similarly to other stratification theories that explain how power begets the privileges, theory of gender stratification explores each sex’s economic power as the major independent variable affecting sexual inequality and how each gender can translate its relative power into different forms of privilege and opportunity (Blumberg, 1984). Being immersed in different aspects of social life, gender constitutes a basis for stratification of cultural beliefs and institutions. Risman (2004) argues the theory of gender as a social structure “has a consequence on three dimensions: (1) At the individual level, for the development of gendered selves; (2) during interaction as men and women face different cultural expectations even as they fill the identical structural positions; (3) in institutional domains where explicit regulations regarding resource distribution and material goods are gendered specific” (p. 433).

One of the key institutions that reproduce social relationships in societies is education. Liberal feminist scholars have viewed education as a source of empowerment and advancement for women. Gender-centred feminists have assumed that education recreates gender inequalities in society. Yet other theorists argued that “education both empowers women and reproduces gender inequalities” (Persel et al., 1999, p. 407). It is beyond the scope of this research to examine every issue about women in Papua New Guinea in the context of education, but higher education is the context of the study. Thus, in the search for gender-related issues in the application of ICT in higher education institutions, feminist theories of gender will shed light on
the discussion about the relationship of gender and education access, experiences and achievements, and whether education and ICT affect gender equity in PNG society.

The discussion on feminist scholarship of gender is incomplete if isolated from multiple axes of oppression, and the discussion must include increasing concern with intersecting domains of inequality. Therefore, the following section focuses on feminism and women in developing countries.

4.2.2. Feminism and women in developing countries

Feminist discourse in its beginning focused on gender equality from the perspective of well-educated, middle-class, white, Western women. Asserted by Western feminism, the idea of woman as a universal subject ignored concerns of Third World women (Richards, 2005). The literature has documented extensive involvement of women of colour during second-wave feminism, when they worked with white-dominated groups, formed women’s caucuses in existing mixed-gender groups, and formed autonomous Black, Latina, Native American, and Asian feminist organisations (Thompson, 2002); yet, their voice and concerns were rarely at the centre of feminist discourse of this time. This inability of mainstream feminism to accommodate needs and issues of women of colour living under social, economic, and political oppression led to the foundations of postcolonial feminism (Sa’ar, 2005).

Postcolonial feminism explores women’s racialised and sexualised otherness by “locating their marginality and oppression within a three-tiered structure of discrimination maintained by colonial and neo-colonial indigenous patriarchies and the academic and cultural hegemony of Western feminism” (Mehta, 2000, p. 396). In its ongoing discourse with Western feminism, which postulates Third World women as a monolithic subject and submissive victims of socio-cultural practices, postcolonial feminism criticises such an approach as reinscribing imperialism and justifying intervention in the lives of Third World women. It calls for continuing concern for women in developing countries as well as “the recognition of power imbalances and inequities among women and that patriarchy combines with other forms of domination to shape women’s lives differently across historical and geographical contexts” (Richards, 2005, pp. 205-206). Complex nexus of major exclusionary mechanisms are incorporated into the analysis of gender oppression in order to make feminism relevant to women of marginalised, colonised or otherwise oppressed categories (Sa’ar, 2005).
In the centre of postcolonial feminism is the concept of social responsibility. Feminists argue that their duty is to speak for those who are unable to speak for themselves. Although heavily criticised by the Western academy as propaganda and functional literature, socially responsible speech incorporates the activist part of feminism in order to articulate the identities of those whose identity and history have been devalued (Hasseler, 1999). African feminist Amina Mama expressed this sense of responsibility in an interview given to Salo (2001): “I have never felt offended by being addressed as a feminist, but rather humbled and daunted with the responsibility it bestows on me.....I like the word [feminism] because it identifies me with a community of confident and radical women, many of whom I respect, both as individuals and for what they have contributed to the development of the world as we know it” (Salo & Mama, 2001, p. 59). In her own words, “feminism signals a refusal of oppression, and a commitment to struggling for women’s liberation from all forms of oppression – internal, external, psychological, and emotional, socio-economic, political and philosophical” (p. 59).

One of the important themes in postcolonial feminist discourse is the impact of the capitalist global economy on the lives of women in developing countries. Although easier access to education and participation in the labour force at higher levels are seen as improvements in women’s lives, women remain at “distinct economic disadvantage relative to men in almost all aspects” (Pyle, 1999, p. 81). Feminists forewarn of eroding economic and environmental conditions, rising cost of living, and declining services that affect women in the so-called developing world. Marginalisation of women caused by development processes in the 1970s has become a foundation of gender in a development paradigm. Built on feminist and development theory, the paradigm lays out the conditions of women in developing countries and explores a future agenda to improve their well-being. However, criticised for ignoring the opinion of Third World women and their exclusion from decision-making, the development paradigm has been supplanted by an identities-of-women framework proposed by Singh (2007). In this approach “women are the primary source of information on their position and are recognized as agents who assess and evaluate their own situation” (p. 105). The underlying assumptions of the framework include: (a) it rejects the generalisation of women’s identity; (b) it accepts “women’s unique place within time-bound socio-cultural contexts”; and (c) it acknowledges “an individual woman’s ability to have multiple abilities and to negotiate a new one” (p. 105).

As discussed earlier, a primary goal of Western feminism is equality between men and women. However, for women living in societies that are built on principles of inequality between females and males, such a goal remains unrealistic. Adopting the goal of Western feminism might mean
that Third World women would lose safety of their family support. Thus, women turn to feminism only in such situations when their economic independence or family support is safeguarded, and the privileges of higher education enable them to do so (Singh, 2007).

4.2.3. Feminist technology studies

Although feminists have been questioning the relationship between gender and technology for only three decades (Landstrom, 2007), the widely acclaimed exclusion of women from IT is much older and has its roots in the term technology being associated with masculinity. As Wajcman and Pham Lobb (2007) discussed, the rise of mechanical and civil engineering as a white, male, middle-class profession in the late 19th century led to formation of a male professional identity that implies an ideal of manliness with its culture of bodily prowess and personal achievement. As a result, it diminished “the significance of both artefacts and forms of knowledge associated with women” and in consequence “male machines rather than female fabrics became the modern market of technology” (p. 3).

One of the strains in feminist technology studies is feminist constructivist technology, which combines constructivist technology studies with a view of gender as a social and cultural construct. Gender is socially constructed through negotiations; thus, genders are continually in the making. Because society is based on hierarchy and inequality, there is a need to explore how technology could be used in gender negotiations to accommodate possibilities for changes in patterns of inequality (Berg & Lie, 1995).

According to feminist constructivist technology studies, there is an ongoing interconnection between technology and gender: while technology is being constructed and used in a changing socio-cultural system, gender is being constructed by technology. Thus, viewed as socially constructed, technological development “facilitates the analysis of gender in the process of technology development as well as the way in which gender is constituted within the process itself” (Cocburn & Ormrod, 1993, as quoted in van den Ende & van Oost, 2001, p. 493). This gender-technology nexus is referred to as “the mutual shaping of gender and technology” (p. 493).

In her discussion of gender and computer science among Malaysian women, Lagesen (2008) outlined four frames of feminist studies of technology: technoscience reconfigured, cyberfeminism, the figure of cyborg, and technofeminism. The notion technoscience reconfigured reflected the transformation of studies from being gender-blind to becoming gender-aware. This
approach examined what restricts social studies of technology from including gender issues in its debate. One of the problems pointed out by feminists was marginalisation of gender in SCOT theory. They found the idea of relevant social groups lacking the decisiveness of what the relevant groups are as well as lacking the analysis of power differences between social groups. “As long as women do not appear as important actors or as a relevant social group, gender is not a relevant category” (Berg & Lie, 1995, p. 344, original emphasis). A main argument of feminist thought in the discourse with social studies of technology “has been that men are set up as the norm against which women are measured and found wanting” (Wajcman, 2000, p. 454). Consequently, feminists have advanced the importance of technology in the formation of subject identity for both men and women. Though important for initiating feminist cognizance of technoscience, the frame was criticised for its tendency toward essentialism (Lagesen, 2008).

Cyberfeminism has emerged in the context of gender analysis of ICT with a special focus on the World Wide Web. It refers to the informational data space of social interaction over the Internet. Cyberfeminists point out that, although existing processes lead to the exclusion of many women, some women have become enthusiastic and skilled cybercitizens. In cyberfeminist vision, “women, computers, virtual reality, and cyberspace are linked together in dispersed, distributed connections – the matrix, which, because of its inherent feminine character, will emerge as the new society that will destroy patriarchy” (Lagesen, 2008, p. 7). This vision offers a picture of young women colonising cyberspace where, “like gravity, gender is suspended” and women can nourish and uphold “the dream of a world free from gender hierarchy” (Wajcman, 2000, p. 460). Though appreciated for reworking of relations between feminism and technology, cyberfeminism was criticised for essentialism as well as for lack of critical perspective that led to overstating the friendliness of cyberspace for women. However, cyberfeminists’ call for using technology for empowering women, especially in developing countries, is of special interest in the context of this study. With all existing and acknowledged obstacles determining unequal power relations at local and global levels and with “hierarchies of power embedded in the construction and design of Internet culture” (Gajjala & Mamidipudi, 1999, p. 8), women are urged to realise the existing potential of the Internet in subverting established power relations and fostering “dialog and action on various unexpected fronts in unpredictable ways” (p. 8). Thus, cyberfeminist reflection in the context of the development and empowerment of women defines the conditions enabling women to “form coalitions and collaborate, aiming to transform social, cultural, and political structure” (p. 15).
Introduced by Donna Haraway in the essay “A Manifesto for Cyborgs: Science, Technology, and Socialist Feminism in the 1980s,” a figure of the cyborg, “a hybrid of machine and organism” (Fernandez, 1999, p. 63) is “self-declared deconstructor of humanism, it is in a double position, enjoying both its human life cycle – and thus its cultural narratives – and the mechanical features of production and disassembly” (Harper, 1995, p. 404). This perspective advocates the exploration of gender relationship in computing with a special focus on the complexities and ambiguities in this relationship. “The gendering of persons is taken not as prior to, but enacted within, technoscientific practices” (Suchman, 2006, p. 324). Technology is optimistically believed to have the power “to create new meanings, new entities and make new worlds. Persons’ own ‘self’ and ‘gender’ are reconstructed in the context of genetic engineering, reproductive technology and virtual reality” (Wajcman, 2000, p. 457). The main critique of this approach alludes to assigning too much influence to new technology, especially to its emancipatory potential.

As an amendment to the limitations of approaches discussed earlier, Wajcman (2004) introduced the notion of “technofeminism”, a theory that “conceives of a mutually shaping relationship between gender and technology, in which technology is both a source and a consequence of gender relations” (p. 107). It assumes that while new technologies are more flexible and open to new meanings and new ways of application, masculinity and femininity are seen as volatile constructions under constant change. Consequently, it calls for exploring how gender and technology are constructed in such an environment and how “gender as practice happens in relation to the performance of work and technology” (Wajcman & Pham Lobb, 2007, p. 5). Some believe that the “computer’s potential for changing gender dynamics will have more resonance in the context of developing countries” (p. 5).

It is believed that the adoption of feminist theory in the research of gender issues in the context of ICT will benefit this study as assumed in the argument presented by Webb and Young (2005). It will provide:

- support for IS commitment to social and cultural aspects
- commitment to emancipatory action that results in the revelation of previously hidden viewpoints, thus contributing to knowledge, and
- emphasis upon the minority or repressed being involved in the development of their own methods for liberation. (p. 88)

In the light of the presented discussion, although recent feminist technology studies have questioned the exclusion of women of colour from what is known as “women’s experience”
(Njambi & Putman Sprenkle, 2004, p. 134), these studies have been concerned mainly with white, middle-class Western women, leaving Third World women relatively absent from mainstream discourse on gender and technology. This research aspires to contribute to filling the gap.

4. 3. Postcolonial Theory

Postcolonial theory embraces a complex array of issues that include identity, gender, race, ethnicity, and racism. Postcolonial is “an elastic and highly contested term” (Carter, 2006, p. 679). A first category of postcolonialism depicts experiences of, and geographical spaces of, former colonised countries and people. A second category is an epoch that acknowledges a specific period of time after colonisation and depicts construction of postcolonial identity in the context of space and time. A third category specifies postcolonial as critique and a “textual approach to realities of oppression and subjugation” (Lunga, 2008, p. 192). Postcolonialism is also a methodology that gives way to the poststructurally driven “theorizations of identity, difference, hybridity and ambivalence” and as such it combines “the epistemological cultural innovations of the postcolonial moment with a political critique of the conditions of postcoloniality” (Carter, 2006, p. 680). Finally, postcolonialism signifies “an ethical and political project resisting hegemonic power and seeking redistributive justice at the local and everyday level at sites of intervention and renewed action” (p. 680). Postcolonialism is thus not only a segment on the history line marking the end of colonial era; but also it apprehends “a moment in world’s history, a configuration of experiences and insights, hopes and dreams arising from a hitherto silenced part of the world, taking advantage of new conditions to search for alternatives to the discourses of the colonial era” (Mishra & Hodge, 2005, p. 378). As such, postcolonialism refers to a new way of thinking that “deconstructs the operations of Eurocentrism in colonial and neo-colonial polities, and develops alternative analysis and propositions based on different ways of knowing” (Hickling-Hudson, 2006, p. 205).

The key insight of postcolonial thought is interconnectedness and the constitutive relationship between North and South, “the way in which the two produce and reinforce the identity of each other both in the colonial past and the postcolonial present” (Abrahamsen, 2008, p. 672). Considered in this perspective, the meaning of such terms as Third World or West emerge as a result of relationship to the other.

Postcolonial theory emerged from literary studies and can be traced to Edward Said who, based on his analysis of Western novels, travel, and anthropological books and media reports, linked Western imperialism with Western culture and consequently constructed the body of theory and
practice that he called “orientalism.” Until Said’s publication in 1978, the term orientalism was used either to describe “the scholarship and ideas together with administrative policy, associated with the East India Company” (McKenzie, 1995, p. 2) or to depict the artistic movement of the 19th century developed principally by the French. In both applications of the term, it had “positive connotations” (p. 2). In Said’s revaluation of the term and his understanding of orientalism as a body of theory and practice, he meant, by theory, Western imperial “intellectual and cultural production, including research, writing, ideas, arguments, images”, and by practice, “the accompanying sociocultural institutions and structures – the colonial administration, universities, museums, media, etc.” (Kapoor, 2002, p. 650). In his analysis of oriental literature, Said pointed out the presence of the West / East stereotype: Westerners were depicted “as rational, peaceful, liberal, logical… without natural suspicion” while Easterners, “as irrational, degenerate, primitive, mystical, suspicious and sexually depraved” (as cited in Kapoor, 2002, p. 650). Thus, while orientalism staged the other (Third World), in fact it served both “to subordinate the Third World and to justify the Western imperial rule” (Kapoor, 2005, p. 1204).

Postcolonialism aims to deconstruct the assumptions of colonial power and superiority (Lunga, 2008) and consequently becomes a “politically correct” term that fosters “the partial containment of people of color” (Martinez-San Miguel, 2009, p. 189). It provides a platform where “a set of guiding principles of political practice morally committed to identifying and transforming the conditions of exploitation in which large sections of the world’s populations live out their daily lives” (Rizvi, 2004, p. 161) are developed in the view of knowledges emerging outside the hegemonic West. From such a perspective, postcolonialism is about “generative relations between different peoples and different cultures and about a refusal to accept the superiority of western constructions of global issues” (p. 161). Furthermore, in its perception of the relationship between the colonised and the colonisers, postcolonialism acknowledges that “colonizers do not only shape the culture and identities of the colonized, but are in turn shaped by their encounter in a range of complicated ways” (Rizvi et al., 2006, p. 256). As Said (1978) argued, “The East has helped to define Europe, has been an integral part of European material civilisation and culture” (as quoted in McKenzie, 1995, p. 10).

In order to appreciate postcolonial theory and its analytical power to discuss issues pertaining to this study, the theory is further explored through discussion of concepts of knowledge and power, hybridity and identity, development paradigms, postcolonial education and postcolonial technoscience.
4.3.1. Knowledge and power

In diverse postcolonial studies, the role of power as a determinant in the process of identity and subjectivity formation, and the relationship between knowledge and power remain of central importance. The postcolonial association of power relations and knowledge draws from the thinking of Michel Foucault, the philosopher of real history “told in terms of conflict and power” (Flyvbjerg, 1998, p. 211) and “a seminal thinker of discourse analysis” (Harald & Lie, 2008, p. 120). His discourse paradigm explored various systems of knowledge without appealing to objective categories of truth and ethical standards. It was constituted by knowledge, meaning, and power viewed in terms of relationship – as being shared by people. On the one hand, discourse specified regularities that govern production and operation of power and knowledge, and thus became “a system for the formation of statements and practices, that by inscribing itself into institutions and appearing as more or less normal, constitutes reality for its bearers and has a certain degree of regularity in an array of relationships” (p. 120). On the other hand, these statements and practices mediated “a will to power” not of one person or group, but “a generalized will to create the possibilities to be able to speak the truth” (Fox, 1998, p. 418).

Foucault studied power “in its own right, rather than reducing it to the central mechanism of class or economic domination” (Foucault, 1980, as cited in Newman, 2004, p. 143). He insisted that power can no longer be viewed as the embodiment of the figure of the sovereign. Rather, “the analysis of power must start from its ‘infinitesimal mechanisms’ – from the multiplicity of practices, relations, techniques and discursive operations that intersect at all levels of social reality” (p. 143). Advocated by Foucault (1980) a power/knowledge phenomenon in which both of the elements were equally important (as cited in Fox, 1998, p. 416), Armstrong (1983) summarized the association: “power assumes a relationship based on some knowledge which creates and sustains it; conversely, power establishes a particular regime of truth in which certain knowledges become admissible or possible” (as quoted in Fox, 1998, p. 416).

Rooted in Foucauldian discourse of power and knowledge, postcolonialism “rejects the conceptualization of power as being held by individuals or groups and as being used to dominate others” and assumes that “power circulates between individuals and that individuals both undergo and exercise power simultaneously and become individuals through the effect of power” (Mehta & Ninnes, 2003, p. 247) and in the context of “networks of culture that provide conditions of possibility” (Harald & Lie, 2008, p. 124). Thus, power is “productive and creative of subjects” (Abrahamsen, 2008, p. 673). Power remains connected with knowledge to produce truth and
rationality. “Truth, in a Foucauldian sense, is a thing of this world, produced through discourses that establish dominant ways of understanding and representing social reality” (p. 673).

### 4.3.2. Postcolonial identity

The concept of identity remains in the heart of postcolonial discourse. One of the cornerstones of an inquiry into postcolonial identity is the writings of Franz Fanon, a black psychiatrist in the Antilles and in Algeria. Drawn from his personal experience and using a psychoanalytic approach, Fanon (1986) outlined the racial identity of colonised people in his first book, *Black Skin White Masks*. Against the background of a colonial environment, he explored the formation of colonial identity:

> Every colonized people - in other words, every people in whose soul an inferiority complex has been created by the death and burial of its local cultural originality - finds itself face to face with the language of the civilizing nation; that is, with the culture of the mother country. The colonized is elevated above his jungle status in proportion to his adoption of the mother country’s cultural standards. He becomes whiter as he renounces his blackness, his jungle. (p. 18)

The purpose of Fanon’s attempts to define colonial identity “was not to win the admission that the black is equal to white but to help the black man to free himself of the arsenal of complexes that has been developed by the colonial environment he lives in” (p. 30).

In his analysis of Fanon’s *Black Skin White Masks*, Bhabha (1986) outlined three conditions to analyse the process of identification. The first condition relates to the fact of existence: “to exist is to be called into being in relation to an Otherness” (p. xv). The second condition refers to the very place of identification that takes place in the “space of splitting,” in the inner aporia of a native’s fantasy “to occupy the master’s place while keeping his place in the slave’s avenging ager” (p. xvi). Finally, the third condition refers to the question of identification that is always “the production of an ‘image’ of identity and the transformation of the subject in assuming that image” (p. xvi).

Identity, as proposed by Fanon, is not a fixed idea or culturally authored definition, rather a production – always in process and constituted within colonial subjects. “Superimposed on the black man’s experiential self is a racial stereotype that creates a disorienting gap between the self-image and the white ideal” (Bergner, 1995, p. 78). Thus, the formation of identity comes with the conceding of a lack of desired qualities of “the white ideal” (Rizvi et al., 2006, p. 251). Even
independence will not bring freedom from colonial complexes: “the colonial subjects remain colonized internally, psychologically” (p. 251) in their desire to become white.

Because identity formation emerges in the context of culture, the postcolonial identity discourse talks about cultural identity. Hall (2003) discussed two distinct ways of enunciating cultural identity. The first approach views it “in terms of one, shared culture, a sort of collective ‘one true self’, hiding inside the many other, more superficial or artificially imposed selves, which people with a shared history and ancestry hold in common” (p. 223). The second approach recognises cultural identity as “a matter ‘becoming’ as well as of ‘being’. It belongs to the future as much as to the past” (p. 225). The former view of cultural identity played an important role in postcolonial struggles becoming a powerful force in the rediscovery of one’s own identity by retelling of the past. As Fanon (1986) stated:

It was with the greatest delight that they discovered that there was nothing to be ashamed of in the past, but rather dignity, glory and solemnity. The claim to a national culture in the past does not only rehabilitate the nation and serve as a justification for the hope of a future national culture. In the sphere of psycho-affective equilibrium it is responsible for an important change in the native. The past is given back its value. Culture, extracted from the past to be displayed in all its splendor. (p. 210-211)

The latter position on cultural identity brings some insights and understanding of the disturbing character of the colonial experience. On the one hand in Said’s orientalist sense, identity of the colonised was “constructed as different and other within the categories of knowledge of the West” (Hall, 2003, p. 225) and they were made to see and experience themselves as the other, belonging “to the marginal, the underdeveloped, the periphery ... always ‘South’ to someone else’s El Norte.” (p. 228, original emphasis). On the other hand, there is a difference within identity. Each otherness, although the same in the relation to the metropolitan centres, has negotiated its dependency differently and this “difference is inscribed in cultural identities” (p. 228). A concept of postcolonial identity finds its refinement in the discourse on postcolonial hybridity, which the next section addresses.

4.3.3. Hybridity

The postcolonial concern with hybridity and identity reflects its understanding of power as a product of subjectivities. Both identities and subjectivities were reconstructed by the colonial experience. Multifaceted practices, philosophies, and cultures imparted to and adopted by colonised people in hybrid forms continue to express colonialism. Thus, “the notion of hybridity marks both the continuities of colonialism and its failure to fully dominate the colonized”

The term hybridity could be used to depict not only heterogeneous plants, animals, and people, but also cultures, traditions, and languages incorporating incongruous elements. It has become an “analytic allegory defining lines of interest and affiliation among scholars of popular and literary culture” (Kapchan & Strong, 1999, p. 240, 246).

Through decades of its use, the term hybridity has been developed from a negative understanding in 19th century scientific racism into positive re-appropriation by social and cultural critics. The former was a feature of colonial racism, a spurious belief founded on unshakeable boundaries between white Europeans and their racial others. The pure, permanent white identity was maintained by labelling those others as both racially and culturally impure. In this context, the term hybridity was used to depict “a condition in which these boundaries of identity are crossed, resulting in illegitimate racial mixing” (Scott & Marshall, 2009, p. 327). The latter use of hybridity challenges previous understandings of identity and culture and implies that the crossing of racial and cultural boundaries is a determining feature of social development. In such a context, the term hybridity assumes that “identity is formed through an encounter with difference” (p. 327) and consequently, “hybridity of identities is not the product of the assimilation of one culture or cultural tradition by another, but the production of something new” (p. 332).

A classical example of Bhabha’s (1990) postcolonial hybrid, “the transnational as the translational” (as cited in Mishra & Hodge, 2005, p. 383), has become a mantra and archetype in postcolonial theory. Bhabha described the transformation of a dispossessed, schizophrenic, often unhappy, and capitalistically exploited postcolonial migrant (ideally of colour) into a powerful subject of (post)modernity. His experience signified the transnationality and translationality of culture. Bhabha wrote, “I must give way to the vox populi: to a relatively unspoken tradition of the people of the pagus - colonials postcolonials, migrants, minorities - wandering peoples who will not be contained within the Heim of the national culture and its unisonant discourse, but are themselves the marks of a shifting boundary that alienates the frontiers of the modern nation” (p. 383, original emphasis). Bhabha’s hybrid instantiated identity, while it was subverted, was “neither One nor the other but ‘is almost the same, but not quite’” (Bhabha, 1987, p. 318).

Often discussed in postcolonial context, the idea of cultural hybridity refers to Said’s (1994) concept of the other and assumes that “partly because of empire, all cultures are involved in one
another; none is single and pure, all are hybrid, heterogeneous, extraordinarily differentiated, and unmonolithic” (as cited in Hickling-Hudson, 2006, p. 204). Consequently, the cultural other is no longer exotic or mystical; rather, it is all around us. The cultural encounter takes place in the colonial contact zone where people from different cultures establish ongoing relationships that are often shaped by conditions of coercion and radical inequality. Pratt (1992) explained that “a contact perspective emphasizes that subjects are constituted in and by their relations to each other. It treats the relations among colonizers and colonized not in terms of separateness or apartheid, but in terms of co-presence, interaction, interlocking understandings and practices” (as cited in Gregoriou, 2004, p. 249, original emphasis).

Carter (2006) discussed the concept of hybrid in terms of boundaries/borders and border thinking. Deeply embedded in Western thinking, boundaries were crucial in the colonial project of denoting the European, and separating out the other. Viewed as signs of modernity, boundaries culminated in the foundations of bounded knowledge, where “rationalization and the autonomous knowing subject is able to subsume the separated object as the known. Those who live border lives on the margins of homelands or ethnic groupings, transform their knowledge into new and unexpected hybrids that are open to change” and lead to “a multiplications of claims of knowledge” (pp. 682-683).

In her discussion of cultural hybridity in the context of education in Kenya, Maeda (2009) assumed that contemporary postcolonial societies see imperialism consolidating the worldwide amalgam of cultures and identities, with all cultures being involved with each other. Western and traditional cultures are enmeshed so deeply that it is difficult to identify what aspects of them are parts of the colonial legacy and may be separated from their endogenous analogues. “Even if one manages to isolate some of them, one is sometimes so deeply shaped and molded by them as to be unable to reject them without rejecting parts of oneself” (p. 339). This denotes a condition called “inescapable hybridity” (p. 339) where one cannot identify the pure form of culture, rather all cultures influence each other.

Postcolonialism that attempts to elucidate the East-West relationship by deconstructing orientalism blends Eastern and Western cultures through the dialogue between them. The concept of hybridity supports the argument against Western cultural hegemony. However, it is not the purpose of postcolonialism to replace one cultural hegemony with another one, but to blend them together so they may co-exist together (Yang et al., 2006).
4.3.4. Postcolonial theory and the discourse of development

Associated with the colonial period, the so-called regimes of truth (the power of Western discourse to marginalise other discourses and ways of being) continue into the present. From a postcolonial perspective, this tendency continues in the discourse of development, which maintains many colonial relationships.

The ability of the rich countries to set standards for what constitutes development and progress can be regarded as a form of power that conditions the choices available to Third World countries. Development discourse helps legitimize interventions in the Third World in order to model it according to Western norms of progress, growth, and efficiency. (Abrahamsen, 2008, p. 673-674)

Development theory began to be constructed in the 1950s in response to how the economies of European colonies, which then comprised almost 30% of the world's population, “might be transformed and made more productive as decolonization approached” (Sylvester, 1999, p. 705). Because Western countries had already industrialized, they provided guidelines on modernisation. The rational use of resources with the support from developed countries within democratic conditions was presented as a formula for swiftly moving from an underdeveloped to a developed stage of decolonizing societies. Modernity became a canon by which societies were assessed. It led to conceptualising of a new ideal order that included a “bureaucratic state, industrial production, rational law, specialization, technical innovation, professionalism, and price-based value” (McMichael, 2008, p. 180). Because of the accumulation of wealth and power in the First World, it was seen as order itself. Thus “development assumed the status of a master concept” (p. 180). The paradigm of development assumed that with the end of division between colonizers and colonised, the underdeveloped world would take up modernity.

Disappointment with development paradigms brought to light underdevelopment or dependency theory. It addressed the issue of the impasse of development after decades of flawed interventions by the West in postcolonial parts of the world that were the result of processes that “had stripped colonies of resources, reorganized their lands, pauperized their labor, and created parasitic elites” (Sylvester, 1999, p. 705) – all so Western countries could have and extend their privileged imperialist position. However, both development and dependency theories shared confidence in the role of “technological innovation, acceptance of scientific rationality, and resource distribution through state and market processes” (p. 707) in development and modernisation while at the same time both theories neglected issues of social development.
Criticised for its “neocolonial tendencies, Western-centric values and centralised decision-making processes” (Kapoor, 2005, p. 1203) development theory has evolved into a participatory development paradigm. “It stands instead for a more inclusive and ‘bottom-up’ politics, with focus on promoting local community empowerment as well as country ‘ownership’ of development programmes, where the state and/or international development agency seeks civil society involvement for policy development and agenda setting” (p. 1203).

Although postcolonial and development theories share some common grounds – “a suspicion of Western liberal modernity, a historical-global analysis, and critical politics” (Kapoor, 2002, p. 647), “one field begins where the other refuses to look” (Sylvester, 1999, p. 704). While development theory, especially in its form of participatory development, gives the impression of bringing the Third World into the centre of development and of being acclaimed as benevolent as it professes “neutrality in order to empower the ‘Other’” (Kapoor, 2005, p. 1204), in fact when scrutinised in the light of postcolonial theory, it centres on the First World and multifaceted elite institutional aggrandisement and geopolitical interests.

Postcolonial theory in conjunction with development theory provides an important analytical perspective to this study in the context of ICT. There is a growing acceptance of the significant role of ICT as an agent of economic and social development in Third World societies. It is believed that properly adapted to local circumstances, ICT can be a powerful tool to combat poverty and foster sustainable development (McNamara, 2003).

4.3.5. Postcolonial discussion of education

The postcolonial nexus of knowledge and power includes also education, “both as an institution where people are inculcated into hegemonic systems of reasoning and as a site where it is possible to resist dominant discursive practices” (Rizvi et al., 2006, p. 257). In such a context, the relationship between education and postcolonialism remains ambivalent. On the one hand, education is criticised in the postcolonial discourse for its complicity with Eurocentric tendencies and practices. On the other hand, education is seen as the only possible venue to reveal and resist “colonialism’s continuing hold on our imagination” (p. 257). It is also seen a site where “legacies of colonialism and the contemporary processes of globalisation intersect” (p. 257).

The initial discussion about the colonial legacy in education reached its culmination during times of independence movements in Africa and other parts of the world in the 1970s and 1980s. Different theoretical paradigms were used as the cornerstone of the discourse. The mainstream
discussion was based on dependency theory that looked into the relationship between colonialism, neo-colonialism and education. It depicted the relationship between colonised and colonisers “as one of omnipotence to the extent that little attention is given to the contradictory effects of colonial education or to the development of forms of educational alternatives and cultural resistance” (Tikly, 1999, p. 610). Another socio-anthropological paradigm used a concept of cultural identity to explain “the role of education in reproducing cultural patterns in the postcolonial period” (p. 610).

Postcolonial theory provides a mode of critique that enables analysis of the relationship between education, globalisation, and resistance to Western hegemony. Such critique is focused on “the continuing impact on education systems of European colonialism, and with issues of race, culture, language, as well as other forms of social stratification including class and gender in postcolonial context” (Tikly, 2001, p. 152).

Although contested, the globalisation paradigm is increasingly used for comparative analysis. Associated with European capitalism and its resultant expansion into other parts of the world, the theory has become a manifestation for “the process of increasing the connectivity and interdependence of the world’s markets and businesses” indicating “a shrinking world, a world that is becoming more interrelated – a totally interconnected marketplace, unhampered by time zones or national boundaries” (Lunga, 2008, p. 196). Tickly (1999) discussed three elements of globalisation that, although existing on a general level, guide the debate on globalisation and education. First, the economic element highlights new forces of a global market that result in a new global division of labour. The results of economic globalisation benefit mostly Western and newly industrialised nations that are embedded into new worldwide networks while shifting the emerging Fourth World “from a structural position of exploitation to a structural position of irrelevance within the new world economy” (Tikly, 2001, p. 160).

Second, the political element “considers the demise of the nation state as an aspect of the new power” (Tikly, 1999, p. 616) of international financial wealth and supranational trading organisations. Finally, the third cultural element “looks at the emergence of the borderless world where national cultures are transformed by global communications and cultural hybridization” (p. 616). The role of postcolonial theory in this debate of globalisation and education is to draw attention “to the false universalism of globalization,” which, while being “a movement of social practice and cultural expansion, is concerned with economic and cultural power” (Yang et al., 2006, p. 281).
Internationalisation of economic practices and its impact on the social, political, and cultural lives “transform educational systems in developing countries into ‘regulated and instrumentalized corpses’” (Lavia, 2007, p. 287). The implications of the new economic global order for education are multifaceted. Negatively, it denotes “impact on enrolment rates and the quality of educational provision” (Tikly, 2001, p. 161). Positively, it emphasises the urgent need for education that will provide skills competitive in the global market. The role of education in the global economic order remains contradictory, with elites having access to prestigious private education that prepares them to become participants in the global economy, but a majority of the population attending local, state schools that make them “marginally competitive for low-skill jobs” (p. 161). Such inequities resemble colonial education, which, aimed at organizing the structure for power and control, “was not meant to liberate the colonized, but rather was the mean whereby the values and interests of the colonizers and masters would be internalized by the colonized and perceived as their own” (Reddock, 1994, as cited in Lavia, 2007, p. 295). The exploitative practices of colonialism and neo-colonialism are responsible for the poor resourcing of education systems in postcolonial countries, as well as “in asymmetries and exclusions based on social class, race and gender, and the hegemony of mono-cultural curricula” (Hickling-Hudson, 2006, p. 214). Results of colonialism are also seen in “a poor pedagogic technology, with excessive dependence on textbooks, examinations, authoritarian teachers, mentalities of dependence, and inability to make connections between texts and experiences” (Majumdar & Kumar, 2003, p. 3049). Postcolonial pedagogies emerging from postcolonial awareness of the need for justice in education and as a refusal to accept and continue with such inequalities, are committed to change and to construct new “cultural and educative forms of practice that are informed by indigenous knowledge” (Lavia, 2007, p. 294).

Culture plays important roles in postcolonial discourse and postcolonial education. Education has been seen as one of the contributing factors in spreading Western culture during the time of colonial rules. It is also seen a consolidating element of Western hegemony in contemporary globalisation with colonisers’ languages as significant legacies of colonialism in education. The significance of language in relation to postcolonial theory demonstrates itself in a fact that “it is a fundamental site of struggle over meaning and by implication the nature of social reality and identity” (Tikly, 1999, p. 615). The control over language is seen as one of the main features of colonial oppression. The colonial education system “installs a ‘standard’ version of the metropolitan language as the norm, and marginalizes all ‘variants’ as impurities” (Ashcroft et al., 2002, p. 7). The postcolonial literature provides examples of different responses to the issue of hegemony and subsequent globalisation of the languages. On the one hand, there is a concern
about the under-use and underdevelopment of indigenous languages, as expressed by Ngugi (1995), “Look at the United Nations, in terms of imbalance ... they [western countries] can veto anything, even against the will of a majority from Africa, Asia. Look at the languages of the United Nations organization. They’re nearly all Western, European languages” (as cited in Maeda, 2009, p. 342).

On the other hand, the spread of colonisers’ languages, especially English, to the extent that they become an implicit part of the linguistic landscape in former colonised countries is seen as “inescapable hybridity” (Maeda, 2009, p. 342). Maeda reported that English coexisted with other indigenous languages in Kenya, and this “hybridity of languages appears to be widely accepted” (p. 342). Moreover, English was considered as a language with high status and associated with access to global networks and consequently to social and economic success. Furthermore, “counter-hegemonic discourses can be formed in English” (Tikly, 2001, p. 168).

The discourse presented on education and postcolonial theory is of special importance to this study situated in the context of higher education in Papua New Guinea. Inherited from colonial powers, the PNG education system faces problems of “overcrowding, limited or obsolete libraries, insufficient equipment, outdated curriculum and underqualified teaching staff” (Papoutsaki & Rooney, 2006, p. 428). Consequently, developing countries appeal to external agencies for assistance. However, the answers re-create colonial patterns and trends of Western domination of knowledge and resources “by virtue of their ownership of scientific systems and new technologies and dominance ...of English language as the medium of instruction and research” (Hay, 2008, p. 19). Such continuity with colonial practices in education in conjunction with “neo-colonial dependencies and the current pressures to comply with Western higher education standards” (Papoutsaki & Rooney, 2006, p. 431) and to provide for globalising market needs, leads to a false impression that “higher education is contributing to the economic growth of the country” (p. 431).

4.3.6. Postcolonial technoscience

The title of this section is taken from Warwick Anderson’s (2002) article Postcolonial Technoscience. As the author argued, postcolonial technoscience provides a new platform to explore “political economies of capitalism and science” (Anderson, 2002, p. 643), the ongoing changes in global restructure of the world’s economical, political, and social relations, and “international traffic of people, practices and technology” (p. 643). Thus, the term postcolonial
technoscience refers both to new configurations of technoscience and to the critical approaches that analyse and identify them.

One way to initiate the analysis of postcolonial technoscience is through the review of the history of technology in the context of postcolonial countries. Arnold (2005) proposed three stages in this relationship. First, industrial technologies created in Europe and dispersed around the world by European agency almost without significant local input, when established in Africa and Asia, were seen as a legacy of colonial intervention. They were considered to be “modern, progressive and largely benevolent” (p. 86). The second stage coincided with nationalist movements in the South and with growing technological skepticism within the West itself. Technological intervention was seen as motivated by greed and physical and epistemological violence. Halm (2003) explained, “It is axiomatic that Western Science and technology anchored its claims to cultural and ontological superiority thereby providing both the cognitive and material means of its imperialism. In other words, discursive violence often leads to, or anchors, material, cultural, and ontological violence” (p. 156). Consequently, first-stage characteristics of Western technologies were replaced with aggression, arrogance, and greed. Finally, the third stage is called postcolonial. Drawing from postcolonial criticism, “the history of technology becomes less an investigation of origins and inventions (a history that has long privileged Europe) than an enquiry into uses, meaning and effects” (Arnold, 2005, p. 87). This phase recognised the limitations of imported technologies and the need “to understand and utilize local conditions as well as securing local cooperation, even by incorporating indigenous traditions and practices” (p. 100).

Deeply embedded in postcolonial theory, the ideas of knowledge and identity provide essential theoretical insights to postcolonial study of science and technology. Postcolonial attempts to challenge the assumption of the objectivity, authority, and universal applicability of Western knowledge, lead to suppositions that “all knowledge traditions, including Western technoscience, can be compared as forms of local knowledge so that their different power effects can be compared without privileging any of them epistemologically” (Anderson, 2002, p. 650). Thus, “technoscience, like any other practice, always has a local history and a local politics, even as the actors involved claim to be ‘doing global’” (p. 650).

The idea of identity, when discussed in relation to technology, finds itself on the intersection of postcolonial studies and electronic media theory. Traditional “understandings of identity as stable and singular” (Fernandez, 1999, p. 64) are challenged by postcolonialism and electronic media theories, which conceptualize identity “as multiple, contradictory and even conflicting” (p. 64). However, while postcolonial discussion of identity “involves collective identities: ethnic, national,
gender” and thus emphasises identity as “historically rooted, open-ended, collective political projects” (p. 64), electronic media theory focuses on “the individual as author of his or her own identity” and therefore identity is seen as “an opportunity for self-development and (re)creation” (p. 65). Despite the differences, both theories acknowledge the importance of electronic technologies in formerly colonised countries as the means “for the construction of identity, since colonized people learn about themselves through these forms of knowledge” (p. 60).

The rapid spread and accommodation of ICT in formerly developing countries is seen to offer opportunity for development and at the same time to raise concerns that it may follow existing patterns of social and economic inequalities. Postcolonial theory with its strategies “to stand in opposition to colonizing and centralizing tendencies” is about “disrupting unfair and unjust arrangements through political, economic and cultural decolonization” (Hay, 2008 p. 23) and thus it provides a platform to address technoscience analysis and make it more receptive to indigenous cultures and epistemologies.

This chapter has attempted a comprehensive discussion of theoretical perspectives pertaining to the purpose of the study. Three theories were presented and examined: social constructivism with a special focus on social construction of technology, feminism, and postcolonialism. Each of the examined theories informs the issues relevant to the studied phenomena and contributes to the comprehensive understanding of them. Social construction of technology provides tools to examine the process of constructing the meaning of technology by participants in this research. Feminist theory informs an understanding of issues related to women access, application, and attitudes towards ICT. It also permeates the concept of women’s empowerment and how it could be realized for participating women. Finally, postcolonial theory provides a mechanism to construct the understanding of technology within the context of postcolonial education.
CHAPTER FIVE
RESEARCH DESIGN

Research design is broadly described as “something that involves a clear focus on the research question, the purpose of the study, what information most appropriately will answer specific research questions, and which strategies are most effective for obtaining it” (Denzin & Lincoln, 1998, as cited in Masha, 2007, p. 165). Thus, this chapter undertakes the task of presenting research questions as well as discussing and justifying the employment of theoretical paradigms and strategies for the collection and analysis of research data.

The purpose of this study is to explore how ICT through higher education can contribute to the empowerment of women in Papua New Guinea. To this end, a main research question was developed that underpinned the conduct of the study:

Does ICT through higher education contribute to women’s empowerment in PNG society?

In order to investigate the problem of the study and to scrutinise the issues embedded in the research, the following questions were developed to focus the conduct of the study as well as collection and discussion of data:

1. What is an ICT profile of higher education institutions in Papua New Guinea?
2. What are the gender-based issues in the access, application, and attitudes towards ICT among students and staff of higher education institutions in Papua New Guinea?
3. What role does ICT play in education in Papua New Guinea?
4. What is the role of ICT in women’s empowerment?

Having the direction of the study clearly defined, it becomes important to choose and to justify the design of the proposed research. This chapter outlines a quadripartite research model for the project. It commences with the discussion on a multi-paradigmatic approach employed for the study. From there, the chapter discusses research methodology. It continues with an overview of different issues in research methods application: different techniques of data collection, analyses, and interpretation are recounted, and justification for their adoption is provided. Table 5.1 outlines the theoretical framework underpinning the research design.
Table 5.1 Quadripartite design of research

<table>
<thead>
<tr>
<th>Epistemology</th>
<th>Constructivism</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theoretical Perspectives</td>
<td>Multi-paradigmatic approach</td>
</tr>
<tr>
<td></td>
<td>Social Constructivism</td>
</tr>
<tr>
<td></td>
<td>Feminism</td>
</tr>
<tr>
<td></td>
<td>Postcolonialism</td>
</tr>
<tr>
<td>Research Methodology</td>
<td>Mixed methods</td>
</tr>
<tr>
<td>Research Methods</td>
<td>Qualitative methods</td>
</tr>
<tr>
<td></td>
<td>Semi-structured Interview</td>
</tr>
<tr>
<td></td>
<td>Survey Questionnaire Open Questions</td>
</tr>
<tr>
<td></td>
<td>Quantitative methods</td>
</tr>
<tr>
<td></td>
<td>Survey Questionnaire (Web-based and paper-based)</td>
</tr>
</tbody>
</table>

5.1 Epistemology

Epistemology is the study of “the nature, scope, and applicability of knowledge” (Walker & Evers, 1997, p. 224). When discussed in the context of research and research design, the relevance of epistemology is signified by Gray (2004) as “a philosophical background for deciding what kinds of knowledge are legitimate and adequate” (p. 16). Epistemology adopted for the purpose of this research is constructivism.

In a human quest for understanding and explaining how we know what we know, constructivism is “the view that all knowledge, and therefore all meaningful reality as such, is contingent upon human practices, being constructed in and out of interaction between beings and their world, and developed and transmitted within an essentially social context” (Crotty, 1998, p. 42). The leading reason to adopt constructivism is the fact that it views knowledge as “created in interaction among investigator and respondents” (Guba & Lincoln, 1994, p. 111). In this view, the research process is not merely a description of existing reality, but also by giving voice to the participants of this study, it provides a platform for construction of meaning for the world they interpret through their experiences. Although the purpose of this study is to comprehend and to reconstruct the constructions that all involved in the process (both participants and the inquirer) initially hold, it remains open to new interpretations as information and understanding improve (Green, 2000; Guba & Lincoln, 1994).
5.2 Theoretical Perspectives

Theoretical perspective is “the philosophical stance informing the methodology and thus providing a context for the process and grounding its logic and criteria” (Crotty, 1998, p. 66). The complexity of this study across such different disciplines as social science, gender studies, Information Systems, and tertiary education, warranted a multi-paradigmatic approach to provide adequate tools to collect data and to analyse the complex experiences of participants. Theories that contribute to the theoretical perspective of this study are: social constructivism, feminism, and postcolonialism. All these theories assume the constructionist epistemology that underpins this research.

Social constructivism advocates that all meaning is socially constructed and is context-specific. It embraces “the goal of understanding the complex world of lived experiences from the point of view of those who live it. This goal is variously spoken of as an abiding concern for the life world, for the emic point of view, for understanding meaning, for grasping the actor’s definition of a situation” (Schwandt, 1994, as quoted in Gregor, 2005, p. 8). From within social constructivist theory, social construction of technology (SCOT) is of a special interest for the study. SCOT provides the tools to discuss how the meaning of technology is negotiated within gendered social context.

The feminist understanding of “gender as a social structure” (Risman, 2004, p. 430) supports the feminist epistemological claim that “knowledge production is situated” (Berg & Lie, 1995, p. 333). While assuming that new technologies are more flexible and open to new meanings and new ways of application, technofeminism calls for exploring how gender and technology are constructed in emerging environments and how gender is practised and renegotiated in the context of technology. Technofeminism also assumes that the computer’s potential for changing gender dynamics could be more strongly realised and manifested in the context of developing countries.

Finally, the postcolonial theory in a special way enlightens understanding of the context of women’s empowerment in Papua New Guinea by providing tools for discussing postcolonial education and postcolonial technoscience. Postcolonial technoscience recognises the limitations of technologies developed in the Western world and the need to negotiate an understanding of technology within local conditions by securing local cooperation, even incorporating indigenous traditions and practices.
Multi-paradigmatic theoretical perspectives guided the selection of practical elements of the research, including methods of data collection and attention to issues of rigour (Green, 2000). Justified by shared epistemological approaches to theories that form the multi-paradigmatic perspective of this study, the quality of research is gauged by effective use of fundamental principles of mixed methods research. According to Johnson and Onwuegbuzie (2004) a researcher “should collect multiple data using different strategies, approaches, and methods in such a way that the resulting mixture or combination is likely to result in complementary strengths and nonoverlapping weaknesses” (p. 18).

All theories have been further discussed in Chapter Four Literature Review: Theoretical Framework. This chapter continues with a discussion of other elements of research design.

**5.3 Research Methodology**

Crotty (1998) described research methodology as “the strategy, plan of action, process, or design lying behind the choice and use of particular methods and linking the choice and use of methods to the desired outcomes” (p. 3). Mixed methods methodology was employed for this research. Although quantitative and qualitative perspectives of research differ in the nature of their data, and the methods for collecting and analysing data, there is no distinction between the two combined methods at the level of epistemology or theoretical perspective (Crotty, 1998; Guba & Lincoln, 1994). Moreover, there are similarities in logic, which makes combining methods possible (Punch, 1998). Figure 5.1 outlines how the selected methodology is utilised in the study.

![Figure 5.1 Parallel simultaneous multiple mixed methods applied in the research](image)

Mixed methods “typically refers to both data collection techniques and analyses given that the type of data collected is so intertwined with the type of analysis that is used” (Tashakkori &
Mixed methods research employs qualitative and quantitative data collection and analysis techniques in either parallel or sequential phases (Teddlie & Tashakkori, 2003). Because a parallel mixed methods design has been selected for this study, the qualitative and quantitative data were collected at the same time and analysed in a complementary manner as discussed in this chapter.

Giannakaki (2005) argued that “combining quantitative and qualitative methods in a single study can help elucidate various aspects of the phenomenon under investigation, providing more holistic understanding” (p. 323). Sale et al. (2002) outlined numerous arguments for combining both types of study into one. They argued that two approaches could be combined because they share a unified logic of the common goal to understand the world around us. Furthermore, the two study paradigms are united by “shared commitment to understanding and improving the human condition, a common goal of disseminating knowledge for practical use, and a shared commitment for rigor, conscientiousness, and critique in the research process” (p. 46). Explaining further the aim of combining different methods, Saukko (2003) argued that using mixed methods is like using different lenses to calibrate an optimally clear vision, so the reality is seen more clearly in a less biased and more systematic way. In the same vein, Cresswell and Plano Clark (2007) argued for using mixed methods:

Mixed methods research is a research design with philosophical assumptions as well as methods of inquiry. As a methodology, it involves philosophical assumptions that guide the direction of the collection and analysis of data and the mixture of qualitative and quantitative data in a single study or series of studies. Its central premise is that the use of quantitative and qualitative approaches in combination provides a better understanding of research problems than either approach alone. (as quoted in Cameron, 2011, p. 96)

Gaining different perspectives from data collected with mixed methods and using them to give a fuller picture is known as triangulation (Williamson, 2005). Triangulation is considered a strategy for improving the validity of research. It supports findings “by showing that independent measures of it agree with it or, at least, don’t contradict it” (Miles & Huberman, 1988, as quoted in Mathison, 1988, p. 13). Among four types of triangulation identified by Denzin (1978) – data triangulation, investigator triangulation, theory triangulation and methodological triangulation – methodological triangulation is the most discussed. It “refers to the use of multiple methods in the examination of a social phenomenon” (as cited in Mathison, 1988, p. 14). There are two types of methodological triangulation: within-method and between-method. Within-method triangulation uses multiple techniques within a given method to collect and interpret data, while between-method triangulation uses complementary methods.
This study uses both the between-method triangulation and within-method triangulation in the following manner:

a) Between-method triangulation – both quantitative method (survey) and qualitative methods (semi-structured interviews and observations) were used to collect data for the project;

b) Within-method triangulation – within qualitative strand of the study, the data was collected through semi-structured interviews and open questions in survey questionnaires.

It was believed that using both kinds of triangulation led to more valid results from this study with each method contributing in a specific way:

a) Within-method triangulation ensured internal consistency and reliability, and,

b) Between-method triangulation tested the degree of external validity (Jick, 1979).

Punch provided methodological justification for combining qualitative and quantitative methods. He suggested the following reasons for bringing both methods:

- To capitalize on the strengths of the two perspectives and to compensate for the inadequacy of each approach.
- To facilitate the structure and process of research; quantitative study allows the researcher to explore efficiently the “structural” features of social life, while qualitative study brings researcher closer to “processual” aspects.
- To interpret the relationship between variables. Quantitative research allows the researcher to establish the relationship among variables, but often proves insufficient to explore the reason for those relationships. Qualitative study allows the researcher to investigate the factors underlying the broad relationships that are established and explain them.
- The use findings from one type of study to verify the findings derived from the other type (Punch, 2005).

It became apparent in this study, that using mixed methods helped to create an extensive profile of ICT application in higher education institutions and provided participants with a voice to explain their own attitudes and perceptions of technology. Embedded within constructionist epistemology, the qualitative and quantitative strands of the study provided findings, which, analysed in triangulated manner, illustrated how meanings of technology and gender were constructed within the context of higher education institutions.
5.4 The Sampling Design

Because there is no widely accepted typology of mixed methods sampling strategies (Teddlie & Yu, 2007) the sampling was designed separately for both strands of the study. Although sampling considerations are equally important in qualitative and quantitative research, qualitative and quantitative researchers approach samples differently (Neuman, 2000). Thus, various sampling strategies were proposed to design a framework that offered many members of the sample population an opportunity to participate in the study. Sampling decisions are discussed separately for each of the study strands. Because of the purpose of the study – exploration of how ICT through higher education can contribute to the empowerment of women in Papua New Guinea – the target population of the study was defined as students and academic staff of tertiary institutions.

5.4.1 Sampling in the Quantitative Strand of Study

Multistage-cluster sampling was selected for the quantitative strand to ensure the sample was representative of the population and as far as possible unbiased in any way. Cluster sampling is the most appropriate technique when the sampling unit is a group (not an individual) that is naturally occurring in the population. Several sampling stages might be carried out to select the participants ultimately chosen to participate in the sample (Kemper et al., 2003).

In the first stage of the sampling process, four groups were selected for the purpose of the study: female and male university students, female and male students of other institutions of higher education (OIHEs), female and male university lecturers, and female and male teachers at OIHEs. In the second stage, the universities and OIHEs were selected. All institutions of higher education in Papua New Guinea are national and therefore students and staff at each institution generally represent PNG cultural complexity. Thus, the researcher considered accessibility, safety, and expenses, in choosing the following research sites:

- Universities: Pacific Adventist University in Port Moresby, University of Goroka, Divine Word University in Madang
- OIHEs: Madang Teachers College, Holy Trinity Teachers College in Mt Hagen, Don Bosco Technological Institute in Port Moresby.

Within the selected universities, sampling groups were found in faculties of Arts, Business, and Education. Two of the three OIHEs are teachers colleges and thus had similar properties, and all
three OIHEs had similar levels of ICT exposure. At each of the selected institutions, the sample was further reduced by selecting a sample group from the selected cluster. Forty-five groups of students (898) participated in the study. All faculty members at all participating institutions were invited to participate in the study. Sixty-four academics did so.

Due to the researcher’s time limitations – as a full-time lecturer at one of the universities, she could undertake the task of data collection only during the semester breaks – invitation posters for staff and students were displayed at various locations in all institutions at least two weeks prior to her arrival at the institution. An overview of the sample design for the quantitative strand of research is presented in Table 5.2.

Table 5.2 Overview of the sampling design in the quantitative strand of the study

<table>
<thead>
<tr>
<th>Selected institutions of higher education</th>
</tr>
</thead>
<tbody>
<tr>
<td>Universities</td>
</tr>
<tr>
<td>Pacific Adventist University, Port Moresby</td>
</tr>
<tr>
<td>University of Goroka</td>
</tr>
<tr>
<td>Divine Word University, Madang</td>
</tr>
<tr>
<td>Other institutions of higher education</td>
</tr>
<tr>
<td>Holy Trinity Teachers College, Mt. Hagen</td>
</tr>
<tr>
<td>Madang Teachers College</td>
</tr>
<tr>
<td>Don Bosco Technological Institute, Port Moresby</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Groups selected within the institutions of higher education</th>
</tr>
</thead>
<tbody>
<tr>
<td>At universities</td>
</tr>
<tr>
<td>In faculties of Arts, Business and Education, first-, second-, third- and fourth-year students, in 36 groups</td>
</tr>
<tr>
<td>All faculty members invited to participate in the study</td>
</tr>
<tr>
<td>At OIHEs</td>
</tr>
<tr>
<td>First-, second- and third-year students, in 9 groups</td>
</tr>
<tr>
<td>Total number of groups = 45</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Total number of participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female students</td>
</tr>
<tr>
<td>Male students</td>
</tr>
<tr>
<td><strong>Total</strong></td>
</tr>
</tbody>
</table>

Selected multistage cluster sampling is an example of probability sampling. This approach is utilised for generalisability or the ability to extend findings from a population sample to a larger defined population. These abilities are based on three premises:
that the number of selected units is large enough for random errors to cancel each other out;
that the distribution of the variables in the population under study is normal, or at least knowable, so that sampling can produce a reasonable estimate of the population at large; and
that the sample drawn can and will be large enough to plausibly produce a reasonable estimate of the population at large. (Kemper et al., 2003, p. 277)

The decision regarding sample size followed Neuman’s (2000) three considerations:

- the degree of accuracy required;
- the degree of variability or diversity in the population; and
- the number of different variables examined simultaneously in data analysis. (p. 217)

Given that the total enrolment in the 2004 academic year in all PNG institutions of higher education was 14,174 students and the total number of lecturers was 985 (Asian Development Bank, 2006b), it is believed that selected numbers of 898 students and 64 lecturers for quantitative strand of study were sufficient to assure accuracy of results.

### 5.4.2 Sampling in the Qualitative Strand of Study

The selection process in qualitative research differs substantially from that used in quantitative research. Qualitative research focuses on how the sample or small collection of cases, or activities clarifies social life. Therefore, the main purpose in sampling in qualitative research is to select people or sites that can best help a researcher to understand the central phenomenon under study (Creswell, 2002). Flick (1998) argued that “it is their relevance to the research topic rather than their representativeness which determines the way in which the people to be studied are selected” (as cited in Neuman, 2000, p. 196). Since the sampling process is done in a deliberate way, with some purpose or focus in mind, it is referred to as “purposive”, “purposeful”, or “criterion-based” sampling (Burns, 2000, p. 465). Purposive sampling is a form of a non-probability sample. In non-probability sampling, the probability of being included into the study cannot be estimated, and there is no guarantee that every element has had an equal chance of being included. Therefore, there is no validity in generalising the account to the entire population.

Convenient purposive sampling was a technique utilised in the selection of participants in the qualitative strand of the study. Convenient sampling involves drawing elements from a group that is easily accessible by the researcher.

There were two sources of qualitative data in the study: data collected through open questions in a survey questionnaire and data collected through semi-structured interviews. All responses to all
four open questions in the staff and student survey questionnaires were recorded for analysis. However, only faculty members were invited to participate in interviews. One important rationale to exclude students from interviews was their limited experience of ICT – at the time data was collected, ICT was a relatively new element at the majority of IHEs. Information included in the poster sent to different IHEs included an invitation for voluntary participation in interviews. Twenty-three faculty members offered to participate in interviews.

Due to such limitations as time, cost, and communications involved in the sampling process, selected sampling – convenient purposive sampling – seemed the most suitable and feasible technique. Table 5.3 presents an overview of the sample design for the qualitative strand of this research.

Table 5.3 Overview of the sampling design in the qualitative strand of the study

<table>
<thead>
<tr>
<th>Type of Higher Education Institution</th>
<th>Semi-structured Interviews</th>
<th>Survey Open Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Female</td>
<td>Male</td>
</tr>
<tr>
<td>Universities</td>
<td>7</td>
<td>3</td>
</tr>
<tr>
<td>Other Institutions of Higher Education</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>Total</td>
<td>13</td>
<td>10</td>
</tr>
</tbody>
</table>

5.5 Data Collection Techniques

The quantitative survey questionnaire and qualitative in-depth semi-structured interview tools utilised in this study are discussed in this section. Rationale for selecting each tool and steps taken to increase validity and reliability are discussed in detail.

5.5.1 The Quantitative Strand Data Collection

In the quantitative strand of this study, data were collected with survey questionnaires. Survey questionnaires were prepared in two forms for staff and faculty members. Both questionnaires were self-administered to participants in two modes: paper-based questionnaires and Web-based questionnaires. It was believed that using two different modes of completion made the questionnaire appealing to participants and consequently increased the response rate. It was also expected that the selection of one of two possible approaches by female and male participants
could demonstrate either the gender similarities or differences in using these two different approaches to the task. The following section discusses a survey questionnaire as a data collection instrument and presents the rationale for its use in this study.

5.5.1.1 Survey Questionnaire

The survey is the most commonly used method in educational and social research (Burns, 2000; Mowbray & Yoshihama, 2001, Wiersma, 2000). It is a method of systematically asking people questions and recording their answers in order to describe the attitudes, opinions, behaviours, or characteristics of the population. Burns (2000) outlined two major forms of surveys: descriptive and explanatory. The descriptive survey seeks to estimate as precisely as possible the nature of existing conditions, or the attributes of a population; the explanatory survey aims to establish cause and effect relationships. Both descriptive and explanatory studies were carried out as the research attempted to establish and explain the gender profile in ICT access, application, and attitudes among staff and students at IHEs. Additional reasons for selecting the survey as the most suitable tool for collecting quantitative data were the short period of time required to administer the survey and the relatively low cost means of collecting data.

Apart from the listed advantages of using surveys, the literature draws attention to some of its disadvantages and limitations. De Vaus (1995) classified common criticisms of surveys into categories: philosophical, technique-based, and political. He explained that a survey only examines particular aspects of people’s beliefs, attitudes and actions, not the context in which they occur which may easily lead to misunderstanding of the meaning of behaviour. The survey merely collects “a mass of facts and statistics and provides nothing of theoretical value” (p. 7). In addition, because surveys rely on a highly structured questionnaire, they are too restricted. However, in spite of these limitations, it is believed that the survey was the most suitable tool of data collection in the quantitative strand of the study. The limitations of this tool were partly minimized by combining the quantitative with the qualitative method.

Survey designs are basically of two types, longitudinal and cross-sectional. The two main attributes that distinguish the designs are the points at which data collection takes place and the nature of the sample (Wiersma, 2000). The longitudinal survey design involves collecting observations and measurements through repeated contacts with the same individuals over a longer period of time. This method is used for studying change or status over a period of time. It is a valuable way of studying development; however, it is also extremely time-consuming, costly, and slow in producing results (Burns, 2000).
In contrast to the longitudinal design, the cross-sectional survey design involves collection of data at one point in time, representing some given population at that time (Wiersma, 2000). This design has the advantage of measuring current attitudes or practices. As well, it provides the researcher with information in a short period of time, the time needed for administering the survey and collecting the information (Creswell, 2002).

For the purpose of this study, a cross-sectional survey was utilised. It examined current ICT-related attitudes, beliefs, opinions, and practices of female and male students and academic staff at tertiary institutions. It also provided a comparison in terms of gender similarities or differences.

Using a survey does not require a particular technique of collecting information (Vaus de, 1995). As noted in the introduction to this section, two forms of the survey questionnaire were prepared for the study for each of the groups: staff and students (see Appendix 1 on page 307).

Because the same sets of questions were asked in both modes of delivery the survey, the following section discusses survey questionnaires for students and academic staff as a data collection instrument with subsequent details about each mode of delivery.

Both questionnaires, for students and for academic staff, consisted of three sections with a total number of 55 questions in the questionnaire for students and 52 questions in the questionnaire for academic staff.

The opening section collected socio-demographic information. Although some authors suggest that background questions should come last (Gorard, 2003), they were placed at the beginning of this questionnaire. Demographic questions do not usually offend, and these questions led respondents well into the questionnaire (Burns, 2000).

The second part of both questionnaires invited participants to share their attitudes toward computers and the Internet. The literature shows that attitudes toward computers are generally thought to be composed of two factors: beliefs that the computer is a beneficial tool and beliefs that computers are autonomous entities (Brock & Sulsky, 1994). Some of the statements included in Brock and Sulsky’s attitude scales were also used to develop a scale of attitude towards computers in this study. A narrative listing of items used for the computer attitude scale is presented in Appendix 3 on page 324. For the purpose of clarity, the statements used verbatim from the original scales listed by Brock and Sulsky are marked with shading.
The second part of the questionnaire, the attitude scale, consisted of two parts that measured attitudes towards computers and attitudes towards the Internet. In the first part of the scale, the total number of 18 items was allocated in the following manner:

- Items 1-5: Computer as beneficial tool
- Items 6-10: Computer as autonomous entity
- Items 11-18: Positive and negative attitude toward computers

Similar principles were applied to the development of the second part. The total number of 15 items was allocated in the following manner:

- Items 19-24: Internet as beneficial tool
- Items 25-33: Positive and negative attitude toward the Internet.

The third part of the questionnaire surveyed participants’ experience with computers and the Internet. The questions focused on the practical applications of computers and the Internet in the daily academic routine at tertiary institutions. Fifteen questions were included in this part. It was anticipated that the questionnaire could establish how female and male students and academic staff relate to computers and the Internet (through perceiving it as a beneficial tool as well as an autonomous entity), and in consequence, it could indicate how these notions relate to the actual behaviour of computer and the Internet use.

There are three basic types of survey research questions: close-ended questions, open-ended questions, and semi-close-ended questions (Creswell, 2002). Open-ended questions supply a frame of reference for respondents’ answers, coupled with a minimum of restraint on their expression. The only restriction on either content or the manner of reply is the subject of a question (Burns, 2000). Despite many advantages of this type of survey question, there were only four open-ended questions in the questionnaire. For the rest of the questions, other types were selected as more suitable. It is believed that the benefits of open-ended questions, such as its flexibility and possibility of providing deeper information on the issues studied, was achieved in the qualitative strand of this study.

The most important characteristic of closed-end questions is that possible answers are pre-specified by a researcher and thus known prior to questionnaire administration. The unknown aspect is the frequency with which answers are chosen (Peterson, 2000). Closed-end questions come in a variety of forms. De Vaus (1995) listed the following as the most widely used: Likert-style formats, rating scale, semantic differential formats, checklists, and ranking formats. Except for semantic differential formats, all other forms of closed-end questions were used in the

---

2 Numbering of items in the second part of the attitude scale continues from the first part.
development of the survey questionnaires in this study. The rationale behind selecting closed-end questions is their uniformity of measurement and therefore greater reliability. Closed-end questions also make respondents answer in a manner fitting the response category and are easily coded (Burns, 2000).

Semi-closed-ended questions have all the advantages of open- and close-end questions. The technique is to ask a close-ended question and then ask for additional response in an open-ended manner. Consequently, the question provides the typical response categories to the question and allows participants to write in an answer that might not fit the response choices (Creswell, 2002). As noted earlier, semi-close-ended questions were also included in the survey questionnaires.

5.5.1.2 Web-based Questionnaire

With the rapid increase of Internet access in Papua New Guinea, it was perceived that the Web-based questionnaire would be an attractive way to survey the academic population at tertiary institutions. In addition, an unlimited number of responses could be collected and stored safely.

The survey was hosted at the server of the researcher's home institution. Access to raw data was available only to the researcher for analysis.

According to Couper (2000), one of the biggest threats to interference from Web surveys are coverage error and sampling error. Coverage error arises from the discrepancy between the target population and the frame population. While the target population is understood as the population one wishes to study, the frame population, as defined by Groves (1989), is “the set of persons for whom some enumeration can be made prior to the selection of the sample” (as cited in Couper, p. 467). In relation to this study, a frame population for the Web-based survey includes those who have access to the Internet. Sampling error, on the other hand, occurs when not all members of the frame population are measured. Although the problem is obvious for the Web survey in general, it is not regarded to be a threat to this particular study for the following reasons:

- The target population was clearly defined as students and staff of tertiary institutions with equal access to the Internet for all, if the access was available at the particular institution.
- The Web survey was only one of two modes available for participants willing to take part in the study and therefore those who were not confident with using the Web-based survey had other means of completing the survey available.
At the time of data collection, two of the three universities provided free access to the Internet for students, and the majority of all institutions provided free access to the Internet for faculty members, but no student and only four faculty members chose the Web-based questionnaire over the paper-based one.

5.5.1.3 Reliability and Validity of Quantitative Data Collection

Punch (2003) argued that empirical research should strive for the best possible quality of data; therefore two important concerns should be scrutinised – reliability and validity. Reliability, or consistency, is a central concept in measurement. There are two main dimensions of reliability: consistency over time and internal consistency (Punch, 1998). Consistency over time, also called stability, means that the same instrument provides a similar score when given repeatedly to the same people, under the same circumstances but over a time period. It is assessed with the test-retest approach. If the same individual’s scores are stable when the instrument is administered a second or subsequent time, then a researcher may believe that the instrument is reliable (Jordan & Hoefer, 2001). Although test-retest reliability evidence is appropriate for all types of questionnaires (Thomas, 2004), it also assumes administering the same survey at least two different times. Because questionnaires were administered only once to each participant, consistency over time was not a suitable instrument for measuring reliability. Another approach – internal consistency – was undertaken in this study.

In internal reliability testing, there are two sets of questions that are functionally equivalent. They are administered at the same time, and the answers are compared to see how homogeneous they are across the halves of the instrument (Jordan & Hoefer, 2001). In this study, SPSS, Statistical Package for Social Sciences, was used to assess internal validity of a 32-item scale developed for the survey questionnaire using Cronbach’s alpha technique. The result of the test, an alpha of 0.708 was acceptable for assuming homogeneity of attitude scale items (Burns & Burns, 2008).

Another central concept in measurement is validity whether the data represent what researchers think they represent (Punch, 2003). Burns (2000) distinguished five types of validity: content, construct, predictive, concurrent, and face. Content validity, or evidence that the questions relate to the objectives of the survey, is the type appropriate for most questionnaires (Thomas, 2004).

To ensure content validity of the proposed questionnaires, the questions were scrutinised against the following criteria:

- Does the question clearly link to the objective as intended?
• Do all questions as a whole provide thorough coverage of the topic?
• To what extent will the questionnaire generate data required? (Thomas, 2004, p. 81).

Although the questionnaires were developed using the principles of question construction, they were pilot tested before the actual research commenced. It is believed that pilot testing the questionnaires helped to assess the developed instrument for data collection, and provided feedback on the quality of the questionnaires. The pilot testing exercise followed guidelines provided by de Vaus (1995), evaluating six aspects of individual questionnaire items:

• Variation (To ensure that an appropriate level of variation was achieved)
• Meaning (To ensure that all respondents understood the meaning of questions in the intended way)
• Redundancy (To ensure that there were no questions that measured the same thing)
• Scalability (To ensure that all items included in the scale were relevant)
• Non-response (To eliminate questions that a large number of people refused to answer). (p. 100)

The pilot study also evaluated the questionnaires as a whole. Three qualities were assessed:

• Flow (Checked whether questions fit together, with a smooth transition from one section to the other, etc)
• Timing (Helped to gain some idea of how much time was required to complete the questionnaire, thus providing accurate information to participants)
• Respondent interest and attention (Checked whether greater variety of questions or change in length of questionnaire was required to avoid monotony and loss of interest in the questionnaire by respondents). (p. 103)

Two groups of first- and third-year students at Divine Word University were invited to participate in the pilot study. Because pilot group members provided comments on the questionnaire, they were excluded from the final sample for the study.

The validity of results of surveys depends on the response rate and the quality of response. Response rate is the percentage of the questionnaires that are returned from the participants to the researcher, while quality of response depends on the completeness of data (Wiersma, 2000). A few strategies utilised in the study encouraged a high return rate.

First, the notification posters were sent and displayed in various places not later than two weeks before the research commenced at each of the participating institutions. The content of the poster included information about the purpose and potential value of the research. It was believed that pre-notifying participants and inviting them to take part in the research could motivate them and was an effective practice for enhancing questionnaire response.
Second, efforts were made to design attractive questionnaires with a professional appearance. Some studies demonstrated that the appearance of the questionnaire could enhance or diminish the response rate. Wiersma (2000) argued that over 80% of experts in survey research indicated the appearance factor greatly affected response rate.

Third, the paper based questionnaires were administered in person and collected upon completion.

Finally, colour bookmarks were prepared and distributed to potential and participating respondents. They served to remind participants about the survey and to encourage them to complete it. The bookmarks held brief information about the survey, the researcher’s contact details, and the location of the online survey.

The return rate in the study was very high: 98% of questionnaires distributed among students and 77% of questionnaires distributed among staff members.

5.5.2 The Qualitative Strand Tool

As mentioned in the previous section, the qualitative strand was conducted simultaneously with the quantitative one. Two sources for qualitative data collections were utilised in the study. One source was participant answers to all four open-ended questions in the surveys. The other qualitative data collection tool applied in the study was the semi-structured interview.

5.5.2.1 Semi-Structured Interview

Although interviews build on the rules of ordinary conversation, where people ask questions and listen to the answers, the key dissimilarity of the qualitative interview is that it is a tool of research used intentionally to learn about peoples’ feelings, thoughts, and experiences (Rubin & Rubin, 1995). There are many different types of qualitative interviews. The methodological literature suggests that a continuum of the degree of interview structure exists. The structured interview is at one end of the continuum and the in-depth, or non-structured interview, is at the other; other forms of interviewing lie between these two extremes (Minichiello et al., 1997). For the purpose of this research, the semi-structured interview was selected to collect data.

In the semi-structured interview, also called a focused interview, the researcher uses a broad topic in which she or he is interested to guide the interview. The semi-structured interview “is designed to have a number of questions prepared in advance; they are, however, sufficiently
open that the subsequent questions of the interviewer cannot be planned in advance but must be improvised in a careful and theorized way” (Wengraf, 2001, p. 5).

A number of assumptions supported the selection of the semi-structured interview for data collection. It was believed that it was mutually beneficial to the participants as well as the researcher: it helped the participants to uncover unrecognised feelings through the interview process, while at the same time the researcher gained knowledge of her own “hidden or conflicting emotions” (Marvasti, 2004, p. 21). The method also provided multiple perspectives to the phenomena under study; by providing respondents with a venue where their voices can be heard, the in-depth interviewing had the potential to uncloak multiple and even conflicting attitudes about the given topic.

The interview questions looked for the information regarding the interviewees’ personal experience of using computers and how they saw the role that computers play in their professional career. The questions also sought insights on how computers fit into the matrix of traditional beliefs and values and how ICT influenced participants’ everyday activities.

A copy of the Interview Protocol is included in Appendix 2 on page 322.

5.5.2.2 Reliability and Validity of Qualitative Data Collection

Striving for generalisability and minimisation of bias, qualitative studies emulate the scientific methods. Questions concerning reliability and validity are conjoined with how reliable and valid the data collection process and analysis are. When related to the qualitative research, validity is defined “as the extent to which a set of meanings derived from several interpreters are sufficiently congruent” (LeCompte & Goetz, 1982, as cited in Franklin & Ballan, 2001, p. 273). Reliability denotes the extent to which other researchers would generate similar interpretations while performing similar data collection procedures and analysis. Franklin and Ballan (2001) suggested that one of the ways to circumvent threats to reliability is to provide the reader with explicit details regarding the theoretical perspective and the research design being used. An account of data collection may include criteria for selecting participants, questions to guide the interviews, and the methods of analysis to employ. All these suggestions were followed to safeguard the reliability of the qualitative strand of the proposed research.

The question of validity in the qualitative approach examines a close fit between the data and what people actually say and do. By validity, Hammersley meant “truth: interpreted as the extent to which an account accurately represents the social phenomena to which it refers” (as cited in
Thus, the term validity means using terminology that participants will interpret consistently, based on their perceptions, attitudes, and behaviours.

One way to ensure validity is to avoid errors that are said to make research invalid. Minichiello et al. (1997) name three types of errors:

- believing a principle to be true when it is not;
- rejecting a principle when in fact it is true;
- asking the wrong question. (p. 177)

The wrong question is one that is not understood by the interviewee or one that is regarded by her or him as evidence of misunderstanding on the part of researcher. To avoid asking the wrong question, the pilot study interviews were conducted, and the understanding of significant terms by the researcher and participants was scrutinised.

### 5.6 Data Analysis

Data collected with mixed methods, as used in this project, require mixed methods for their analysis. The literature provides an ongoing debate leading to the assumption that mixed methods offer a more comprehensive analytical technique than either quantitative or qualitative data analysis alone can offer (Miles & Huberman, 1994; Onwuegbuzie & Teddlie, 2003; Punch, 2005). In mixed methods research, the reality under study is examined, analysed, and interpreted using a range of different approaches, thus providing deeper understanding.

Concurrent data analysis was utilised as the mixed method for analysing this study’s data. Although this strategy provides a richer understanding of the variables and their relationships, it also limits the researcher to one type of data analysis, qualitative and quantitative, on each subset of the data (Tashakkori & Teddlie, 1998). Despite this limitation, employment of mixed methods for data analysis in this study complies with the purposes of mixed methods evaluation as outlined by Caracelli and Green (1993):

- triangulation (seeking congruity, corroboration and correspondence of results obtained with different methods studying the same phenomenon),
- complementarity (seeking enhancement and clarification of the results from one method with results from the other method used to measure overlapping but distinct facets of the phenomenon),
- development (using the results from one method to inform or develop the other method),
- initiations (recasting questions or results from one method type with questions or results from the other method type to add depth and breadth to inquiry)
- expansion (seeking to enlarge the breadth and range of inquiry by casting method types for different inquiry components).

As illustrated in Figure 5.2, for the purpose of concurrent data analysis, the quantitative and qualitative data sets were recorded and analysed with different techniques suitable for each of the datasets. Because there is no program that provides a comprehensive set of tools to record and handle both types of data present in mixed methods research (Bazeley, 2003), two different research software applications were used for qualitative data recording and analysis and for quantitative (statistical) analysis of numerical data: NVivo was used to transcribe, handle, and analyse text data; SPSS was used for numeric scores of quantitative surveys. Within the qualitative strand, thematic networks were employed as an analytical tool; statistical tests were used to analyse numeric data. They are further discussed in the following sections.

![Figure 5.2 Overview of data analysis approaches](image)

### 5.6.1 Quantitative Data Analysis

Quantitative data collected through survey questionnaires were recorded and analysed with the statistical software package. Oates (2006) described quantitative data as evidence based on numbers. To analyse such data means to “look for a pattern in the data and draw conclusions” (p. 245). Statistics provides a wide range of established techniques for quantitative data analysis. It offers a “universal means and criteria for evaluating key points and making generalized conclusions based on the evidence” (p. 254). Guided by research questions and type of generated data, several statistical tests were used in the data analysis process.
Cross-tabulation, also called contingency tables, was used to observe relationships between variables. A contingency table is “a two-dimensional table showing frequencies in each combination of categories for two dichotomous nominal variables” (Burns & Burns, 2008, p. 324). A Chi-square test, a non-parametric test of significance, was used with contingency tables to establish the independence or association of frequency counts in various categories.

Another statistical test used in the quantitative analysis was the Analysis of Variance (ANOVA) test. The purpose of ANOVA is “to decide whether the differences between means of observations is simply due to chance (random sampling error) or whether there are systematic effects that have caused scores of observation in one or more groups to be statistically significantly different from those in other groups” (Burns & Burns, 2008, p. 285). The test was run to determine whether the observed differences in application of computers between university students and OIHEs students were due to chance or to systematic effects.

A Factor Analysis technique was applied to derive and describe participants’ attitudes towards computers and the Internet from 32 scale items. This major technique in multivariate statistics demonstrates which variables clump together to form super-ordinate variables. It is achieved by attempting to identify a simple pattern in a more complex pattern of relationship among variables by placing together closely related individual items to form a theoretical construct or factor (Burns & Burns, 2008).

Explanatory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA) are closely related. EFA is exploratory in nature; “CFA aims to confirm theoretical predictions, testing whether a specified set of constructs is influencing responses in a predicted way” (Burns & Burns, 2008, p. 443). EFA was selected for analysing data collected in this research survey questionnaire.

A given set of correlations has an infinite number of factor solutions. One of them is Principal Component Analysis (PCA), which is “a way of identifying patterns in data, and expressing the data in such a way as to highlight their similarities and differences” (Smith, 2002, p. 13).

The PCA in an EFA was selected for the purpose of data analysis in this study. The rationale behind the choice followed the argument developed by Burns and Burns:

- There were too many (32) variables in the scale; therefore, data reduction was necessary to reduce the number of variables for analysis without any loss of information contained in all.
- The purpose of analysing this part of the questionnaire was to identify the nature of the construct influencing participants’ responses.
• Research sought to discover the nature of the constructs underlying attitudes expressed toward computers and the Internet – a basis of construct validity.
• The PCA generated “factor scores” representing values of the underlying constructs that were used in other analyses, such as comparing gender differences in computer and Internet attitudes (Burns & Burns, 2008, p. 444).

There are two different methods in PCA, correlation and covariance, both of which were used in this study. The results were similar; only the order of the components varied slightly in importance. The results discussed in the Findings chapter were derived with the PCA correlation method.

Another test used in the quantitative data analysis was the independent t-test. The aim of the test is to determine whether “two groups differ significantly or not” (Burns & Burns, 2008, p. 261). The test was conducted to evaluate the hypotheses that the female and male students differ significantly in their attitudes towards technology.

Because the assumption for the parametric t-test could not be met for the staff data set, the Mann-Whitney U test was used to evaluate the hypothesis that the female and male staff differed significantly in their attitudes towards technology.

For all tests applied, required test assumptions were met. The results of statistical tests are presented in Chapter Six Research Findings. Charts, boxplots, and error bars were used to visualise test results.

5.6.2 Qualitative Data Analysis

The growing popularity of qualitative research, valued for its richness and complexity, has led to its use in a wide spectrum of research themes, and to multiple perspectives and practices for analysing data that attempt to describe different aspects of social life (Punch, 2005). The purpose and, at the same time, the challenge of qualitative analysis is to make sense of data (Patton, 2002), or, as expressed by Richards and Morse (2007), to make data. “Making data is a collaborative, ongoing process in which data are interactively negotiated by the researcher and participants; the data are rarely fixed and unchanging ... making data is complex” (p. 107, original emphasis).

“Transcendental realism”, the Miles and Huberman’s (1994) framework for qualitative data analysis, has been adopted for the purpose of this study. With the assumption of knowledge
being a social and historical product, Milles and Huberman’s data analysis framework aims to “account for events rather than simply to document their sequence” (p. 4) with the purpose of revealing “individual or social process, a mechanism, a structure at the core of events that can be captured to provide a causal description of the forces at work” (p. 4). The analysis is “directed at tracing out lawful and stable relationships among social phenomena, based on the regularities and sequences that link these phenomena” (Punch, 2005, p. 197). As presented in Figure 5.3, the paradigm has three main streams of data analysis: data reduction, data display, and drawing and verifying conclusions that together with data collection activities “form interactive, cyclical process” (Miles & Huberman, 1994, p. 12).

![Figure 5.3 Qualitative data analysis framework](image)

Employing Miles & Huberman’s data analysis framework and its three concurrent components brought order and meaning into the data collected.

### 5.6.2.1 Process of analysis

The process of data reduction, as all in other streams of data analysis, occurs continually throughout the analysis process. In order to ensure that meaningful and useful results were yielded from the data under scrutiny, the researcher adopted thematic networks as an analytic method. It is a flexible analytic tool that draws on core features common to many approaches in qualitative analysis, including Miles and Huberman (Attride-Stirling, 2001). Using thematic networks is “a way of organizing thematic analysis of qualitative data with the web-like network as an organizing principle and a representational means” (pp. 387-388) to move from text to interpretation. Applied in thematic networks, thematic analysis is seen by some qualitative researchers as a “foundational method for qualitative analysis for its thematizing meanings” (Braun & Clarke, 2006, p. 77) skills widely used across qualitative analysis. One of the reasons for
the use of thematic analysis in this study was its flexibility and compatibility with the constructionist paradigm. With constructivist epistemology underpinning this research, thematic analysis was used to examine “the ways in which events, realities, meanings, experiences and so on are the effects of a range of discourses operating within society” (p. 82).

The full process of data analysis with the thematic analysis networks consists of three major stages: (1) the reduction and breakdown of text, (2) the exploration of text, and (3) the integration of the exploration (Attride-Stirling, 2001). An overview of steps involved in each of the analyses stages is listed in Figure 5.4.

![Figure 5.4 Stages and steps in the qualitative analysis employing thematic networks](image)

**Figure 5.4 Stages and steps in the qualitative analysis employing thematic networks**

*Adopted from Attride-Stirling, 2001, p. 390*

**Stage 1: Reduction and breakdown of text.** The first stage in thematic networks analysis is the reduction of the volume of raw data collected and breakdown of text. As presented in Figure 5.4, it was achieved in three steps: (1) by coding material, (2) identifying themes, and (3) constructing thematic networks.

*The Coding Manual for Qualitative Researchers* describes a “code as a word or short phrase that symbolically assigns a summative, salient, essence-capturing, and/or evocative attribute for a portion of language-based or visual data” (Saldaña, 2009, p. 3). Coding in qualitative data analysis aims to “describe faithfully important details of the phenomenon and to organize the data” (Brent & Slusarz, 2003, p. 284) in order to identify themes. As Boyatzis (1998) summarised, “a good thematic code is one that captures the qualitative richness of the phenomenon. It is usable in the analysis, the interpretation, and the presentation of research” (as cited in Neuman, 2006, p. 461). The researcher’s challenge is “to see and recognize themes in the data” (p. 461). In line with the selected hybrid approach to theme identification, the coding framework in this research
was devised “on the basis of the theoretical interests guiding the research questions as well as on the basis of the issues that arise in the text itself” (Attride-Stirling, 2001, p. 390). In the coding process, 263 codes were identified and applied to the body of qualitative data. They were organised into eight groups (see Figure 5.5) that reflected and complemented the research questions.

![Tree Nodes](image)

**Figure 5.5 Parent nodes containing codes in the NVivo application**

The second step in the reduction stage involved the identification of themes. Ryan and Bernard (2003) defined a “theme as conceptual label placed on discrete happenings, events, and other instances of phenomena” (p. 87). As a “classification of more discrete concepts” (p. 87), it is a natural way to connote the fundamental concepts that the researcher attempts to describe. There are two ways to identify themes: in an inductive or “bottom up” way, or in a theoretical or deductive or “top down” way. In the first approach, the themes are identified in the raw data by analysing the core content of data “to determine what’s significant” (Patton, 2002, p. 463). The second approach draws from the researcher’s theoretical or analytical stands and thus it is “more explicitly analyst-driven” (Braun & Clarke, 2006, p. 85). A hybrid approach of inductive and deductive theme development was applied to qualitative data analysis in this research. The inductive part of the approach allowed for themes to emerge directly from the data. The deductive part included themes originating in the theoretical framework, as well as ones that surfaced in the quantitative analysis. As a result, the selected hybrid approach complemented the research questions and kept the focus of data analysis on them (Fereday, 2006).

During the second step of analysis, illustrated in Figure 5.6 that shows the beginning of the working table, codes were grouped into clusters. During re-reading of codes’ text segments, various issues were identified from which themes (Basic Themes) were identified.
Figure 5.6 Reduction and breakdown of text: excerpt from codes to themes step

The third and final step in the reduction and breakdown of text stage of data analysis is constructing thematic networks. In this step, themes identified earlier become the fountainhead for emerging thematic networks. Attride-Stirling (2001) observed that the objective of this step is to “summarize particular themes in order to create larger, unifying themes that condense the concepts and ideas mentioned at a lower level” (p. 392). In the process of constructing a thematic network for the project, originally identified themes were arranged into Basic Themes. Basic Themes were then rearranged into Organising Themes, which are “proposition, argument, assertion or assumption” (p. 393) underlying Basic Themes. Organising Themes are unified by a “principal metaphor that encapsulates the main point in the text” (p. 393) into Global Themes. The process of working with Themes, from Basic Themes into Global Themes, is illustrated in Figure 5.7 which shows a fragment of the developed table.

<table>
<thead>
<tr>
<th>Basic Themes</th>
<th>Organizing Themes</th>
<th>Global Themes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Two different types of society in PNG: patrilineal and matrilineal.</td>
<td>Women's traditional roles</td>
<td>ICT and women's issues</td>
</tr>
<tr>
<td>2. In the matrilineal society women were in the center of clan.</td>
<td>Women's inferiority</td>
<td></td>
</tr>
<tr>
<td>3. Inpatrilineal society women were subordinate to their husbands and had no rights.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Main role of women was to provide for family.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Most of the time women spent attending to household chores.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Women are expected to remain submissive to men and in consensual do role for men.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 5.7 Reduction and breakdown of text: excerpt from Basic to Global themes step

There were six Global Themes identified in the qualitative data:

- Disparities in the access to technology
- Issues in ICT application
- Attitudes towards technology
Each of the Global Themes produced a thematic network. A sample of a thematic network, the thematic network for the global theme ICT and women’s issues, is presented in Figure 5.8.

Stage 2: Exploration of text. This stage covers two next steps in the analysis. The first one involves describing and exploring the networks where analysis brought the researcher back to the text to read it again through the Global Themes, Organising Themes, and Basic Themes. In the process, the patterns that underlined themes emerged and were explored further. In the second step of this stage, summarising thematic networks, patterns that emerged in the previous steps were further explored and made explicit.

Stage 3: Integration of exploration involves interpretation of patterns. It brought together the deductions in the summaries of all the networks and “these deductions and the relevant theory, to explore the significant concepts, patterns and structures that arose in the text” (Attride-Stirling, 2001, p. 394). The aim of this step was to review issues that emerged through the research questions and the lens of the theories that constitute the theoretical framework for the study.
5.7 Integrative Framework for Validity Claim of Mixed Methods

Evaluation of mixed methods is a prerequisite for good research as a disciplined form of inquiry. A validity claim in this mixed methods research is made with an integrative framework for inference quality as developed by Tashakkori and Teddie (2008).

The quality and transferability of inferences in mixed methods is considered by some scholars as “a vehicle for improving the quality of inferences that are potentially obtainable from either QUAL or QUAN strands of a study” (Teddlie & Tashakkori, 2009, p. 295). However, because of the ongoing discussion in the literature on whether it is possible to successfully integrate qualitative and quantitative approaches in one successful project, Tashakkori and Teddie (2008) proposed an integrative framework for “inference quality” (p. 101) – a term that enhances the process and the outcome of evaluating the quality of conclusions that are made on the basis of the findings in a study. A meta-inference – an overall conclusion and understanding “developed through an integration of the inferences obtained from the qualitative and quantitative strands of study” (p. 101) – addresses both exploratory (e.g., What is a gender profile of access, application, and attitudes towards ICT in IHEs in Papua New Guinea?) and confirmatory (e.g., Can ICT empower PNG women?) questions of the research and therefore provides perspective that neither the qualitative nor quantitative approaches could do alone. The two leading criteria in evaluating the quality of inferences are design quality and interpretive rigor.

“Design quality” refers to the degree to which the researcher has selected and implemented the most appropriate procedures for answering the research questions (Teddlie & Tashakkori, 2009). Design quality is assessed on the following criteria: design suitability (also known as translation fidelity), design fidelity/adequacy, within-design consistency, analytic adequacy. It is believed that the design quality of this research has been achieved. All efforts were made to ensure that the appropriate procedures were selected to answer the research questions. From the first step of defining the theoretical framework, through selection of research methodology, sampling, data collection instruments, and data analysis and interpretation, each step was informed and justified with appropriate literature. The research results were incorporated into a conceptual framework to answer the research questions. Integration of the inferences drawn from multiple strands of mixed methods study does not require an implied or actual agreement (consistency) of the inferences. Inconsistency between two (or more) sets of findings, as presented in Chapter Six Research Findings, provides information that would otherwise be lost (i.e., not uncovered) if only one type of study were used. Figure 5.9 illustrates how each element of the research process fits into the whole study process.
“Interpretative rigor” refers to the degree to which credible interpretations have been made on the basis of obtained results (Teddlie & Tashakkori, 2009). The criteria of interpretative rigor are: interpretative consistency, theoretical consistency, interpretative agreement, interpretative distinctiveness, and integrative efficacy (Tashakkori & Teddlie, 2008).

Every effort was made to achieve interpretative rigor. Conclusions presented in the Chapter Six Research Findings follow results of both qualitative and quantitative analysis. The inferences are consistent with the type of evidence demonstrated. To ensure theoretical consistency, inferences were validated with current theories in the field and with empirical findings of other studies. The results are presented in two discussion chapters: Chapter Seven Discussion of the Findings Through the Lens of Research Literature and Chapter Eight Discussion of the Findings Through the Lens of Theoretical Framework.

5.8 Ethical Issues

Research that involves the use of human participants raises some important ethical considerations. The section discusses ethical issues pertinent to this study.

Privacy and confidentiality are recognised as two of the most important ethical issues in social research. Folkman (2000) argued that “respect for privacy and confidentiality is at the heart of the conduct of ethical research with human participants” (p. 49). A right to privacy of participants is protected by the right to refuse to participate in research or to answer questions and is an essential part of informed consent, which will be discussed in a subsequent part of this section. A researcher protects the privacy of participants by not disclosing their identity after the information is collected. This takes two forms, anonymity and confidentiality (Neuman, 2000). For this research, anonymity was offered as a means of protecting the rights of participants in the
quantitative strand of this study. The paper-based surveys were anonymous. No questions unveiled the identity of participants or educational institutions.

As for the Web-based survey, the ethical guidelines set by the European Society for Opinion and Marketing Research (ESOMAR) were applied. ESOMAR is an international association that promotes the development and use of marketing, social, and opinion research, as recognised forms of scientific endeavour, and as an important basis for effective management decisions in the public and private sectors alike. It also establishes a code of ethical practice and professional standards (European Society for Opinion and Marketing Research, 2005).

Privacy and confidentiality pertain to an informed consent agreement. Sieber (1992) defined voluntary informed consent as a continuous, two-way communication process between participants and researcher, as well as a specific agreement about the research conditions. The author pointed researchers’ responsibility to provide participants with all necessary information pertaining to the study before the consent to participate is given. Fischman (2000) outlined the list of elements that informed consent should include: “a clear statement of the purposes, procedures, risks, and benefits of the research project, as well as the obligations and commitments of both the participants and the researcher” (p. 35).

Voluntary informed consent was sought from all people invited to participate in the study. Steps were undertaken before the invitation was issued to ensure that everyone involved in the study received information enabling them to give informed consent. Information about the research was circulated in the form of a poster placed on student and staff notice boards in the institutions selected for the study at least two weeks prior to commencement of data collection. The poster information explained the purpose of the study, the anticipated outcome of the project, and possible benefits from the research to the participants. It also described methods involved in the data collection and procedures undertaken in order to assure confidentiality and anonymity of participants. The information on the poster indicated clearly that participation in the research was strictly voluntary. It ended by explaining whom to contact for answers to pertinent questions about the research and participants’ rights, and an invitation to participate in the research. Similar information was formulated into a voluntary consent form, which is a written document attesting to the fact that participants are informed about the study for which they are volunteering (Fischman, 2000). A brief version of the poster information was also placed on the title page of the paper and Web surveys.
In terms of obtaining consent from participants, different approaches are a common practice in each of the methods. In the quantitative strand of study, the returning of a completed survey was considered as giving consent. In the qualitative strand of study, participants were asked to sign the consent form before the interview commenced; a copy of the form was given to participants and a copy retained by the researcher. All participants who consented to the study were issued a bookmark with information about the research, the researcher’s contact details, and the location of the Web-based survey. A copy of the consent form is included in Appendix 4 on page 327.

Divine Word University (DWU) guidelines for academic research were observed. Following the policy regulations, safeguards were planned and observed to protect confidentiality. All collected data were secured in a locked filing cabinet in the Research Centre at DWU with the researcher having the only access to it. In terms of data collected in interviews, an additional step was undertaken to protect the privacy of participants: the identifying details of all participants were coded.

Other important ethical considerations of this research resulted from the educational institution environment of the study. The first issue, which is antecedent to the one described previously in this section, is one of gaining access to a site through what might be called “the site’s ‘gatekeeper’” (Wiersma, 2000, p. 418) and of respecting the site where the research takes place (Creswell, 2002). Therefore, permission to conduct the study was obtained from the approving body of each IHE selected for the research as well as lecturers-in-charge of sample groups. A sample of a letter of request sent to the heads of the selected IHEs is included in Appendix 5 on page 329. Taking into account different levels of ICT proliferation at tertiary institutions and to avoid comparisons between specific places, it was ensured that no information was included to indicate directly the origin of the data, except for a general statement such as university or OIHE.

Another issue involved in research conducted in an educational setting is role conflict for the research-lecturer. Sales and Lavin (2000) argued “that given the disparities of power between teachers and students and the related potential for abuse of this power, people who are researchers and teachers may either intentionally or unintentionally find themselves in situations of conflicting interests” (p. 111). Keeping in mind the possibility of role conflict in the research conducted by a lecturer, it was decided not to include students whom the researcher was teaching at the time the research was conducted at DWU.
5.9 Limitations and Delimitations

Every study has potential weaknesses or problems as identified by the researcher. Limitations are “uncontrollable threats to the internal validity of a study” (Ellis & Levy, 2009, p. 332), i.e., problems beyond the researcher’s control. Delimitations are “factors, constructs and/or variables that were intentionally left out of the study” (p. 332), research issues within the researcher’s control and considered in the research process.

The biggest limitation of this study has been the time factor. The researcher was limited in her data collection activities because the study was undertaken in part-time mode while she was employed as a full-time lecturer at university. Her professional obligations restricted data collection activities to study breaks; therefore, the whole process of visiting five other IHEs scattered in different parts of the country took two years. Two years is a long period of time in research that involves technological advances. The researcher is conscious of further implications of the time factor, namely that the level of ICT proliferation in all IHEs could have changed considerably before the results of this data analysis were presented.

The other big limitation of this study has resulted from limited access to scholarly library resources in PNG academic institutions. Although the researcher has made every effort to overcome this constrain, especially by using technology to access digital research repositories and databases, she is mindful that the quality and extent of literature review might have been compromised.

The selection of research sites was guided by such factors as accessibility and security. Papua New Guinea has some of the most expensive air travel in the world; therefore, two research sites were chosen in Madang, the residential town of the researcher, two sites in the Highlands region accessible by road, and two sites in Port Moresby, the capital city, accessible only by aeroplane.

One possible delimitation of the study is the fact that only faculty members were invited to participate in interviews. A number of issues contributed to such a decision. First, ICT proliferation at a majority of the IHEs was relatively low; therefore, it was assumed that the majority of students would not have an adequate level of experience to provide meaningful information related to the purpose of the study. Second, long distances between institutions and short periods allocated for visits to research sites made it impractical for the researcher to identify possible student participants prior to commencing data collection activities in a certain site.
5.10 Overview of the Research Design

As established in the course of this chapter, the research design has been developed within constructivist epistemology. A multi-paradigmatic approach was adopted with three leading theories of social constructivism, feminism, and postcolonialism, used to facilitate the investigation of how ICT through higher education can contribute to the empowerment of women in Papua New Guinea. A mixed methods paradigm was adopted to provide, as much as possible, holistic understanding of the issue under the study. The data collection and data analysis were conducted concurrently. Table 5.4 provides an overview of the research design.

Table 5.4 Overview of the research design

<table>
<thead>
<tr>
<th>Research Question</th>
<th>Data Collection Instruments</th>
<th>Participants</th>
<th>Timeline</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. What is an ICT profile of higher education institutions in Papua New Guinea?</td>
<td>Questionnaires</td>
<td>Faculty members</td>
<td>June, September 2007 and 2008</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Students</td>
<td></td>
</tr>
<tr>
<td>2. What are the gender-based issues in the access to, attitude, and use of ICT among students and staff of higher education institutions in Papua New Guinea?</td>
<td>Interviews, Questionnaires</td>
<td>Faculty members</td>
<td>June, September 2007 and 2008</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Students</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Students</td>
<td></td>
</tr>
<tr>
<td>4. What is the role of ICT in women’s empowerment through education?</td>
<td>Interviews, Questionnaires</td>
<td>Faculty members</td>
<td>June, September 2007 and 2008</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Students</td>
<td></td>
</tr>
</tbody>
</table>

This chapter presented and discussed in detail all considerations pertaining to the research design. It outlined a quadripartite research model for the project and staged the discussion on a multi-paradigmatic approach employed for the study. Each of the sections introduced different issues in research methods application: different techniques of data collection, analyses, and interpretation were recounted, and justification for their adoptions was provided.
CHAPTER SIX
RESEARCH FINDINGS

This chapter presents the research findings of this study which are a prerequisite to better appreciate the theme of the thesis. This chapter commences by profiling ICT in higher education institutions in Papua New Guinea. Then, it discusses three different gender-related aspects of ICT issues. First, it measures access to ICT available to female and male faculty members and students. Second, it assesses the application of ICT by these groups. Third, it gauges attitudes toward ICT. The final section unveils women’s issues in ICT as perceived by research participants.

6.1 ICT Profile of Institutions of Higher Education in Papua New Guinea

This section presents a comprehensive profile of ICT application in IHEs in Papua New Guinea. With an overview of ICT exposure at research sites, it commences with an account of the level of accessibility and application of computers and the Internet among students and academic staff at different tertiary institutions. It then proceeds with a detailed report of attitudes and beliefs about technology. Finally, it concludes with a discussion about the role of ICT in the higher education context. Such an overview of computers and Internet application becomes the framework for further discussion of gender-related issues in different aspects of human interaction with ICT in IHEs.

6.1.1 Research sites

The study included six IHEs, the names of which are not revealed for reasons discussed in the Ethical Issues section in Chapter Five, Research Design. They are simply referred to as Universities (Uni1, Uni2 and Uni3) and Other Institutions of Higher Education (OIHE1, OIHE2 and OIHE3).

At the time of this study, universities and OIHEs had noticeable differences in the institutional provision of ICT services. Uni2 and Uni3 had two student computer labs: one for mainly teaching purposes and available to students for their own work outside scheduled sessions and the other computer lab mainly for students’ access. Uni1 had 4 computer labs and more computers available for students in the library; the student-computer ratio was 3 to 1. Uni1 and Uni3 provided limited access to the Internet, and Uni2 had no free Internet access for students. At all universities, each faculty member had their office computer and limited access to the Internet.
Much less favourable was the provision of ICT services at the three OIHEs. Although each institution had one student computer lab, students had access to computers only during lab sessions (1 or 2 hours per week). None of the OIHEs provided free access to the Internet for students. Faculty members had access to computers in the staff room with a limited number of desktop computers and no or very limited access to the Internet. Some faculty members admitted having no experience of the Internet.

The following sections recount access, use, and attitude to ICT in IHEs based on data derived through the survey questionnaire. Because there were only two questions related to access to computers, the results are presented here with the data related to the application of computers. The results are presented separately for staff and students at universities and OIHEs. The final section provides qualitative discussion that complements statistical findings in regard to the presence of ICT in PNG higher education. Not all students answered every question in the survey questionnaire; thus, the different respondent numbers with the percentage differences are reported below.

### 6.1.2 Access and application of computers among students

This section explores the extent of access to, and usage of, computers in IHEs in Papua New Guinea. It considers issues of availability of computers and personal experiences of using computers in an academic environment.

As indicated earlier, there was a clear disparity in ICT proliferation at different IHEs. University students had relatively easy access to computers; OIHE students had very limited access, mostly restricted to scheduled sessions. In order to better understand students’ accessibility to computers, the participants were asked if they owned a computer. There was no significant difference between participants from different institutions: 35% of university students and 38% of OIHE students claimed ownership of a computer (Figure 6.1). The slightly higher percentage of students at OIHEs having computers of their own may be due to lower institutional exposure to computers at OIHEs. Because these institutions did not provide an adequate number of computers, the students obtained their own if they could afford to do so.
Among 893 students who answered the question (578 at universities; 315 at OIHEs), 36% reported that they own a computer (35% at universities; 38% at OIHEs). A Chi-square test revealed that the difference between participants from the two types of institutions was not significant ($\chi^2(1) = 0.781$, $p = 0.377$). Thus, student's owning a personal computer is not dependent on the type of institution where they study.

The results of a Chi-square test revealed a statistically significant difference between students from the two different types of institutions. University students were more likely to use computers more often than OIHE students ($\chi^2(4) = 98.863$, $p < .001$).

The consequence of difference in institutional exposure to technology described earlier was demonstrated in the frequency of computer access and amount of time spent by students working with computers. University students accessed computers more frequently (Figure 6.2). Of the university students, 51% used computers every day, while only 20% of OIHE students had an opportunity to work with computers daily. As much as 12% of students at OIHEs and 6% at universities accessed a computer less than once a month. The relatively high percentage of university students who accessed computers less than once a month could be related to their health-related aversion to computers, as recounted in the Attitudes toward technology section in this chapter.

To further explore the extent of daily use of computers, participants were asked about the time they spent working with computers. Interestingly, the differences were not as significant as in relation to access to computers. 56% of university students and 53% of OIHE students spent 1 to 3 hours on average per day using computers; however, students from universities were more likely to use computers for a longer period of time per day (Figure 6.3).
The results of a Chi-square test revealed a statistically significant difference between students from two different types of institutions of higher education in regard to the amount of time they spent using computers on an average day. University students from universities were more likely to use computers for a longer period of time on a single day than OIHE students ($\chi^2(3) = 27.783, p < .001$). A Chi-square test revealed no significant difference between participants from the two types of institutions in relation to the amount of time they spent using computers for either academic or entertainment, or both academic and entertainment, purposes ($\chi^2(2) = 0.842, p = 0.656$). Thus, students at all surveyed institutions used computers mainly for academic purposes.

In addition to questions related to access to computers, the survey explored the applications to which computers were put. The participants were asked to summarise the main purpose of their time spent using computers: mainly for academic purposes, mainly for entertainment purposes, or equal time for both purposes. Almost half (45%) of all participating students ($n = 873$) declared that they used computers mainly for academic purposes. Only 17% of participants admitted using computers mainly for entertainment purposes. The remaining 38% claimed they spent equal amounts of time for academic as well as entertaining purposes. Similar results were obtained for both types of educational institutions (Figure 6.4).

What people might believe about their behaviour is not always what they do in reality, as pointed out by Wajcman (1998), who observed that although women and men managers claimed to have different managerial styles, there was no systematic gender differentiation in practice (as cited in Deem, 2002, p. 840). Thus, further tests were run to explore if students’ beliefs about their use of computers matched their practice. Participants were given nine options that described some possible academic and entertainment activities on the computers, with an option to include activities other than suggested. A principal component analysis (PCA) test was used to determine
students’ main activities on a computer. Two main factors\(^3\) were deemed important, supported and attested to by students as their main purposes of computer use. Students claimed they used computers for academic purposes first and entertainment purposes second (Table 6.1).

**Table 6.1 Three main components resulting from a PCA test that depict students’ main activities when using a computer**

<table>
<thead>
<tr>
<th>Rotated Component Matrix a</th>
<th>Component</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Listening to music</td>
<td>.861</td>
</tr>
<tr>
<td>Playing games</td>
<td></td>
</tr>
<tr>
<td>Reading lecture notes</td>
<td>.754</td>
</tr>
<tr>
<td>Reading literature</td>
<td>.685</td>
</tr>
<tr>
<td>Reading PPTs</td>
<td>.723</td>
</tr>
<tr>
<td>Searching for new</td>
<td>.619</td>
</tr>
<tr>
<td>information</td>
<td></td>
</tr>
<tr>
<td>Watching videos</td>
<td></td>
</tr>
<tr>
<td>Writing assignments</td>
<td>.432</td>
</tr>
<tr>
<td>Writing letters to friends</td>
<td>.519</td>
</tr>
<tr>
<td>Other activities -</td>
<td></td>
</tr>
<tr>
<td>creating pictures</td>
<td></td>
</tr>
<tr>
<td>Other activities -</td>
<td></td>
</tr>
<tr>
<td>typing lecture notes</td>
<td></td>
</tr>
<tr>
<td>Other activities -</td>
<td></td>
</tr>
<tr>
<td>computer self-training</td>
<td></td>
</tr>
</tbody>
</table>

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 4 iterations.

*Note.* A PCA with subsequent rotation (Varimax) was conducted for 12 items of a list of possible activities on a computer. Many correlations were in excess of .03 and both KMO (KMO measures .753) and Bartlett’s tests (\(p = .000\)) produced criteria that supported the application of PCA. The commonalities varied from .744 to .215. The three components were deemed important. Factor 1 was loaded on 6 items that reflected using computers for academic purposes and accounted for 24.1% of variance. Factor 2 was loaded on 2 items that indicated the use of computers for mainly entertainment purposes and accounted for 14.4% of variance.

Further tests run on both factors questioned previous findings that the application of computers in both types of IHEs did not differ. An Independent T-test shows statistically significant differences between students’ main purposes of using computers at both types of institutions Factor 1 [Computers are used mainly for academic purposes]: \(t(868) = 7.582, p < 0.001\); Factor 2 [Computers are used mainly for an entertaining purposes]: \(t(868) = -3.856, p < 0.001\). University students were more likely to use computers for academic purposes (Figure 6.5); OIHE students were more likely to use computers for entertainment purposes (Figure 6.6). An ANOVA test was run to validate the results. The test results (\(F(1) = 57.493, p < 0.001\)) confirmed a statistically significant difference between groups as to their main purpose for using computers.

\(^3\) Factor 3 was loaded on items added by 3% of participants only; therefore, it is not considered representative for the entire population and is not included in the further analysis.
The distribution of Factor 1 was significantly different for both groups ($p < 0.001$). University students were more likely to use computers mainly for academic purposes ($n = 568, \bar{x} = 0.1816, s = 1.0083$) than OIHE students ($n = 302, \bar{x} = -0.3416, s = 0.8901$).

Finally, students were asked about their favourite software application. Entertainment software was selected as the most favoured by 29% of OIHE students and 19% of university students. The second most favoured were word processing applications, by 28.5% of university students and 25% of OIHE students (Figure 6.7).
two types of institutions \(\chi^2(9) = 46.796, p < 0.001\). Thus, it can be claimed that students’ software application preference depends on the type of institution.

It is argued that one cause of the reported results about the use of computers was unequal institutional exposure to ICT. On the one hand, universities provided more computers for students’ use in student computer labs and had a clear policy of computers being used for academic purposes only. The public character of student labs also made them more likely to be used for academic purposes only. On the other hand, as reported earlier, with lower exposure to ICT at the institutional level, a higher percentage of OIHE students owned a computer. The more private character of computer use contributed to the fact that OIHE students were more likely to spend more time using computers for entertainment.

In summary, this section explored the extent of access and the application of computers by students at tertiary institutions. Statistical results revealed significant differences between students from universities and those from OIHEs. The university students used computers more often and for a longer period of time, and they were more likely to use them for academic purposes.

6.1.3 Access and application of computers among faculty members

To complete the sampled profile of ICT availability and use in IHEs in Papua New Guinea, the following section explores ICT access and personal experiences of faculty members at universities and OIHEs. Not all academic staff members at tertiary institutions had equal access to computers. As stated at the beginning of this chapter, universities provided a personal computer for each faculty member, while OIHE staff accessed computers in a common room with a limited number of desktop computers. The following discussion will look into the issue of availability and use of computers by academics. However, in order to accommodate different institutional arrangements, findings are presented separately for staff from universities versus from OIHEs.

In order to better understand staff accessibility to computers, the participants were asked if they owned a computer. Participants from different types of institutions showed a significant difference \(\chi^2(1) = 18.141, p < 0.001\). As much as 88% of university lecturers but only 33% of OIHE lecturers claimed to own a computer. The differences between the academic staff from both types of institutions continued in the frequency of computer use, with the university staff making more frequent use of computers. Of the university faculty members, 92% claimed usage of computers every day, while only 47% of OIHE faculty staff accessed computers daily (Figure 6.8).
The results of the Chi-square test revealed a statistically significant difference between the academic staff from two types of higher education institutions. University faculty members were more likely to use computers more frequently than OIHE academic staff ($\chi^2(3) = 16.078, p < .001, n = 644$).

The Chi-square test confirmed the significant difference in the amount of time computers were used by the academics at universities and OIHEs ($\chi^2(2) = 9.772, p = .008, n = 64$). The university staff members were more likely than OIHE staff to spend more time using computers.

To further explore the extent of daily computer use, participants were asked about the time they spent working with computers. The differences between staff from different tertiary institutions continued. While 45% of the university academics spent more than 5 hours using computers, 47% of the OIHE academics spent between 1 to 3 hours (Figure 6.9).

In addition to questions relating to access of computers, the survey explored the way the computers were used. The participants were asked to summarise the main purpose of their time spent using computers: mainly for academic purposes, mainly for entertainment purposes, or equal time for both purposes. Despite differences in the accessibility to computers (reported above), 87% of university lecturers and 73% of OIHE lecturers claimed to be using computers mainly for professional purposes (Figure 6.10).
A Chi-square test revealed no significant difference in the purpose of computer usage at different institutions of higher education ($\chi^2(2) = 3.175$, $p = .204$, $n = 64$). Both groups indicated using computers for mainly academic purposes.

A Chi-square test confirmed a significant difference between the university and OIHE academics in the use of computers for research related activities ($\chi^2(1) = 4.905$, $p = .027$, $n = 64$). The university faculty members were more likely to use computers for research activities.

When examined further, all participating staff members indicated using computers for mainly academic activities: 92% of staff was using computers to prepare lecture notes, 75% to do research, and 56% to do administrative work. Other than the academic activities that attracted them, academics were listening to music (30%), playing games (20%) and watching videos (11%). Except for one activity (doing research, see Figure 6.11), there was no significant difference in the way staff from different institutions used computers.

When asked about their favourite software package, faculty members across institutions indicated word processing (65%), web browser (10%), communication (6%), presentation (6%), and spreadsheet packages (6%). Again, there were no significant differences between institutions in the choice of favoured software package.

In summary, the study explored the tertiary institution academics’ access and use of computers. There was a significant difference in institutional exposure to technology with universities providing easier access than OIHEs to computers for staff members. Consequently, academics at universities accessed computers more frequently and spent more time using them. However, despite the difference in accessibility, lecturers in both types of institutions used computers for academic purposes mainly.
6.1.4 Access and use of the Internet by students

This section explores the extent of access to and use of the Internet among students in IHEs in Papua New Guinea. It considers issues of availability of Internet connection and personal experiences of using the Internet in an academic environment.

Similar to the use of computers, there was a noticeable difference in Internet accessibility and in Internet exposure at different IHEs. Uni1 and Uni3 provided limited free access to the Internet for their students, whilst Uni2 students and all OIHE students were not provided with free access to the Internet. Almost 20% of all participating students indicated having no familiarity with the Internet; of these 79% studied at two institutions in different provincial capital cities in Highlands provinces. 56% of those who declared having the Internet at home were studying at two institutions in the capital city on the mainland’s south coast and almost 35% at a university in a provincial capital on the mainland’s north coast (Figure 6.12). Students’ exposure to the Internet depended not only on the type of the institution they attended, but also on the Internet penetration in the area where the institution was located.

A Chi-square test revealed that the difference between students’ exposure to the Internet at different institutions of higher education was significant ($\chi^2(10) = 510.667$, $p < 0.001$, $n = 898$). The majority of those who had no Internet exposure at home, the institution or other places were studying at two institutions in Highlands provinces.

At the institutional level of exposure to the Internet, the dataset revealed that 15% of university students and 30% of OIHE students had no Internet experience (Figure 6.13). Although, as stated earlier, the exposure to the Internet at different institutions was affected by the institution’s type.
and location, with the Highlands region being less advanced, the discussion below continues in a manner consistent with separate results reported for students from universities and from OIHEs. This will enable the understanding of the application of ICT in higher education institutions to develop.

Figure 6.13 Students’ Internet exposure at the institutional level

There was a significant difference between institutional exposure to the Internet at universities and at OIHEs ($\chi^2(2) = 30.124, p < 0.001, n = 898$).

Figure 6.14 Students’ answer to the question ‘Are you required to pay a fee for using the Internet?’

Although the majority of students paid a fee for accessing the Internet, there was a statistically significant difference between types of institutions. OIHE students were more likely to pay and to pay more for their access to the Internet than university students ($\chi^2(1) = 26.722, p < 0.001, n = 595$).

For 62% of students who had some experience with the Internet, access to it came at personal financial cost (Figure 6.14). However, there was a significant difference depending on the type of institution. While 82% of OIHE students were required to pay a fee, only 56% of university students had to pay for Internet access. Among those who were required to pay a fee, 57% claimed they were willing to spend up to 20 Kina fortnightly.

To further explore student level of access to the Internet, they were asked how often they accessed it and how much time they spent on the Internet on an average day. Of university students, 29% declared using the Internet every day and 42% used the Internet a few times a week. Less fortunate were their OIHE colleagues of whom 53% accessed the Internet less than once a month (Figure 6.15).
The difference in the frequency of Internet access by students at different types of institutions was statistically significant with $\chi^2(4) = 120.717, p < 0.001, (n = 571)$.

The slight difference in the amount of time the students from different types of institutions spent using the Internet was not statistically significant ($\chi^2(3) = 3.799, p = 0.284, n = 578$).

Although there was a significant difference in the frequency of the Internet access between students from different types of institutions, the difference in time they spent using the Internet was not significant (Figure 6.16). On an average day, 56% of students were using the Internet for less than 1 hour, 38% between 1 to 3 hours, and only 2% longer than 5 hours.

In order to examine the application of the Internet, the survey explored the purpose of Internet access and what kind of information the participants were searching for. The most popular activities were research indicated by 531 students (88%, $n = 601$), email by 354 students (59%, $n = 602$), entertainment by 245 participants (41%, $n = 601$) and online meeting people by 151 students (25%, $n = 601$). Among possible purposes for using the Internet that participants added to the suggested choices were downloading software and updates (5 students) and even pornography (3 students). Further tests were run to understand if the participants from different types of IHEs differed in their purpose of using the Internet. The students showed no significant difference in their use of the Internet for research, entertainment and online meeting of people. However, use of the Internet for email differed between institutions: university students were more likely to use the Internet for this purpose (64%) than the OIHE students (38%) (Figure 6.17).
The students’ use of the Internet for emailing differed significantly between both types of institutions of higher education ($\chi^2(1) = 27.013, p < .000, n = 602$).

To complete the exploration of Internet use, students were asked about the kind of information they were searching for on the Internet. The majority of participants (93%) reported searching information related to their study. The other reported types of information were news (47%), music and videos (38%), hobby related (30%) and games (16%). When examined within both types of IHEs, statistical tests revealed no significant difference in students’ searching for study-related information. However, there were statistically significant differences between university students and OIHE students in searching for other types of information. University students were more likely to spend time searching for news ($\chi^2(1) = 5.322, p = .021$) and hobby-related information ($\chi^2(1) = 13.250, p < .001$), while OIHE students were more likely to spend time on the Internet looking for music and videos ($\chi^2(1) = 17.999, p < .001$) and games ($\chi^2(1) = 9.006, p = .003$). Students made Internet searches predominantly with two search engines: Google was used by 85% and Yahoo by 60% of students. Among other search engines used by participating students were MSN (14%) and Hotmail (10%). University students were more likely to use Google than students from other institutions ($\chi^2(1) = 45.359, p < .001$).

Although emailing was included as one of the reasons for using the Internet, the issue was explored further with questions about frequency of using an email application and the content of emails. There was a significant difference in the frequency of checking an email box on an average day by students from both types of institutions. Of university students, 41% opened their email box 2-3 times a day and 14% did not check email daily, while 23% of OIHE participants checked email only once a day and 63% of OIHE students did not check their email box daily (Figure 6.18).
Students from different types of institutions of higher education differed in their frequency of daily email application usage. University students checked their email boxes more often than OIHE students ($\chi^2(4)=106.318$, $p < .001$, $n = 547$).

The content of students’ email at different institutions of higher education was significantly different. OIHE students were more likely to use email for study and combined study and other than study related purposes university students ($\chi^2(2)=37.161$, $p < .001$, $n = 532$).

Participants were asked if the email content was mostly study-related, mostly other than study-related, or equally study and other than study-related. Again, students from different types of higher education institutions differed in their email content. Of university students, 54% said that the content of email was equally study and other than study-related, and only 9% of them used email for mainly study-related purposes. Using email for study and other than study purposes was the first choice also for OIHE students (38%); however, more students at OIHE than at universities were using email for study-related purposes (34%) (Figure 6.19).

In summary, access to the Internet for students at different IHEs was determined not only by the type of the institution they attended but also the location of the institution. Due to the lower penetration of the Internet in the Highlands region, students at the participating university and OIHE located there had very limited or no experience using the Internet. Many students were required to pay for access to the Internet. In general, although students reported using the Internet for academic-related activities, they pointed out using it also for news and entertainment. The priorities in purpose of Internet access varied between types of institutions.
6.1.5 Access and usage of the Internet by academic staff members

As discussed earlier, there was a noticeable difference in accessibility to the Internet and in Internet exposure at different institutions. While all participating universities provided limited free access to the Internet for lecturers, only OIHE3 provided such service to faculty members. At OIHE1 and OIHE2, staff reported having limited access to the Internet in the past; however, due to the high cost of using the Internet, the service was removed. When asked about having an Internet connection at home, only 25% university staff members and 7% of OIHE academics reported using the Internet at home. At OIHEs, 11% of faculty members reported having no experience with the Internet at all.

Consequently, with higher exposure to the Internet, university lecturers accessed the Internet more frequently than OIHE lecturers (Figure 6.20).

A Chi-square test revealed that the academics at universities and at OIHEs significantly differed in their access to the Internet ($\chi^2(4) = 13.111, p = .011, n = 55$). While 63% of the university staff accessed the Internet every day, only 29% of the OIHE staff accessed the Internet daily.

However, further tests showed no significant difference in the amount of time the staff from the tertiary institutions spent using the Internet on an average day (Figure 6.21).
To understand better the use of the Internet, academics were asked about the purpose of their access to the Internet and the kind of information for which they were looking. For the purpose of using the Internet, 88% of participants pointed to research. Other important reasons were email (79%), banking (18%) and online meeting people (16%). They were looking for work-related information (93%), news (56%) and hobby-related information (26%). The test revealed no significant difference between the academic staff from both types of institutions in their application of the Internet. More detailed information was sought in regard to use of the email application. There was a significant difference between institutions. Of university lecturers, 33% checked their email more than 5 times a day; 57% of OIHE lecturers checked email once a day (Figure 6.22).

![Figure 6.22 Frequency of email application usage on an average day by the academic staff at institutions of higher education](image)

The academic staff from universities and from OIHEs differed significantly in their use of an email application with the university lecturers more likely to open email more often ($\chi^2(4) = 16.887, p = .002, n = 55$).

Again, though there was a difference in the frequency of the email application usage, there was no significant difference in the email content. Of lecturers, 38% used email for professional purposes mainly, and email content of 52% of the academic staff was equally professional and other than professional.

In summary, as reported in this section, exposure to the Internet between the academic staff from universities and OIHEs was noticeably uneven. However, despite this disparity, all faculty members used the Internet, including an email application, mainly for academic purposes.
6.1.6 Attitudes toward technology

The information regarding the participants’ attitudes towards computers and the Internet presented in this section was collected in the survey questionnaire scale. The scale description is presented in the Research Design chapter.

A Principle Component Analysis (PCA) technique was applied to derive and describe participants’ attitudes towards computers and the Internet from 32 scale items.

There are two different methods in PCA: correlation and covariance. PCA was applied using both methods. The results were similar with only the order of the components varying slightly in importance. The results discussed in this section were derived with the PCA correlation method.

Similar to the previous results, participants’ attitudes towards computers and the Internet were recorded and analysed for both groups (students and academic staff); therefore, they are reported separately.

6.1.7 Attitude toward ICT among students

A PCA with subsequent rotation (Varimax) was conducted on 32 scale items of a questionnaire concerning students’ attitudes and beliefs about computers and the Internet. The Keiser-Meyer-Olkin (KMO) and Barlett’s test produced criteria that supported the application of PCA (KMO measured .807). Commonalities varied from 0.628 to 0.362. Applying Kaiser’s Rule and the scree test, the following nine factors were deemed important.

Factor 1 was loaded on 6 items that reflected belief that computers are autonomous entities and superior to humans. The factor accounting for 7.4% of the variance was exemplified by the three highest loading items: “Computers make me feel that machines can be smarter than people,” “Computers make me feel that sometime in the future machines may be running our lives” and “Computers are superior to humans in processing information.”

---

4 The most commonly used rotation, it increases interpretability of results by rotating factors so that there is less discrimination between high and low loading variables. Rotation does not affect the total common variance of the test but redistributes it and makes a sharper distinction between loadings (Burns & Burns, 2008).
5 Kaiser-Meyer-Olkin (KMO) and Barlett’s test measure the sampling adequacy, which should be greater than 0.5 for a satisfactory factor analysis to proceed (Burns & Burns, 2008).
6 Commonality is the proportion of variance in the variable that can be explained by the common factors.
7 Kaiser’s Rule determines the selection of factors for interpretation with eigenvalues greater than 1.
8 An alternative method to the Kaiser’s Rule. The successive eigenvalues are plotted on a graph; only those factors are accepted for interpretation that occur on and above where the plot levels out.
Factor 2 was loaded on 6 items and accounted for 6.8% of the variance. It was labelled Technology\textsuperscript{9} seen as a beneficial tool for study and work and was represented by the four highest loading items: “Internet is a great source of information for my study,” “Having a permanent access to the Internet will definitely improve my academic performance,” “I like the idea of learning more how to use a computer,” and “Using a computer significantly increases my satisfaction at work.”

Factor 3 was loaded on 4 items that accounted for 5.9% of the variance and reflected fascination with the Internet as represented by three highest loading items: “The Internet is fascinating,” “Using the Internet is fun,” and “I feel confident when surfing the Internet.”

Factor 4 was loaded on 3 items and accounted for 5.9% of the variance. It appears to measure negative attitude towards technology; it was labelled as Technology is frustrating because it is too complex; it is exemplified by contributing loading items: “Computers are difficult to understand and frustrating to work with,” “Computers make me uncomfortable because I don’t understand them,” and “The Internet intimidates me because it seems so complex.”

Factor 5 was loaded on 7 items that accounted for 5.7% of the variance and appears to measure a positive opinion that technology becomes an integral part of a daily life as illustrated by the three highest loading items: “I cannot imagine life without the Internet,” “Life would be more enjoyable without the Internet” [negative loading], and “Life is becoming easier and faster with computers.”

Factor 6 was loaded on 8 items and accounted for 5.6% of the variance. It was labelled Technology changes the world around us and is exemplified by two highest contributing loading items: “The Internet has changed the world into a global village” and “Computer speeds up scientific progress and achievements.”

Factor 7 was loaded on 5 items and accounted for 5.1% of the variance. It appears to measure a positive view that technology brings a better life to those who use it as illustrated by the three highest loading items: “I feel confident when surfing the Internet,” “The computer brings a better life to the average person,” and “The Internet makes it easier contact with family and friends.”

\textsuperscript{9} There are three different terms used to label factors: Computers, the Internet and Technology. The choice of the term was guided by the loading of particular items contributed to the factor. If the contributing items relate to the computer or the Internet only, then the term Computer or the Internet respectively was used to label the new factor, if the contributing items relate to both computers and the Internet then the term Technology was used.
Factor 8 was loaded on 4 items that accounted for 5.1% of the variance and appears to measure strong negative attitude toward the Internet as exemplified by two highest loading items: “People are becoming slaves of the Internet” and “A lot of harmful information is coming to community through the Internet.” It was labelled as The Internet has a harmful effect on the community.

Finally, factor 9 was loaded on 3 items and accounted for 4.5% of the variance. It was labelled Computers make learning more fun and is depicted by the two highest loading items: “Computers make learning more fun” and “Computers are so amazing they stagger the imagination.”

Taking into account that ICT exposure at universities and OIHEs differed as described earlier, further tests were run to explore if identified differences influenced students’ attitudes and beliefs about computers and the Internet. The Independent-Samples t-test revealed that students from different types of IHEs differed significantly only in Factor 1 Computers are superior to humans (t(612) = 6.316, p < .001) and Factor 5 Technology becomes an integral part of a daily life (t(612) = 2.452, p = .014). The university students were more likely than OIHE students to view computers as superior to humans and see technology as an integral part of daily life (Figure 6.23 and Figure 6.24).

Figure 6.23 Boxplot showing the distribution of Factor 1 (Computers are superior to humans) among students at universities and at OIHEs

The distribution of Factor 1 was significantly different for both groups (p < 0.001). The university students were more likely to view computers as superior to humans (n = 443, x̅ = 0.1536, s = 0.9825) than the OIHE students (n = 171, x̅ = -0.3978, s = 0.9356).

Figure 6.24 Boxplot showing the distribution of Factor 5 (Technology becomes an integral part of daily life) among students at universities and at OIHEs

The distribution of Factor 5 was significantly different for both groups (p = 0.014). The university students were more likely to view technology as integral part of a daily life (n = 443, x̅ = 0.061, s = 1.0306) than the OIHE students (n = 171, x̅ = -0.1587, s = 0.8996)
In summary, despite significant differences in the application of computers and the Internet at universities and at OIHEs, students hold similar attitudes and beliefs about ICT with a statistically significant difference in only two of nine factors. The majority of attitudes and beliefs were positive; only two of nine factors reflected some negative feelings. The most important factors that guided the students’ selections on the attitude scale were:

1. Computers are superior to humans.
2. Technology is a beneficial tool for study and work.
3. The Internet is fascinating.
4. Working with technology is frustrating.
5. Technology becomes an integral part of a daily life.
6. Technology changes the world around us.
7. Technology brings a better life.
8. The Internet has a harmful effect on a community.

### 6.1.8 Attitude toward ICT among academic staff

As with the students’ dataset, to derive and describe the academic staff attitudes and beliefs about computers and the Internet from 32 scale items, factor analysis was applied. The rationale behind selecting this procedure was discussed in the Research Design chapter.

PCA with subsequent rotation (Varimax) was conducted on 32 scale items of an attitude scale. Both the KMO and Barlett’s test produced criteria that supported the application of PCA (KMO measured .540). Commonalities varied from 0.860 to 0.570. Applying Kaiser’s Rule and the scree test, the following ten factors were deemed important.

Factor 1 was loaded on 11 items that reflected belief that computers are autonomous entities and superior to humans. The factor accounted for 10.4% of the variance and was exemplified by the four highest loading items: “Computers make me feel that machines can be smarter than people”, “Computers can make important decisions better than people”, “Computers make me feel that sometime in the future machines may be running our lives” and “Computers are so amazing that they stagger the imagination”.
Factor 2 was loaded on 9 items that accounted for 9.4% of the variance and appears to measure a positive opinion of technology\(^{10}\) which becomes an integral part of a daily life and impacts private and social life as illustrated by the three highest loading items: “Life would be more enjoyable without the Internet” [negative loading], “Life is becoming easier and faster with computers” and “Computers make it possible to speed up scientific progress and achievements”.

Factor 3 was loaded on 6 items that accounted for 7.8% of the variance and appears to measure fascination and familiarity with the Internet as represented by three highest loading items: “I feel confident when surfing the Internet”, “The Internet is a great source of information I need for my work and research” and “Life would be more enjoyable without the Internet” [negative loading].

Factor 4 was loaded on 6 items that accounted for 7.5% of the variance and appears to point to positives and negatives of the social aspect of the Internet as represented by the four highest loaded items: “The Internet makes easier contact with my family and friends”, “The Internet has changed the world into a ‘global’ village”, “People are becoming slaves of the Internet” and “A lot of harmful information is coming to the community through the Internet”.

Factor 5 was loaded on 7 items and accounted for 7.5% of the variance. It was labelled as Computers are a beneficial tool for an academic performance and was represented by the three highest loading items: “Using computers saves time and work”, “Using a computer significantly increases my satisfaction at work” and “I like the idea of learning more how to use a computer”.

Factor 6 was loaded on 8 items that reflected pleasure associated with work completed with technology. It accounted for 7.3% of the variance and was exemplified by the three highest contributing factors: “I love to learn more about the Internet and its usage”, “Computers make preparing study materials more fun” and “Using the Internet is fun”.

Factor 7 loaded on 4 items and accounted for 7.2% of the variance. It appears to measure negative attitudes towards technology labelled as Technology is frustrating because it is too complex as exemplified by contributing loading items: “Computers are difficult to understand and frustrating to work with”, “Computers make me uncomfortable because I don’t understand them” and “The Internet intimidates me because it seems so complex”.

Factor 8 was loaded on 4 items that accounted for 6% of the variance and appears to measure a positive opinion that the Internet becomes an integral part of daily life as illustrated by the three highest loading items: “Access to the Internet has become a necessity of daily routine for many

\(^{10}\) See footnote 9, page 135
people”, “I cannot imagine life without the Internet” and “Life would be more enjoyable without the Internet” [negative loading].

Factor 9 was loaded on 4 items that appear to measure negative attitudes towards computers. It accounted for 5.4% of the variance and was exemplified by the two highest loading items: “Computers are superior to humans in processing information” [negative loading] and “I do not feel I have control over what I do when I use a computer”.

Factor 10 was loaded on 5 items and accounted for 4.8% of the variance. It appears to measure a positive view that technology is fascinating and easy to learn as exemplified by the three highest loading items: “Computers are extremely accurate and exact”, “Given a little time and training anybody could learn to use computers” and “The Internet is fascinating”.

Considering differences in ICT exposure at universities and at OIHEs, further tests were run to explore if identified differences influenced the academic staff attitudes and beliefs about computers and the Internet.

The Mann Whitney U-test revealed that the academic staff from universities and from OIHEs differed significantly only in Factor 1 Computers are superior to humans [U = 68.0, p = .019]) and in Factor 9 People no longer control work done on a computer [U = 81.0, p = .046]). Further tests were performed and graphs created to explore and better illustrate the differences.

The university academic staff was found more likely to view computers as autonomous entities superior to humans than their OIHE colleagues (Figure 6.25).
The distribution of Factor 1 was significantly different for both groups \((p = 0.019)\). The university faculty members \((n = 44, \overline{x} = 0.1211, s = 0.9950)\) were more likely than the OIHE lecturers \((n = 7, \overline{x} = -0.7609, s = 0.6748)\) to view computers as an autonomous entity superior to humans.

The OIHE academic staff was more likely to believe that people no longer control work done on a computer (Figure 6.26).

In summary, despite significant diversity in the exposure to computers and the Internet at universities and OIHEs, the academic staff across institutions held similar attitudes and beliefs about ICT with a statistically significant difference only in two of nine factors described earlier. Lecturers felt positively and held positive beliefs about ICT; only three of ten factors reflected some negative feelings. The most important factors that guided the academic staff selections on the attitude scale were:

1. Computers are superior to humans.
2. Technology becomes an integral part of a daily life.
3. The Internet is fascinating.
4. The Internet makes life easier but has a negative impact on society.
5. Computers are a beneficial tool for an academic performance.
6. Technology makes work more fun.
7. Technology is frustrating.
8. The Internet becomes an integral part of a daily life.
9. People no longer control work done on a computer.
10. Technology is fascinating and easy to learn.

6.1.9 ICT for education

This section aspires to complement the quantitative account of access, application and attitudes toward ICT of the students and academic staff of the tertiary institutions with a qualitative discussion about the role ICT plays in the academic environment. The discourse develops around three main themes: ICT supports program delivery, ICT supports research, and obstacles in the application of ICT in higher education.

6.1.9.1 ICT for an academic program delivery

Many different aspects contributed to the perception that ICT plays a significant role in academic program delivery. One of them is a conviction that technology is helpful in updating existing academic courses as well as in developing new ones. On the one hand, the lack of available current literature and the lag of PNG academic staff behind developing trends in academia worldwide makes the process of updating and developing courses a challenging one. On the other hand, technology, especially the Internet, also provides the means to diminish difficulties in this area.

I’m just travelling around the world when staying in my room trying to find out what’s happening in my own field, which is a curriculum and make this relating to courses I’m taking here. I’m just searching for the information and depending entirely on my lectures and my notes, and everything that I’m doing is mostly depending on computer’s findings through the Internet. And I found it a very useful way we are trying to use, even to build our expertise in our own areas, in teaching, in specialization. It makes me feel confident and it makes me feel that I’m in tune with what’s happening around the world when I am teaching students here. And I found the Internet very useful in my career (UM11).

Also, what I teach, I always try update what it’s been in websites; take some information, what is in textbooks. It makes it easier for me to deliver my lessons. Easier for me to teach my students. And another times, I make references for students to go and check on this, like making easier for students to learn themselves too. And, like my learning towards... It makes teaching easier, it makes searching for information easier, it makes research easier (OM23).

Another reported aspect of ICT application in course delivery is the great potential of technology to support a higher standard of program delivery. Lecturers participating in the study believed that the application of modern technology helped them to become more professional and consequently to perform their academic duties more proficiently. There was a range of activities
when technology employment made course delivery easier and dexterous, such as preparing and delivering lecture presentations, preparing and distributing lecture notes, preparing and marking different types of student assignments.

I used a power point presentations in my lectures because I have a data projector as well as I have a laptop when I came back from Australia, I brought those two equipment and now I feel, look, your presentations you know, more professional and the standard is there and at least I can do it at my own level in the classroom with my students (OF03).

I depend a lot on the computer for all my courses and even mark students’ work on the screen – I give students assignment which they drop into the folder so I mark it on the screen which is faster for me. Though my eyes just... I have to come out after half an hour and then go back. Much of my work I actually do with a computer. I have a desktop there that belongs to the school and I have my own laptop. And I depend a lot on it. When it goes out, I really feel I got stuck, when the power goes out (UF21).

In addition to its usefulness, technology was also reported as important to support students’ learning process. One of the participants compared rather poor engagement of students in her institution to the excitement and commitment to study of students at other institutions. As the lecturer pointed out, her institution lacked the ICT support while the students from other institutions were excited and motivated to commit to study because of ICT availability there. Also other participants confirmed that use of computers in the learning process strengthens students’ motivation.

Look at the [name of the OIHE], it’s the institution that is at a higher level but it is a challenge because we do have computers, but there are not enough for everyone to have access to it; and also we do not have Internet access and that’s also it disables their learning in a way. They are not exposed to the new materials that are coming. When you go back to the library, they all are old materials, books are out of date, and this is still a challenge. And we need to have computers in higher education institutions with the Internet access and the students will... when they learn new things and if they will have access to the Internet, it motivates them in a way too. See new things and learning new ideas. But here, you are going back to the old same stuff with books and papers and I think sometimes learning get stagnant because you are always stuck, you do not have Internet access; because you are not exposed to the new ideas and theories that have been developed but we always stacked with books that are being out of date. Like [name of a student], she came from [name of the Uni], she was so excited because she has the Internet access, she has flash drive and she said, I got this and I got this and I am doing this. This makes students looking forward to learn more because they have, they were motivated. And when you look at it, it’s more like they are in line with modern technology and the change that is coming. But when you look at the [name of the OIHE], we need to have that vision that students can learn outside of books as well as using books (OF03).
From my personal view, I am mostly interested in spending my time on the Internet to get more information and know more about certain things, people, places, etc. which increases my knowledge level and also it motivates me to acquire more information (UMS4y/OQ).

For many participants, both staff and students, a very important aspect of ICT in the teaching/learning process was the fact that technology made work more enjoyable. This element built-into technology eased the burden of everyday work; some participants suggested a link between enjoyment associated with using technology and their work productivity.

Work became easier now. Typing is easier now, you just touched type and you get the result. And so, it empower me in one way, it facilitated my performance. Typing was not tedious anymore, it became fun, it became enjoyable (UF13).

Computer is making my work easier, enjoyable and I’m having more fun with it. Computer is enhancing my work productivity to improve (UML/OQ).

One of the aspects of ICT widely discussed by participants was its role in distance education. On the one hand, technology enables access to education for those who are in a workplace. As discussed earlier, the majority of participating staff members reported using technology to upgrade knowledge in their area of expertise. On the other hand, technology enables taking of courses from various locations around the world. The potential of the Internet to shrink the world space made resources from educational institutions around the world more readily available.

Nowadays, we don’t need to go to Australia or US to do a course. All you have to do is apply now and you can do course online. You don’t need to go overseas and spend thousands of Kina, all you have to do is sit down at your computer and then you do study while working so saves a lot of money. So, that’s one of the positive impacts (OM17).

However, despite the outlined important role of technology in program delivery, the presence of ICT in the process brings up some limitations and challenges. First, a number of lecturers pointed to a lack of discipline during computer lab sessions. Obviously, excitement associated with working with computers, and especially with surfing the Internet, keeps students’ attention from the lecture presentation.

When I am teaching in class, I get very angry because they are checking emails and surfing the Internet. They just know how to do it; they minimize the screen and they are surfing and when I catch them they are caught too. So, it’s interesting, kids are very excited especially at school that they are learning certain new things and they want to have all the time to themselves to do that (UF20).

Secondly, the lack of proper training was reported by both staff and students. Students felt that without a proper introduction to ICT they were spending a lot of time using computers or
searching the Internet without getting results they could have achieved if better trained. Although all institutions provided a basic one-semester introductory course in end-user computing and word processing, generally the students’ exposure to different aspects of computing and Internet usage are rather basic.

Computers are fun and are a great asset for work, as long as you know how to use one. Computers now have a lot of software programs that means that you have to know about these programs in order to utilize the program and if you don’t, then you are not making full use of the computer (UF3y/OQ).

I would like the IS lecturers to offer lectures on how to manage Internet usage. The target groups to be all first years and upwards for those who missed out / interested. This will help individuals to manage well their quota. The current situation shows that we students waste a lot of our quotas browsing everywhere, opening up unwanted information, sometimes we do not understand we are really doing or seeing, Example, Internet promotion games, etc., to win a gift. Explain to us students if there’s any danger registering unnecessarily on webs (UF4y/OQ).

Faculty members reported different aspects related to the lack of proper training and the consequences of this for their professional performance. First, most of the staff had never received any formal computer training; thus, when given computers and the access to the Internet for their professional use, they felt inadequately prepared. They would have liked to attend computer courses; none were organised for academic staff in the years these research sites were visited.

I still see myself as a computer illiterate because I can only use the computer program which is the word processor (OF16).

For us, lecturers, it would be good to have some academic support programs ... Most of us who didn’t have any formal training we are learning in front of the computer. I really think it would be very helpful if we learn especially in institution like this (UF21).

I would put emphasis on the training so we can be able to keep the quality teaching to the students. Because if we are not trained well then we could not be effective with our students. All depends on instructor’s directions (OM17).

Another important aspect related to the lack of training is frustration experienced when working with computers. As discussed in the previous section, statistical results of the attitude towards technology scale revealed that although faculty members viewed technology as a beneficial tool for an academic performance, at the same time they found computers uncomfortable and frustrating to work with because they don’t understand them. The Internet intimidates staff due to its complexity.
Some time you may accidentally go open things which we did not suppose to get. That why I am sometimes frightened because I may be touching something that opens up, something that I don’t want and then how do I close it, or how do I get rid of it. Many times I happened to come across things that I did not want to open, just things like list of journals, or text there which is not relevant to your topic I’m not... well, I guess if you choose the right words, you might get document that you need (UF01).

Third, one more important aspect reported by staff is lack of guidelines and training about how to incorporate Internet resources into academic work. Although a plagiarism policy is defined, the tools to assist lecturers with marking writings containing Internet resources are not provided. Lecturers found it too tedious and time consuming to follow every reference on the Internet while the Internet connection is very slow. They question the quality of work done in such a manner.

I kind of wondered did my teachers know where I got that papers. Do they want to know that I’m just reading of the internet, what it is they want from me? So, I think that area has to be really fine tuned in the assessment and for the faculty that suppose to really describe to the staff or the academics what is it what we want from you in this area (UF12).

Sometimes, they spent so much time that it affects their academic progress and working on assignments, and we have to be very particular now with plagiarism and the like. While in the past, when they were writing, they were actually writing and looking for things in the library now, they just cut and paste it so we have to be very careful with that (UF21).

6.1.9.2 ICT to support research

One of the important roles of ICT in the academic environment is to support research activities. The application of technology in the process of development of new academic courses and self study in areas of expertise was discussed in the previous section. The following discussion focuses on other aspects of the Internet that contribute to research. One of them is easy and fast Internet access to an immense range of information.

Like if I have to do a research or if I have to do some writing or maybe collect information related to my qualifications, I go to the Internet. I can rely on the Internet because I can get information elsewhere as long as I got address there that I can just click and I can get the information that I want (OM18).

Extraordinary attention paid in the discussion to the Internet as a source of information is better understood in the light of the shortage of current professional literature experienced by most of the institutions. With the blame put on the government for the lack of funding, and consequently the impoverished state of the institutional libraries, people turned to the Internet to fill their information gaps.
Although we are at university, because it’s a third world country there is a lack of books, reference books and other materials. But with the Internet, you can basically access up to date information from around the world (UM08).

So the Internet access is an awesome thing. It’s a wonderful thing connecting worlds, connecting people, connecting ideas and if we do not have information in the library, you have a huge electronic library at your disposal (UF07).

The role of technology in support for research is not limited to being a source of information but extends into other aspects for conducting research, such as finding new possibilities of funding research or cooperation with academics around the world. As mentioned earlier, the Internet provides easy access to materials published by researchers worldwide. It also provides the platform for an academic partnership.

Through the use of emails I can now easily communicate with other colleagues from around the world. Just yesterday I jointly submitted the project with the colleague in London for some research project in here. That won’t be possible if we won’t have access to the Internet or email system. But now that’s possible; you can work on collaborative projects with your colleagues from around the world (UM08).

I can send information to the whole team; it’s very important (OM23).

6.1.9.3 Obstacles in ICT utilisation in higher education context

ICT plays an important role in different higher education institution functions, such as delivery of academic programs or research. However, participants reported a number of obstacles that hinder the application of technology. One of the most strongly felt was the lack of equipment, especially in OIHEs. As reported earlier in the section Research sites, differences in technological exposure was visible between institutions. As previously noted the universities provided computers to every staff member, while in OIHEs computers for staff were available only in a common staff room. Lecturers found the limited number of desktop computers, and some of them being out of order for a long time, not good enough for their work. Similarly, Internet access in some of the institutions was a source of frustration rather than of potential.

We have only three computers in the staff computer room here. The rest are not working. So we more or less rush to see who is the first one in there to get the work done (OF6).

It is a challenge because we do have computers, but there are not enough for everyone to have access to them. Also, we do not have Internet access and that’s also it disables their learning in a way, they are not exposed to the new materials that are coming ... And we need to have computers in higher education institutions with the Internet access and the students will learn new things and if they will have access to the Internet, it motivates them in a way too (OF03).
We are restricted to using the Internet connection to 40 minutes in one month, so the rate using the Internet and our exposure to the Internet is very limited. I can divide these 40 minutes to the four weeks, then in one day I use the Internet for 4 minutes. And in 4 minutes I would have to open up, conduct my research. But, by the time I read one email, 4 minutes is up, so I am just closing, disconnecting the Internet and that’s it. It’s very sad situation (OM18).

The situation seems to be exacerbated by poor equipment management. Institutions experienced the lack of well trained IT staff. In some places the same person was responsible for computer training for students as well as IT support.

We don’t have enough qualified IT people particularly to fix it, so that’s the problem. It can become very costly when it comes to computer repair when something goes wrong, because most users we don’t really know how to troubleshoot some the PC problems (OF14).

Poor ICT management reflects lack of staff awareness of different issues involved in the use of technology. Apart from the cost of hardware acquisition, the total cost of ICT includes such other expenses as consumables, Internet access fees, maintenance, etc. With very limited funding for ICT in the majority of institutions, the growing cost of the technology application leads to strict policies about the use of computers and the Internet. Staff in one OIHE reported that due to high cost, they lost previously enjoyed access to the Internet.

People need to know how to look after the equipment. Like at this institution, previously there was Internet access. But people abused what was there, that’s why bills were very high and they had to cancel the program because they were not able to meet the cost. So, it’s more like people have to learn how to look after things and foresee the expenses, long term and short term, then we’ll be able to have things that can stay for long time. Otherwise, things will not stay long because we are not careful and we are not conscious and we are not taking extra precautions how to look after these things (OF03).

In summary, this chapter presented a detailed account of an ICT application in higher education institutions in Papua New Guinea. It included the quantitative and qualitative findings. A significant unevenness in the institutional adaptation to ICT was reported. As discussed, the universities showed higher levels of computer and the Internet access. There were statistically significant differences in the use of computers and the Internet between the students from different types of tertiary institutions, with the university students being more likely to focus on academic activities. However, the university and OIHE faculty members did not differ in their application of computers and the Internet. The majority of activities on computers and on the Internet were related to academic activities. In both groups, the staff and students in general held
positive attitudes and beliefs about computers and the Internet. Both groups viewed computers as an autonomous entity superior to humans. They believed technology has become a beneficial tool for study and work and an integral part of daily life. Staff and students realised that technology brought an enjoyable element to work and study done with computers and the Internet. However, academic staff and students alike found working with technology frustrating due to its complexity and saw the Internet as having a harmful effect on a community. A discussion about the role of ICT in the higher education environment illuminated its significance in the development and delivery of academic programs and research.

The ICT profile as presented in this chapter will become a framework for further discussion of gender-related issues in the application of ICT in higher education institutions.

6.2 Gender Issues in Access to ICT in Institutions of Higher Education

The previous section created a comprehensive profile of ICT application in IHEs in Papua New Guinea. Within this framework, the following sections discuss gender-related issues in access to, application of, and attitudes towards computers and the Internet. Unlike the previous section, this one discusses the participating staff and student groups together. It commences the discussion about gender-based issues with an overview of differences and similarities in access to computers and the Internet.

The following discussion combines into one discourse the results of the qualitative and quantitative data sets. Although the quantitative results refer separately to computers and the Internet, the qualitative discussion applies the terms ICT and technology in relation to computers and the Internet. Unlike in the previous chapter, where access to, application of, and attitudes towards computers and the Internet were discussed separately, this chapter focuses on gender issues and considers technology, computers and the Internet, together. The reason for the use of such terminology is that interviewees used the terms computer, the Internet and technology interchangeably.

The analyses of gender-related differences in access to ICT identified three important levels: differences within IHEs, a gender digital gap in society and a social digital gap related to computer access differences between rural and urban regions of PNG.
6.2.1 Access to ICT within institutions of higher education

As presented in the ICT profile, the majority of academic staff and students at participating universities and OIHEs had access to computers only during their time at the institution. As previously noted, depending on the type of the institution, there were differences of institutional exposure to computers: more computers being available for students’ use at the universities, fewer computers and more restricted access provided at the OIHEs. Similarly, university staff members were provided with a desktop computer in their office, while OIHE lecturers had access to computers only in a common staff room.

With the understanding of institutional differences in access to computers, the study explored any gender-related differences in computer accessibility. Statistical analysis revealed no significant difference in access to computers between female and male student participants.

The majority of female students accessed computers a few times a week (40%) or every day (38%), while the majority of male students accessed computers every day (43%) or a few times a week (35%) (Figure 6.27).

![Figure 6.27 Female and male students’ answer to the question: “How often do you use a computer?”](image1)

![Figure 6.28 Time spent using computers on an average day by female and male students at tertiary institutions](image2)

The results of Chi-square test revealed no statistically significant difference in frequency of computer access between female and male tertiary education students ($\chi^2(4) = 5.894, p = .207$).

Similarly, there was no statistically significant difference in the time spent using a computer on an average day between female and male tertiary education students ($\chi^2(3) = 2.634, p = .452$).

There was no statistically significant difference in the time female and male students spent using computers on an average day. 52% of female students and 58% of male students spent between 1 to 3 hours per day using computers (Figure 6.28).
Likewise, there were no statistically significant differences in the access to computers between female and male lecturers. 73% of female lecturers and 87% of male lecturers accessed computers every day (Figure 6.29).

The results of Chi-square test revealed no statistically significant difference in frequency of computer access between female and male tertiary education students ($\chi^2(3) = 6.239, p = .101$). 46% of female lecturers and 40% of male participants spent between 3 to 5 hours per day using computers. Among staff members, 31% of females and 42% of males used computers more than 5 hours daily. However, the Chi-square test revealed that the differences in the amount of time spent using a computer on an average time was not statistically significant ($\chi^2(2) = 0.857, p = .651$).

Academic staff members spent more hours per day using computer than students; however, there was no statistically significant difference between genders. Of academic staff, 42% used computers between 3 to 5 hours or more (Figure 6.30).

### 6.2.2 Gender differences in access to the Internet

The ICT profile revealed in the previous chapter showed a difference in accessibility to and exposure to the Internet at different IHEs. Generally, universities demonstrated a higher level of exposure to the Internet than OIHEs. All universities provided limited free access to the Internet for their faculty members; Uni1 and Uni3 provided similar service for their students. Among the OIHEs, only OIHE3 provided faculty members with free access to the Internet. No OIHE provided free access to the Internet for students.

In the background of institutional exposure to the Internet, the research further examined gender similarities and differences in Internet accessibility. To gauge Internet accessibility for female and
male students, participants were asked about their home connection to the Internet. At home, 18% of females and 10% of males had connection. Participants who did not answer any survey questions related to the Internet were considered to have had no Internet experience. 25% of females and 16% of males admitted having no familiarity with the Internet (Figure 6.31).

Figure 6.31 Female and male students’ exposure to the Internet at institutions of higher education
Female and male students’ exposure to the Internet differed significantly (p < 0.001). More female (25%) than male students (16%) reported having no familiarity with the Internet. More female (14%) than male students (8%) had access to the Internet at home.

The gender disparity continued in the frequency of Internet access. 47% of female and 30% of male students accessed the Internet a few times a week while 23% of female and 24% of male students accessed the Internet every day (Figure 6.32).

Figure 6.32 Female and male students’ frequency of Internet access
A Chi-square test revealed a statistically significant difference in the frequency of female and male students’ access to the Internet ($\chi^2(4) = 22.159$, p < 0.001). While slightly more male students (24%) than female students (23%) accessed the Internet every day, many more females (47%) than males (30%) accessed the Internet a few times a week.

Figure 6.33 Time spent using the Internet on an average day by female and male tertiary students
The majority of students, 52% of females and 59% of males, used the Internet less than 1 hour on an average day. More than a third of the student population (42% of females, 35% of males) used the Internet 1 to 3 hours daily. However, the indicated differences between genders in their daily use of the Internet were not significant ($\chi^2(3) = 3.177$, p = 0.365).
Despite statistically significant differences in access to the Internet, female and male students showed no difference in the amount of time spent using the Internet on an average day. 52% of female and 59% of male students spent less than 1 hour daily (Figure 6.33). 

There were fewer statistically significant differences between female and male faculty members at tertiary institutions. Nineteen percent of females and 6% of males admitted having no experience of the Internet. Among those who had access to the Internet, 46% of women staff and 56% of men staff used the Internet every day (Figure 6.34).

A Chi-square test revealed no statistically significant difference in the frequency of female versus male faculty members’ access to the Internet ($\chi^2(5) = 5.026, p = 0.413$). While 56% of male lecturers and 46% of female lecturers accessed the Internet every day, 31% of women and 28% of men accessed the Internet a few times a week. Noticeable difference was recorded between female and male academic staff members who had never used the Internet: 19% of females and 6% of males.

Academic staff did not display significant gender differences in the amount of time they spent using the Internet on an average day: 48% of female and 50% of male faculty members spent 1 to 3 hours every day using the Internet (Figure 6.35).

Statistical results suggest no significant difference between genders in both groups of participants in the majority of issues related to participants’ access to computers and the Internet. The only recorded differences were found among students where females were found more likely to have no experience with the Internet, Internet access at home and more frequent access to the
Internet during the average day. However, qualitative analysis did not confirm the above findings and revealed far deeper differences in access to computers in IHEs. Many interviewees pointed to difficulties that female students faced in terms of computer accessibility. Officially, all research participants at each institution had an equal opportunity to use computer facilities available to them. However, male cultural domination in PNG society, as well as their physical strength, resulted in male students having first access to computers. Both female and male participants commented on this:

Here at the university, I think we have computers for, we call it the open labs means anybody can go there, men and female. I think in the reality, because of the limited number of computers, we have aggressive males to make it difficult for females to access. ...I think wherever there is access to both male and female, males by the very nature are more aggressive would probably try to intimidate females from accessing like computer labs (UM08).

Female students felt that because of discriminative access to computer facilities, they were treated unfairly.

Due to lack of computers, it is seen that mostly male students have access to the few computers that we have so it’s like unfair to the female students (UFS1y).

Males perceived their forceful first access to computers as acceptable within PNG cultures.

Papua New Guinea is a male dominated society. And every male seems to think and believe that they own everything and they have the right to do everything first then the female. ... That has to do with cultural influence. So, men first, ladies last. It is cultural influence, we can’t help it (UM11).

Another important reason for females’ unequal access to computers is related to unsafe environments. Because of the high risk of harassment, assault, and rape in Papua New Guinea, some institutions restrict female students’ night movement within campuses. Although there were no such official restrictions for female staff members, some of them also considered lack of security on the campus as a disadvantage, forcing them to complete their work on computers during days only.

It is a disadvantage in my case because we are unable to come out in the night to work because it’s not safe here. It’s not safe to move around in the night (OF06).

Some participants, including males, found the uneven access to computers unacceptable and called for administrative action to ensure fair access.
There should be some policy in place that would assist females especially to just have access, I mean here within university we should probably have separate labs so that females will have their own, we don’t need to worry about that, but at the higher level, they should have policy to encourage females to buy their own computers, or have a policy to assist them, almost like a TESAS scheme, loan scheme or something like that (UM08).

Interestingly, although a few participants made appeals similar to that quoted above, pointing to administrative bodies to take action, no one suggested an awareness campaign to influence behavioural change within the community. It seems that, although males’ aggressive behaviour was perceived as unfair towards females, it was socially acceptable, even by female participants. Change, if any, was expected to come either by administrative decision or by providing females with other means for computer access.

One of the suggested ways to solve inequities and to give women better access to computers was to assist them to purchase a personal computer. This proposal seemed to have additional importance considering the difference in the level of computer ownership. Although there was no statistically significant difference between the female and male academic staff members in their ownership of personal computers (females 73%, males 76 %, Figure 6.36), the level of ownership between female and male students differed significantly (females 31%, males 40%, Figure 6.37).

Chi-square test revealed that female and male lecturers at tertiary institutions did not differ significantly in their ownership of personal computers ($\chi^2(1) = 0.086, p = 0.769$)

There was a significant difference in ownership of a personal computers between female and male students at tertiary institutions ($\chi^2(1) = 7.534, p = 0.006$).
6.2.3 A gender digital gap in access to technology

The difference in access to computers between female and male students reflected the situation in the wider community where men were perceived as computer owners.

Men own computers compared to women in PNG. In government, business houses, private firms, women use computers but men own them. In institutions male grab the first opportunity and female make other arrangements when it comes to using computers (OFL/OQ).

As previously noted, PNG society is still considered male-dominated. Traditional understanding of male superiority was reflected in contemporary institutional structures, which favour men. One of the OIHE male lecturers pointed to some sources of the ownership differences:

Men have access to computers because they can afford it, ... they get a bigger salary than most women have and so they have that advantage of owning a computer or having access to it. That is how I see and I know of a few people who own computers in their houses where woman are more like denied to having access to using a computer so the men always have that advantage (OM22).

Females’ access to computers was restricted by their lower salaries. In addition, many women pointed out the consequences of gendered social roles as one of the factors that contribute to the difference in access to computers. A woman was expected to take care of her own family, including extended relatives, first.

That’s how I see because with females we have a different workload and different roles at home so the time management is something, so the time we spend on computer particularly on the Internet, would be much more limited than males because of our other commitments particularly family commitments (OF14).

6.2.4 A societal digital gap in access to technology

Differences in access to computers between rural and urban Papua New Guinea were of great concern to almost all participants. Although it is beyond the scope of this study situated in the context of IHEs to discuss in depth the societal digital gap, the situation does affect the education system, including higher education, as indicated by one of the participants:

The Education Department is saying that computers will be issued to schools for the students’ use. This is unfair to most of schools primary and secondary in the very remote areas. No road link and no electricity. For secondary a small generator runs electricity for only a couple of hours (4-5 hours) in these remote schools. When these students enter
tertiary institutions, they are intimidated by students who attended urban/city schools and who are familiar with computers (OFL/OQ).

Participants reported a number of different obstacles that contributed to the huge disparities between rural and urban Papua New Guinea in ICT exposure and penetration. Some major disadvantages of rural areas include difficult geographical terrain; lack of infrastructure and services; high cost, even unaffordability, of computers and Internet connection; lack of knowledge; and high illiteracy among the rural population. Most participants brought up the lack of electricity as one of the most important impediments to the development process in rural areas. Although such alternative power sources as generators or solar batteries do exist, the cost of operating them is not affordable for the majority of the rural population.

I think it would be difficult if you don't have the electricity. You can have the computers there, but if you don't have the electricity you can't really use it. Like even, if you have the solar, and power with batteries, and set up own computers in rural place, that shouldn't be difficult, but it would be expensive actually sitting things up this way. At the moment, where I come from, we don't have electricity that goes in, most of the rural places in PNG don't have access to electricity, except having a generator. We have our own generator that run, so we can use it, but it is very costly to run the generator (UF01).

Interestingly, the majority of those who discussed the gap between rural and urban PNG tended to blame local politicians and their (mis)understanding of development for the lack of technology outreach in rural communities.

In my own opinion, it [lack of technology in rural areas] got to do with political system in the country. Our politician, how they seem pursue development, where development should come first and foremost in their priority? It is politicians bringing that into their province and bringing that to the society. They make it there the priority and people and places ought to be introduced to this sort of things: technology. I cannot think of any other reason except to blame my politician not to bring that service into the province (UF20).

Dependency on the government’s provision seems to be prevalent at all levels of society. The government is held responsible for the lack of infrastructure and is expected to provide resources for development in rural places. However the government policy to introduce ICT education to all schools is seen as unattainable due to the lack of infrastructure and manpower.

When they say there is a notice on the newspaper, computers in classrooms in 2008. It’s a joke (OF02).

The first thing for the government is to train more people. For example we have teachers in the remote places. Let’s say, if you bring computers down there. The computers are there and if there is not trainer, who is going to train those people. The Government should have
to look at producing more trainers in computer literacy. ... I think that it’s hard because we have to look at the power supply because it works with power. We have to look at the satellite system. These are some of the things you have to consider. Anyway, Government will pay (OM15).

Other important aspects that hindered the introduction of technology in rural locations were the strong traditional culture in the village setup and the lack of understanding of the importance of technology among the rural population. Some participants expressed their concern whether the grassroots would readily accept technological change.

When I go from the town to my village, it’s like I am living in two different worlds. Like I am swinging in a pendulum from one section to the other. It is very different there. You don’t have electricity, you don’t have anything else. You go back to the basics. So it will take some generations, I should say, for the use of computers and other sort of development (OF06).

Contributing factors to low proliferation of ICT services in rural communities is the local concept of development combined with the lack of understanding of benefits of technology for life in rural areas. The traditional concept of development refers to the goods and benefits that are gained by the local community.

I think it has do with people’s attitudes toward development, how they perceive development. When there is development happening, people turn to demand too much, too much out of what is happening. So, sometimes politicians hold back, because they know that when they bring this sort of development to the society on the other hand people would be demanding: you bring this; we want this, so.... It becomes kind of obstacle for the developers to move to these areas... Culture is so strong that when they are not happy with development they can do anything and anything under the sun to stop you from what you are doing. It may not be physically but in some supernatural sort of activity that would stop you from further continuing what you are doing. So, it’s kind of very difficult to penetrate the rural in my society (UF20).

As a consequence of a clash between global and local meanings of development, people often resolve to engage supernatural forces to have things done their own way. One of the participants told a story about supernatural forces moving a telecommunication tower from where it was installed by Digicel (mobile phone company) to the location where the community wanted it to be installed in the first place. As much as it may sound irrational, the basic point of such a story is that, as long as local people do not comprehend the benefits of technology, they will not cooperate and accept it in their communities.
One of the many consequences of an existing gap between rural and urban Papua New Guinea is the relatively low level of education available in rural areas. It is reflected in the low academic level of students coming from outside the major centres in the country.

I think it is just kids in cities know how to use computers. Most of students in rural areas they don’t know what a computer is. For example, I have been teaching IS for two years, most of the students who come from rural areas, especially from highlands, one of the secondary schools in the highlands, they don’t know how the computer looks like, how it feels to use it. There is a very big disparity between the rural areas and urban kids. So, only students in urban areas have a privilege to use computers (OM17).

In summary, this section presented the gender related issues in access to computers and the Internet. Statistical analyses show no gender difference in the frequency of computer access or of time spent with computers on an average day. It recorded gender differences in access to the Internet but no difference in the time using the Internet. However, qualitative data revealed important gender issues that are part of the daily struggle of women in their access to computers and the Internet. Although equal access to technology is officially provided for female and male students and staff members, the majority of females, especially students, found themselves in discriminatory situations where their access to computers was restricted due to cultural reasons or an unsafe environment. For female staff members, one of the important factors that affected their access to technology was their traditional role at home, where they were expected to take care of the family and extended families first.

An important aspect discussed by female and male participants in relation to access to technology is the huge disparity between rural and urban Papua New Guinea. The lack of power, infrastructure, and services in combination with strong traditional cultures and local concepts of development results in almost no ICT availability in rural areas. One of the consequences of such situations is a very low level in the schooling system and uneven educational opportunities for students from rural versus urban centres.

The discussion of gender issues continues in the relation to the application of computers and the Internet.
6.3 Gender-related Differences and Similarities in the Application of ICT

The analyses of gender-related differences and similarities in the application of technology are discussed in the context of ICT use in higher education institutions. A special section is dedicated to discussion of ICT in communication.

6.3.1 Gender issues in the application of ICT in higher education

The discussion about gender-related issues in the application of ICT commences with an overview of the statistical results in regard to gender similarities and differences in the application of computers and the Internet in the higher education sector and proceeds with a qualitative discussion of the issues.

The study looked into the use of computers by academic staff and students at tertiary institutions. When invited to summarise their purpose for using computers, both groups showed no statistically significant gender differences. Among academic staff, 83% of males and 84% of females indicated using computers for mainly academic purposes (Figure 6.38). However, among students, 46% of males and 44% of females declared using computers for academic purposes and 20% of males and 15% of females admitted using computers primarily for entertaining purposes (Figure 6.39).

The female and male faculty members did not differ significantly in declared purpose of using computers ($\chi^2(2) = 0.084, p = 0.959$).

A Chi-square test revealed no significant difference in the purpose of computer usage ($\chi^2(2) = 5.585, p = 0.061$).
The study further explored whether the participants’ own perception of their computer use was consistent with their actual use of computers. All participants were asked to indicate different activities performed with computers on an average day. As previously noted in the ICT profile, the activities performed by lecturers referred mainly to their professional performance. The majority of the academic staff declared using computers for preparing lecture notes (females 96%, males 90%), doing research (females 73%, males 76%), attending to administrative tasks (females 58%, males 55%); in terms of entertainment, they used computers for listening to music (females 31%, males 29%), playing games (females 15%, males 24%) and watching videos (females 15%, males 8%). None of the computer activities manifested a significant difference between genders of academic staff. However, different results were found among students. As previously noted in the ICT profile, there was no difference between genders in students’ own perception about computer use, with the majority of student participants spending time on computers either for academic purposes or spending an equal amount of time for academic and entertainment purposes. However, genders differed in their actual use of computers. Female students were more likely to use computers for academic activities (Figure 6.40), while male students were more likely to use computers for entertainment (Figure 6.41).

The distribution of Factor 1 was significantly different for both groups (p = 0.011). Female students were more likely (n = 360, \( \bar{x} = 0.1027, s = 0.9757 \)) than male students (n = 510, \( \bar{x} = -0.0724, s = 1.0114 \)) to use computers for academic purposes.

Both groups significantly differed in their use of computers (p < 0.001). Male students were more likely to use computers for entertaining purposes (n = 510, \( \bar{x} = 0.1223, s = 1.0069 \)) than female students (n = 360, \( \bar{x} = -0.1733, s = 0.9651 \)).
To extend the understanding of gender similarities and differences in ICT usage in tertiary institutions, application of the Internet by faculty members and students has been examined. The ICT profile showed that the main purposes for accessing the Internet by academic staff were research (88%), email (79%), banking (18%) and online meeting people (16%). They were looking for work-related information (93%), news (56%) and hobby-related information (26%). Although further analyses generally revealed no statistically significant differences between female and male lecturers in the purposes listed above for accessing the Internet, differences were noticeable in two instances: banking and online meeting people. 24% females and 14% of males pointed to online banking as their purpose for using the Internet; 24% of female and 12% of male academics indicated online meeting people as their purpose for using the Internet. In relation to the kind of information for which lecturers were looking on the Internet, the further analyses did not reveal any statistically significant differences. However, difference was noticeable in relation to the news, which was accessed by 64% of male compared with 43% of female academics.

Female and male faculty members did not exhibit significant statistical differences in their access to and use of email. However, as shown in Figure 6.42, males accessed their email on an average day more often than females. Almost 60% of male academics accessed email 4 to 5 times (29%) and more than 5 times (29%) on an average day, while 43% of female academics accessed email 2 to 3 times on an average day.

A Chi-square test revealed no significant difference in the frequency of email access between female and male academics at the institutions of higher education ($\chi^2(4) = 5.930, p = 0.204$).

A Chi-square test revealed no statistically significant difference in the content of email between female and male academics at the institutions of higher education ($\chi^2(2) = 2.744, p = 0.254$).
When asked to summarise the content of their emails, 62% of female and 46% of male academics indicated that the content was equally professional and other than professional. 24% of female and 46% of male academics said that their email content was mostly professional (Figure 6.43).

As was the case for academic staff members, students at tertiary institutions used the Internet in ways similar to the ICT profile previously noted. Among the most popular activities were research indicated by 88% of student participants, email by 59%, entertainment by 41%, and online meeting people by 25%. To complete this discussion, students were asked about the kind of information for which they were searching on the Internet. The majority of participants (93%) reported searching for information related to their study. The other reported types of information were the news (47%), music and videos (38%), hobby-related (30%) and games (16%).

Unlike with faculty members, some differences between female and male students were statistically significant in the purpose of access to the Internet. Both groups differed in email being considered as a purpose to use the Internet by 68% of females and 53% of males ($p < 0.001$) and in entertainment viewed as a main reason to use the Internet by 35% of females and 45% of males ($p = 0.016$). There was no statistically significant difference in the type of information searched on the Internet by female and male students, except for games. More males (19%) than females (12%) acknowledged looking for games on the Internet.

As indicated earlier, almost 60% of all participating students indicated using email as a purpose of access to the Internet. The difference was statistically significant between female and male students in their frequency of checking their email on an average day. 42% of females checked their email 2 and 3 times, and 12% checked it more than 5 times per day, compared with 32% and 6% of males in the same categories (Figure 6.44).
Female students reported checking email more often on an average day than male students did. A Chi-square test revealed statistically significant difference in the frequency of email usage between female and male academics at institutions of higher education ($\chi^2(4) = 17.301, p = 0.002$).

When invited to summarise their email content, 52% of all participating students indicated it as equally academic and other than academically related (females 53%; males 52%). However, female and male students significantly differed statistically in their use of email for purposes other than academically related (female 52%; male 31%) as shown in Figure 6.45.

Although the qualitative analysis confirmed the statistical results, it also provided additional insights into the gender-related issues in the application of ICT in higher education context. As previously noted, the majority of participants reported using computers mainly for work-related activities although they also acknowledged using computers for purposes other than academic. However, when discussing the issue of application of computers, there were some gender differences in the perception of computer use. Women stressed the exclusive use of computers for academic activities.

Women use computers for working purposes (UF01).

I think with ladies, we really use it if we really need to use it. ... That’s how I see because with females we have a different workload and different roles at home so the time management is something, so the time we spend with on computer particularly on the Internet, would be much more limited than males because of our other commitments particularly family commitments. That’s for men and women (OF14).
I use it [a computer] for professional work, but I have to leave the box and go on to normal daily life. So in other words, I don’t use computers if it’s not to do with professional work (OF16).

Women used computers to perform their professional duties. The time spent on the computer was restricted by their family commitments. As mentioned in the section discussing access to technology, women’s roles as family providers and family carers restricted use of computers to what was seen as necessary to fulfil professional obligations. Although women did not complain about having additional duties, and therefore less time to use computers (called it “normal daily life”), the number of references to this issue showed that they did feel them rather strongly.

Similar to female academics, some male academics reported using computers for mainly academic duties.

I only use computer for professional activities, typing lecture notes, worksheet, reading email, surfing web for articles for professional readings/research (UML/OQ).

Although the majority of males reported using computers for academic purposes and acknowledged the importance of technology in their professional careers, they did not stress using it for academic purposes only. On the contrary, some of them saw no difference between women and men in the application of technology.

In terms of using computers by academics, I think there are no differences between genders. It depends on how people value computer and its significance to their working environment (OML/OQ).

It might be argued that similarities in the application of computers in the educational context were due to very limited use of computers. The majority of female and male academic staff used technology to prepare lecture notes and assignments for students and to keep student records. The majority of academics’ use of software application was limited to word processing, Excel and PowerPoint. No one mentioned using any software application in complex ways to integrate ICT into teaching and learning processes. The fact that women discerned the gender difference in the application of computers was related more to their lack of available time, and other family obligations than to their actual computer use. The limitation of the academic staff’s computer use, as discussed here, was due to their lack of proper training.

Most of the teaching staff, we also have inadequate knowledge about the computer; we already use the Microsoft Word to type, just do basic typing of test papers or lessons and all these and assessments, entering of scores on the Excel and maybe all thing necessary to
do their grading. Those are the areas that we are mostly confined to because most of us, we are not trained computer experts (OM18).

Both female and male pointed out the lack of proper introduction to computing as an obstacle in effective use of computers for teaching purposes as well as a reason for time wasted trying to figure out how to complete different tasks. They believed the institutions in which they were working should provide courses in computing as well as continuing assistance to ensure that the technology be used in more effective ways. Special attention was given to the use of the Internet. On one hand, it was seen as a vast source of information and an enormous help in preparing a course. On the other hand, this wonderful tool for academic work could have been better used if academics knew how to do so.

We have never been taught how to surf the Internet and get the information that we wanted. So when we are surfing the Internet we would use up all our credits looking at sites which we were not supposed to and picking up information that we thought were appropriate for us but if someone who really knew how to do research on the Internet would just look at our papers and said ‘this is crap, you collected information that just not vital to support what are you writing about’. So, when it comes to academic search for information we still don’t know how to do it properly because we pick up anything from anywhere (UF20).

The important difference between female and male academic staff members in technology use lay in men spending more time on computers for leisure activities. Interestingly, primarily women pointed to this issue.

I think men have more time to sit and surf the net to use this technology. Women use it only when work requires it. At home, they will not use it this much because they are busy with housework, housekeeping, looking after the children. All these domestic chores would offer little time for women to access, to have access to the computer. But men have all the free time to use it (UF13).

Males tend to access pornographic materials on the Internet and other stuff I don’t think is good. ... Especially some of our older students, and males and some younger students, male students, I’ve seen them, they actually printing these pornographic pictures. ... Others who are lazy who have nothing to do, they gamble on the computer, play games, especially male students I observed in postgraduate computer lab. When you see ladies, they are doing some work, they are very busy at the computer working while males playing games, they come at night to do other things which they don’t want us to see or something (UF10).

Academic staff generally did not notice much difference between female and male students, especially in their use of computers for academic activities.
Because it is a requirement that they must learn and it’s a requirement that the work they submit must be printed out so that is why not much of difference. So, I think the use of computers is the same for the males and females... (UF07).

Whether they males and females use it differently, I think it depends on like if you are student I think the use of computer is basically the same is for word processing. Here we require everybody to have typed work. ...I think it depends on, like if they are students they is probably the one way to go, and there is mostly word processing, if they have access to the Internet, maybe there will be differences in the way males use and the way female use computers (UM08).

The lack of differences between female and male students in study-related computer activities could be ascribed to the fact that, officially, all students had access to the same computer facilities and they all were expected to use them for their studies. The fact that students submitted their work completed with computers could have been understood as an indicator that they used computers in the same way. However, lecturers teaching computer courses found females more focused on the tasks at hand while males were more focused on exploring computers on their own or simply doing other activities besides study.

I see the boys will be a little more tricky and they will go out of boundaries do at least other things and programs. I’ve seen this when I was supervising my students while young teacher was walking away, so to teach in the front, the girls were just following step by step instructions, they were trying to do things, while boys were on to other programs and when went, they put it off and they pretended to listen. ... In terms of gender equity, I think women will do more things and will be more maybe fruitful in a way to get more results through using computers by using time wisely by doing the right things, you know, they will be more effective in whatever way and whatever things they will do than male (UM11).

Students themselves admitted using computers not only for academic purposes but also for entertainment. This confirms results obtained from the survey questionnaire where 52% of students reported using computers for both academic and entertainment purposes. The favourite entertainment activities with female students were playing games and chatting with friends on email, while male students favoured playing games, listening to music and exploring the Internet.

The presentation of gender issues in the application of ICT in educational contexts continues with discussion of another dimension identified in the study, use of ICT as a means of communication.

6.3.2 ICT as a new “digital garamut”

In Papua New Guinea, the prevalent understanding applied to every-day events is that Melanesian culture is all about the relationship. The importance of human relationships in PNG
society surfaced in this research in relation to ICT as a new means of communication, discussed by both female and male participants. This section considers the role of ICT in displacing traditional ways of communication and in creating new communication opportunities.

The advent of new technology has not changed the traditional value of communication, which has always been in the centre of community life in traditional Melanesian societies. Males and females pointed to the ability to provide connections with family and friends as one of the most important features of ICT, equal in importance to searching for new information. When asked to summarise their attitude to computers, the participants shared:

- Computers are fantastic. Computers assist me in searching for new information, communicating with relatives and friends (UFS4y).

- A vast source of generally reliable information and means of global communication (UML/OQ).

- I find Internet very useful to collect material for my teaching and for communicating with friends as well as my students and my work colleagues (UFL/OQ).

Technology as a mean of communication was eagerly and enthusiastically accepted. Furthermore, ICT was adapted in traditional society to displace old ways of communication.

- In previous days, when you wanted to communicate you have to go far, up towards the mountain and shout down to those people. And from there those people shout to others: he is saying that, saying that. For the communication, it’s everything (OM19).

Different societies had their traditional ways to communicate among themselves and with other groups. In many parts of PNG, people used a garamut\textsuperscript{11} for important communications. Nowadays, the drum’s role in communication is being replaced by technology. With increasing ICT proliferation in all parts of PNG, ICT is becoming a modern digital garamut (Kolodziejczyk, 2011) or a contemporary sign of global and local merging. Interestingly, only initiated men could beat the traditional garamut, so they were the communicators. The digital garamut is available for women; thus, ICT brings the means of communication into the hands of women.

Not only did ICT displace old ways of communication, but also it created new opportunities to communicate in ways not known in the past. The Internet and Internet-based services played a special role in these new forms of communication. Among the most often mentioned new ways

\textsuperscript{11} Carved from a felled tree, the slit drum or \textit{garamut} is the most important instrument in many PNG regions. The drum’s sound is understood as its voice. This voice can carry long distances to announce meetings, call individuals, issue warnings, and even contact neighbouring villages. Communication occurs through a complex series of rhythms and tones beat out with a wooden stick by an initiated man.
to communicate were email services and social networks. Although email was often used by women and men for both private and job-related communications, there was a noticeable difference in the participants’ discussion of the purpose of using an email. While the majority of females used email in order to keep in touch with family and friends, the majority of males seemed to use email mostly for job-related communications.

Through the use of emails, I can now easily communicate with other colleagues from around the world. Just yesterday, for example, I, we jointly submitted the project with the college of London for some research project in here. That won’t be possible if we won’t have access to the Internet or emails system. But now that’s possible, you can work on collaborative projects with your colleagues from around the world. You can communicate with them like that (UM08).

But on the other hand, the email service has been awesome. My husband was away last year, if we did not call each other for a few days, on the internet we were able to converse daily so you know that’s really miles ahead service provided (UF07).

Male participants noticed another important difference in the use of email, in relation to females’ email content. They reported that women were sending all kinds of wisdom-coaching presentations. It seems that women’s email content was more social and religious than men’s.

I noticed that a lot of secretaries, they send this religious type of messages and they send it to everybody and a lot of male academics – probably the politics of running the university and that kind of things. ... The secretaries they like all this wisdom kind of coach and a lot of secretaries are quite good in doing that. So that may be difference in the use of email (UM08).

The other new way of communication, the social networks, was mentioned only by women participants. They loved to keep in touch with their friends using social networks. They found it fascinating that this new communication platform brings them close to family and friends and also helps to find new friends.

Chatting with friends, going to sites that have a lot of young people chatting with one another. The famous site that we have here and a lot of students are into is beboy. A lot of young people are putting their profiles there and they are chatting to one another (UF20).

In terms of just getting again the networks from high school all that, it’s just so easy now. It actually enables you to communicate with people that were lost to you and that was so dear to you in terms of high school. ... That’s what I mean, in terms of if you really into friends and you like maintaining contacts, I just love it. Yeah! So, that’s my love of the internet. It’s my attitude toward it now (UF12).
Although, as discussed earlier, technology was wholeheartedly accepted as a new means of communication, some participants pointed to disadvantages of new, when compared with traditional, communication. They felt the lack of face-to-face interaction as a big loss in the new communication processes.

Communication, everything is communicated through email on this campus. We have to rely on emails. We now say ‘hi’ on email, you know, lack of face-to-face contact is the situation now. It is a problem (UF21).

For Melanesian people who cherished personal interaction in communication with others, and for whom good relations with others was at the heart of everyday life, such a change in the communication process was problematic.

I think it is negative. It’s not making people getting in touch with people very much. Making them isolated. As soon as you have those things [technology] you are by your own. You know that you own the world by yourself. So I can see that, it really trying to, the kind of relationship that we have between people, once you have those things, you have the computer, you stay there all the time with the computer. You got a phone to talk with people. So you do not have very much more time to talk to people that you have around to get ideas from them. What you do, you stick with those things like computer, mobile phones, like this. ... In order to, we will have to look for some ways in which people have to interact with each other. We should look at some things which involve people getting together, doing things together at the same time (OM19).

In summary, generally there was not much difference in the use of computers for professional purposes. Women and men admitted using computers to complete their work duties. However, an important difference noted by female lecturers was women’s exclusive use of computers for academic work while men had the luxury to use computers for academic as well as entertainment activities.

Similar results were reported in relation to female and male students’ computer use. Students were using computers for both academic and entertaining purposes. There was not much difference in their application of computers for study-related activities. For entertainment use, however, more female students pointed to their chatting with friends on email while more male students pointed to accessing the Web.

The other important aspect of the application of technology discussed in this section was communication and related to it two roles of technology: the application of ICT for displacing old, traditional ways of communication as well as new communication opportunities introduced with
the advent of technology. In terms of gender issues, the findings demonstrated that ICT as digital garamut brought the communication means into women’s hands.

6.4. Gender Issues in Attitudes Towards ICT

The gender profile presented in Gender-related Differences and Similarities in the Application of ICT section discussed in depth the results of the attitude scale. The statistical tests revealed that a majority of female and male students and staff held mostly positive attitudes and beliefs about ICT. Table 6.2 summarises factors that guided participants’ selections on the attitude scale:

<table>
<thead>
<tr>
<th>Guiding factors in students’ attitudes</th>
<th>Guiding factors in staff’s attitudes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Computers are superior to humans.</td>
<td>1. Computers are superior to humans.</td>
</tr>
<tr>
<td>2. Technology is a beneficial tool for study and work.</td>
<td>2. Technology becomes an integral part of daily life.</td>
</tr>
<tr>
<td>3. The Internet is fascinating.</td>
<td>3. The Internet is fascinating.</td>
</tr>
<tr>
<td>4. Working with technology is frustrating.</td>
<td>4. The Internet makes life easier but has a negative impact on society.</td>
</tr>
<tr>
<td>5. Technology becomes an integral part of daily life.</td>
<td>5. Computers are a beneficial tool for an academic performance.</td>
</tr>
<tr>
<td>6. Technology changes the world around us.</td>
<td>6. Technology makes work more fun.</td>
</tr>
<tr>
<td>7. Technology brings a better life.</td>
<td>7. Technology is frustrating.</td>
</tr>
<tr>
<td>8. The Internet has a harmful effect on a community.</td>
<td>8. The Internet becomes an integral part of daily life.</td>
</tr>
<tr>
<td></td>
<td>10. Technology is fascinating and easy to learn.</td>
</tr>
</tbody>
</table>

The statistical results of the attitude scales are the starting point for the following discussion about gender differences and similarities in female and male students’ and staffs’ attitudes toward technology. It is then supplemented with qualitative data results to better delineate women’s and men’s attitudes towards ICT.

6.4.1 Gender differences in students’ attitudes toward technology – results of the attitude scale

An independent-samples t-test was conducted to evaluate the hypotheses that female and male students did not differ significantly in their attitudes towards technology. The results showed that
the mean scores of two out of nine earlier identified factors were statistically significantly different: Factor 3 *The Internet is fascinating* and Factor 9 *Computers make learning more fun*. Additional tests were run to explore the gender differences in the two factors.

For Factor 3 *The Internet is fascinating*, an independent-samples t-test revealed that female and male students differed significantly in their fascination with the Internet. Male students were more likely to hold the view that the Internet is fascinating (Figure 6.46). Figure 6.47 presents additional visual information for the distribution of scores for Factor 3.

![Figure 6.46](image1.png)  
**Figure 6.46** Boxplot showing the distribution of Factor 3 (*The Internet is fascinating*) among female and male students in institutions of higher education

The distribution for Factor 3 was significantly different for both groups (p = 0.019). Male students were more likely (n = 368, $\bar{x} = 0.077$, s = 1.036) than female students (n = 246, $\bar{x} = -0.115$, s = 0.933) to view the Internet as fascinating.

For Factor 9 *Computers make learning more fun*, an independent-samples t-test revealed that female and male students differ significantly in the view that computers make learning more enjoyable. Male students were more likely to view computers as machines that make learning more fun (Figure 6.48). Figure 6.49 presents additional visual information for the distribution of scores on Factor 9.

![Figure 6.47](image2.png)  
**Figure 6.47** Error bar for female and male students showing clear divergence of the 95% confidence interval Factor 3 (*The Internet is fascinating*) scores for each group.
Figure 6.48 Boxplot showing the distribution of Factor 9 (Computers make learning more fun) among female and male students in institutions of higher education.

Figure 6.49 Error bar for female and male students showing clear divergence of the 95% confidence interval Factor 9 (Computers make learning more fun) scores for each group.

The distribution of Factor 9 was significantly different for both groups (p < 0.001). Male students were more likely (n = 368, \( \bar{x} = 0.128, s = 0.993 \)) than female students (n = 246, \( \bar{x} = -0.192, s = 0.980 \)) to view computers as machines that make learning more enjoyable.

6.4.2 Gender differences in staffs’ attitudes toward technology – results of the attitude scale

The Mann-Whitney U-test was conducted to evaluate the hypothesis that female and male academic staff members did not differ significantly in their attitudes towards technology. Test results show that female and male faculty members’ attitudes towards technology differed significantly for Factor 1 Computers are superior to humans and Factor 10 Technology is fascinating and easy to learn. Additional tests were run to explore gender differences in the two factors.

For Factor 1 Computers are superior to humans, the Mann Whitney U-test revealed a statistically significant difference (U = 186.0, p = .029) between female and male academics in their belief about computers as superior to humans. Female faculty members were more likely than male faculty members to view computers as superior to humans (Figure 6.50). Figure 6.51 presents additional visual information for the distribution of scores on Factor 1.
Figure 6.50 Boxplot showing the distribution of Factor 1 (Computers superior to humans) among female and male faculty members in institutions of higher education

The distribution of Factor 1 was significantly different for both groups ($p = 0.029$). Female academics were more likely ($n = 18, \bar{x} = 0.426, s = 1.020$) than male academics ($n = 33, \bar{x} = -0.232, s = 0.922$) to view computers as superior to humans.

For Factor 10 Technology is fascinating and easy to learn, the Mann Whitney U-test revealed a statistically significant difference ($U = 179.0, p = .020$) between female and male academics in their belief about technology as fascinating and easy to learn. Female faculty members were more likely than male faculty members to view technology as fascinating and easy to learn (Figure 6.52). Figure 6.53 presents additional visual information for the distribution of scores on Factor 10.

Figure 6.52 Boxplot showing the distribution of Factor 10 (Technology is fascinating and easy to learn) among female and male faculty members in institutions of higher education

The distribution of Factor 10 was significantly different for both groups ($p = 0.020$). Female academics were more likely ($n = 18, \bar{x} = 0.466, s = 0.891$) than the male academics ($n = 33, \bar{x} = -0.254, s = 0.975$) to view technology as fascinating and easy to learn.

Figure 6.53 Error bar for the female and male faculty members showing clear divergence of the 95% confidence interval Factor 10 (Technology is fascinating and easy to learn) scores for each group

170
In summary, this section presented statistical analyses of the two attitude scales for female and male students and academic staff in IHEs. Among students, differences were found in two out of nine guiding factors. Male students were more likely to believe that the Internet is fascinating and that computers make learning more enjoyable. Similarly, gender differences were found in only two of ten guiding factors among faculty members. Female academics were more likely to view computers as superior to humans and to view technology as fascinating and easy to learn.

6.4.3 Attitudes towards technology – concurrent analyses

The statistical analyses revealed minor gender differences in attitudes towards technology between tertiary staff and students; the majority of attitudes were positive. The only two negative aspects of technology shared by both groups referred to the frustration experienced when working with technology and a belief that the Internet has a harmful effect on a community. Qualitative analyses not only corroborated statistical findings but also deepened understanding of attitudes towards technology by providing more balanced lists of positive and negative views and beliefs about computers and the Internet (Figure 6.54).

![Figure 6.54 Attitudes towards technology held by students and staff in higher education institutions as identified in thematic network for ‘Attitudes towards technology’](image-url)

**Positive attitude**
- Technology is a limitless source of information.
- Technology is powerful because it gives access to knowledge.
- Computers contribute to the quality of work making it easier and better done.
- Confidence when using technology encourages its wider application.
- Computers are fascinating because they are smarter than humans.
- Technology is seen as a new and welcomed phenomenon.

**Negative attitude**
- Technology is replacing social interaction.
- People become addicted to technology to the point of being controlled by it.
- Computers remain a luxury available to group of a privileged people.
- Using technology may be frustrating when it does not perform up to expectations.
- Technology can easily distract people from tasks at hand.
- Lack of proper training causes anxiety when using technology.
- Overdependence on technology leads to weakening of criticism about the content of information.

**Ambivalent attitude**
- People ascribe human characteristics to a computer.
- Technology is a new phenomenon alien to PNG cultures.
6.4.3.1 Positive attitudes towards technology

As noted earlier, the majority of attitudes towards technology identified in the quantitative analyses were confirmed by results from qualitative analyses. One of the attitudes identified in the quantitative analyses was a belief that technology is a beneficial tool for study and work. The perception was also shared by both women and men although they expressed the notion in different forms. The most common expressions that referred to a beneficial aspect of technology in relation to study and work were “handy” and “useful”. The participants saw computers as very helpful in the completion of work tasks.

Work has become easier now. Typing is easier now, you just touched type and you get the result. And so, it empowers me in one way, it facilitates my performance. Typing is not tedious anymore, it becomes fun, and it becomes enjoyable (UF13).

Furthermore, participants believed that the computers made work more efficient and of better quality.

Obviously, computer has a big impact on improving work productivity and staff performance (UML/OQ).

Computers not only contributed to the efficiency of work but also, as discussed by interviewees, computers changed the way things were done in the workplace.

In the past, our tests, worksheets, all these were typed by a school secretary. You had a draft, gave a copy to the secretary and she did it for you; or you photocopy and you cut, paste, shift into another blank sheet. But, with the computer, with the aid of the scanner, you can scan, compile, and fix it easier. ... So, it made job a lot of easier now (OF14).

People found the usefulness of computers enjoyable. The fact that computers helped to complete work faster and easier was greatly appreciated.

Computers are more advanced, fast and easier to use. They make life easy and fun and more enjoyable (UFS3y).

Another positive attitude discussed by participants expressed their confidence in using technology. Interestingly, only women shared the notion. It validated the statistical finding of female academics being more likely to see technology as fascinating and easy to learn.

Today I feel very confident; actually I teach others how to use the computer and run classes and I learnt so much of it myself because I teach it myself. And, I got to love it (UF20).

Although only women talked about feeling confident using computers, both women and men had
generally good experiences with the computers and both genders expressed their interests in learning more.

Computers are good. They make work easy. It would be good to know more about them (OML/OQ).

I would love to learn how to use the software itself, like spreadsheet, database, power point, that was one of these things that I really wanted to learn how to do it (UF20).

Both genders shared their fascination with technology.

Computers are fantastic. Computers assist me in searching for new information, communicating with relatives and friends and also for entertainment purposes. Computers definitely play a part in my day-to-day lifestyle (UFS4y).

When using the computer or Internet, I feel excited. Sometimes, I could hardly wait when I’m in the entertainment category. And sometimes I feel so happy when I find an answer to my problem. I am always excited when I’m in front of a computer (OML/OQ).

One of the important factors that contributed to fascination with technology was the perception of technology as a limitless source of information. It provided access to a whole new world of information. Importantly, the access to information was made easy and convenient.

I appreciate the fact that I become computer literate. I use it for almost for everything. It’s limitless, especially with access to internet. The database is available and kind of information that is there is mind-boggling. So you know, you got a wealth of information literally at your fingertips basically (UM08).

All the resources are basically at tip of my finger, so for me it’s actually more always wealth, that’s how I describe it now that you know, gosh, everything is there. There is immensity of it, you know. I have a lot of respect for it (UF12).

In addition, technology was seen as powerful because it gave access to knowledge.

Computer knowledge is very powerful because it’s learning (OF02).

I’ve gotten to realize more about power of what these machines or the computer is got to be actually aiding me, you know, in terms of information now (UF12).

6.4.3.2 Negative attitudes towards technology

The statistical analyses revealed two negative attitudes shared by all participants regardless of gender: “Working with technology seen as frustrating” and “The Internet has a harmful effect on a community”. Both findings were confirmed by the qualitative analyses. The participants shared that using technology may be frustrating, especially when it did not perform to expectations.
Other difficulties that contributed to the negative feeling about using computers were problems with unstable power supply, viruses and fear of losing data, and computers being valuable commodities and attracting thieves. In addition, faculty members and students complained about the lack of proper training. On the one hand, participants pointed to a relationship between good training and creative use of technology; on the other hand, the lack of training experienced by the majority of staff and students caused confusion and lowered their satisfaction with the quality of work completed with computers.

My course at university was more like a foundation. It helped me to strengthen my computer knowledge and then it helped me with my international studies with my degree in education. But that extra course that I did on a computing – on learning for students, I could see that students can learn a lot of things being guided by the teacher and then showing them exactly where to research on different topics, then they will do their work. ... And I found it very helpful. For me, as a professional, it gives me that confidence that I can do anything on the Internet. And I will know exactly what to do if I get there. Because sometimes you can get lost on the Internet – that's what I found. Find exactly the information that you want. Sometimes I remember, back at uni that I would be searching for information then I would be gradually getting off track and then ‘no, no I have to get back to what I was looking for’. It’s like, it helps if you really know what are you looking for then you are on track; sometimes you can get lost along the way on the search (OF03).

I would like the IS lecturers to offer lectures on how to manage Internet usage. The target groups to be all first years and upwards for those who missed out/interested. This will help individuals to manage well their quota. The current situation shows that we students waste a lot of our quotas browsing everywhere, opening up unwanted information, sometimes we do not understand we are really doing or seeing, Example, Internet promotion games, etc, to win a gift. Explain to us students if there’s any danger registering unnecessarily on webs (UFS4y).

The above listed impediments were shared by both genders. However, there was one problem that was reported by women only – it related to the impact of a computer on health. Women saw computers as causing different health problems, from eye problems to mental conditions to body abnormalities.

Computer is new and exciting. It is helpful in many ways but also has its defects for instance, creates anomalies in some parts of the body (UFS1y).

The use of computers is fine but can cause damage to the eyes when everything is computer-oriented. ... People become too dependent on computers which may minimize their thinking capacity (UFS1y).

Among negative aspects of technology, both genders widely discussed harmful effects of the Internet on society. Despite the positive perception that the Internet makes life easier, it was also
seen as having a gross negative impact, especially on the young generation. Special attention was given to pornography and its damaging effect on persons and male attitudes to women. Although banned by PNG law, pornography was easily available through the Internet.

People that have access to the Internet they kind of use these things and distribute and pass on. So that was an experience that I came across with people using the Internet to collect pictures of pornography and then just sharing them among young people and it was not very good. So that’s the bad side of it that I see with the Internet (OF05).

Easy availability of pornographic materials worried the participants who saw them as having bad influences on the Internet users. A lot of time was wasted due to unlawful searches of Internet content.

That’s the risk, some of the materials that are available are not legally allowed in the country, for example pornographic materials. This is the risk because at the moment in the country technically and legally they do not have machines in place to protect it (UM09).

Sometimes you can take your attention away to all kinds of things that are on the Internet like pornographic materials that are not good for children, and lecturers. I know that the things are there that you can just spend all your time, waste your time doing things that really take you away from your work, and your ethics, and how you can use things; there are things there that just take you away by. When you have access to the Internet, you have access to every good and bad thing. And some people choose to spend more time on the bad things than the good things (UM11).

In the discussion, special attention was given to harmful effects of the Internet on younger generations. It worried parents, especially those who were unable to control children’s activities on the Internet, that their children might not follow traditional ways.

Well, already there are illegal sites, pornographic sites; and like you know watching a current affairs on TV. Kids as young as 13 and 14 access the information from the internet on how they can commit suicide, so that’s a worry, you know? Papua New Guinea parents, there are some parents that are able to afford the service and kids are smart, once they learnt the use of internet. The negative aspects of it will be behaving like the other kids in the other western societies already behaving. That’s a worry (UF07).

But it’s the Internet that is a bit scary, or I am concerned about. Concerned about the negative things and effect it may have on youth now all over the world. To be honest, I think it shouldn’t come quickly to us (OF02).

Damaging influences of the Internet were also seen in the wider perspective of negative changes in the entire society. Unrestricted access to pornographic materials was believed to induce ambiguity of traditional ethical values.
It’s my fear, what are my values? What is right and what is wrong? What is good and what is bad? ... We have to hold strong on our moral values if we have to stand against that type of information [pornographic] (OF02).

And I see that it ... bad influence in the way people see things, and cultural beliefs, such as sex education. Access to the pornographic images, all these things is taboo in our culture and the Internet can break that. And it will have a lot of impact on the lives of people, young people, especially males. And after you access to all kinds of images, it will directly got impact into social problems like rape, all other things, early marriages, and all kinds of experimentations of what they see on the internet which is bad for the young people in PNG. I can see a lot of impacts, bad impacts about the Internet, computers especially the Internet to the younger people more than those in colleges and universities (UM11).

To deal with negative aspects of the Internet, participants called for personal and social responses. On the personal level, one way to avoid the content that could be damaging was to discipline oneself while working with the Internet. On the social level, to protect society and its traditional values, many suggested introduction of censorship or some other form of control of Internet content.

Generally it [the Internet] is good but if they visit illegal websites, then personally it’s not good. But on the other hand, use it responsibly and use it for your good and use it for advancing and not for destroying yourself emotionally, mentally, sexually (UF07).

There have to be strict guidelines on what can be done on the Internet, kind of like a censor, you know, what are the things that you can’t actually browse and so forth (OML/OQ).

Another negative attitude identified in the quantitative analyses that was confirmed by the qualitative discussion was “People no longer control work done on a computer”. People become dependent on technology to the point of being controlled by it. In a short period of time since computer proliferation among academia in the country, technology became so important that for many it seemed impossible to complete academic duties without it. Many women and men expressed their dependency with the oft-repeated phrase, “I cannot do without it [the computer]”, while others shared more of their experiences:

I use a computer and I get really frustrated when the power goes out because I depend a lot on the computer for all my courses and even mark students’ work on the screen. ... If there is power blackout, we all just move out of offices because we all rely so heavily on a computer while before, the power went off, you can still work on other things. Sometimes, office is even closed because everything is computerized (UF21).
Computers are very good but when they break down that’s when we are, just no life. Computers look like they have become the lifeline, when they breakdown everything stops, everything collapses so the term used is “computer world” now (OM04).

I’m mainly depending on the computer and to tell you the fact, if the lights go off, I close the door I go out and stay outside. Because I can’t go without using the computer; it makes my mind switch off (UM11).

For some research participants, their dependency on technology seems to have reached a state of addiction. Although lecturers reported over-reliance on technology, the problem seemed to be more prevalent among students. Some students admitted skipping meals to remain working with a computer or breaking up their relationships as a consequence of all their time spent on computers. Different terms were used to describe the fixation: apart from “addiction”, students used terms like “computer freak” or “slave to the Internet”.

When I enter the computer room, I feel as though I’m in a fantastic world. I concentrate and focus on the screen not wanting to be disturbed by any other things. I think of playing or use it without rest (OFS3y).

Some lecturers saw students’ addiction to computers as an impediment to their academic progress. While acknowledging that technology has the potential to support learning and teaching, too much time devoted to technology may have adverse effects on students’ expected progress.

Students spent so much time that it affects their academic progress and working on assignments, and we have to be very particular now with plagiarism and so forth (UF21).

Positively, some people realised that being personally disciplined about computer use would mitigate addiction to technology.

In my own time, yes, but during working time, it’s work. If I have time at home, yes, I play games; but now, with the demand of job, it’s either job or a game, otherwise your job is not completed; it requires some discipline too (OF14).

It requires more discipline on my part. I tend to go off control doing unnecessary things (UMS4y).

I think computers should be used to assist people and not to control people. If computers are used in this manner, then computers are good for people but if people rely on it and make it become a center of their life, then there is a serious problem (UFS2y).

As discussed earlier, qualitative analyses confirmed quantitative studies in relation to attitudes towards computers. In addition, qualitative results pointed to two other negative attitudes
towards technology. First, “Technology replaces social interaction” expressed people’s disillusionment with technology used as a platform of social interaction. Generally, they saw technology as a valuable means of communication with family and friends; however, they realised that technology might replace face-to-face contact with others. They saw this new social interaction model as alien to traditional Melanesian cultures; thus, they had a negative perception of technology used for communication purposes. Participants’ perceptions of technology as a means of social interaction were further discussed in section 6.3.2 ICT as a new “digital garamut”.

The second negative attitude related to computers being seen as luxury items available only to a group of privileged people. Two important factors contributed to the perception: the high cost of personal computer ownership and huge social disparities.

Maybe economic situation is also one contributing factor. Because we don’t have money to have these equipments (OF03).

It is a very new technology and many Papua New Guineas do not have access to this. A computer first of all, a computer set and the Internet. The Internet is expensive and restricted to only few; you know the kind of people in higher level of country where they can be able to afford a computer and have the Internet linked up and all this. It’s very expensive (OM22).

The two factors were interconnected. Because computers and the Internet were very expensive, only the relatively wealthy could afford them. As presented in the previous chapter on ICT profile, huge disparities in technology’s proliferation in Papua New Guinea caused very limited access and use of computers and the Internet in rural areas. Thus, computer use and Internet connection in educational institutions was seen as a privilege.

I’ve been lucky because my parents they are middle class so I’ve always been in a middle class society; I have a privileged life compared to others so in terms of having TV, radio and all that back in 80s, we were probably some of the few that had all of that. ... And that because Dad and Mom, we were in Australia where Dad came and did his masters (UF12).

I think that students all across every institution should be given privilege of access and usage of computers and internet to be on equal footing with the academic performance in other modernized countries. Government should look at the policy to introduce internet access and usage to all institutions in the country. By far and foremost most of the disadvantaged ones in this area are the ones in the rural areas. It seems that there is already a trend here where the elite have more access than those unprivileged ones who come from the lower class families (OMS4y).
6.4.3.3 Ambivalent attitudes towards technology

One of the two ambivalent attitudes identified in the qualitative analysis was ascribing human characteristics to computers. Participants, women and men, academic staff and students, used different terms to express this attitude. One of them was “computer is my partner”. When asked to clarify the term, a female lecturer said:

I am using the computer a lot; I am beginning to depend on the computer a lot now. If I don’t have one, I’ll feel a bit inadequate (OF02).

The computer was also perceived as a friend and companion able to fill emotional and social needs as well as assist in the study.

I love computers; they are like a friend to me. When I’m lonely they are there for me. When I need to complete my school work I turn to them for help (UFS2y).

I fall in love with my computer in the office every day. It’s my best friend. It plants a seed of curiosity in my mind to pursue knowledge with a sense of determination and enthusiasm (UML/OQ).

Categorizing people’s attitudes was difficult because the participants’ terms implied positive and negative connotations. On the one hand, such terms as “workmate” or “companion” insinuated practicality of computers and their positive important role in completion of academic work. On the other hand, such terms as “best friend” or “lifetime partner” alluded to exclusiveness of computers in someone’s life and tendency towards computer addiction.

The other ambivalent attitude towards technology identified in the qualitative analyses only was the perception of technology as a new phenomenon alien to PNG cultures. Female and male participants shared this notion.

There is hardly any relation to it because this [computers] is a foreign idea that was created somewhere out there and has been introduced and it is part of making work easier when it goes with education. ... It [technology] is not related to any culture at all in our society in Papua New Guinea because we did not create it and it was not there before (OF05).

Although technology was seen as a foreign concept that required a new set of skills, the realisation of its importance initiated a call that all Papua New Guineans should advance in knowledge and use of computers. There seemed to be no way back to pre-computer times.

Computer skills are new skills and knowledge to Papua New Guineans. It requires time and effort to help all Papua New Guineans to get access to these facilities. Many things are still new for Papua New Guineans in terms of using it (UML/OQ).
No one wants to go back to biro and paper now. It has become so useful now, I think there is no going back so, there will be more and more inventions. Next time computers might do away with thinking (OM04).

Ambivalent also was the perception of computers as a foreign concept alien to PNG cultures. On the one hand, computers were seen as outlandish concept that has no connection with traditional PNG cultures. This perception brought the negative connotation and uncomfortable feelings about the contact of foreign computer-related ideas with traditional values which were discussed in the previous section. On the other hand, the attitude also had positive connotation because people realised that technology has became a part of their own life and has effected positive changes in private and social lives.

Both the ambivalent attitudes discussed here require further study in order to better comprehend them.

In summary, this section presented statistical analyses of the two attitude scales for female and male students and academic staff in IHEs. Among students, differences were found in two of nine guiding factors. Male students were more likely to believe that the Internet is fascinating and that computers make learning more fun. Similarly, gender differences were found only in two of ten guiding factors among faculty members. Female academics were more likely to view computers as superior to humans and to view technology as fascinating and easy to learn. Qualitative analyses not only reaffirmed the statistical results but also enriched understanding attitudes towards technology by providing an in-depth discussion about positive, negative and ambivalent perceptions and beliefs held by the staff and students in tertiary institutions.

6.5 ICT and Women’s Issues

The previous sections created a gender profile of the access, application and attitudes to ICT in higher education institutions in Papua New Guinea. A number of gender-related similarities and differences in staff and student dealings with technology were indicated. This section seeks to summarise some of those issues as well as to complement them with additional gender concerns. Commenced with women’s place in traditional society, the discussion proceeds to women’s status in the digital age.
6.5.1 Women in traditional society

It is beyond the scope of this study to provide a comprehensive narrative of traditional women’s status in PNG society, particularly considering the presence of vast cultural diversity. Although PNG has patrilineal and matrilineal affiliations, with consequences especially for land tenure, females and males have considered society as male dominated. Participants shared perceptions of female roles as raising children and performing household duties.

Computers, all the information... maybe women are ignorant. They don't know. Because in PNG traditional society, women just got married and raise kids (OM17/M).

The above perception was given by a male academic originating from a matrilineal society. The common understanding that matrilineal systems put a woman in the centre of social life is somehow disturbed by the limited roles as seen and expressed by OM17/M. However, it remains in line with assumptions underlying the “Matrilineal Puzzle”¹³ that “1 Women are always controlled by men; 2 Male roles are structurally central in all social systems; 3 The roles of fathers and husbands are the most important social roles of men, these being transferred in matrilineal systems to the maternal uncle and brother, who take over the paternal and partnership functions” (Watson-Franke, 1992, p. 476). Although in some PNG matrilineal societies “women’s economic contributions were substantial” (Macintyre, 2003, p. 120), their political status was not, with men taking up a role of decision-making. Thus, generally the situation of women in both matrilineal and patrilineal societies has many commonalities: they are expected to do all household chores and take care of children.

Women do almost everything. They work, apart from bearing children, they work very hard; they are more like slaves to their husbands. ... Women becoming too submissive to their husband. They think that man says they must do. If they don’t do, they even got bitten or they even got killed. ...If men gathered for a certain meeting and men said no women are supposed to come, no women would go for that meeting because they need to listen to men. ... And most of meetings it involves only men and decision making is entire men... it is men who are doing the decision making. As women, we are very submissive to our fathers, brothers, and other men and because we have grown up in that kind of society, coming to school, we become very submissive to men around us. ... So, in terms of having a say over a decision, women have no say at all in the society. Decisions are made by men and that’s it (UF20/P).

¹² For a better understanding of the issues presented, in this chapter information regarding participants includes their clan affiliation: M for Matrilineal; P for Patrilineal.

¹³ A term introduced by A. Richards (1950) to express the confusion over male roles in matrilineal kinship.
Women are expected to remain submissive to men and in consequence act as servants for men. Their status in society is considered to be very low.

Even though we have education system, even if a woman is educated, that woman will still be very submissive to a husband or to a father or to brothers. Because it is expected of the culture that she needs to be submissive (UF20/P).

Women are regarded as no body or we can say low class people. They will only submit to their husband. The husband is in charge, so they never have the upper hand. Like some of the responsibilities that are played by men, the ladies will not be, they do not have a right, they are not given the privilege to be in charge or take responsibility of some of the duties that are supposed to be done by men. So generally, the understanding is still there, the men or the husbands, they are the bosses. That’s the general understanding. It is still there these days (OM18/P).

Education is one of the sectors where women’s inferiority is clearly manifested. From the very beginning of Western-type education system in Papua New Guinea, boys were given priority in terms of schooling. Parents preferred to educate their sons expecting higher financial returns upon the son’s completion of formal education. Furthermore, additional custom-related perspectives lowered girls’ chance for education: “the family labour requirements, marriage, and pre-marriage arrangements were more important” (Fox, 1999, p. 36) than sending a daughter to school.

Really, when from the time when PNG was introduced to all this education thing, men were given the priority before the girls into this and probably women, we underestimated ourselves that we could not get into the top courses (OF05/P).

In one aspect, the situation seems to improve for girls when their parents realise the value of girls’ education and seeing it as a future investment.

The trend is changing a little bit that fathers beginning to see that educating a daughter is much more important than their sons because sons are turning to be very mischievous than daughter. So, they are kind of seem to be a little bit liking having to educate women because, you know... Others turn to realize that women or girls turn to take care of them later on in the future other than their sons. So, they are trying to invest a lot in their daughters now (UF20/P).

However, other strong traditional implications governing female-male relationships in society still pertain in educational environments. On the one hand, underlying kinship morality holds that all kinsmen should be loyal to one another. On the other hand, the big-man leadership model (there is no big-woman leadership model) and traditional male domination in society reflect the reality of women’s subordination to men (Chao, 1984; McElhanon & Whiteman, 1984). This has strong
implications in higher education settings. As discussed earlier, women were obliged to give men first access to computers. The traditional role of being a family provider limited women’s time for using computers. While men access the Internet or use computers, women spend the majority of their time taking care of family, including extended relatives. Furthermore, as shared by number of participants, women were obliged to do typing for male clan members.

The issue of women doing typing for men appeared to be fairly common. When discussing women’s use of computers, typing was characterised as a typical task for females.

The girls seem to do a lot of work for the boyfriends and maybe because of the subconscious mind, girls will be typing for guys (OF02/P).

You will find that it’s ladies who majority are better users of computers because of their actual roles back in the workplace. They are usually ones that typing reports on behalf of their male colleagues. ... Because most of the ladies are very good typists, men kind of dump all the work on to them. ... Because of that shift from typewriter, it was always seen as a women role, secretary using the typewriter, and so men always said, you women, you do the typing (UF12/M).

One of the reasons for such categorisation is traditionally uneven educational opportunities for females and males. Males generally have better education and hold higher positions in workplaces. Females generally receive a lower level of education, are destined to marry at a young age, and hold lower positions in workplaces. However, as education is a source of discrimination in society, females who achieve the same education as men may have opportunities for advancement.

They [parents] are trying to invest a lot in their daughter’s education now. And we are hoping that this investment would eventually change the women’s way of thinking towards the community, how we always lived (UF20/P).

6.5.2 Women in the digital age

There is now gender equity that is been preached, but there is a real need, general need for everybody to work together to bring the respect for women and to realize that women are important just like men. And equity fairness is what we need to see promoted (UF21/P).

Similar calls for gender equity surfaced in different contexts in this study. Considering that “ICTs have given us remarkable tools to achieve an enhanced vision of inclusive development strategies which along with an expanded understanding of the power of knowledge have the potential to transform our rhetoric into reality” (Huyer & Sikoska, 2003, p. 6), technology has the ability to play an important role in women’s empowerment.
In their discussion about the role of technology in women’s lives, participants pointed to two important aspects: ICT to support women as family providers and ICT for women’s empowerment. A woman’s traditional role as family provider was being redefined and adapted to the new changing environment. Although a woman was expected to provide for her family, the way she accomplished her task was changing.

To ensure survival the mama must go and look for food, right? The mother has to be one step ahead of the man all the time because it is within us; I got to ensure the survival of my people, or my household, or my clan, it’s to go out and search for food. And in that sense, if I want my students to get the best education, and to ensure that they find good produce for themselves, is that I feed them with technology. I feed them with the use of software, what’s available on the computer, especially because they are able to utilize that as an extra tool, as extra armour to them bettering themselves in their area of influence (UF12/M).

Participants expressed the belief that technology-related skills provide women with additional opportunities to procure the means for family survival.

It [computer] helps women for employment. Because, maybe somebody who hasn’t got a job but is trained typist or secretary, can type for other people to get money. Could use the computer for income. It’s the mother who provides in the house (OF02).

Getting a well-paid job was perceived as a way for women to empower themselves. However, there was a noticeable difference in this regard between urban and rural areas. In the urban environment, where many job positions required ICT skills, being able to meet the requirements and secure satisfactory job was seen as a big achievement.

If women learn the skills of using computers, they will also become empowered to do their work with facility. I know, when my sister-in-law was working at the provincial government DMS office, she learnt to use the Lotus and she was doing the finances and kept the record, she had a bit of status. And people talked about her referring to as having skills that most people don’t have. She gained herself status in that way, that she could do many things that the other employers don’t have (UF13/P).

Considering the low proliferation of technology in rural areas, having computer skills did not have a similar effect on the status of women in the village.

People don’t see computers used in the village. I am thinking about rural setting. In towns it’s different, it will help women when she masters such skills, but in the village, people may say “ok, so what?” You see, if you are going to the garden, you mastered computer skills, but what use of it when you are in the garden? Those kinds of thoughts would come. I think my clan, or my village will give me a status as being educated this far but they
wouldn’t see me as being able to use computer. Simply, because they don’t see a computer being useful in the village setting. In a town it’s different story. Women that have a computer, the Internet access, she will have some status, higher status that other women that don’t have such things (UF01/P).

However, despite differences between the rural and urban environments, it was acknowledged that ICT held potential for positive changes in women’s life, both private and social.

With women, gaining some exposure to computing will boost their morale, they will feel good (UF21/P).

With this introduction of computers it will open up eye for women. Everything is there; they may sit at the computer and see there is a woman in US that runs for presidency and these things will motivate them (OM17/M).

Another important aspect discussed was the future change of a workplace mentality that might happen with more educated and computer-skilled women entering the workforce. As discussed earlier, males held the majority of higher positions. Participants felt changes in understanding about the importance of girls’ education in addition to new opportunities brought to the work market by ICT had potential to increase women’s chances for well-paid positions.

It will work in that way: once computer helps facilitate someone’s work in the workplace, so it will keep status higher but women can raise up to that level too. ... the number of female students we send out to the workforce will also influence the workplace. Yes, because they will be computer literate, they can be able to work with skills that will facilitate their work and so they can rise up in the workplace, can raise their own status and the emotional levels. And it is a skill that is required: if you are computer literate that’s a big advantage. So, it puts them to move on and to succeed and achieve more things (UF13/P).

In summary, for traditionally male-dominated society, technology has a very special role to play in changing the status of women. Traditionally reduced to household chores without power for decision making, modern women, especially in urban areas, could use their computer skills to secure well paid positions to provide for their family as well as to increase their own status in the community.
CHAPTER SEVEN
DISCUSSION OF THE RESEARCH FINDINGS IN LIGHT OF THE RESEARCH LITERATURE

The main purpose of the study is to affirm the role of ICT in higher education in the empowerment of women in Papua New Guinea. It also undertakes to create a gender profile of access, application, and attitudes to ICT in PNG tertiary institutions and to evaluate how ICT informs changes in the higher education sector. To achieve this purpose, this chapter discusses the research findings of this study presented through the lens of the research literature. The PNG context presented in Chapter Two and The Literature Review in Chapter Three inform and guide the discussion. The major themes comprising the chapter are:

- Gender issues in access, application, and attitudes to ICT,
- ICT for higher education in Papua New Guinea, and
- ICT for empowering of PNG women.

7.1 Gender Issues in Access, Application, and Attitudes to ICT

Although institutions of higher education have long sought to include technology, ICT offers particular enticements and challenges for IHEs in the 21st century (McCoy et al., 2001). One of the intrinsic opportunities offered by ICT is to bridge the gender digital divide: it promises equal access to educational opportunities for all, especially those traditionally disadvantaged (Chad, 2002; Earp et al., 2007; Trucano, 2005). To what extent the promise has been delivered has been a motivation for research for decades with studies focused among other issues on gender equality in access, application, and attitudes to ICT.

Gender has also been a factor in studies of human interrelation with technology. One of the first researchers to explore issues related to gender, social class, and race/ethnicity in the application of computers in educational environment was Rosemary E. Sutton. She clarified the term equality as used for the purpose of such studies as “a quantitative property that describes parity among groups along some index (e.g., access to computers, attitudes towards computers)” (1991, p. 477) and distinguished equality from equity, the latter referring to “judgments concerning justice” (p. 477). The following discussion applies Sutton’s understanding of equality. It explores gender equality issues in access, application, and attitudes of students and staff at tertiary institutions in Papua New Guinea.
Initiated in Chapter 6 Research Findings, the discussion on different aspects of gender issues in ICT in PNG tertiary institutions continues in the context of research findings worldwide.

### 7.1.1 Gender issues in access to ICT

When computers were first introduced into the educational environment, equality of access soon surfaced as a big concern. Reviewing a decade of research in gender equality in computer accessibility in educational contexts in the United States and other countries, Sutton (1991) reported gender differences favouring boys in access to computers in school. Similar findings in access to computers were also reported from studies that explored home computer usage. Later studies (Volmand and van Eck, 2001) claimed that the gender differences in computer use by girls and boys gradually declined in the 1990s. In the same vein, Chad (2002) affirmed that women and men entering IHEs in the United States used computers frequently in almost equal numbers. She also confirmed that teenage girls accounted for the fastest growing segment of female Internet users, contributing to women gaining parity with men in using the Internet. The fast growing proliferation of computers in developed countries diminished the disparities between genders. According to Stoilesucu and McDougall (2011), who reported from a university in Toronto, “there were more computers than students in the computer labs; therefore, access to computers was not an issue” (p. 317). To accommodate a significantly different presence of technology in educational environments between developed and developing countries, the following discussion of gender issues in access to ICT in tertiary institutions is placed on a canvas of research conducted in the developing world where infusion of technology is more comparable to the PNG context.

Taking into account institutional differences in access to computers and the Internet, the quantitative results concerning gender disparities among female and male students and academic staff members have shown no statistically significant difference in access to computers, however, they have shown statistically significant differences in access to the Internet. More female (25%) than male (16%) students had no experience with the Internet; more female (14%) than male (8%) students reported having the Internet connection at home; more female (70%) than male (54%) students accessed the Internet every day or a few times a week. No differences were recorded in the amount of time spent using the Internet on an average day: the majority of students spent less than 1 hour daily. Among academics, as much as 19% of female but only 6% of male faculty admitted having no experience of the Internet. Furthermore, 46% of female and 56%
of male academics used the Internet daily, and 48% of female and 50% of male academics used the Internet for 1 to 3 hours daily.

The recorded lack of significant gender differences in computer accessibility seems to contradict relevant research literature. Irwin (2000), in her extensive debate on gender inequalities in technology in developing nations, argued that “gender inequalities in computer access persist. Equal gender access to technological resources in traditional societies is more the exception than the norm” (pp. 197-198). Noted contradiction could be attributed to the scope of this research - the study has been limited to IHEs. The official institutional policies assured that women and men had equal access to computers. The majority of participants had access to computers only in an institution. Although outside of the immediate scope of this research, participants commented that men own computers while women work with computers, an observation that supports Irwin’s claim that inequalities in computer accessibility in developing countries still exist.

Taking into account that a computer is used to access the Internet (until recently, mobile Internet access has not been part of technology infusion in higher education in Papua New Guinea), the comparable access to computers of female and male participants places in question recorded differences in access to the Internet. However, deeper socio-demographic analyses allow for their interpretation. First, two factors contributed to the higher proportion of the female student population having no experience with the Internet: only two of six participating institutions provided (limited) access to the Internet for students; in the remaining institutions, students paid fees to access the Internet outside the institution. Asked how much they were willing to spend to access the Internet fortnightly, male students were prepare to spend significantly higher amounts of money than female students were. Second, a higher percentage of female students having Internet access at home is attributed to general trends of women’s education in Papua New Guinea. On one hand, boys are favoured over girls at all levels of education: if they have a choice, parents are more willing to spend money on boys’ education (Geissinger, 1997; Johnson, 1993; Pomponio & Lancy, 1986; Zimmer-Tamakoshi, 1993). Tertiary enrolments show the disparity: female students made up 39% of student population in tertiary institutions (33% at universities, 42% at OIHEs) (Asian Development Bank, 2006a). On the other hand, the literature indicates that “female students are much more likely than male students to have educated and employed fathers, fathers who by virtue of their own education are aware of the benefits of education for women, and thus more likely to be supportive of their daughter’s aspirations” (Zimmer-Tamakoshi, 1993, p. 78). The presented factors support the notion that female students’ higher
level of Internet connectivity at home is attributed to higher social status of female students enrolled in IHEs.

The access to computers, however, does not involve only physical availability of computers for personal use. Because the use of computers occurs in socio-cultural contexts that determine personal experiences, it is important to take into account personal experiences and preferences in computer access and application. The qualitative strand of this research brought to light female struggles experienced in computer accessibility. Female students at all institutions and female academics at OIHEs experienced different types of impediments in their access to computer labs, all of which could be positioned under the umbrella of socio-cultural implications. Female students were impeded from computer access by male colleagues who, physically stronger than they, forcefully gained first access to computers. Female students and academics were also restricted in their access to computers due to unsafe environments. Finally, female academics in particular were expected to adhere to their traditional roles as a family caregiver first, with computer user a distant second.

The socio-cultural factors influencing women’s access to computers in the educational environment reflect women’s status in the wider community. Papua New Guinea’s society is male dominated. Traditional male superiority governs female-male relationships. In general, PNG women, educated as well as illiterate, are expected to remain subordinate to their kinsmen. Although women strongly felt the obstacles to computer access in open labs were instances of injustice and discrimination, they endured them as socially acceptable.

Women’s struggles in computer accessibility are not exclusive to the PNG context. The research conducted in other developing countries affirms these findings. Hafkin (2002) in her overview of gender issues in ICT policies in developing countries argued that “sometimes collateral cultural factors, other cultural attitudes based in gender bias, and not the immediate gender identification of technology use, prevent young girls and women from accessing and using ICTs” (p. 5). She illustrated her notion with examples from Uganda and India. In Uganda, the socio-cultural norm that “girls do not run” limits girls’ options; boys ran to computer labs first and refused to let girls use computers. Similarly to these research findings, curfew hours for girls introduced in Uganda educational institutions for security reasons further constrained girls’ access to computers. Hafkin also recounted situations from India’s educational sector, where “the aggressiveness of boys pushing away girls prevented the girls from using the computers” (p. 5).
In the same vein, Mbambo-Thata et al. (2006) found in their research among female students at the University of Zimbabwe that “women’s experiences of information and communication technologies (ICTs) are not divorced from their social context” (p. 67). They revealed that female students appreciated the benefits of ICT for learning and did not lack confidence in their capacities compared with male students. However, the female students’ accessibility was constrained by socio-cultural demands: their time was restricted as they were expected to perform their gendered roles at home. The Zimbabwe female students also experienced aggressive male domination when trying to access computer labs provided by the university.

Yet, based on the Infundo14 inception report that sought critical assessment of problems associated with the introduction of ICT to African education, Unwin (2004) argued that “the evidence concerning the gender implications of the introduction of ICT into African education remains somewhat ambiguous” (p. 155). However, he admitted that “the evidence suggests that technological innovations initially benefit the most privileged in any community and, in many 'developing' countries, these are usually men. Anecdotal evidence from computer laboratories in many African countries would support the conclusion that it is invariably men who have most access to computers in universities, colleges and schools” (p. 155).

7.1.2 Gender issues in using ICT

The discussion on computer and Internet accessibility in IHEs excluded from its body the studies conducted in the developed world based on the notion that the digital divide between developed and developing countries is too wide to provide common ground for a discourse. However, the notion could not be applied to other forms of technology infusion in the educational context. Thus, further discussion about the application of, and attitudes towards, ICT includes research literature from different parts of the world.

This study revealed that faculty members and students summarised their purpose of using computers as mainly for academic purposes, though in different proportions – 85% of staff and 45% of students. Only 5% of staff and 17% of students self-assessed their purpose of using computers as for entertaining mainly. There were no significant statistical differences between genders. However, disparities surfaced in analyses about people’s actual behaviour when using computers. Although there were no differences between female and male academics and they all used computers mainly to prepare lecture notes, to do their research or to attend to

---

14 Infundo is The UK government’s initiative, from March 2000, aiming to bring ICT benefits to the poorest and least privileged in Africa.
administrative tasks, there were statistically significant differences between female and male
students. Female students were more likely to use computers for mainly academic purposes,
while male students were more likely to use computers for entertainment purposes.

The tendency for faculty members to use computers for mainly academic purposes confirms
findings of research in other parts of the world. Cuban (2001) observed in a study among faculty
at Stanford University that professors used computers mainly for preparing lecture notes and for
writing their personal research. The application of technology in regular curricular and
instructional routines was found marginalised (as cited in Alvarez & Busby, 2002). Similar findings
were reported by Jankowska (2004) who examined faculty habitual use of ICT at the University of
Idaho, USA. She reported that more than 55% of participants considered themselves as
competent computer users. The majority of them spent 30 or more hours weekly using a
computer (excluding Internet usage). Faculty members reported using computers for
communicating “with students and peers, working on manuscripts, research proposals, and
conference papers, preparing study and instructional materials for students and disseminating
those instructional materials by using video teleconferencing, computer simulations, presentation
tools, and audio-visuals” (p. 54).

As presented in more depth in section 6.1.10 ICT for education, the use of technology by
academic staff varies between individuals and is determined by their level of competency and
“their assumption about appropriate and viable methods for their content domain” (Bain &
McNaught, 2006, p. 100). Faculty members embrace ICT as a significant academic tool for
advancing their scholarship of teaching if well aware of its transformative potential and well
prepared to utilise it.

The research finding related to application of computers by PNG tertiary students is consistent
with findings in other parts of the world. PNG male students were more likely to use technology
for entertainment activities, while female students were more likely to stay focused on their
academic work. In the same vein, Losh (2003) argued that “most of research findings indicate that
men use information technology more than women for diverse tasks and entertainment” (2003,
p. 56).

McCoy et al. (2001) studied computer use and attitudes of about 800 senior-year (year 4)
students in a technology-rich environment at an American university where students were issued
personal laptops. The study revealed that males were more frequent users for Resources,
Entertainment and Total Use categories. No gender differences were found in the categories of
Tool Use or Communication. A decade later, Kay and Lauricella (2011) conducted a similar study focused on gender differences in the use of laptops in IHEs in the United States. An extended mixed-methodology study revealed that males demonstrated higher levels of computer proficiency and Internet experience. Females were found more task-oriented than males; they tended to use computers for academic activities more than males. The study also suggested that male students more than female students played computer games during class.

To explain existing gender differences in application of ICT, scholars point to traditional roles that technology has played in Western society. Technology has been considered a male domain (Chad, 2002; Lie, 1997; Wahler & Tully, 1991; Wajcman, 2004; Wentling & Thomas, 2004). Men remain the main technology designers and developers (Zhou & Xu, 2007). Newmarch et al. (2000) added to the argument:

The design of software has tended to be targeted to boys with educational and recreational software still designed to suit boys, rather than girls. Computer games, which encourage children to become familiar with computers, are generally based around masculine themes like war, crime and male sports. Even programs that are designed to be gender neutral were more likely to be similar to those designed for boys than for girls. (p. 8)

Similar assumptions about technology as a male dominated domain exist in developing countries. Mackay and Parkinson (2010) argued, in the context of teacher trainees of technology in South Africa, that gendering of technology “as male is part of a naturalized vision of social organization in which men are associated with the active, with reason and with the private sphere” (p. 87). The authors further maintain that such perception of technology “permeates cultural beliefs” (p. 87) and subtly determines the way women and men make their choices regarding technology. Participants in the present research shared in this assumption about technology and saw it as a male-dominated field.

Computers were seen as a male tool, or male dominated tool in terms of having to use it, in terms of programming, and fixing it (OF14).

We have only male personnel working in our IT department. It would be nice if females are also employed and I as a female could talk freely to females and ask for their assistance in getting more information to work on programming and cabling and networking of computers (UFL/OQ).

Where there is less computers, male students always dominate and female students always suffer. From what I observe here at [Uni name] so many females still do not know how to use computers because they do not have access to computers every day (UMS,2y).
Papua New Guinea is a male-dominated society. And every male seems to think that they own everything and they have the right to do everything first then the female even though a lot of females are educated. So, men first, ladies last. It is cultural influence, we can’t help it. I think it will influence male thinking that they will use it [technology] first and then the ladies (UM11).

Gender disparities in regard to application of ICT, as observed in this research, are in line with research findings worldwide. Though the gender divide seems to be closing in relation to computer access, it still exists in relation to computer and Internet use.

### 7.1.3 Use of the Internet and email

The report about gender and ICT prepared by the OECD Office (2007) revealed a gender pattern in Internet use among the population in participating countries. The report showed that women’s and men’s common activity on the Internet was emailing. Downloading software and using the Internet for entertainment (music, films, games) were reported as male-oriented activities. By contrast, a female-oriented interest was searching the Internet for all kinds of health-related information. Other studies conducted among Taiwanese teenagers revealed that gender differences in online activities still exist (Lin & Yu, 2008). Lin and Yu reported that due to the importance of school work at this age, searching the Internet for study-related information was one of the main reasons to use the Internet; another popular activity was online entertainment. In terms of gender differences, females were found “to hold a more pragmatic view of the Internet while males tend to focus more on enjoyment” (p. 321). Females tended to use emailing to support their social needs more than males.

A similar gender pattern of Internet usage has been found among PNG tertiary education students. There were no gender disparities in Internet usage for academic research; female and male students admitted looking mainly for study-related information. A gender divide emerged in relation to other activities done on the Internet. All students indicated using emailing extensively; however, more female than male students saw it as their main purpose to use the Internet. Male students were found to look for entertainment on the Internet more than female students.

A similar gender pattern of Internet usage has been found among PNG academics. The main purposes of their access to the Internet were research, email, banking, and online meeting people. Gender differences were noticed only in banking and online meeting people – women

---

15 The Organisation for Economic Co-operation and Development includes 34 industrialised countries.
were more likely to use the Internet in both instances. More male lecturers than female lecturers searched for news.

Although as indicated earlier, the above findings are similar to general Internet usage patterns revealed by researches in other parts of the world, findings of this research and research around the world are not totally conclusive. One element shared by research conducted in the educational environment is that students and staff spend the majority of their online time searching for study-related information. Other aspects of Internet usage are specific for different locations. Some gender similarities are identified.

In their study of postgraduate students’ use of search engines at a university in Nigeria, Salako and Tiamiyu (2007) concluded that participants mainly searched the Internet for their academic work, and particularly for project/thesis work and term papers. Searching for job vacancies was the only non-academic activity by postgraduate students. The authors attributed the academic activity-oriented use of the Internet to environmental factors, such as the low level of Internet access on campus or at home, the low level of Internet sophistication, and the high cost of commercial Internet access. However, the findings of this study do not affirm such an explanation. With similar environmental factors, students admitted searching the Internet for information related to their study, but also for news, music and videos, hobbies and games. Observed differences in research findings deserve further explanation. All research students in Nigeria had prior experience of Internet use; almost 80% had more than 2 years’ experience. They were postgraduate students about to complete their university study; their search for job vacancies indicated a career-oriented focus. Contrary to this, all participants in this research were undergraduate students; 90% of them had no prior experience in Internet use. The novelty of Internet access made it an attractive device to access entertainment as well as academic resources.

Noticeable gender differences were also found in the use of email application. Chad (2002) argued “that women take greater advantage of email to maintain relationships with friends and kin across distance than do men” (p. 3). Chad’s notion has been affirmed by this study. Participants’ email content being other than professional was more likely for female staff and students than for male staff and students. Although the survey questionnaire did not ask about the specifics of email content, the participants shared their use of emails during interviews: the majority of participants who talked about using email to communicate with other researchers and academics were male lecturers; the majority of those who indicated using email to connect with family and friends were female participants.
One way to elucidate gender differences in the use of email for communication purposes is to comprehend how women and men communicate without technology. Discussing gender differences in interpersonal communication, Debrand and Johnson (2008) argued that “women were more relationally” (p. 20) oriented; thus, in their relationships and communications, women’s behaviour and attitudes are associated with sharing and emotional intimacy, while men are more focused in their relationships on common activities. The authors also indicated that women are socially expected to maintain family ties, while men may not keep the contact if there is no instrumental reason behind it. The above argument seems to illustrate presented findings: PNG women in IHEs were more likely to use email to communicate with family and friends, while PNG men in the same institutions were more likely to use email to communicate with other academics and researchers.

7.1.4 Gender issues in attitudes

Porter and Donthu (2006) claimed that the “attitude toward an innovation is a critical intervening variable in the innovation adoption decision” (p. 1000). Consequently, when applied to technology contexts, attitude is “conceptualized as a potential user’s assessment of the desirability of using that technology that predicts an individual’s use of technology” (p. 1000). In the same vein, Carey et al. (2002) argued that there is a significant relationship between computer attitudes and computer competency; more positive attitudes towards computer use were demonstrated along self-reported high computer skills level users.

Gender was an insignificant factor in tertiary staff members’ and students’ attitudes to ICT; staff and students participating in this research demonstrated similar attitudes towards technology. Statistical tests revealed that a majority of female and male participants held mostly positive attitudes and beliefs about ICT. Fascinated with technology, they believed that computers were superior to humans. They also perceived technology as a beneficial tool for their study and work, and an integral part of a daily life. Among guiding factors in nine of students’ and in ten of staff members’ attitudes, only two were negative. Staff and students experienced frustration when working with technology due to the lack of proper training and believed the Internet had a harmful effect on a community. Staff indicated that people are no longer in control of work done on a computer. Analyses in the qualitative strand of the study balanced the perception of ICT: more positive as well as negative and ambivalent attitudes were identified. Participants appreciated technology as a limitless source of information. However, they believed ICT limits traditional social interaction and leads to addiction to the point of being controlled by technology.
7.1.4.1 Students’ attitudes to ICT

International studies conducted among college freshmen in Australia, China, Ghana, Puerto Rico, and the United States revealed that students in all geographical areas showed an overall positive attitude towards computers (Carey et al., 2002). In the same vein, McCoy et al. (2001) revealed that students, regardless of gender, in a technology-rich environment displayed positive attitudes toward computers. The only gender-related difference pointed out by the research was males’ self-rating their computer expertise higher than females. Similarly, Bebetsos and Antoniou (2009) explored the gender differences in computer attitudes among Greek university students and found that male students were more positive than female students about the idea of using computers. They attributed the difference to males’ longer and more extensive use of computers. The two cited studies suggest that the possible gender differences in attitudes toward technology would surface if males have longer and more extensive experience in computer and Internet use.

Stoilescu and McDougall (2011) found that female students at a Canadian university demonstrated high anxiety, lack of confidence, and underachievement in a computer science program. Finding no gender disparities in access to computers in this technology-rich environment, authors evinced other factors contributed to the persistent gender digital divide. One of the factors discussed was social stereotypes. Male students believed that IT was traditionally considered a job or career for men but health care and education were for women. Other revealed stereotypes were related to prejudice and discrimination. Male students suggested that females were not attracted to computer science because they lacked good logical skills in computation. Gender stereotypes tolerated in the society remained for female students a deep-rooted problem inhibiting females from taking computer science courses.

In her research at the University of Guam, Inoue (2007) found that students had highly positive attitudes toward computer technology. The study indicated no gender differences between female and male students. The lack of gender differences in the perception of technology between female and male participants was due to the fact that “this university is situated in a small island and people go to the same schools and, consequently, their pattern of thoughts, expectations and behaviours are merged through their academic and social interactions” (p. 140). The above argument is pertinent to this study. Although some aspects of the study context are different – e.g., Papua New Guinea’s population is much bigger than Guam’s and consequently, the whole education system is much bigger – in both places, participants’ contact with technology took place only in educational institutions. Their experience of technology and their attitudes...
toward it are crafted by the institutional exposure to ICT as well as institutional technological culture.

Carey et al. (2002) attributed the overall positive attitude towards ICT among students in developed and developing countries to “the global trend towards increasing computer use and the global proliferation of the computer” (p. 231). The authors further argued that because computer access impacts attitudes towards a computer, “the greater the access and usage, the more positive the attitudes towards this technology” (p. 232). Carey et al.’s argument remains credible for this study. The PNG higher education sector has embarked on ICT infusion. Although ICT proliferation differs between tertiary institutions, the usefulness of technology for academic and non-academic purposes is widely acknowledged and appreciated. Utilisation of technology in its role to enhance learning and teaching practices in the higher education sector remains at an initial stage in Papua New Guinea; thus, measuring more positive attitudes with greater access was not yet possible during this study. However, ICT is enthusiastically accepted and it is perceived as effective in the educational context. This is argued that disparities between the findings of this study and Carey et al.’s research relate to specific contexts and research designs. This study was conducted within tertiary education institutions. As indicated earlier, the majority of participants’ accessed computers and the Internet only while in the institutions, and for the majority of students, their first contact with a computer took place at the institution. However, despite relatively short exposure to ICT, general perceptions of technology were highly positive. There are a number of factors that contribute to the positive notion that technology is highly desirable and useful in an educational environment: the novelty of computer usage with an enjoyable element being a part of interaction with technology and the advertised potential of ICT to revolutionise educational practices.

7.1.4.2 Staff’s attitudes to ICT

The arguments supporting the notion of the generally similar attitudes towards technology among PNG female and male students are also apposite to the discussion about gender issues in staff attitudes towards technology. However, issues pertinent to the academic profession, such as the use of technology for teaching and learning scholarship, require further analysis.

There is a significant similarity between this study and the results of a survey conducted among more than 1,100 Greek teachers (Jimoyiannis & Komis, 2007). Teachers demonstrated high motivation to integrate ICT into their daily teaching practice. The results reiterated a positive correlation between the level of competency and the level of acceptance. Jimoyiannis and Komis argued that “providing opportunities to teachers to acquire ICT skills is critical in order to
strengthen their beliefs about the value of ICT in teaching and learning” (p. 166). The authors also identified issues that impeded teachers’ perception of technology as a revolutionary tool for education and made them sceptical about the value of ICT in teaching practices: teachers exhibited a consumer-like approach to ICT in education; they anticipated potential difficulties they might face when trying to organise and manage students’ learning activities based on ICT; they were sceptical about using ICT in education “because they believe that ICT restricts social interaction and isolates people” (p. 167).

The similarities between the Greek findings and this study converge in a few common attitudes. Teachers do have positive attitudes towards technology. They believe ICT holds great potential to enhance their teaching ability and to improve students’ learning efficiency. However, the approach to technology remains more consumer-like: the importance of the product is recognised by its market demand.

In society where everyday life activities are driven by technology, where technology has become a commodity, education cannot stay outside the trend. The acceptance of technology within different aspects of the educational environment is inevitable. The potential of ICT for educational change is often seen as a most convincing means of establishing educational institutions firmly in competitive knowledge-driven society. However, the demand for technology infusion and the potential that technology holds are not yet the reality of life in the majority of educational institutions in Papua New Guinea as well as worldwide. Teachers need adequate training in computer skills as well as in application of technology for teaching and learning purposes. On one hand, lecturers recognise the relationship between good training and effective use of technology; on the other hand, the lack of training is seen as a source of anxiety and frustration.

I have been teaching in [institution name] for two years and nothing was organized. But I went for some studies. As I have said, technology is changing every day so we need to update our staff on the regular basis so they can cope with the current trends, with what happens. So, I would put emphasis on the training so we can be able to keep the quality teaching to the students. Because if we are not trained well then we could not be effective with our students (OM17).

Participants in this study echoed the Greek teachers’ belief that technology restricts social interaction and isolates people. Technology is widely accepted and acclaimed as a new digital garamut; a modern and effective way to communicate with people within closer and wider communities. However, at the same time, participants expressed their disillusionment with
technology as a communication platform where face-to-face contact is superseded by a computer screen.

In terms of gender differences in attitudes to ICT among academic staff, Jimoyiannis and Komis (2007) reported that the male teachers were more positive about ICT in education while the female teachers were neutral or negative. They argued that “the gender factor still seems to be critical in fostering positive beliefs about ICT in education” (p. 168). This study does not affirm all of the Greek study findings. Only two of nine identified attitude factors were statistically significantly different between genders and one negative attitude demonstrated only by females. Women were found more likely than men to view computers as superior to humans, and they viewed technology as fascinating and easy to learn. Only women expressed their concerns about negative impacts of technology on human health. In all other, widely discussed attitudes to technology, gender was not found as a dividing factor.

7.2 ICT in PNG Higher Education

Higher education in the globalised world of the 21st century is placed in the context of the knowledge society and market economy; those in higher education have to realise its new role in preparing contemporary citizens of the information driven society “in which the creation and dissemination of knowledge are of paramount importance” (UNESCO Institute for Statistics, 2009, p. 11). Higher education institutions worldwide are destined to play a special role in preparing graduates to adjust to changes in knowledge production, diffusion, and application. In the process, ICT plays a special role. However, the implementation of ICT within the higher education sector creates new challenges. “Higher education institutions are not only producing and supporting technological innovations but are at the same time intensive users and subject to the limitations of ICT” (Välimaa & Hoffman, 2008, p. 278).

In the context of developing countries, the role of ICT in higher education seems even more important and challenging. Agbonlahor (2008) observed that the radical changes in tertiary education are necessary for multiple reasons. Enhancing information technology “affords university academics and researchers a unique opportunity to bridge the knowledge gap between them and their counterparts in developed nations. In fact, it is seen as crucial to the continued survival of universities and research institutes in developing countries” (p. 131). The universities and OIHEs must be able to equip developing nations’ labour force with the skills necessary to operate in the knowledge society. Similarly, Banya and Elu (2001) argued that although one of the most important roles of the higher education sector in Sub-Saharan Africa is the development of
human resources, “the sector has been said to generate and disseminate knowledge and innovation, act as an intellectual and educational leader for the whole education system, provide a vehicle for service to the local community in analysing and solving problems, support the conservation and careful adaptation of local traditions and values, and act as a symbol of national prestige” (p. 6).

The participants in this study have demonstrated a strong conviction that ICT plays an important role in the higher education environment. They acknowledge the significance of ICT in different aspects of academia. The following discussion follows the themes identified in the study. It commences with a broad discussion of ICT’s role in supporting program delivery. It continues with ICT and its role in academic research. Finally, it discusses the ICT presence in the teaching/learning process and the potential of technology to enhance students’ academic achievement.

7.2.1 Supporting program delivery

Finger et al. (2007) acknowledged that “the use of new and emerging technologies has gained many proponents in higher education as a means for opening possibilities for improved delivery of programs with benefits for educators and students” (p. 83). The importance of ICT in supporting academic program delivery emerged in this research as one of the most important aspects of applying technology in an educational context. Statistical results revealed that despite noticeable differences in computer accessibility at universities and OIHEs, faculty members across different types of tertiary institutions used computers mainly for academic purposes. More than 90% of academics declared they used computers to prepare lecture notes, and 75% used computers to do research. More than 90% of academics declared they used the Internet for work-related information, and almost 90% used the Internet for research.

The general perception of technology among academic staff participating in this research was that ICT is not only a desirable tool for teaching and learning at the IHEs, it has become a necessary tool. The faculty members discussed ICT supporting academic program delivery in different contexts. They acknowledged that the easy access to the Internet and its vast information resources make the constant updating of units easier and more enjoyable. They also observed that access to Internet resources makes up for lack of current professional literature in institutions.
I use it [technology] for all kinds of things. Like for my courses I can search the Internet. In my own area of ethno-mathematics, for example. When I was at Monash University working on my PhD, I typed in ethno-mathematics, and nothing came out; and it was 1994. But now, I type in the same and there are millions of different sites and information on ethno-mathematics. So, it’s amazing. Information as such we have I can easily access through the Internet (UM08).

In addition to updating existing courses, lecturers advised themselves using the Internet to collect materials for new courses and/or new teaching materials.

When I teach, I have to search the web to find out latest information, compare what I read from the books and all that to other sources on the Internet to make comparisons and then design my own teaching materials based on that (UM09).

The easy availability of professional information was very important to lecturers. On one hand, it placed them in the context of the profession worldwide. On the other hand, it boosted academics’ professional morale.

I’m just travelling around the world when staying in my room trying to find out what’s happening in my own field, which is curriculum, and make this relating to courses I am teaching here. I am just searching for the information for my lecture and my notes and everything that I am doing, I mostly depend on computer’s findings through the Internet. I found it very useful; even to build our expertise in our own areas, in teaching, in specialization. It makes me confident and it makes me feel that I am in tune with what’s happening around the world when I am teaching students in here. And I found the Internet very useful in my career (UM11).

They also found that academic professional duties are less demanding when completed with technology. In addition, the daily activities become more enjoyable.

I find the computer very useful in preparing power point slides for my lectures, apart from the convenience of obtaining information for academic purposes (UFL/OQ).

ICT has made teaching and learning more fun and easy. I can prepare a huge amount of teaching materials and use ICT to conduct lectures’ presentations. The best of all is that it makes editing and work much easier (OML/OQ).

The experience of employing technology for academic practices as shared by faculty members participating in this research remains in line with trends in academia worldwide. As Turney et al. (2009) indicated “technology is increasingly being exploited for learning and teaching in universities around the world, largely because it is considered to offer greater flexibility in relation to time, place, pace, entry and exit” (p. 71). The research literature provides illustrations of synergies of the use of ICT and the adoption of new teaching and learning strategies for
program delivery. Collis and van der Wende (2002) reported results of a study carried out by the Center for Higher Education Policy Studies in Australia, Finland, Germany, Norway, the Netherlands, the United Kingdom, and the USA with almost 700 participants. The aim of this study was to investigate emerging trends in the application of ICT in higher education and how future developments could be predicted and strategies made based on that. Although the study confirmed that the observed use of ICT in tertiary education context is less advanced than expected, it also affirmed that “ICT has clearly become part of the blend, serving as a complement to already existing instructional tools. ICT use, in terms of e-mail, word-processing, PowerPoint, and the Web, has become standard as part of the teaching and learning process” (p. 7).

For the application of ICT in educational contexts, “the growth of web-based applications has made the web an important educational medium” (Saeed et al., 2009, p. 98). Indeed, employing Web technology in an educational environment “shows particular promise for supporting meaningful learning through its remarkable functionality, support for flexible delivery modes and capacity to link and connect those involved in the learning process” (Levin, 1999, as cited in Hedberg et al., 2002, p. 736).

As illustrated earlier, the participants in this research expressed a strong conviction that although technology in general is changing the way they operate and conduct their daily professional activities, the Internet played a special role.

What I teach, I always try to update with what it’s been in websites. It makes it easier for me to deliver my lessons. Easier for me to teach my students. And another times, I make references for students to go and check on this, like making easier for students to learn themselves too. And it makes teaching easier; it makes searching for information easier, it makes research easier (OM23).

I depend a lot on the computer for all my courses and even I mark students’ work on the screen. I give students assignment which they drop into the folder so I mark it on the screen which is faster to me (UF21).

Despite rather optimistic opinions about the role of ICT in supporting program delivery, current application of ICT at tertiary institutions has been found to be still at the emerging stage. Technology was merely employed to prepare lecture notes and students’ materials. Some lecturers reported using PowerPoint to deliver the content of their presentations and marking students’ assignments on computers. Up-to-date technology has been used as a substitute for the traditional program delivery mode: traditional hardcopy students’ handouts are replaced with electronic copies; instead of written assignments, students are instructed to submit electronic
copies. Only one female lecturer reported using an additional software package, which she called “toolbox.” The lecturer was teaching the Small Business Management unit in Distance Learning mode at one of the universities. The package, bought by the university from the Australian Training Council, consisted of a broad range of activities and simulations to introduce students to different aspects of small business operations as well as assessment tools.

The literature provides an extensive list of technology tools that, used in educational context, may contribute to the learning-teaching process. Bates (2010) argued:

> The recent development of Web 2.0 and mobile technology tools, such as blogs, YouTube, mobile phones and cameras, virtual worlds, and e-portfolios, now enable learners to collect, create, transform, and adapt their own learning materials. These tools can be used for collaborative learning, group work, projects, problem solving, and creative thinking, to develop skills needed in a knowledge-based economy. (p. 21)

None of the participating faculty members reported using the Internet and other mobile technology tools in their academic practice. The current rather limited application of ICT in IHEs in Papua New Guinea could be justified by a few contributing factors, including limited access to computers and the Internet at the majority of IHEs, lack of proper training for staff, lack of policies guiding the use of technology in educational contexts that include embedding technology into curricula, and a techno-determinist approach by institution administrations, which claims that merely installing the technology will guarantee rational and competent use.

However, the discussed limitations should be put into a broader perspective. The literature reveals that despite the heralded benefits of ICT for education, the reality is far from expected. David White (2008), the Director of Lifelong Learning, European Commission, exposed the problem by saying: “Although ICT has had a major impact on education and training at all levels, its impact has not yet been as great as we hoped and expected. The task of transforming the teaching and learning process is still just beginning. Some innovation content is there: but not enough” (p. 5). Kirup and Kirkwood (2005) pointed to disappointing results of recent research that suggest “that the impact of ICT has fallen short of the rhetoric that it would produce radical change in learning and teaching” (p. 185), consequently leading to understanding that the promised transformatory potential of ICT in education is being missed. In the same vein, Abbonlahor (2008) found in Nigeria that acquiring ICT is not followed by immediate application. In the process of acquiring technology, Nigerian universities exhibited the attitude of technological determinism. Consequently, despite the higher number of computers in IHEs, “the use of these
technologies have, in a large number of cases, not enhanced either individual or institutional level productivity” (p. 132).

7.2.2 Supporting research

Another equally important function of ICT in the context of higher education that surfaced in this research was its role in supporting research. The faculty members acknowledged the twofold contribution of technology in their academic research: ICT as a rich source of information for research, and ICT as providing new venues of conducting research.

7.2.2.1 ICT as a great source of information

Research lies at the very core of the Internet’s existence. Begun in the 1960s, the Internet was a research project aiming to examine the feasibility of interconnecting different types of computers and computer networks for military purposes. Universities and colleges were among the first institutions to be connected to the Internet. What started as a military experiment “has become a major communication medium and source of information for millions of people” (Fielden, 2000, p. 59).

The participants in this study, academic staff as well as students, acknowledged the Internet as an expansive source of information. They saw it as a platform facilitating access to a wealth of information worldwide. The following are some examples of their appreciation:

The world of information; the bank of it (OM22).

It deals with a wide range of subjects and it’s easily stored there. Someone does the work of storing for you and you just find it. I find it really useful. I have a lot of references and full references and articles from Googles for my thesis (UF13).

I use it [computer] for almost everything. It’s limitless, especially with access to Internet. The database is available and kind of information that is there is mind-boggling. So, you got a wealth of information literally at your finger tip basically. You have just to type up any word and you got basically millions of different things about the same (UM08).

If we have the chance to get Internet or have access to Internet, then it’s very useful. From the Internet you can go anywhere, search for anything that you want, do research. It’s very easy (OM19).

The Internet really helps to do my research. Because, when I want to access some people, sometimes other things that I need. So, the Internet is very important. Anything I want to find, any information is all there and it comes (OM17).
The Internet was discerned as a vast ocean of information. The easiness of access to the resources was perceived as one of the major advantages of the Internet as a source of information. The emerging significance of electronic resources over physical ones, inevitably leads to the discussion of ICT as a library substitute.

7.2.2.2 ICT as a library substitute

One of the most visible examples of a transformative role that ICT plays in research is the growing significance and acceptance of electronic resources over physical library collections. In the new digital era, “the library is becoming less a collection house and more a center for knowledge navigation, a facilitator of information retrieval and dissemination. In a sense, the library and the book are merging. One of the most profound changes will involve the evolution of software agents, collecting, organizing, relating, and summarizing knowledge on behalf of their human masters” (Duderstadt, 2001, p. 62).

The participants in this study demonstrated highly positive perceptions of electronic resources.

Internet access is an awesome thing. It is wonderful thing connecting worlds, connecting people, connecting ideas and if we don’t have information in the library, you have a huge electronic library at your disposal (UF07).

The academic staff and students found the Internet an easy-to-access source of vast information. Two aspects of their use of the Internet for data collecting purposes surfaced as the most significant. On one hand, PNG tertiary institutions have limited current academic literature resources; the majority of books are outdated and they cannot satisfy study needs of staff and students. On the other hand, the Internet has an immense wealth of readily available information and is perceived as a perfect tool to collect information for all academic purposes. The following are some examples of participants’ opinions on these issues:

Computer is very helpful for me to do my studies; easier and faster than library resources (OMS4y).

I depend on the Internet for most of my research tasks to collect information that I cannot gather from books in the library (UFS3y).

Internet is becoming a very powerful tool for me as an academic due to shortage of current books in our library, the lack of resources in Papua New Guinea. My only way to make myself confident about recent publications and recent things on certain topics that I want to teach I mainly depend on the computer (UM11).
When you go to the library, it is old materials, books are out of date, and this is a challenge. So, we need to have computers in higher education institutions with the Internet access for students to see new things and learn new ideas. But here, you are going back to the same old stuff with books and papers and I think sometimes learning get stagnant (OF03).

The research literature provides examples of similar integration of ICT into the academic domain. More than 3,000 participating UK researchers were found rather conservative in their choice of sources; yet, they were also eager to explore and adopt new opportunities. The Internet was perceived as an important research tool enabling the provision of electronic information through the use of e-books, e-journals and other Web-based sources (Houghton et al., 2006). Devi and Singh (2009) reported that more than 90% of scholars at Manipur University in India used the Internet for their research work. Although the majority of participating academics did not agree that the number of library users decreased with the advent of the Internet, they were in favour of the notion that the Internet substituted for the library.

Notwithstanding the fact that the respondents of this research shared similar acceptance of the Internet as a tool for scholarly research with other academics worldwide, the PNG context had a particular aspect. Almost all who share their view on the matter stressed the lack of other physical resources. The Internet was seen as a great avenue to obtain necessary information because there were no other ways to complete the task. It was a solution, even at the institutions where Internet access was very limited (see Section 6.1.1 Research sites).

**7.2.2.3 ICT as a communication and collaboration venue of research**

One aspect that has gained importance in academic research over the last few decades is the use of collaboration (Abramo et al., 2009; Houghton et al., 2004a, 2004b; Schroeder, 2007, 2008). Among many factors that contribute to the growing importance and practice of collaboration within academia are innovations in communication technologies that remove barriers in research collaboration (Abramo et al., 2009).

Communication is one of the prerequisites of successful collaboration. To develop trust and to build consensus around different aspects of research, the research team members have to find ways to facilitate and maintain communication. Web technologies provide such tools. Discussing e-research collaboration in academia, Siemens (2010) argued that “digital tools facilitate communication and collaboration and allow people across many geographical locations to coordinate tasks and research outputs” (p. 35). In the same vein, Houghton et al. (2006) maintained that “the growing use of ICTs in research is having a fundamental impact on the way research is being conducted in many fields” (p. 171).
Participants in this study also indicated the enabling role of ICT in collaborative research and evidenced different aspects of ICT involvement in collaborative research. One of them was a facilitating role in networking with academics worldwide.

Internet plays very significant role. I can send information to whole team. It’s very important; it’s there (OM23).

Through the use of emails, I can now easily communicate with other colleagues from around the world. Just yesterday we jointly submitted the project with the College of London for some research in here. That won’t be possible if we won’t have access to the Internet and emails system. But now that’s possible, you can work on collaborative projects with your colleagues from around the world. You can communicate with them like that. Nowadays, for projects, like research or projects to do with AusAID funded projects, you can only access them through the Internet. Also, researchers around the world have their own websites with their publications and you can be able to access their papers so that makes you, definitely helps academically (UM08).

As indicated by a University Male Lecturer, the benefits of ICT in research processes – easy communication with academics in other parts of the world, greater access to information, collaborative research projects and participation in sponsored researches – remain in line with other research findings. Houghton et al. (2004a) discussed an enabling role of technology in changes affecting academic research. On top of listed advantages, ICT provides access to high performance computing, enables easier handling and organising huge volumes of data, and enables a greater variety of enhanced publication, dissemination, and communication mechanisms.

ICT capacity to facilitate communication and sharing of resources between researchers across academia worldwide has been widely acknowledged. For example, the Commission of the European Communities listed sharing of resources, instruments and knowledge as a basic requisite for the full development of a European Research Area (Abramo et al., 2009). The possibility of ICT enabling easy collaboration between academics in research is more apparent in small or developing countries. Smeby and Gornitzka (2008) observed in the context of higher education in Norway:16

International contacts at the level of the individual university researcher have been a core prerequisite for development of the knowledge base of small countries. Personal contacts between researchers remain the core of international research cooperation in academia: university researchers have their identity anchored in disciplinary networks and

---

16 Norway is considered a small country with 4.9 million inhabitants living on a land area of 323,787 km² (Statistics Norway, 2011).
communities and international contacts are structured by the nature and orientation of such communities. (p. 37)

Similarly, although from a widely differing perspective, Nayati-Ramahobo (1996) discussed the culture of networking in educational research in Eastern and Southern Africa. She maintained that “the lack of collaboration between researchers caused the major setback to the development of educational research in the region exemplified in duplication of efforts in the midst of scarce resources and lack of sharing of the skills necessary for the generation of knowledge” (p. 80). Given the shortage of information resources in Papua New Guinea, ICT is perceived as the convenient way to facilitate different aspects of research on an international stage and thus it is seen as the preferred avenue for developing research in local academia.

7.2.2.4 Critical assessment of ICT as a source of information

Academics and students at tertiary institutions in Papua New Guinea perceive ICT as a significant tool for successful delivery of academic programs and an important element supporting different aspects of academic research. However, enthusiastic acceptance of technology and highly positive perceptions of its usefulness for academic purposes should not overshadow the reality of rather poor preparation provided for technology application. Many staff members and students confessed they felt inadequate to use technology to benefit from advantages claimed for it. The limitations were felt at different levels and so were the consequences. The lack of computer and Internet skills and of knowledge of what and how technology could be used in an academic quest often led to disappointing results. For example, many people spent much time searching and downloading contents of questionable academic quality.

Internet is really good, but there are problems associated with it. Especially when you are beginning to learn how to use the Internet and out of your excitement you are learning to surf and surf everything and anything interesting that comes and you just surf through. What the students don’t realize, we don’t realize, that we spend so much time and we don’t really get what we are looking for (UF20).

I love using computer; it makes life interesting and fun and increases my knowledge of the outside world especially by using Internet. However, sometimes at the end of the day I feel that I am just wasting my time without learning anything at all (UFS1y).

The experience of academic staff and students at tertiary institutions in Papua New Guinea is similar to experiences in developed as well as developing countries. Clausen (1996) studied the Internet as a tool for research libraries. She surveyed more than 400 Danish Internet users from business, higher education, and research environments. The majority of participants used the Internet for information retrieval. Business people perceived that the quality of reference work
available on the Internet had improved significantly, while researchers and academics held less positive opinions. Floridi (1996) argued that there was a widespread need for quality control of Internet resources so the users would be able to “distinguish between the intellectual space of knowledge and a very polluted environment of junk mail and data” (as cited in Clausen, 1996, p. 120).

Jankowska (2004) attempted to identify information needs of professors at the University of Idaho, USA. She surveyed the extent of access and usage of electronic resources available through the university library. The study indicated that “in this time of rapid development of ICTs and information overload” (p. 63), the faculty relies on library e-services and resources. It also confirmed that “unawareness of the range of databases, the lack of knowledge about electronic resources among faculty, lack of time, lack of training, and instruction were critical obstacles to effective use of electronic resources and services by faculty” (p. 63).

Heil (2005) affirmed the earlier findings of the majority of students using the Internet to conduct research. She found that students demonstrated “infatuation” (Conclusion section, para. 2) with the Internet because of its massive amount of information. However, students did not have adequate knowledge of the Internet and its functions so as to comprehend the credibility of Internet sites and were not able to critically evaluate them.

Salako and Tiamiyu (2007) examined the use of Internet resources by postgraduate students at the University of Ibadan in Nigeria. They found that students relied heavily on search engines for their academic research. The majority of students claimed they found information on the Internet for which they were looking. However, the study revealed that they used predominantly simple queries on mostly one or two search engines. The authors claimed that students could have obtained better results if they had used more sophisticated browsing tools and techniques.

When discussing overloads of Internet information and the use of ICT, authors indicated a strong need for information literacy training that would provide tools to not only access the information but most importantly, to examine and analyse the quality of the material presented on the Internet and to transform information into useable knowledge (Adeogun, 2006; Doring, 1999; Heil, 2005; Katz, 2007). Golian (2000) reminded:

Although Internet search engines and databases are remarkable tools, it is important to realize that these tools do not obviate the scholarly process. In fact, many researchers comment that the Internet has greatly compounded the common research problem of ‘too much information’. It is not uncommon for scholars to spend countless hours searching the
Internet for relevant Web sites and then spend additional hours sifting through enormous amounts of information in order to locate high quality scholarly information that is reliable and relevant to their research project. (p. 106)

In the context of the above statement, it is safe to say that a key to successful participation in the experience of knowledge sharing over the Internet is digital information literacy and competency. Digital literacy, a term introduced by Paul Gilster in 1997, embraced in general terms the ability to use and understand information obtained from different digital sources (as cited in Bawden, 2008). Since then, the term has been evolving to include different aspects of searching, obtaining, processing, storing, and sharing of information with digital media. Katz (2007) termed ICT literacy as “a twenty-first century form of literacy in which researching and communicating information via digital environments are as important as reading and writing were in earlier centuries” (p. 4). Katz et al. (2004) further defined ICT literacy as the “ability to appropriately use digital technology, communication tools and/or networks to solve information problems in order to function in an information society. This includes having the ability to use technology as a tool to research, organize, and communicate information and having a fundamental understanding of the ethical/legal issues surrounding accessing and using information” (as quoted in Katz, 2007, p. 4).

Scott and O’Sullivan (2005) went further in their observation of necessary information literacy for students in an information society. They argued that in the new epistemology redefined by the nature of the Internet “student learning and comprehension has been significantly transformed by hypertext medium” (p. 22). This transformation should be reflected in hypertext literacy that will accommodate researcher’s ability to formulate knowledge from the information found on the Internet. In the same vein, Golian (2000) argued that “information competency is not simply a matter of computer literacy; it is a combination of subject knowledge, information-seeking behaviours, and technology training” (p. 107).

By way of summarising the critical analyses of ICT as a source of information, it is argued in here that ICT has the potential to become a more important source of professional information within higher education. However, this potential can be realised and utilised only with students and staff becoming more knowledgeable in ICT recourses and more skilled in accessing them and using them.
7.2.3 Students’ learning

The introduction of ICT into educational contexts promised to revolutionise all aspects of program delivery including the learning-teaching process. However, a number of issues influence the successful implementation of technology into educational practice. On the one hand, as Condie and Livingston (2007) argued, the extent of ICT influence on the learning process depends upon the roles adopted by students and teachers, especially by “the model of the learner held by the teacher and the pedagogy adopted by them” (p. 337). On the other hand, Oliver (2002) claimed that the very nature of ICT makes them tools of educational change by the way they initiate, negotiate, and support teaching and learning processes. Students using ICTs for learning purposes become immersed in the process of learning and as more and more students use computers as information sources and cognitive tools, the influence of the technology on supporting how students learn will continue to increase. The following discussion negotiates approaches presented in the light of issues raised by research participants.

Students participating in this study demonstrated a very high opinion of the use of computers for academic purposes. They enjoyed using technology and they believed it was an indispensable tool for their study. However, despite the enthusiastic acceptance of computers for learning at tertiary institutions, students’ perception about the application of technology was somewhat limited to the tasks previously done without computers. Computers seemed to complement paper, pen, and library resources. Students used technology to complete and submit their assignments, to search for information and to communicate with others. The clash between highly positive perceptions of the usefulness of technology for learning and the actual use of technology for learning was well manifested in students’ responses to the survey’s open questions. When asked to summarise their attitude toward a computer, students expressed favourable opinions about it.

I like to use the computer to do my assignments and make notes of presentations, because it’s very clear and readable done using a computer. It’s more professional. It’s very easy and fun when you know how to use all the programs (UFS3y; #228).

Computers provide and save time for other work. Computers overall make life easier for work, assignments, research and other work (UMS3y; #54).

Despite their admiration for technology and high perception of a computer’s ability to enhance their study, the same students, when asked why they choose the paper-based over the Web-based questionnaire, said:

17 Survey questionnaire ID number; additional information about the research participants is provided in here so each piece of datum quoted in here could be better appreciated.
Because writing on a paper is faster than web-based. You think faster as you write (UFS3y; #228).

It helps me write more clearly. Also provides more conveniently the time to express clearly my thought than in a web-based questionnaire (UMS3y; # 54).

The reported phenomenon could be explained by the fact that students were more accustomed to traditional forms used in the educational process. For the majority of students, an IHE was the first place of contact with technology. Educational practice at the secondary level had not exposed students to technology and its influential potential. In addition, the official ICT policies at tertiary institutions clearly indicated that technology should be used for academic purposes only. Despite such circumstances and despite resorting to paper-based questionnaires, students’ exciting experience with technological novelty contributed to their belief of the promised benefits of technology.

This contradiction between what students believed about their usage of computers and their actual practice is not solely the experience of participants in this study. Contradictory findings were also reported by Luik and Kukemelk (2008), who examined in-service and pre-service Estonian teachers’ perceptions about changes in the learning process caused by employing ICT. The authors reported some positive and some negative changes in the student’s and teacher’s roles in the learning and teaching processes. The fact that students were becoming more independent learners who were able to choose their own pace and path of learning corresponding to their individual learning style, level, and needs, was perceived as a positive change. However, the other change in students’ attitudes and practices was perceived as negative. The same students were found becoming more passive; they used materials for their assignments from the Internet without critical analysis of their values, or used the materials given electronically by the teacher. “Students did not want to take notes or read long text. Instead, they wanted that notes are prepared by the teacher; that they get handouts and in the class they can just sit and listen” (p. 20). Authors indicated that the result was unforeseen, “because most of the studies have found that, in the learning process with computers, students play a more active role” (p. 21).

The issue of technology influencing the way students learn was not apparent in the discussions with participating academic staff. In fact, only one lecturer mentioned the role of technology in students’ learning processes. She observed how proper assistance from a lecturer supported with technology could contribute to a student’s achievement.
That extra course that I did during my studies in Australia – ICT for Educators – I could see that students can learn a lot of things being guided by the teacher and then showing them exactly where they have to go to research on different topics, then they will do their work. We need to have computers in higher education institutions with the Internet access the students will ... when they learn new things and if they will have access to the Internet, it motivates them in a way too: see new things and learning new ideas (OF03).

The female lecturer (OF03) raised three important issues. First, she took up a course during her study that prepared her to use technology as an educational tool. As discussed earlier, technology has transformative potential to change the teaching-learning process. However, the potential is realised and utilised only if lecturers are aware of it and are prepared to make technology part of their pedagogy. Second, the lecturer suggested that students “will do their work” if appropriately guided. She indicated a role shift: from lecturer-centred teaching to a student-centred approach. Finally, this female lecturer affirmed that access to the wealth of information on the Internet motivated students’ learning.

Experiences of the application of ICT in the learning-teaching process worldwide result in mixtures of successes and disappointments. Wood (2010) reported on research conducted at a university in Canada that delivered a Bachelor of Education program with Moodle, a course management system, platform. When asked to summarise their attitude towards technology as a learning tool, students identified technology as very positive learning tools if used for academic purposes. One participant explained, “Students benefit from information that is conveyed using visuals, connections, repetitions, discussion, choice, applicability. The use of technological tools such as SMART Boards benefits the teacher and students. It’s visual, it provided access to so many amazing resources, and it’s interactive. However, the use of technology is no substitute for good teaching and critical thinking” (p. 303).

The earlier observation made by the female lecturer (OF03) remains in line with research findings in other parts of the world. Condie and Livingston (2007) claimed after Fabry and Higgs (1997) that “teachers must make two radical changes—they must learn how to use technology and they must fundamentally change how they teach” (as cited in Condie & Livingston, p. 338). Adeogun (2006) affirmed that information literacy skills of teachers have a great influence on information seeking behaviour of their students. In the information society learning environment, teachers must acquire technological competence to prepare students to function in the digital reality. In the same vein, Inoue (2007), discussing the role of lecturers in higher education, indicated that modern technology accelerates a shift from the lecturer being “an expert dispensing the knowledge to a resource or a guide” (p. 135).
The female lecturer (OF03) asserted her new role as a guide in the process of students’ learning. Being prepared for such a role, she appreciated the change in her pedagogy and the results she observed in students’ approach. The use of technology in the learning process made students motivated to take responsibility for their own learning.

The positive correlation between learner’s motivational level and their engagement in the learning process and academic success is discussed in numerous research studies (Bekele, 2010; Hug et al., 2005; Kim & Frick, 2011; Svinicki, 1999). Svinicki (1999) provided extensive insight into the theory of motivation for learning. One of the theories developed within a cognitive paradigm, defines motivation as “the need to have consistent, accurate, and useful understanding of the world” (p. 20). In this understanding, learners seek to find more information when the feedback they received indicated “mismatch between their memory structure and the ‘real world’” (p. 20). Other motivation concepts shifted the focus on different aspects influencing students’ learning: goals and their impact on learning and self-determination and learner’s perception of being in control of their own destiny. Ford (1992) termed the concept of learning motivation as “the organized pattern of pursuing goals, beliefs, and emotions” (as cited in Lim & Morris, 2009, p. 284).

Kim and Frick (2011) in their study of changes in motivation in technology-mediated courses pointed to other aspects that influence students’ motivation to learn: such external factors as students’ support system and learners’ instructional and organisational setting and such personal factors as learning style and technological preferences. Kim and Frick found that the level of technological competence will contribute to students’ motivation and ultimately to students’ academic success. “Automaticity in the use of technology itself is important in order to reduce cognitive load” or otherwise students are faced with learning how to use the technology when they should be devoting their attention to what it is they are expecting to learn” (p. 16).

Bekele’s (2010) review of motivation and satisfaction in Internet-supported learning environment research concluded that “technology per se neither motivated nor satisfied students” (p. 124). However, the papers reviewed also indicated that technology was one of the most important factors in students’ academic achievements. Technological factors contributing to students’ satisfaction included “use of synchronous and asynchronous tools and multimedia. Easy-to-use software, friendly screen layouts, and flexibility; the perceived/ actual easiness and use of technologies along with support services” (p. 124).
In the context of the above discussion, it is argued here that embedding technology into the teaching-learning process fosters students’ motivation to learn and consequently contributes to students’ academic achievement. Although the application of ICT is in initial stages in PNG higher education, it already indicates positive results.

7.3 ICT for Empowering Women

The participants in this study demonstrate strong convictions that the advent of ICT in Papua New Guinea has great potential to contribute to the advancement and empowerment of women. The notion reflects the idea widely discussed in the literature that ICT can bridge the gender digital divide and become a dominant tool in women’s empowerment (Primo, 2003). Although the literature examines many different aspects of ICT in the context of the empowering women, the current discussion is led along the factors identified in the data analyses and is limited to three main issues: ICT to support a woman as a family provider; ICT to support raising women’s status; and ICT to raise awareness about women’s empowerment.

7.3.1 ICT to support women as family provider

The traditional role of PNG women as family provider has surfaced in this research in different contexts. On the one hand, the role limits women’s time, with ramifications for their ability to access computers. Many women, especially in urban areas, are sharing their time between professional duties and domestic chores. There is little time left for them to switch on a computer or to search the Internet for purposes other than work-related. In this regard, PNG women share similar conditions with women around the world (Broadhurst, 1997; Huyer & Sikoska, 2003; Primo, 2003). Although the time limitation is particularly strongly experienced by women in developing countries, Primo (2003) indicated that “it is also a phenomenon in more affluent societies, and has important implications for the kind of content that women are likely to perceive as useful and worthwhile” (p. 49). She also reported that because “for almost all women, time is in short supply” thus they are less likely than men to have the leisure to use ICT” (p. 49). The female participants in this study did not complain about the situation and thought of the inhibited computer accessibility as ‘a part of life’ and the natural consequence of their domestic duties. However, the fact that only women pointed to men using computers for leisure activities indicated that though accepted, the restriction in computer accessibility was not liked: women want to share with men the benefits offered by technology. One of the female participants confessed:
When I first learnt how to use the email, I couldn’t live a day without sending an email message. It was very exciting for me and just to walk past the computer lab without having to go and send an email was like ‘oh, I didn’t do something’. I like to go to the Café all the time and surf the net and chat with my friends, and check out what’s new on the site and everything else (UF20).

On the other hand, these research findings reveal that women’s traditional role as family provider has been redefined and adapted in the context of ICT. Digital age women are still expected to provide for the family; however, the way they might fulfil their family obligations is changing and reflecting wider technology-related changes in society. Women have realised that ICT-related skills might assist them in the very tight job market to find a well-paid job. The opportunity is even better comprehended in the context of higher education, as one of the participants reflected:

The mother has to be one step ahead of the man all the time because it is within us; this ‘I got to ensure the survival of my people, or my household, or my clan’, it’s go out and search for food. And in that sense, I’m connoting to if I want my students to get the best education, and to ensure that they find good produce for themselves, is that I feed them with technology, I feed them with software, what’s available on the computer, especially because they are able to utilize that as an extra tool, as an extra armour to them, bettering themselves in the area of their influence (UF12).

Similar findings were reported in the literature from other parts of the world, both developed and developing countries. Perrons (2002) recalled the UK government’s Women’s Unit (Women’s Unit 2000) declaration and argued that “ICT represents a new opportunity for women to gain high-paid employment while managing their work life balance” (p. 275). Kvasny (2003), in her extensive research which focused on how gender, race, and class influence attitudes to technology among participants in a community technology centre in a US city, reported that ICT was constructed as “a mechanism for liberating entire classes of women economically and socially. A common refrain was that computer skills would help women to obtain higher paying clerical jobs” (pp. 112, 114). With reference to women and ICT in the Middle East, Taysir (2000) reported that technological education is a tool of “upward social mobility” (p. 5). She argued that “technological education would lead to a higher percentage of women occupying higher-paying jobs, with the attendant consequences of enhanced social status, security and mobility” (p. 5). Omamo (2009) reported a study in Kenya that indicated “that women are highly optimistic, embracing ICT as a practical mechanism for achieving entry into the labour market” (p. 183). Menard-Warwick and Dabach (2004) in their research explored the impact of computers on two low- and middle-class Mexican families and recounted high expectations expressed by the
participants that computer skills will help them to get a better paid job. Authors quoted one female participant who said:

[A]t this time I'm ironing, but in the long run [computer skills] could help me. Because sometimes they need people to work in the front to take in the clothes, and now that is done with the computer....[Now] I pack, wash, iron, and, well, who knows – in a little while I could be in front....The day when my manager asks me, "Do you know how to use a computer?" I will joyfully tell her, "Yes!" (p. 380)

Despite the heralded benefits of ICT for women’s advancement in the workplace, the literature has also presented a less enthusiastic view. Melhem et al. (2009) referred to Nancy Hafkin’s research in the Philippines and Thailand, in which she compared women’s and men’s higher education, participation in small business and ICT access and found that it does not translate into women’s equal representation in leadership or government positions. The authors argued that “the mere fact that more women are employed in the manufacturing sector facilitated by ICTs does not necessarily mean that these same women are benefiting from literacy or higher learning program or gaining leadership, communications, or negotiation skills” (p. 38). Although the argument does not diminish the possible role of ICT for women’s betterment, it calls for more critical analyses of the current status quo.

As indicated earlier, the participants in this research enthusiastically claimed that ICT holds potential to help women to support their families by getting well-paid jobs. However, the types of jobs named in relation to technology did not extend beyond clerical jobs, or assisting others with word processing for a fee. Although expected job opportunities are not within the range of well-paid occupations, the expectation should be read in the context of the socio-economic situation of women in Papua New Guinea. The share of women in wage employment in the non-agricultural sector in 2004 was only 35.4% (Asian Development Bank, 2011), one of the lowest among more than 45 developing Asian and Pacific countries. The current job market for women is rather scanty. Apart from professions that require a higher degree, such as education and medicine, where women are well represented, the majority of women are employed as either domestic workers or shop attendants. For these groups of less educated underprivileged women, any better-paid employment opportunity seems to be an important step up the social ladder. Obtaining and mastering ICT skills are seen as ways to secure employment and thus to provide for a family.

---

18 According to The World Factbook, in 2010 urbanisation reached only 13% of population; 85% of the labour force was employed in the agriculture sector (CIA, 2011).
7.3.2 ICT to support the raise of women status

The discussion in the previous section focused on the economic empowerment of women. It continues now with another factor in women’s empowerment identified in this study – the role of ICT in raising women’s status in society and therefore their social and political empowerment.

The economic empowerment of women through ICT is important for women around the world, including women in Papua New Guinea. The consequences of such empowerment go beyond the immediate family. There is more in economic empowerment than just financial gain, as the executive director of the community technology centre researched by Kvasny (2003) observed: “The true value of what we are doing is not the technology, but the empowerment that comes from it. We are enabling residents to discover a world of information and knowledge that they would not have access to were it not for our centers” (p. 114). Technology not only provided means for economic betterment but also as a result, it became a platform for women’s advancement in society. The vast body of literature provides numerous examples of ICT’s role in the social and political empowerment of women. One of them comes from extended exploratory studies conducted by the UN Economic and Social Commission for Asia and Pacific in the Caucasus and eight countries in Central Asia. The research assessed women’s organisations’ use of ICT and its role in women’s life. Despite the acknowledged barriers to the full application of ICT in their operations, the non-governmental organisations (NGOs) participating in the research praised ICT and its role in empowering women. The report cited some participants’ perception of ICT:

Information received by women [through ICT] improves their education, legal literacy, and self-awareness. In this way every woman can become an active participant in efforts to create new, more democratic societies.

[ICTs] help to improve the knowledge of women, establish a women’s information network, support partner relationships, and achieve financial independence. (Economic and Social Commission for Asia and the Pacific, 2001, pp. 83-84)

Women participating in this research shared with women in other parts of the world the perception that ICT has great potential to change women’s status in the society, though their perception was focused on disparities between urban and rural areas. While there was strong conviction about ICT and its role in raising the status of women in town, it was questioned in regard to women living in the village. The section 6.5 ICT and Women’s Issues recalls the story of a woman who gained higher status for herself in the community because she was the only one who was able to work with specialised software in the government agency office where she was employed. “People talked about her as having skills that most people don’t have” (UF13).
Mastering computer skills not only secured her job position, but also raised her status in the community.

However, the same could not be said about the role ICT plays in the rural setting. While computers are in use in the majority of government offices and in private and state business environments, the proliferation of computers outside towns is very low and almost nonexistent in the rural areas. Many people in rural places have never heard about computers; they are far from understanding the practical application of computers for their life. In such environments, the role ICT might play for women’s social empowerment is not easy to define. On the one hand, computer skills are hidden under the umbrella of education, as one of the participating women observed:

In the village they see me as a woman of status because of my education [the participant holds the PhD degree], but not because as someone who knows how to use the computer. Because the education is what covers it all (UF01).

On the other hand, contacts with the outside world require some new skills that a majority of villagers do not have. Women who have computer skills may play a new role in society.

If a woman has got to know how to use a computer, at least word processing, that woman is seen as a valuable asset in the community because ... maybe there are some organizations that are interested in community development so they may be able to use this woman. And I also see that if a woman goes to secretarial school and at least learn how to use a computer, that woman is becoming very useful in the society, because every other person doesn’t know how to use computers and she uses her skills to help the community (UF20).

In the above observation, a woman is seen as a valuable asset for a community and her computer skills are valued by others when they are useful for the entire community. It puts the observed situation in the context of traditional culture and the concept of a big-man. Given Papua New Guinea’s complex cultural reality, it is far beyond the scope of this discussion to dwell upon different types of big-men and leadership. However, some common characteristics are expected from big-men: wealth, oratorical skills, and generosity. Ketan (2004) argued that “it is not the fact of wealth but its deployment which is important” (p. 72). A leader is expected to share his wealth with kinsmen, especially in the exchange times, such as bride price or compensation. Given that leadership models in Papua New Guinea are more meritocratic than hereditary in nature, someone may gain the status once he or she meets the qualities expected by a community; the expectations include personal economic gain. Although traditionally there is not a big-woman model, and contemporary Papua New Guinea remains a male-dominated society, if a community
appreciates a woman’s merits, it elevates her status. In this respect, ICT might play a significant role in helping women not only to provide for their families, but also to become respectful members of their communities. However, given low technology proliferation in rural areas, high illiteracy levels, the higher-than-in-urban-areas cost of operating computers and the Internet, promises of ICT to raise women’s status in society are yet to come to reality and be appreciated at levels similar to other parts of the world.

7.3.3 ICT for an awareness for empowering women

Another aspect related to the empowerment of women discussed by participants in this study was the role ICT might play in the awareness of women’s empowerment. The importance of awareness is acknowledged in the literature. Chen (2004) argued:

Given that ICTs allow an increased flow of information and knowledge, increased availability and use of ICTs allow increased exposures to the customs, norms and practices of other cultures and societies. This in turn tends to increase awareness of issues surrounding gender equity. As such, ICTs can be an invaluable tool in positively changing people’s attitude, including women themselves, towards women by disseminating educational programs and gender equity. (p. 10)

The awareness was seen by participants in this study as happening at two levels: personal and social. On a personal level, ICT could help women to strengthen their self-esteem and self-awareness as one of the participants shared:

With women, gaining some exposure to computing will boost their morale, they will have this identity at least...they will feel good about themselves (UF21).

ICT was also seen as a platform where women might find new ideas for their private and professional lives. One of the female participants summarised:

I’m spending a lot of time looking at the other passions of my life, like culture, art, music and all that. I am finding what people are doing in other parts of the world in terms of, you know, culture and their places, and maintain the culture, and all that, so I think instead of reinventing the wheel you can actually look up things that other people did (UF12).

The awareness of the potential of ICT for women’s empowerment has been seen in the social context as well. Though the technology proliferation outside the urban areas is rather low and private computer ownership is relatively low as well, the advent of ICT into professional environments is a reality and computer competency has become a valuable asset in the job
market. Women are adapting to the new social reality and starting to comprehend the benefits technology can provide for their advancement in social and private life.

The number of female students we send out to the workforce will also influence the workplace. Yes, because they will be computer literate, they can be able to work with skills that will facilitate their work and so they can rise up in the workplace, can raise their own status and the emotional levels. And it is a skill that is required; if you are computer literate that’s a big advantage. So, it puts them a place to move on and succeed and achieve more things (UF13).

The findings of this research reaffirmed what had been found by researchers around the world. Women found technology to be a helpful tool to assist them in learning about the outside world. Macuever et al. (2009) investigated whether women in rural areas in Mozambique, who had access to ICTs through telecentres, were becoming more powerful. Given the very poor life situation of research participants, the most available ICT tool for them was radio. Yet, women said, that “radio programmes are very important to them, because it is through them that they find out what is happening in the world” (p. 25).

The importance of proper awareness in regard to the role ICT might play in women’s empowerment was researched by Laizu et al. (2010). They examined the situation of rural women using ICT tools in Bangladesh and investigated whether access to ICT changed their lives in terms of socio-economic development. The research concluded that “if women’s engagement in ICT is active and in-depth in terms of learning and education, then women could become more empowered” (p. 281). However, ICT should be considered as just a tool, a catalyst for the change. Laizu et al. argued that awareness must be developed among women to promote empowerment through ICT intervention. “Women’s real life experience and knowledge can be used as an information source for other women in similar contexts and thus their ability and skill is [sic] increased as they gain insight into social, economic and political processes which leads to an overall improvement of life” (p. 278).

Among grassroots women entrepreneurs in Uganda, research revealed many positive impacts of ICT on women’s empowerment, including women as role models. Women were “prompted to attend computer lessons at the telecenters after observing other women perceived to be of high repute in society doing the same” (Bakesha et al., 2009, p. 151).

For women who aspire to play an active role in social and political life, ICT is a powerful tool that helps to change aspiration into reality. Skalli (2006) researched the use of technology by women
activists in the Middle East and Africa and concluded that there are a variety of areas where technology plays an important role in the empowerment of women:

It permits access to information and knowledge outside the mechanism of censorship, so that relevant and pertinent information can be received and retrieved in a faster, more cost-effective and timely fashion. It increases the volume of women’s voice, initiatives and activities on traditional media. It encourages women to think about new ways to establish relations, forge alliances, and broaden the scope of their intervention. (p. 51)

This research finding confirmed that women in Papua New Guinea view ICT and especially the Internet as a vast source of information waiting to be readily accessed. Women are also inspired by the way ICT changes lives of women around the world. PNG women activists have found their way to the worldwide forum and made their voice heard on the Web. Groups like Meri i kirap sapotim (Garap, 2004), Kup Women for Peace (Jackson, n.d.) or Leitana Nenan Women’s Development Agency (Hakena, 2008) are using the Internet to promote PNG women’s issues.

This chapter has discussed the research findings through the lens of the research literature. There were three major sections. The first section compared the gender profile of access, application, and attitudes towards technology of IHEs in Papua New Guinea with similar studies in other parts of the world. The second section discussed the perceived role of ICT in PNG higher education. With the insights from the research literature the role of ICT was affirmed in the area of program development and delivery, for academic research and students’ learning. The third section discussed the role of ICT for women’s empowerment. With the support of research conducted in other parts of the world, the discussion asserted the threefold role of ICT in the process: in supporting women in their role as family providers, in raising women’s social status, and in awareness of women’s empowerment through ICT. The next chapter continues the discussion of research finding through the lens of theoretical frameworks.
CHAPTER EIGHT
DISCUSSION OF FINDINGS THROUGH THE LENS OF THE
THEORETICAL FRAMEWORK

The purpose of this study is threefold: to create a gender profile of ICT access, application, and attitudes in higher education institutions, to examine ICT presence in the educational landscape, and to appraise the impact of ICT on women’s empowerment in Papua New Guinea. The study identified the complexity of issues embedded in the access to technology, its application, and people’s attitudes. It revealed specific meanings that PNG computer users apply to ICT in their interaction with technology. It also recognised the importance of technology for future development of postcolonial higher education as it faces the challenges of the knowledge society. Finally, the study acknowledged multiple roles of ICT in empowering women.

These findings are discussed here through the lens of the theoretical framework introduced and discussed in Chapter Four. The three theoretical paradigms are: social constructivism with a special focus on social construction of technology, feminism, and postcolonialism. The intersection of the theoretical framework, research literature, and research findings brought to light major themes that comprise this chapter:

- PNG-specific technology constructs,
- ICT as a catalyst of change for postcolonial education in the PNG context, and
- Empowering roles of ICT for women

8.1 PNG-Specific Technology Constructs

Constructivism was the underlying epistemology guiding the research process in this study. Within this paradigm, one of the theories employed for the purpose of the study was social constructivism. The fundamental assumption of the theory is the lack of either objective reality or objective truth; the meaning is created by those who interpret the reality. With the focus of the research on the complex relationships of people and ICT, the research took up the social construction of technology (SCOT) paradigm to investigate, analyse, and comprehend the complexity of participants/technology interaction. The theory “assumes that artefacts can be interpreted in many different ways – they have the property of interpretative flexibility” (Bruun & Hukkinen, 2003, p. 101). Interpretations given to technological artefacts are socially and culturally
embedded. Construction of a new meaning of technology evolves within the technological frame of the relevant social groups and wider context.

8.1.1 Relevant social groups and the wider context of the research

This research explores different aspects of ICT’s presence in IHEs in Papua New Guinea. Two essential elements are under scrutiny: female and male staff and students in tertiary institutions as relevant social groups and IHEs as the location within the national context. Relevant social groups are “embodiments of particular interpretations” (Klein & Kleinman, 2002, p.29); members of a certain social group interpret a technological artefact in similar ways. Understanding the characteristics of social groups and the wider context is a starting point for comprehending PNG-specific technology constructs.

As the meaning of technology is constructed within social interaction, the social reality surrounding participating actors is important. Revealed in this research, meanings of PNG-specific constructs of technology are negotiated within social interactions among tertiary institutions’ staff and students. Their perceptions of different aspects of technology are the result of a number of factors contributing to their technology experience. Contact with technology takes place most frequently within educational institutions. For the majority of participants, the extent of their technological experiences is confined to the level of technology infusion at a certain institution. As presented in section 6.1 ICT Profile of Institutions of Higher Education in Papua New Guinea, staff and students at universities have more exposure to computers and the Internet than staff and students at OIHEs. Despite disparities in availability of computers at different types of institutions, the use of technology is guided by similar institutional policies. All staff and students are expected to use technological resources for academic purposes.

Seen in the wider perspective of the nation, the IHEs seem to be technological islands in a technology-ignorant sea of rural Papua New Guinea. A deep digital divide has been realised and reported by participants living in urban areas. A number of factors contribute to low technology proliferation in rural areas. On one hand, Papua New Guinea’s rugged terrain and limited infrastructure pose massive challenges to attempts to bring technology into rural areas. On the other hand, “a basic Luddite mentality and the widespread bureaucratic inertia in government remain the biggest obstacles to the serious development of ICTs in the country” (Evans & Ninol, 2003, p. 3). One of many consequences of poor ICT infrastructure in rural areas is the lack of exposure to technology for students in these areas. Although the level of technology infusion in urban areas is higher, not many educational institutions provide computers for students. The
researcher’s own experience of teaching a computer course in a secondary school in one of the Highland provinces indicated that the level of students’ exposure to technology is minimal. Students enrolling in tertiary institutions have very little knowledge of how to use computers (Simeon, 2005, p. 5). Thus, students construct their meaning of technology within the teaching-learning environment that they experience during their study at a particular tertiary institution.

All social interactions are negotiated within cultural boundaries. Papua New Guinea’s cultural landscape is exceptionally rich with around 800 cultural groups using different languages. It comprises patrilineal and matrilineal societies. Although the status of women differs between the two kinship lineages, generally the status of women in the country is lower than that of men (Brouwer et al., 1998). Women are expected to remain submissive to men within their clans. Women’s versus men’s experience of technology is negotiated not only within the institutional framework, but also within cultural frameworks for female-male relationships.

As pointed out earlier, SCOT theory assumes that the same technological artefacts used by different relevant groups in different wider contexts may have different meanings. ICT has been used in education worldwide for several decades. However, different social contexts of technology impact the meaning assigned to it by computer users. This study revealed a number of PNG-specific constructs of technology:

- Technology as a male domain,
- Technology as a communication tool – a digital garamut, and
- Technology as a digital library.

**8.1.2 Technology as a male domain**

Technology as a male domain is not a construct of technology original to Papua New Guinea. An extensive body of research literature discussing ICT within gender contexts uses the phrase. However, the meaning constructed in Western societies is not necessarily apposite to the PNG context.

Different authors representing different schools of thoughts assigned different meanings to technology as a male domain and put the term into different perspectives. Kleif and Faulkner (2003) argued that in order to understand why certain technologies have been developed and the way it happened, we need to understand the people who made them. They further elaborated that “men’s attraction to technology is considered a matter of fact that needs no further explanation; male technologists are viewed as ‘native’, whereas female technologists remain
‘exotic’. Boys’ and men’s pleasures in technology demonstrably contribute to the continued dominance of engineering occupations” (p. 297-298). In the same line, Irwin (2000) in her discussion about gender inequities in technology within the context of developing countries argued that “at micro-culture level, the computer reflects a narrower predominantly male culture” (p. 196). In this view, computers are creations of males and consequently they “reflect the cultural, perceptual and cognitive perspectives of these creators” (p. 196). Clegg et al. (2003) added to the discussion that “modern computing has its origin in the military” (p. 45) and was popularised for personal use initially through the games market promoting it as “toys for boys” (p. 45).

Feminist discussion of technology stages technology as “both a source and a consequence of gender relations” (Wajcman & Pham Lobb, 2007, p. 4). Strong words of Cockburn (1985), “Technology is a medium of power” (as cited in Wajcman, 2004, p. 10), exemplified the radical feminist view that Western technology is the embodiment of patriarchal values and consequently the means of domination and control over women and nature (Wajcman, 2004). A meaningful feminist discourse on social stratification and power distribution provides insight into men’s ability to “define social ordering of people and artefacts” (Lohan, 2000, p. 898). Segal (1997) summarised, “It is only particular groups of men in any society who will occupy positions of power and influence. But this is precisely what secures rather than undermines the hierarchical structuring of gender through relations of dominance: the symbolic association of masculinity with power and femininity with powerlessness” (as quoted in Lohan, 2000, p. 898, original emphasis). In the context of technology, this symbolic association of masculinity with power extends to a social perception of the symbolic association of technology with masculinity. The association “also works in reverse order. That which is considered technological is also perceived to be masculine, emphasizing the cultural association of technology/technological virtuosity with men, hegemonic masculinity and status” (p. 903). Similarly, Henwood and Wyatt (2000) reaffirmed their more than decade-old observation: “In the context of a world where men hold most of the powerful positions and control the use of resources, we understand technology as being imbued with essentially male-centred values... [A]ll men, regardless of race and class, benefit from their ability to control and dominate women. Access to and control over technological decision-making is one means by which this control is maintained” (Zmroczek, Henwood & Wyatt (1985), as quoted in Henwood & Wyatt, 2000, p. 128, original emphasis).

As a consequence of this perception of technology in society, the literature points out the under-representation of women in ICT fields in higher education studies and consequently in the ICT
workforce (Bolliger, 2008; Miliszewska et al., 2006; Randall et al., 2002; Trauth, 2002; Wajcman, 2006; Wentling & Thomas, 2004). There are numerous factors contributing to the problem. As noted earlier, gender-related stereotypes, although significant, are not the only determinants of gender imbalance in the ICT workforce. Lagesen (2007) reported that women are not attracted to the technological fields because they perceive computing as “as an activity predominantly for anti-social boys and men, and then incompatible with their image of themselves as young, socially active women” (p. 69).

In the context of PNG tertiary institutions, perception of technology as a male domain surfaced in discussion related to computer accessibility and use. Although institutional policies assume equal access to technology for men and women, women experience different obstacles in every day attempts to use computers, especially in institutions where the computer resources were limited. Male students were first to get access to computers, as one participant described:

Send a class up for an educational research; you will see that the males are the ones that are putting their fingers on the computer. All the ladies stand at the back. Unless if it [computer] is free, ladies may have a chance (OM19).

Some women shared that they are obliged to do computer work for their male colleagues.

The girls seem to do a lot of work for the boyfriends and maybe because of the subconscious mind, girls will be typing for guys (OF02).

Ladies are usually ones that are typing reports on behalf of their male colleagues. ... They [men] kind of dump all the work on to them so the ladies have actually talked to me about that (UF12).

In addition, women’s access and use of technology is restricted by their socially defined roles.

I think men have more time to sit and surf the net, to use this technology. Women use it only when work requires. At home, they will not use it, because they are busy with housework, housekeeping, looking after children. All these domestic chores would offer little time for women to access and use the computer. But men have all the time to use it (UF13).

One of the distinctions between the Western construct of technology as a male domain and the PNG-specific construct is that in Western society, technology is seen as a manifestation of culture of those who create it – men, while in PNG society, the construct of technology is negotiated within the cultural implication of female-male relationships. In Western society, nurtured by decades of male domination within technological fields, technology as a male domain became a socially accepted stereotype: women’s perception of technology is often determined before their
experience with technology takes place and is reinforced in the process of interaction with technology. In Papua New Guinea, technology as a male domain does not carry an historical context; it is a novelty for both men and women. Women are just as attracted to technology as men and their perception is not determined prior to their experience with technology. However, as consequences of cultural female subjectivity, women are expected to give men first access to computers or do computer work for men. Women’s use of computers is limited to work-related tasks due to their family obligations.

8.1.3 Technology as communication tool – digital garamut

The communicative aspect of ICT is embedded into technology. The term information communication technology indicates communication being the very centre of technology purposes. Similarly to the construct discussed earlier, the construct technology as a communication tool is not original to Papua New Guinea. However, the originality of the construct is ingrained in the context of PNG culture.

Studies of the evolution of human communication recognise technology and cultural systems as significant variables influencing human communication. Chesebro and Bertelson (1996) observed that with the growth of the global communication systems fostered by development of electronic media, the importance of traditional oral modes of communication is changing. Since 1844 and 1876 respectively when the telegraph and telephone were invented, the development of electronic telecommunication has been changing the world and “the social and individual consequences of these new electronic media systems are still emerging” (p. 19).

Inkinen (2006) asserted that “technology has provided an easier and in some respects time- and location-free mode of communication and tools for enhanced interactive communication” (p. 54). Drawing from local social, cultural, and political processes, the new information communication technologies have been influencing and facilitating changes in communication patterns (Tenhunen, 2008). Writing of email and instant messaging on college campuses, Lancaster et al. (2007) observed that students use these technologies to “trade messages with friends, keep in touch over distance, communicate on work-related projects and exchange new ideas” (p. 5). Although students value face-to-face relationships, technology is “increasingly being used to communicate in social and work environments” (p. 5).

In the context of communication technologies and gender, the literature indicates that although men were more likely to be first adopters of technology, women were not excluded from access
to technological artefacts if they could afford them. Furthermore, the gender digital divide has been diminished in the last decade to the point of women gaining parity with men in access and use of technology, especially the Internet (Liff & Shepherd, 2004).

Given the extraordinary impact of communication technology on virtually all cultures Katz and Aakhus (2002) called for deeper understanding of how “people fit these devices into their lives and to what effect” (p. 316). When studied in the context of PNG social and cultural interaction, the understanding of technology as a communication tool is complemented with PNG-specific cultural aspects.

Communication structures and media have had their place in PNG society for thousands of years. They were designed “to serve the internal needs of the small tribal states ... and their encounters with neighbouring tribes. Their sources used were first and foremost the human body but also instruments or media constructed from natural materials in the environment” (Gemo, 1994, p. 38) – like the garamut, kundu, the conch shell, and other artefacts.

Similar to other communication devices, the garamut has been used traditionally for two purposes: communication and music. “In communication, very distinctive rhythmic codes which may represent a person, a clan, a location, length of time, or a multitude of other keywords for specific purposes, are used. Each purpose has its own set of keywords and rhythms” (Pongiura, 1995, 111). Interestingly, people are able to tell a story using a garamut and a system of codes and rhythm. “It would be like a normal face-to-face conversation” (p. 111).

As noted in this study, communication has been mediated with the use of communication media in Western as well as PNG societies for centuries. Contemporary technology has been affecting and transforming communication worldwide. What distinguishes the meaning of the PNG-specific construct of technology as a communication tool from other parts of the world is the women-liberating effect of technology in the PNG context. In Western societies, women were not specifically excluded from access and usage of communication devices. The men were more likely to be first to have access to technology and use it more than women; however, women were not restricted from access and usage if they could afford it. In Papua New Guinea, traditional communication media were used only by men. “Children and women were not allowed to drum. Informally men individually beat drums for pleasure. On formal occasion, men drummed in groups to accompany singsings [cultural performances] or during secret rituals in men’s houses” (Lohman, 2007, p. 91). While traditional garamut was beaten only by men, the contemporary digital garamut is available to women as well. Technology as a communication tool freed women
and extended their means of communication, making women not only recipients of communication originated by men but originators of communication as well.

8.1.4 Technology as a digital library

One of the important aspects that exemplify the transformative role of ICT in higher education is its application in the academic research context. Participants acknowledged the importance of ICT in different aspects of research; they saw it as a great source of information and a powerful venue of research collaboration. They saw technology as a digital library, one more PNG-specific technology construct identified in this study. The extent of Internet usage for the purpose of research is discussed in more depth in section 6.1.10 ICT for education. The following section introduces the idea of a digital library and summarises Internet usage in the PNG higher education context so as to explore an emerging PNG-specific technology construct – technology as a digital library.

8.1.4.1 The concept of a digital library

The concept of a digital library is not original to Papua New Guinea. In fact, H. G. Wells (circa 1938) developed the idea of a digital library long before the development of the first computer. He created an “idea of a world brain that could supplement, add functionality to, and even replace traditional libraries” (Brown, 2005, para. 3) and caught the imagination of his contemporaries with similar quixotic devices (Harter, 1997). The concept of a digital library has been embodied in the last two decades along with changes in ways knowledge has been created, shared, disseminated, and stored digitally. Mason (2010) defined the vision of a global digital library as “digital preservation of, and access to, knowledge and artefacts in a system that enables sharing of this knowledge across time and place” (para. 1). Lagoze et al. (2005), in their contribution to the idea of digital libraries, outlined their role as matching and extending traditional libraries. As such, digital libraries “should feature a high degree of selection of resources that meet criteria relevant to their mission, and they should provide services, including search, that facilitate use of the resources by their target community... Freed of the constraints of physical space and media” (para. 6, original emphasis), digital libraries should be collaborative and contextual. The most appealing aspect of such a vision of digital libraries is that they “enable anyone who has access to the Internet and who has a web browser to reach into a collection of objects that represent the world’s knowledge. Knowledge produced and stored in one place can be accessed from any other place” (Mason, 2007, p. 210). For participants in this research, the ability to access library resources in other parts of the world was one of the significant advantages.
of Internet application. The ability to overcome physical distance and the openness to all who have access to the Internet, allow tertiary staff and students in Papua New Guinea to take advantage of resources worldwide, as one of the participants shared: “you got a wealth of information literally at your fingertips” (UM08).

8.1.4.2 The digital library in higher education

From ancient times, libraries, seen as repositories of human knowledge, were recognised as “the most precious elements of an institution of higher learning. ... The library is the key to an institution’s academic strengths. It is the heart and soul of the learning process” (Koohang & Ondracek, 2005, p. 408). In developing the knowledge society of modern times, the advantages of digital libraries were from beginning of their existence acknowledged within the higher education sector. The ability to provide access to vast sources of information made digital libraries an important element of higher education library provision. Manifold functions of digital libraries have been especially important in the domain of academic research, where they “greatly increased access to research outputs and improved efficiency of the research process, particularly literature review” (Read, 2008, p. 71). In the same vein, Koohang and Ondracek (2005) observed that digital libraries are natural complements to electronic learning settings. Digital libraries have many benefits such as “bringing information to users; providing enhanced searching, sharing, collaboration, and use of information; and lessening the digital divide” (p. 408).

In Western society, where higher education libraries have long been at the heart of learning and other scholarly activities, the digital library extends rather than challenges traditional library functions. Although digital libraries are becoming less visible in the higher education landscape, their role “becomes more essential to providing access to scholarly information (both online content and in print)” (Read, 2008, p. 72).

8.1.4.3 The PNG digital library in historical context in PNG

The concept of the digital library in the PNG context requires background information into library services, especially in higher education. A digital library makes possible significant access to quality sources for the first time in the island’s history.

The first reading room was set up in the 1880s in Port Moresby for the few officials and white residents. A Library Institute Hall was opened in Port Moresby in 1914. From 1936, when the Commonwealth Library Service initiated a Public Library Service, the library service continued to develop, establishing 24 branches by 1974. However, based on the Western model of public librarianship, the service catered to mainly the expatriate community and the Papua New
Guinean elite. The major development in the post-independence area was establishment of the National Library Services in 1975 and opening of the first National Library in 1978. Unfortunately, decentralisation of public library responsibilities to the provincial governments in 1978 saw libraries’ consequent decline despite continuous centralised processing services and advice of the National Library Service (Evans, 1995).

With the development of tertiary institutions in the 1960s, academic libraries were established. “True to form elsewhere these had a positive attitude to libraries and these tertiary institution libraries became the most significant ones in Papua New Guinea” (Evans, 2002, n.p.). However, as Evans indicated, library services catered well only to four major national tertiary institutions and were insufficient for the remaining almost 60 IHEs. Although the importance of library services was declared in the National Higher Education Plans in 1990 and 2000-2004, library services and infrastructure appear in both documents only as a part of a broader term ‘Physical Plant and Facilities’; the term that includes also the area of land; buildings; services like water and electricity; site development such as roads, carparks and recreational horticultural works; clinics and agriculture field stations (Commission for Higher Education, 1999).

8.1.4.4 PNG-specific construct of technology as a digital library

When discussing the use of ICT for academic purposes, staff and students acknowledged the significance of ICT for academic research. They saw the Internet as a vast source of information. In their enthusiastic acceptance of technology for information access, staff and students in Papua New Guinea do not differ from colleagues worldwide. However, there is a significant difference in the understanding and functions of the Internet as a digital library. As discussed earlier, the digital library in higher education in the Western context is more an extension to the existing physical libraries; a digital library’s functions are complimentary to the traditional library services. The digital library in higher education in the PNG context, however, is more like a substitute for traditional library services. As presented below, participants complained about the lack of physical resources at their institutions. For them, the technology, especially the Internet, brings new and long awaited access to knowledge sources not available in home institutions.

When you go back to the library, there are all old materials; books are out of date, and this is still a challenge. We need to have computers in higher education institutions with the Internet and the students will learn new things (OF03).

Although we are at university, because it is a third world country, there is a lack of books, reference books, and other materials. But with the Internet you can basically access up to date information from around the world. I think that’s the way to go (UM08).
It [Internet] is becoming a very powerful tool for me as an academic due to shortage of current books in our library, lack of resources in Papua New Guinea; it is my only way to make myself confident about recent publications and recent things on certain topics what I want to teach, I am mainly depending on the computer (UM11).

Due to inadequate experience of library resources, the majority of participants did not associate the library with a repository and source of world knowledge. World knowledge has come within their reach only through the Internet. That is the reason why some of participants perceived the Internet as a library in itself (OM23). Other participants shared:

It [Internet] is like a whole library on my desk so I can get access to it (UF10).

Connecting ideas and if we do not have information in the library, you have a huge electronic library at your disposal (UF07).

With limited books in the [university name] library, the Internet substitutes that area. Thank goodness for the creation of this machine (UFS3y).

Thus, the specificity of the technology construct as digital library lies in the wider context implications: in the context of PNG higher education, a digital library is not an extension of a traditional physical library but a substitute.

8.2 ICT as a Catalyst of Change for Postcolonial Education in Papua New Guinea

The discussion of the research findings through the lens of the theoretical frameworks focuses here on higher education and ICT. Embedded within postcolonial discourse on education and technoscience, the section draws also from sections 2.2 Tertiary Education in Papua New Guinea, 6.1 ICT Profile of Institutions of Higher Education in Papua New Guinea, and 7.2 ICT in PNG Higher Education. The following themes were identified and are presented here:

PNG postcolonial education,
Postcolonial technoscience in the PNG context,
Postcolonial cultural identity, and
Potential of ICT for higher education.

8.2.1 PNG postcolonial education

Although the research is set within the higher education landscape, it could also be seen within general education. The discussion on PNG postcolonial education commences with a broader
historical perspective, proceeds with some characteristics of contemporary postcolonial higher
education and concludes with postcolonial education within the context of globalisation.

**8.2.1.1 Postcolonial education – a wider perspective**

For Papua New Guinea, as for many other developing nations, higher education had not emerged
as part of the cultural processes within indigenous society. Rather, colonial power imposed the
continuation of Western-style education. Writing about legacies of the colonial era in Papua New
Guinea, Hughes (2002) identified education as “the biggest failing” (p. 5). The colonial power did
not attempt to incorporate indigenous knowledge systems “based on understanding of the
physical, social and spiritual environments” (Kanu, 2007, p. 72).

In her juxtaposition of indigenous education of Mende people in Sierra Leone with colonial
education brought by British colonial power, Kanu pointed out three significant features of
traditional education – “interwoven curriculum, communalism and multi-layered understanding
transmitted through stories and proverbs” (p. 72) – that, neglected by colonisers, led to the
failure of Western-type education.

As among Mende people, traditional education in Papua New Guinea was spliced with society
needs; the purpose was to prepare young generations for social responsibility and community
participation. Guthrie (2011) identified three forms of traditional education in Papua New Guinea:
informal, non-formal, and formal; in all forms children learned by observing, participating,
imitating adults; in all forms of education, valuable knowledge was of a practical character. The
formal aspect of traditional education was realised in initiation ceremonies. Preliterate PNG
traditional societies accommodated their traditional knowledge, myths, and liturgies in forms of
stories, folktales, proverbs, and songs. In Papua New Guinea, as among indigenous people of
Sierra Leone, “knowledge was practice-based and deeply linked with spiritual beliefs of the
people” (Kanu, 2007, p. 73). Colonial education was divested of spiritual and communal aspects,
and was exploitative and instrumental in nature – with the purpose “to prepare indigenous
people for conversion to Christianity and for employment as soldiers, mine and plantation
labourers, and clerks” (Pomponio & Lancy, 1986, p. 41).

Although Western-style education was initiated in Papua New Guinea in the 1880s, the first
institutions of higher learning opened about 80 years later in 1965. A complex set of factors
stultified the growth and development of education. Discussing pre-war education, Howie-Willis
(1980) discerned the nexus of the lack of government sustenance, white hostility, and the
colonists’ economic interests that led to educational neglect. Resistance to move beyond primary
education originated partly from an assumption that “Papua New Guinea’s colonial era would continue for a century or more” (p. 12). The post-war era brought a number of internal and external pressures for development of secondary and tertiary education. International political pressure exerted on Australia in the early 1960s sped Papua New Guinea toward independence (Pomponio & Lancy, 1986). The initial idea of a tertiary institution “similar to a university college” was developed in 1960 and became reality in 1965 with establishment of the University of Papua New Guinea (UPNG) in Port Moresby and an Institute of Higher Technical Education (Unitech) in Lae. In anticipation of independence, the goal of higher education in its initial stage was to prepare high level manpower for the needs of individual government departments, statutory authorities, churches, or missions (Parry, 1984).

8.2.1.2 Contemporary postcolonial higher education

Papua New Guinea inherited the coloniser’s educational systems (Papoutsaki & Rooney, 2006) with alien conventions, operating principles and traditions of the wider world (Kerry, 2007). The colonial legacy has been manifested in an educational system that had “a pyramid structure with a narrow primary base, a narrowing secondary middle, and an even narrower university peak. Such a system helped to perpetuate the consolidation of foreign rule and provided for a minority of the educated elite” (Nongkas, 2007, p. 280).

One of the consequences of such an education system is the relatively low importance assigned to the higher education sector in government policies and the lack of financial support to maintain and continue development of institutional infrastructure. As in the majority of other developing countries, PNG higher education’s fragile physical infrastructure impedes teaching, research, and student learning (Bloom & Rosovsky, 2006). Participants in this study indicated a number of encumbrances that hinder their professional performance.

In the context of ICT as one of the main aspects of this project, listed impediments were related to access and usage of computers and the Internet. For the majority of staff at OIHEs and students at all institutions, the first issue was the inadequate number of computers and lack of, or very limited, access to the Internet. They also pointed to the lack of maintenance, leading to breakdown of physical resources placed in institutions. One of the OIHEs had nine computers in the staff computer room, but only five were functional; the other four had not functioned for months and there was no one to rectify the problem. An indirect aspect that impacts higher education is the lack of infrastructure in lower educational sectors throughout the country. The lack of road links, electricity, and teaching resources in primary and secondary schools, especially in rural areas, reverberates in the poor quality of students enrolling in tertiary education. One
participant observed that “when these students [from rural areas] enter tertiary institutions, they are intimidated by students who attended urban/city schools and are familiar with computers” (OFL/OQ).

An important characteristic of education systems inherited from colonial powers is the concept of dependency. Dependency theories, strongly associated with centre-periphery and neo-colonialism theories (Altbach, 1998; Collins, 2011; Quy, 2010), share with them the notion that “the less developed countries (the ‘periphery’, and the ‘satellite’, or the ‘province’) are dependent upon the more developed (the ‘centre’, the ‘core’, or the ‘metropolis’) because of the latter’s domination and exploitation” (Quy, 2010, p. 22).

Altbach (1998) outlined five elements that reinforce the dependency of higher education in developing countries: Western-style education implanted in the Southern Hemisphere by former colonial powers that continues to exist in postcolonial times; Western languages that dominate higher education in developing countries; consumers of higher education in developing countries being dependent on research, interpretations, and information generated in developed countries; the means of communication of knowledge being in the hands of the industrialised nations; and a huge number of students from the South studying in the North. These elements are present in higher education in Papua New Guinea. The academic system is based on a predominately Western knowledge framework; there is strong pressure to comply with Western international higher education standards; dependency on foreign “experts” reinforces Western models of academic research, the curriculum, and other functions of higher education (Papoutsaki & Rooney, 2006). Westernisation of higher education in Papua New Guinea is exemplified by the PNG Universities Review (Garnaut & Namaliu, 2010), an audit report prepared at the request of the PNG and Australian prime ministers. Although an important document providing an overview of the current state of PNG higher education and valuable recommendations for rehabilitation and improvements of IHEs in their different aspects and functions, the report has remained tied to the Australian government’s aid program and has taken into consideration numerous international development commitments to which Papua New Guinea and Australia have agreed. In the same vein, although with reference to one particular higher education institution, MacWilliam (2011) claimed in his Submission to Australian Review of Aid, “There is an urgent need to rebuild and expand UPNG19 to meet the country’s national objectives, and in line with Australia’s national interest” (p. 1).

19 Erected in 1965, UPNG remains the biggest state-owned university.
Postcolonial dependency manifests itself at different levels. Uraizee (1994), in her discussion of the postcolonial mind, talked about many postcolonial conditions that include positive and negative legacies of the coloniser/colonised relationship. Negative legacies include, among others, economic and psychological dependency on the imperial power. One of the personifications of postcolonial dependency is a handout mentality that permeates all levels of PNG society, including IHEs. Although the issue is complex, two factors are important contributors to the handout mentality in Papua New Guinea. First, in traditional and still very strong politics big-men, leaders, do handouts in cash and kind to their followers (Rynkiewich, 2000). Second, the strong handout mentality also results from continued aid from foreign governments and development organisations (Togolo, 2006).

Although exposed mainly in relation to politics and leadership, where handout mentality is seen as having “a negative impact on people’s perspectives, attitudes, mentality and their effort in community development” (Ambang, 2008, p. 23), this research uncovered its deep roots in the educational system. One of the most common phrases used by participants was “the government must.” They indicated the government was responsible for the low computer and Internet penetration within the country, especially in education, and they expected the national government to improve their situation.

As a Papua New Guinean I see that not many of us have a computer or internet at home and having access to them is very hard and also expensive. Since they are becoming important these days, the government should do something to make it easily accessible to its people and less expensive (UMS2y).

What I consider important is the government must introduce more computers to institutions so students can have more time to go through internet and to the globe as a whole (OMS2y).

I think that it’s hard because we have to look at the power supply because computers work with power. We have to look at the satellite system. These are some of the things you have to consider. Anyway, Government will pay (OM15).

In addition to expectations that government should provide necessary resources, this research revealed a deeper level of dependency in that authority should also provide solutions to interpersonal relations. Women were found to experience various obstacles in their access to computers in all IHEs. Some hindrances were related to the traditional subordination of women in society. All participants expressed that women should have equal access to technology, but their suggested solutions called for government intervention rather than autonomous social change, such as raising awareness of gendered obstacles.
8.2.1.3 Globalisation of postcolonial education

Another important characteristic of postcolonial education is its global perspective. Called neocolonialism by some writers (Altbach, 1998, 2005; Collins, 2011; Quy, 2010), globalisation brings a new dimension into the discussion about higher education in developing countries. The UNESCO’s 2009 World Summit on Higher Education defined globalisation in the context of higher education as “the reality shaped by an increasingly integrated world economy, new information and communication technology, the emergence of an international knowledge network, the role of the English language, and other forces beyond the control of academic institutions” (Altbach et al., 2009, p. 7). Although universities were global in their nature from the beginning of their existence – they used Latin as a common language; they served an international student clientele; faculty/staff was international; institutions were affected by outside campus social and economic changes within societies (Altbach, 2006) – yet “21st-century realities have magnified the importance of the global context” (Altbach et al., 2009, p. 7).

Globalisation has seemed to promise international collaboration in knowledge production and easier access to borderless knowledge (Uvalic-Trumbic, 2004); yet, the academic world of the new millennium is characterised by centres and peripheries stronger than ever. The major universities of the North constitute the centre of international knowledge, establishing patterns and standards for academic work worldwide. “The academic systems of the developing countries are, without exception, imported from the North” (Altbach, 2003, p. 3). The inequality in wealth, size, access to institutional infrastructure, and other resources deepens dependency by people in peripheries. PNG institutions of higher education are at the periphery of world academia. All IHEs in Papua New Guinea are teaching institutions depending, like IHEs in other developing countries, on more powerful academic centres “for research, the communication of knowledge, and advanced training” (Altbach, 2006, p. 126).

Altbach (2006) further argued that one of the factors in globalisation of higher education is the dominance of English, which remains central to communicating knowledge and education worldwide, even in countries without English as the language of higher education. Romaine (1992) added that “language was well recognized by European colonizers to be an important instrument of social control” (p. 78). Placed in the context of technology, English and other Western languages are seen to efficiently express ideas of modern technology. Within the complex PNG linguistic scene, English remains a language of education. Participants in this research considered English part of their educational landscape and generally did not take issue
with it; however, one OIHE female lecturer (OF02) acknowledged the alien character of English. She saw a problem at the nexus of computer use and mastering English:

Computer does all checking with grammar and all this, so it is not really helping them. English is not our language, so they have to learn proper grammar, sentence structure first (OF02).

English as a language of technology was also seen as a barrier in using computers in rural areas, as observed:

One problem of people not using computers in the village is the electricity. The other, because of the culture, the languages and all this; you see, we have seven hundred languages and it is really difficult (UF10).

The other significant aspect of globalised higher education, relevant to the PNG context, is the Northern export of curriculum and incorporation of some general education in first-degree programs. Sponsored by the World Bank and UNESCO (2000), the report Higher Education in Developing Countries: Peril and Promise advocates general, also called liberal, education as a constructive alternative to the existing largely specialised undergraduate curricula common in developing countries. Moreover, often the developing countries’ academic institutions seek the validation of academic quality as well as models of higher education development and professional norms from the Northern centres (Altbach, 2003). Although some research interpreted the export of academic models, curricula, and programs as a new form of colonialism – the union of unequals (Altbach, 2006) – academic staff participating in this research were rather enthusiastic about it. One participant observed:

In terms of what we are teaching as well as how we actually imaging the tangible aspects of education, I think it has to be with what is happening globally as well (UF12).

In practice, close to the export of curricula and programs is increasing global use of common course materials. Access to electronic databases and multinational publishers stimulates the influence of academic materials originating in the large academic systems of the North (Altbach, 2006). With very limited research done within PNG academia to inform teaching and learning at IHEs, easy access to knowledge and research resources from academic centres was eagerly embraced by academic staff participating in this study. “Access to valuable study/ research literature” (UML/OQ) and “access information on the courses I am teaching” (UF10), were seen as great advantages of being part of globalised education. There was an obvious fascination with the amount of information available through the Internet.
It [the Internet] is limitless. The databases available and kind of information that is there is mind-boggling.....you have access to a lot of different information databases; you have just to type up any word and you got basically millions of different things about the same (UM08).

This is the power of the Internet in terms of immensity of the information out there....It’s truly global (UF12).

With the limitations of local academia discussed earlier, poor physical infrastructure and limited resources, fascination with resources available through the Internet extends to deep dependency on the Web’s content.

I am trying to find out what is happening in my own field, which is curriculum....I am just searching for the information...and everything that I am doing is mostly depending on computer’s findings through the Internet. And I found it a very useful way what we are trying to use here [information from the Internet]...even to build our own expertise in our own areas, in teaching specialization. It makes me feel confident and it makes me feel that I am in tune with what is happening around the world when I am teaching students here (UM11).

Computers make me lazy. I don’t think critically on research issues for myself. I rely mostly on what I collect from sources in the computers (UFS3y).

Dependency on Western-produced knowledge was seen as a source of power. As female participants shared:

Computer knowledge is very powerful because it is learning (OF02).

I have realized more about the power of what this machine has got to be actually aiding me in terms of information now (UF12).

Information communication technologies, a transformative force of globalisation, is reinforcing and shaping higher education worldwide. The following sections further examine ICT through the lens of postcolonial technoscience and the presence of technology within globalised higher education.

**8.2.2 Postcolonial technoscience in the PNG context**

Within postcolonial discourse, postcolonial technoscience is an inquiry into the uses, meaning, and effects of technology in postcolonial realities. It acknowledges the limitations of imported technologies and the need to understand and utilise local conditions as well as securing local cooperation, even by incorporating indigenous traditions and practices.
This research, with its one of its three important focuses being placed on ICT, is firmly established within a postcolonial technoscience framework. It recognises the limitations of technologies developed in Western countries and imported to a postcolonial and developing countries. Promoted as an important means of bridging social and gender digital divides, contemporary technology in fact re-establishes existing inequalities. Too expensive for the majority of people living in rural areas depending on subsistence farming, computers and the Internet are affordable only to rich, urban residents. The digital gap is widening as observed by one of participants:

Students who are in the village, they don’t know a computer; even grade 11 and grade 12. But those who have access in the city, they know. It is like when you compare, in this Papua New Guinea, there are two parts of the world: I can say % does not know how to use a computer. Probably % knows because more population comes from the remote places like in the village so they do not have access to computers (OM15).

Technology is heralded as a bridge between the North and the South by fostering economic growth in developing countries (Flor, 2001; Kodakanchi et al., 2006; Kuofie & Hackney, 2006). However, interventions by Western powers foster postcolonial relationships by using Western models of progress, growth, and efficiency (Abrahamsen, 2008). The advocated potentials of ICT might be realised and utilised in the context of developing countries only when technology is properly adapted to local circumstances (McNamara, 2003).

This study revealed that educated and urban individuals saw technology as a sign of global development reaching Papua New Guinea. They believed that ICT provides the means to do business in new, more efficient ways as well as creating previously unknown business opportunities; technology puts Papua New Guinea on the world map.

Computers are used at homes, used in the schools, at universities. They are used in business and in government – almost all sectors of the society. People are beginning to see it [computers] not as an aid but as a tool or as an important medium where things can be done. For example, business, they use that not as a tool to publish themselves or rather putting information about themselves in a powerful method for all to see. And it is not only for business or commercial entities, but any type of organizations, NGOs or government institutions (UM09).

However, though perceived by the majority as a sign of development, global technology meets with opposition from the local realities in PNG development. People consider something as a sign of development only if they understand it and see real benefits for themselves.

For technology to be enhanced and utilised at the grassroots level for development purposes, it has to be recognised as valuable by local communities. With numerous hindrances affecting ICT
proliferation in rural areas, the majority of rural people see no practical application for computers in their daily life. Global expansion of technology clashes with the local reality of life; Westernisation of lifestyles supported by technology, especially through the Internet, is confronted by traditional beliefs. As a consequence of a clash between global and local meanings of development, people often resolve to engage supernatural forces to have things done their own way. Reported in section 6.2.4 A Societal digital gap in access to technology a story about supernatural forces moving a telecommunication tower illustrates that local people have to comprehend the benefits of global technology to cooperate and to accept it. Local communities’ involvement and indigenous beliefs have to be factored into implementation of global technology at all levels, including in the educational context.

Considering issues in postcolonial technoscience will continue in section 8.2.4 Potential of ICT for higher education with a discussion of technology’s potential to transform PNG higher education. The current discussion proceeds with postcolonial cultural identity as realised in the research process.

8.2.3 Postcolonial identity

To explore the issue of postcolonial identity as revealed in the research, two issues are under scrutiny: cultural identity and the impact of ICT on the development of postcolonial identity.

Cultural identity is a significant subject in postcolonial discourse. Hall (2003) described cultural identity as 1. “shared culture, a sort of collective ‘one true self’” that reflects “the common historical experiences and shared cultural codes which provide us, as ‘one people’, with stable, unchanging and continuous frames of reference and meaning” and 2. as reality where critical points of deep and significant difference constitute “what we have become”; in this sense, cultural identity “is a matter of ‘becoming’ as well as ‘being’. It belongs to the future as much as to the past” (pp. 223-225). Papua New Guinea’s many cultural identities are far beyond the scope of this research; however, culture and cultural identity surfaced in the course of discussion about the impacts of technology on society.

In the context of computers and the Internet presence is his home village, a participant shared:

The life style of these villagers has changed; many of the traditional ways of doing things have been kind of forgotten, if you like. And the village people are usually coming to understand and telling their children you have to go and learn about these things,
computers. Because they have seen a lot of fascinating things and very interesting things coming out of computers, and telephones and television and all these stuff (OM 22).

Bad influence coming from the Internet was one of the most common issues raised in relation to Internet usage at IHEs. One participant observed:

I can see a lot of misuse. And this is where computers are bad to the society in Papua New Guinea. And I see the bad influence on people, in the way people see things, and cultural beliefs, such as sex education. Access to the pornographic images, all these things is taboo in our culture and the Internet can break that. And it will have a lot of impact on the lives of people, young people, especially males. After you access to all kind of images, it will directly got impact into social problems like rape, all other things, early marriages, and all kinds of experimentation of what they see on the Internet which is bad for the young in PNG (UM11).

Technology, especially the Internet, is perceived as a threat to traditional values and beliefs. Despite a voracious desire to be connected to the global world, and to be part of a global society, people realise that access to the Internet can initiate negative, as well as positive, changes in society, especially among young people. Participants called for setting up some measures, for example, Internet censorship, to protect the young generation from unwanted influence.

Challenges to cultural identity, revealed in the research, are part of PNG society’s experience of globalisation. Rizvi (2009) noted that the continued existence of local cultures is threatened by the global consumerist culture. “New information and communication technologies have enabled instantaneous circulation of information, ideas, and images, making it possible to conceive of the world as a single space shared by all of humanity.....The so-called global culture has by and large reproduced the colonial structures of inequalities, with the postcolonial elite playing a major role in their reproduction” (p. 52).

The confrontation of the traditional with the global culture realised in the course of this study revealed the formation of postcolonial and cultural identity that is a cornerstone of postcolonial theory. The identification process comprises three conditions, as described by Bhabha (1986): 1. “to exist is to be called into being in relation to an Otherness”; 2. the identification process takes place in the “space of splitting”, in the inner aporia of a native’s fantasy to occupy the master’s place while sustaining this place in “avenging anger”; 3. identification is always “the production of an ‘image’ of identity and the transformation of the subject in assuming that image” (pp. xv-xvi). The conditions of postcolonial identification were realised in this research at the nexus of technology, culture, and education.
Technology and higher education are two of the main focuses of this research; they constitute the framework where the confrontation with Otherness takes place: confrontation of the Local with the Global. The awareness of one’s own identity is realised when faced with the Other.

To the culture there is hardly any relation to it [computers and the Internet] because this is a foreign idea that was created somewhere out there and has been introduced and it is part of making work easier when it goes with education (OF05).

Although some participants saw technology as alien, and some saw it as a threat to traditional beliefs, they simultaneously and enthusiastically embraced it. There is a clear desire to possess what is available in other places, to live the lifestyle of people in Western countries.

It [Internet] really influences the way they are living, their life style. Using Internet, they get to check out what’s new and go to shop and ok., this is what I found on the Internet and this is what I want to get so I will look like those people whom I’ve seen on the Net, I want to be like them. So, it’s kind of changing life style in that way. It is influencing their way of doing things. Because they know that with the computer they can download music, they can watch movies. It really changes their kind of attitude (UF20).

Cultural identification, seen as a process, is negotiated at the trajectory of a desire to possess technology and become part of a global movement, and the rejection of technology as a threat to traditional values and beliefs. As result, a hybrid cultural identity is created where the new forms and models of life negotiated with technology are to be balanced with traditional values and beliefs, as one participant (OM 19) described. He talked about the changes caused by technology in the way people communicate at their workplaces. People use email or telephone, and meet less, to discuss issues. He concluded:

In PNG we are going at speed with the changes, we are changing very fast, so we should at least balance these kinds of things – with the way we take the new technology plus our old way of doing things. We have to balance them out (OM19).

The sense of being part of a global community, although realised in the context of local realities, creates appreciation of the change that is taking place.

Papua New Guinea is no longer isolated from the outside world. You can be able to connect with your neighbouring countries or with the world at large....When you are exposed to the outside world your perception of issues that are affecting a community is broadened. So you are able to think I would say globally; think that I am a regular Papua New Guinean but for as long as I am a human being, the same way with this information that I have read and digested and understood, I would tend to think that another person in another land would have the same concept, the same idea, the same thinking as the way I am thinking of the
issue. So it would make me a broad thinker. We can think more globally; it will affect me because of my culture and my environment (UF07).

Bowker (2008) argued that “learning to use the Internet is integrally about learning to accept the categories of Western knowledge....Key to our universality is our particular knowledge/power nexus: scientific knowledge and technological prowess marching hand in hand today as did the missionaries and the merchants in the nineteenth century” (p. 252). Being part of the global village, Papua New Guinea remains, like other developing countries, within the transformative power of technology. The potential of ICT to pursue higher education and to preserve traditional culture is the main focus of the next section.

8.2.4 Potential of ICT for higher education

Technology is seen as a driver and a vehicle of change for higher education (Knight, 2008; Loxley & Julien, 2004; Oh, 2003; Oliver, 2002). This study revealed wholehearted acceptance of technology within higher education in Papua New Guinea. Staff and students acknowledged the importance of ICT in different aspects of tertiary institution functions – teaching and learning, research, community outreach, as well as for personal development. One participant summarised:

I think in terms of development stands, you can see the computer playing a major role in terms of the education area, building the mind, enabling people to have not just a narrow view of this is where I am from, but it enables you to have widest scope. I feel it is really important that hopefully more computers go out to rural areas with satellite dish so the kids are able to have the software and have tools in place so they can actually be educated in that way and have links outside. And I think, the technology is one of those things where it makes you feel inspired that there is something beyond what you know, this life, this country, or it makes you feel that there are more good things (UF12).

In the context of postcolonial discourse on education, it is important to recognise also the potential of ICT in the context of the education and knowledge society. If the role of higher education is to prepare citizens to live within, and to contribute back to, the society in meaningful ways, changes in society become challenges for higher education. The graduates in a knowledge society must acquire “a strong intellectual framework for accessing information to create new things effectively” (Adeogun, 2006, p. 45); they should be able “to access, synthesise and build information into new knowledge” (p. 46).

The PNG government’s Mid-Term Development Plan 2011-2015 acknowledged the importance of the higher education sector in nation building in the past as well as its leading role to prepare a
workforce needed for the country’s prosperity in the future. Practitioners of current higher education must reassess its role and its structure to face the challenges of a knowledge society. According to the plan, one way to achieve the goal is by improving access to, and the quality of, the Internet and other communication technologies (Department of National Planning and Monitoring, 2010). Providing future graduates with ICT skills contributes to their employability in a competitive job market.

Looking at the workplace, when a person finishes a college, a lot of employers require that they would be computer literate. To introduce computers in higher education is beneficial to the employers as well. Because when students are graduated and they go to work, they already know what to do, it increases their chances to get a good job and increases their efficiency there (UF20).

The private sector wants their work force to be educated to use systems and how to use technology for their own competitive advantage in the market place (UM09).

While postcolonial discourse views education as one contributing factor in spreading Western culture during the colonial epoch and a consolidating element of Western hegemony in contemporary globalisation, education may at the same time be a platform to maintain and celebrate traditional culture. Confronted by the influx of foreign artefacts, alien ideas and values, higher education in Papua New Guinea has investigated ways to preserve the distinctive aspects of indigenous cultures and to absorb useful information and participate in the sharing of global knowledge. ICT may contribute to the process in meaningful ways. Anastasia Sai, a senior lecturer at a PNG university, shared her experience of employing modern technologies for safeguarding traditional heritage with digital technology:

In 2009 in the unit Issues in Oral History students recorded stories told in their own languages. 29 languages were recorded.... A copy of their work was deposited in the National Archives in Port Moresby. Last year [2011] the students in Oral History started working with the Madang Haus Tumbuna20 to record stories of the Madang artefacts there. We started on the balangut canoe from Rivo village. This is a big vessel used for trading with communities in Raicost, Karkar Island, Bagabag Island and along North Coast communities all the way to Unlingan villages. We went to Rivo village and interviewed this elder and recorded the stories with the digital recorders and then transcribed and written up. This will be presented in the Haus Tumbuna for the story of the miniature balangut trade canoe’. (personal communication, March 25, 2012)

The discussion of the research findings through the lens of theoretical framework continues with a special focus on gender issues in light of feminist theory.

20 Madang Haus Tumbuna [House of Ancestors] is a local museum and tourist centre located in Madang.
8.3 Women’s Empowerment Through Education and ICT

This part of the discussion of research findings through the lens of theoretical frameworks continues with a special contribution from feminist theory.

Feminist ideas have been present in the academic environment for more than a century, shaping its intellectual and social landscape. Since the time of Elizabeth Cady Stanton, who “asserted that women must be given equal opportunities to those of men if they were to achieve their greatest potential” (Ropers-Huilman, 2002, p. 109) and who attempted “to pry open the doors of education for women” (p. 109), women within and outside of academia have emphasised the importance of education for women’s personal development and full social participation. Feminists attempted to influence the higher education environment on a number of levels: from ensuring women’s full access to all positions in higher education as students, faculty members, or administrators, to securing proportionality in highly paid and prestigious positions in academia. Feminists also drew attention to other issues affecting women’s professional performance, such as “women’s ways of knowing”, the need to balance work and family issues, sexual harassment, and the gender gap in higher education leadership” (p. 110).

Feminist activism in higher education intensified with the beginning of the second wave of feminism in the 1960s and 1970s, resulting in increased numbers of women participating at the tertiary level as students, faculty members, and administrators and resulting in the establishment of women’s studies as a discipline. Writing about feminism in US higher education, Marine (2011) argued that “women have mobilized to draw attention to many diverse aspects of feminist struggle, such as creating responses to sexual violence, breaking silence on issues of gendered inequality, and instituting affirmative action in hiring and admissions” (p. 15).

To respond to the growing importance of ICT in private and social life, feminists joined the academic discourse and contributed to the field, especially with their discussion on the social construction of technology (Henwood & Wyatt, 2000; Klein & Kleinman, 2002; Landstrom, 2007; Wajcman, 2000) and technofeminism (Lagesen, 2008; Wajcman, 2004). More in-depth analysis of social construction of technology and technofeminism are presented in the Chapter 4 Literature Review Theoretical Framework. When discussing technology within the higher education

21 Elizabeth Cady Stanton (1815 – 1902) was the best known and most conspicuous advocate of women’s rights in the 19th century. Her Declarations of Sentiments, presented at the first women’s rights convention in 1984, provided a base for the first women’s movement she led in the United States (Griffith, 1984).
landscape, feminists focus mainly on the unequal participation of women in information technology studies (Clegg & Trayhurn, 2000; Lagesen, 2008; Mellstrom, 2009; Randall et al., 2002). This section contributes to the discussion about women in academia in a developing country with a special focus on empowering women through education and ICT.

The discussion here draws from sections 2.1 Gender Issues in Papua New Guinea, 2.2.3 Women in higher education, and section 6.5 ICT and Women’s Issues; all of these sections provide the wider context of life circumstances of women in Papua New Guinea as well as introduce and analyse the research findings. The following themes evolved at the nexus of the wider context, research findings, and theoretical framework and are presented here: Women’s subjectivity in postcolonial education, empowerment of women through education and ICT for empowering women in the knowledge society.

**8.3.1 Women’s subjectivity in postcolonial education**

Women’s traditional subordination was the reappearing theme in this research in the discussion of gender issues in the context of technology access and application in IHEs. Female students at all tertiary institutions and female staff at OIHEs felt women’s daily struggle was unjust, although it was generally accepted socially. Unequal access to computers was taken as a natural part of Papua New Guinea’s male-dominated society. The reification of the image of subordinated women – the gendered Other – “tends to project the unequal state of affairs to the public as if it were permanent, natural and outside of time” (Fox, 1999, p. 34).

Women’s subordination in access to computers exemplifies the gender divide in the educational sector, which reflects social stratification and re-strengthens the gender divide. Social and cultural customs have been influencing gender differences in educational opportunities in colonial and postcolonial Papua New Guinea (Sukthankar, n.d.). Here, female participation rates in all levels of education remain one of the lowest in the world, reinforcing that “women’s access to and participation in formal education is an overwhelming image of women as subordinate, dominated by men in society” (Fox, 1999, p. 33).

Traditional women’s subjectivity reinforced disparities between genders and was reflected in the education during pre-contact and during colonial times. Establishing tertiary education in the 1960s did not significantly improve women’s educational opportunities. Although they were allowed to enrol, women constituted only 10% of the student body at the University of Papua New Guinea in Port Moresby in the 1970s and were facing many difficulties. In his summary of
women’s rights in the first two decades of tertiary education in Papua New Guinea, Howie-Willis (1980) concluded:

Traditional patriarchal beliefs about masculinity and femininity and the properness of dominant male and submissive female roles seemed deeply ingrained in the minds of the Papua New Guinean men now in control of modern institutions like the University. The persistence of these seemed likely, all feminist agitations notwithstanding. And so the prospects for UPNG women, students and staff alike, remained daunting. Having become convinced of their grievances, the women in Papua New Guinea’s universities were unlikely to give up the struggle. (p. 264)

More than three decades after Howie-Willis’s observation, his assertion seems prophetic. Although more women are enrolled at the tertiary level, cultural implications prevail and continue to determine women’s subordinate status in the society as well as in the educational landscape. Economic development of the country in the 1990s enabled more people, including women, to enter the education system. “However, the picture for the majority has not improved, and one of the greatest sources of inequality is an increasing differentiation of power and wealth between men and women. By international standards, including less developed countries (LDC), UNDP data show that participation rates for women in Papua New Guinea are among the worst in the world” (Fox, 1999, p. 34). According to the 2011 UN Human Development Report, Papua New Guinea’s human development index (HDI) was 0.466, positioning the country at 153 of 187 countries and territories worldwide. In the Gender Inequality Index (GII), Papua New Guinea had a value of 0.674, ranking it 140 of 146 countries in the 2011 index. Only one woman, a nationalised expatriate, held a parliamentary seat in 2011 (0.9%), and 12.4% of adult women reached secondary or tertiary education compared with 24.4% of their male counterparts (UNESCO Institute for Statistics, 2011). The political and social landscape favours men. Government bureaucracies are male dominated, and “legal institutions reflect their colonial origins, reinforcing a sex/gender hierarchy in which women’s lives are subsumed in the categories of ‘custom’ and ‘tradition’” (Macintyre, 2000, p. 146).

Male domination in different aspects of social life, especially in higher positions in workplaces, is a consequence of women being disadvantaged in educational opportunities, as one female participant observed:

---

22 HDI is a summary measure for assessing long-term progress in three basic dimensions of human development: a long and healthy life, access to knowledge, and a decent standard of living.

23 GII reflects gender-based inequalities in three dimensions: reproductive health, empowerment (measured by the share of parliamentary seats held by each gender and attainment at secondary and higher education by each gender), and economic activity.
From the time when PNG was introduced to this education thing, men were given the priority before and got into this; probably women, we underestimated ourselves that we could not get into the top course and we left a vacancy for men to get in and it is how we have more men in a top post job....Man is a boss....Priorities in the workplace are for men first then women....When you request for something, it is like, it’s not important for you, you can do without it (OF05).

Male domination in the society continues to be reflected in contemporary higher education. Male aggression demonstrated in getting access to computers, as revealed in this study is a sign of women’s subordination. Male aggression towards women being part of almost daily experience for PNG women has been confirmed by a number of current studies exploring gender relations. Sai (2007) observed that male aggression “is seen in some PNG societies as a masculine characteristic and identity” (p. 287). One male participant in my research shared:

PNG is male dominated society. And every male seem to believe, that they own everything, and they have right to do everything first then the female.... It is cultural influence, we can’t help it (UM11).

In the same vein, one of the participants in Sai’s research (2007), a community development officer, shared with her:

Generally, men see women as lower than them, and this is men across board. ... All my schooling has been in mission schools. Looking back, I see traces of this, that even missionaries see women, even religious women as inferior to men. It is everywhere – government, in the village, in institutions of learning, in NGOs, everywhere. Now you don’t see women in executive positions, I mean there are, but much fewer that it’s supposed to be. A lot of women should be in executive positions. ... That’s an indication of where men like women to be. (p. 264)

Although colonial and postcolonial education maintained the social stratification of traditional society and male domination, higher education and ICT have the potential for women’s empowerment, as discussed in the following sections.

**8.3.2 Empowering women through higher education**

“They see me as a woman of status because of my education” (UF01). Indeed, education is the key to successful advancement in contemporary society for all, especially those who traditionally were disadvantaged, like women. Without education, the progress of social change will not be possible. Although one female participant shared:
They [women] are still submissive because they are educated only up to grade 10 level. They don’t go other than that. That is why their level of thinking is still very much like other women at home (UF20).

This female lecturer (UF20) was optimistic about a new trend she observed when on holiday in her home village. She noticed that more girls are being given opportunities for education; fathers have started to realise that educating daughters could be a better investment for their own future, and thus they are sending girls to school. The female participant concluded that “we are hoping that this investment would eventually change the women’s way of thinking towards the community, how we always lived” (UF20). Her observation remains in line with Sukthandkar’s (1999) recommendation in the context of mathematical education in Papua New Guinea: “It should be evident that any attempt to improve the quality of women’s education must first and foremost focus on changing the society’s attitudes towards women. These social attitudes which perceive women as inferior beings have, as already noted, been institutionalized by the society within its educational system” (p. 137). Rooted in traditional practices and reinforced by colonial practices and negligence towards women’s education, the cultural attitude favouring men in education is slowly changing.

Female and male participants in the research called for more awareness and encouragement for female students to progress in their education and consequently in their professional career. They saw it as opportunity for women’s empowerment.

I think we need to educate, to give more awareness to ladies that we are equal participants....We can have more female students with computer technology professionals and other jobs dominated by males (OM18).

The number of female students we send out to the workforce will also influence the workplace.... It puts them at position to move on and to succeed and achieve more things (UF13).

Attitudes towards promoting women advancement in the educational sector were also discussed by Sai (2007). She revealed opinions of modern educated male Papua New Guineans. Sai asserted that “men working in the field of education argue that they encourage female students to progress and to reach their potential in their field by generating a gender-conscious perspective in curricula, and in revising and producing policy aimed at promoting both gender balance, and equal participation” (p. 274). The future of Papua New Guinea lies with the education of girls, as one of Sai’s respondents, a male academic, summarised:
It’s my firm belief that, if we educate girls and give them the opportunity to be educated, I think it contributes to the development of women. If we don’t develop women, they can’t bring any development to Papua New Guinea. We have to have educated men and women to stand side by side to realize the full progress of this country. Otherwise we’ll have an illiterate population; we’ll still have corruption; we’ll still have the problems we are having now. I don’t see we can get over that without educating both men and women. (p. 277)

Women’s empowerment may be realised in many different forms. One of the signs of women’s empowerment is their gaining financial independence from a husband or clan members. Writing of a women’s project on Lihir Island, Macintyre (2003) described the changing situation of young women: those with “secondary education and ambition were eager to work for wages and to take up offer of training. This option guaranteed income, meant that they felt part of the development project, and gave them opportunities to gain economic independence” (p. 125). Because the research focused on both ICT and higher education, the possibility of gaining a well-paid job as a result of education was discussed in the context of computer skills. Education and computer skills were seen as desirable for professional advancement.

The experiences of women in other countries support the argument that education benefits women and empowers them within society. Aslam et al. (2008) found that more educated women in Pakistan were more likely to get wage employment with higher earnings. They established that “education does increase gender equality in labor market outcomes, through both improved occupational attainment of women and reduced gender gaps in earnings in any given occupation” (p. 87). Amir-Ebrahimi (2008), who investigated the use of cyberspace for Iranian women’s empowerment, observed that access to better education allowed women to enter a public sphere where they become active in government administration, public and private organisations and NGOs. With women’s increasing presence in universities and in public forums, “they gradually become active agents of social change, generating important challenges regarding the status and rights of women under Islamic law in the private and the public spheres” (p. 91).

Although the presence of women in PNG contemporary higher education is gaining in importance and recognition, it is not yet at the desired level. Writing about women’s leadership in IHEs, Vali (2010) discussed numerous challenges faced by female academics: the predominately masculine organisational ethos of a university, biased appointment processes and discrimination, and the lack of support systems in terms of mentoring and networking among women and for women. Educated women are often subjected to additional pressures. In her writing about educated women in Papua New Guinea, Spark (2011) observed that “because being educated reflects a deviation from prevailing sociocultural norms about gender, these women’s status as tertiary-
educated, makes them, in some ways, particularly vulnerable” (p. 3). It is a situation often found in societies “where the status of women is in a state of transition” (p. 3). Many contemporary PNG men still seem to have reservations about the empowerment of educated women and see them as too modern and representing “all that is wrong with contemporary Papua New Guinea society” (Zimmer-Tamakoshi, 1997, as cited in Spark, 2011, p. 5). In the same vein, Fox (2007) affirmed that for many men, the subordination of women is “a time-honored cultural factor in Papua New Guinea society ... any transformation of the role and status of women in society was a Western imposition of their concept of equity and equality, which went against traditional culture” (p. 122).

8.3.3 ICT for empowering women in the knowledge society

Hafkin and Huyer (2006) discussed two distinct groups of women in contemporary society: “Cinderellas” are women mainly in the developing world with no or little access to education and ICT, who remain in the “basement of the knowledge society” (p. 1), and “Cyberellas”, who are well educated, fluent in computer applications and different usages, and fully participating in the benefits offered by technology in the knowledge society. Their book questions and attempts to answer how Cinderellas could become Cyberellas.

The majority of women in Papua New Guinea remain in the Cinderella category. Their access to education is restricted by socio-cultural norms. Those who achieve higher education still struggle to overcome gender-related burdens. As discussed earlier, women participating in this research pointed to their disadvantaged situation in relation to access to technology: male colleagues exercised their superiority and claimed the right to have first access to available computers and the Internet; female’s traditional family obligations impeded availability of their time for computer use; the lack of security on university campuses restricted women’s movements in the evening hours. However, women were determined to take advantage of opportunities given to them. They viewed technology as important for them while at IHEs but also for their future career.

I now view computers as an essential especially for educational purposes. In today’s world and age, the world is moving forward with more inventions and technology, and advancement in computing and usage is one. I need a computer for my studies (UFS3y).

Today the world is changing so we need to move on with the changes. Computers are doing a lot for humans in many areas. People today need to be educated more about computers especially students who are to have access to broaden their ideas on things they know little
about. This will help them to prosper in the academic years in institutions, colleges, universities, and even job areas or work places (OFS2y).

As noted in section 7.3 *ICT for Empowering Women*, ICT was seen as a tool for women’s empowerment at different levels: women with computer skills might find it easier to find a well-paid job and thus ICT has the potential to assist women in their role as a family provider; educated, technology-shrewd women may find it easier to raise their status in society; technology might also be used to facilitate women’s empowerment by promoting successful women’s role models. The contribution of ICT in women’s empowerment as revealed in this study confirms findings of similar studies in other parts of the world. In their analyses of technology and women’s advancement in Latin America countries, Garido and Roman (2006) identified a number of contributions of ICT to the process: ICT renews women’s self-esteem and self-confidence that they can change their lives; it provides venues for women’s collaboration; it improves women’s competitiveness in job markets and creates new entrepreneurial opportunities; and ICT opens opportunities for women’s participation in national and international networks contributing to policy-making processes.

One of the important means of women’s empowerment in feminist scholarship is the use of ICT, especially the Internet, for social activism. The notion that cyberspace provides a platform where women of all ways of life may come together to create a new society without patriarchy emerged into cyberfeminism. Wajcman (2004) explained, “Web-based technology generates zones of unlimited freedom”, that cyberfeminism translates into “liberation of women” (p. 63). Cyberspace is a reality “where gender inequality, like gravity, is suspended” (p. 66). Youngs (2004) identified two major themes in feminist analysis of the Internet as a platform where traditional patriarchal boundaries defining unequal social relations of power are disrupted: at the boundary between private and public spheres, and at the boundary between national and international spheres. Both types of these traditional boundaries were identified in the research in relation to life and professional careers of PNG women. Traditionally, a woman’s identity was defined in relation to her private life as a wife and mother, while a man’s identity was defined by his relation to the public. Notwithstanding that women enter the public sphere by getting education and jobs, for the majority of them their traditional roles take precedence over professional duties; social expectations remain unchanged.

In relation to the second type of boundary – between national and international spheres – Youngs observed that “women suffered from a double domestication...If they have been, and remain to a significant degree around the world, unequally present in or absent from the political and
economic spheres of decision-making and influence in national settings, they have been even more unequally present in or absent from those realms in international settings. International relations has been, and in many senses remains, a bastion of masculinist principles and influence” (p. 189). PNG women share the disadvantaged situation of women worldwide. For years, they have been absent from the political scene and unheard in policy-making processes.

In the background of such a setting, Youngs claimed that the Internet provides a platform where the transgressive potential of the cyberspace “has implications for women’s capacities both to relate to one another, and to make political, economic, and cultural contributions to their own and other societies, and to local, national, and international issues and processes, as individuals or collectively” (p. 189). Women participating in this study were fascinated with the potential of the Internet in terms of connectivity and closeness: the Internet has the potential to connect them with other women around the world: they saw the Internet as a way to learn about other women, their lives in other parts of the world, to be inspired by them but also to share their own stories. Despite noted earlier, numerous limitations in access and use of the Internet, women felt that, when circumstances would be more permissible, the Internet could provide a platform where women can express themselves and contribute more meaningfully to social processes on national and international levels. The enabling power of the Internet in women’s empowerment was shared also by Nath (2006) in her debate on empowerment of women through ICT-enabled networks which is understood “as the use of ICTs by or for women to develop further their skills and abilities to gain insight about actions and issues that affect them …, as well as to build their capacity to be involved with, voice their concerns about, and make informed decisions on these issues” (p. 192).

This chapter discussed the research findings through the lens of three major theories comprising the theoretical framework. Social construction of technology provided tools for detailed discussion of PNG-specific constructs of technology. Postcolonialism enlightened the discussion of the transformative presence of ICT in postcolonial higher education in Papua New Guinea. Finally, feminist theory shed light on women’s issues, especially women’s empowerment through ICT and education.
CHAPTER NINE
CONCLUSIONS AND RECOMMENDATIONS

This final chapter presents the synthesis of the study. Commencing with an overview of issues discussed in the previous chapters, the purpose of the study and study design, the chapter continues with drawing conclusions emerging from the study and offers recommendations for future research.

9.1 Purpose of the Research

The research problem emerged at the intersection of factors that influence the lives and well-being of PNG women: traditional culture, education and ICT. In the context of the traditionally shared notion of male dominance in PNG societies, at the beginning of the 21st century women’s status remains very low. Phenomena that are relatively new to Papua New Guinea – classroom education and ICT – are widely recognised and acclaimed as means of women’s empowerment in other parts of the world. Within this context, the purpose of this study has been to explore whether ICT through higher education contributes to women’s empowerment in PNG society and how its potential could be realised and utilised in the future. To address the problem, the study was situated within the higher education landscape and considered the perspectives of female and male staff and students and their access, application and attitudes towards ICT.

In order to better understand the issues pertaining to the research problem, the study was guided by the main research question: Does ICT through higher education contribute to women’s empowerment in PNG society?

To scrutinise the issue, the study answered four research questions that underpinned the conduct of the study:

1. What is an ICT profile of higher education institutions in Papua New Guinea?
2. What are the gender-based issues in the access, application, and attitudes towards ICT among students and staff of higher education institutions in Papua New Guinea?
3. What role does ICT plays in education in Papua New Guinea?
4. What is the role of ICT in women’s empowerment?
The summary of the results pertaining to the four specific research questions is presented in section 9.3 Research Questions Addressed: The Key Findings of the Study. The chapter continues now with an overview of the research design.

9.2 Research Design

The study adopted a constructionist paradigm because the researcher’s stand was to reconstruct existing reality as effectively as possible and provide participants with a platform from which they could be heard. A constructionist paradigm also allowed participants to reconstruct and interpret the meaning and dynamics of social interaction. A multi-paradigmatic approach was justified by the complexity of this study that crosses disciplines as different as social science, gender studies, information systems, and tertiary education. The mixed methods paradigm utilised in the study “provided a better understanding of the phenomenon under investigation” (Teddlie & Tashakkori, 2009, p. 286). The quantitative and qualitative strands of the study required separate considerations in relation to sampling strategies and data collection and analysis. A total of 898 students and 64 faculty members participated in the study. The data were collected through survey questionnaires and semi-structured interviews. The quantitative data were analysed with statistical tests and the qualitative data were analysed with the thematic networks. The validity claim in mixed methods results was considered with an integrative framework for inference quality (Tashakkori & Teddlie, 2008). Finally, the four theories adopted for the study provided perspectives through which to interpret the complex experiences of participants. The key findings of the study are presented in the next section.

9.3 Research Questions Addressed: The Key Findings of the Study

As noted earlier, the study was guided by four research questions. Answers to them addressed the purpose of the study. This section presents the key findings of the study organised under the research questions.

9.3.1 What is an ICT profile of higher education institutions in Papua New Guinea?

The question aimed to create a comprehensive ICT profile of IHEs in Papua New Guinea. It sought to explore the provision of ICT services at the institutional level at different types of IHEs. It also
sought to examine access, application and attitudes towards ICT among staff and students at different types of IHEs.

The study recorded noticeable differences between universities and OIHEs in institutional provision of ICT services. At the universities, each faculty member had an office computer and limited access to the Internet. Although the number of computers for students varied between universities, generally there were computer labs for teaching purposes and additional computer labs for students’ work outside scheduled sessions; two out of three universities provided additional computers in the library. The same two out of three universities provided students with limited free access to the Internet.

Much less favourable was the provision of ICT at the three OIHEs. Faculty members shared computers in a common computer room with a limited number of desktop computers and no or very limited access to the Internet. There was a computer lab for students at each of the OIHEs; however, students could work with computers primarily during scheduled lab sessions. None of the OIHEs provided students with free access to the Internet.

As a consequence of disparity in the availability of ICT services, some disparities were noted in the access and application of computers and the Internet at different types of IHEs. Academics at universities accessed computers more frequently and spent more time using them. However, despite the differences in accessibility, lecturers in both types of institutions used computers primarily for academic purposes. Also, significant differences were found between students from universities and OIHEs. The university students used computers more often and for a longer period of time, and they were more likely to use them for academic purposes.

Despite noticeably uneven institutional exposure to the Internet, all faculty members used the Internet, including an email application, mainly for academic purposes. Students’ access and use of the Internet was determined not only by the type of the institution they attended but also the location of the institution, with students in the Highlands region having very limited or no exposure to the Internet. In general, students were using the Internet for academic-related activities, news, and entertainment.

Despite significant diversity in the exposure to ICT services at universities and OIHEs, the academic staff and students across participating institutions were found to hold similar attitudes and beliefs about ICT. The majority of attitudes and beliefs were positive. Both groups viewed computers as an autonomous entity superior to humans. They believed technology became a beneficial tool for study and work and an integral part of daily life. Although both groups
expressed their fascination with technology and were enthusiastic about using it for study and work, at the same time academics and students alike admitted frustration caused by the complexity of technology and recognised that the Internet was having harmful effects on communities.

9.3.2 What are the gender issues in access, application, and attitudes towards ICT among students and staff of higher education institutions in Papua New Guinea?

The second question sought to explore the gender-based issues in access, application and attitudes towards ICT among research participants.

In terms of computer and Internet accessibility, the study identified a digital gap at three important levels: differences within IHEs, a gender digital gap in society, and a social digital gap related to differences in computer access between rural and urban regions of Papua New Guinea. At the first level, statistical results suggested no significant difference between genders in the majority of issues related to participants’ access to computers and the Internet. The only revealed differences were found among students where females were more likely to have no experience with the Internet; if they had Internet access, they were more likely to have it at home and use it more frequently during the average day. However, qualitative analysis revealed far deeper disparities in access to ICT. The study pointed out female students’ difficulties in computer access. Numerous factors were identified that contributed to the problem. Male cultural domination and their physical strength resulted in male students having first access to computers. Gendered social roles and consequently social expectations for women to take care of their families first, limited female academics’ time available for computer use. Lack of security on campuses restricted female participants’ work with computers to day hours only.

The gender differences in access to computers at tertiary institutions reflected the situation in the wider community. The study found that contemporary institutional structures favoured men, e.g., they generally occupied higher positions. Consequently, having access to financial resources, men were perceived as computer owners.

The social digital gap was also reflected in disparities in computer accessibility between rural and urban Papua New Guinea. The lack of power, infrastructure, and services in combination with strong traditional cultures and local concepts of development resulted in almost no ICT proliferation in rural areas. The study concluded that one of the consequences of such situations
is a very low level of ICT use in the schooling system and uneven educational opportunities for students from rural versus urban centres.

In terms of gender disparities in the application of ICT among staff and students, the study results were mixed. Statistical results identified no gender differences among academics in their use of computers and found that females and males used computers mainly for academic purposes. Similarly, there were no gender differences in accessing the Internet for research and email. However, female academics were found more likely to use the Internet for banking and meeting people online, and male academics were more likely to access the Internet for news. Although no statistically significant gender difference was found in the frequency of email access and content of emails, male academics were more likely to open email more frequently during an average day. Female academics’ email content was more likely to be equally professional and other than professional compared with male academics’ email content being more likely to be mostly professional.

The study recorded dissonance between students’ perception of their use of computers and their actual use. Statistical results revealed no gender differences in student participants’ perception of computer use. However, although the majority of them claimed using computers for academic purposes or academic and entertainment purposes, a statistically significant gender difference was found in the actual use of computers. Female students were found to be more likely to use computers for academic purposes while male students were found to be more likely to use computers for mainly entertainment purposes. Some significant gender differences were found in the access and use of the Internet and email. Although there was no gender difference in access to the Internet for research purposes, significant differences were found in other categories: female students were more likely to consider email as the main purpose to use the Internet and male students were more likely to consider entertainment as the main reason to use the Internet. The differences were also found in the frequency of email use and email content. Female students were more likely to check it more frequently and females’ email content was more likely to be other than academic-related.

The study provided further insights into gender-related issues in the access and application of ICT in a higher education context. The qualitative results confirmed the statistical tests. They also revealed that while female academics used computers almost exclusively for academic purposes, men use them more for leisure activities. Women discerned the gender difference in the application of computers. They understood it as related to the lack of availability and other family-related obligations rather than to their actual use of computers. In the quantitative results
similarities between genders in the application of computers in an educational context were due generally to very basic use of computers. The study found that due to the lack of proper training and of on-going assistance, academics’ use of software applications was limited primarily to Word, Excel and PowerPoint.

In terms of ICT application, the study revealed the importance participants assigned to technology as a means of communication. The communication aspect of ICT was consonant with the traditional value of communication, which has always been in the centre of community life in traditional Melanesian societies. Participants recognised two roles of technology for communication: displacing old, traditional ways of communication as well as providing new communication opportunities introduced with the advent of technology. Although both female and male participants enthusiastically accepted technology for communication purposes, only females were found to use social networks. The study revealed that ICT as digital garamut brought communication means into women’s hands.

Furthermore, the study demonstrated complex attitudes, perceptions and beliefs about ICT held by research participants. Three categories were identified: positive attitudes, negative attitudes and ambivalent attitudes.

Female participants and male participants expressed numerous positive attitudes. They shared the notion that technology is a beneficial tool for study and work. They believed that computers made work more efficient and of better quality. They also shared a fascination with technology. Two important factors that contributed to the notion were perception of technology as a limitless source of information easily and conveniently accessible, and perception of technology as powerful because it gave access to knowledge. Although only women expressed their confidence in using technology, all participants were interested in learning more.

Similarly, numerous negative attitudes were revealed in the study. All participants shared that using technology may be frustrating, especially if it did not perform to expectations. Confusion and a low satisfaction level with the quality of work completed with computers were associated with the lack of training. Other difficulties that contributed to negative feelings about using computers were problems with an unstable power supply, viruses and fear of losing data, and computers being valuable commodities that attracted thieves. The negative aspect of technology widely discussed by both genders was the harmful effects of the Internet on society. Despite the positive perception that the Internet makes life easier, it was also seen as having a gross negative impact on the younger generation. Pornography, banned by PNG law but easily available through
the Internet, was seen as having a damaging effect to the entire society. Unrestricted access to pornographic materials was believed to make traditional ethical values ambiguous. Another negative aspect of ICT that concerned all participants was the notion that people became dependent on technology to the point of being controlled by it. Students’ addiction to computers was seen by lecturers as an impediment to their academic progress. The use of computers for communication purposes noted earlier, seemed to have some negative aspects. People realised that technology can replace social interaction; therefore, they saw this new social interaction model as alien to traditional Melanesian culture. There was one negative attitude reported only by women. They saw computers as causing various health problems, from eye problems to mental conditions to body abnormalities.

Finally, the study revealed two ambivalent attitudes towards technology. First, participants were ascribing human characteristics to computers. On the one hand, participants saw the computer as a friend and companion to fill emotional and social needs as well as to assist in study. On the other hand, participants used terms that alluded to the exclusiveness of computers in someone’s life and tendency towards computer addiction. The second ambivalent attitude was the perception of technology as a new phenomenon alien to PNG culture. On the one hand, the stress put on the computers as alien and thus having no connection with traditional PNG cultures, brought the negative connotation and uncomfortable feelings discussed earlier. On the other hand, the attitude also had positive connotations because people realised that technology has become a part of their own lives and has effected positive changes in both their private and social lives.

9.3.3 What role does ICT play in education in Papua New Guinea?

The question sought to explore the perception of participants about the role ICT plays in the educational sector in Papua New Guinea. The study revealed wholehearted acceptance of technology within higher education in Papua New Guinea. It also demonstrated a threefold function of technology in its capacity to support program delivery, the teaching/learning process, and research. The study also identified some obstacles in applying ICT in higher education.

In ICT’s role to support program delivery, the study pointed out two important roles. It assisted academics in updating current courses offered at tertiary institutions. It also assisted them with the necessary resources to create and offer new programs. Both functions of ICT were enhanced by the Internet viewed as a source of vast professional literature.
Closely associated with program delivery was the role ICT played in supporting the teaching/learning process. The study concluded that in this area ICT use was rather rudimentary. Although students were enthusiastic about learning with technology, in fact their application of ICT was limited to tasks previously done without computers. The academic staff also enhanced their teaching through ICT in only elementary ways. The study concluded that the main reason for the limitations noted was because academic staff lacked competence to incorporate technology into their curricula and consequently to lead students into more technologically enhanced learning.

The study acknowledged the twofold contribution of technology in the academic research: ICT played a significant role as a vast source of information, and at the same time it provided new venues of conducting research. ICT, and especially the Internet, was perceived as the library substitute. Technology enabled faculty members to communicate easily with other academics in other parts of the world, by providing a means to participate in collaborative research projects and sponsored research.

Finally, the study concluded that numerous obstacles hindered the application of technology. The strongest impediment felt, especially at OIHEs, was the lack of ICT services. The problem was exacerbated by poor equipment management. The growing cost of technology applications led to strict policies about the use of computers and the Internet. Also, noted earlier, the lack of proper training and ongoing assistance limited full utilisation of ICT for educational purposes.

### 9.3.4 What is the role of ICT in women’s empowerment?

The question sought to explore women’s status in the digital age and how ICT could contribute to empowering PNG women. The study identified the role ICT plays in changing women’s lives and their status as Papua New Guinea evolves from a traditional to a digital society.

The study revealed the threefold role of ICT in empowering women: it supports a woman as a family provider; it supports raising women’s status; and it facilitates awareness about women’s empowerment. Traditionally identified by their domestic roles, women with enhanced technological skills are more competitive in a better-paid job market and thus are assisted in fulfilling family obligations. Given that leadership models in Papua New Guinea are more meritocratic than hereditary, someone might gain in status once he or she meets the qualities expected by a community. Although traditionally there is not a big-woman model, and contemporary PNG society remains male-dominated, if a community appreciates a woman’s
merits, it elevates her status. In this respect, ICT might play a significant role in helping women not only to provide for their families, but also to become respected members of their communities. However, the study concluded that because there is less technology in the rural areas, high illiteracy levels, and the higher-than-in-urban-areas cost of operating computers and the Internet, the promises of ICT to raise women’s status in society and be appreciated at the levels similar to other parts of the world, are yet to become reality.

The study revealed that participants saw the role of technology in their awareness of women’s empowerment at two levels: personal and social. At the personal level, ICT assisted women in strengthening their self-esteem and self-awareness. ICT provided a platform where women found new ideas for their private and professional lives. In the social context, ICT assisted women in learning about the outside world and assisted those who aspire to play an active role in social and political life. The study noted the presence of PNG women activists in the worldwide forum. The study also pointed out existing socio-cultural restrictions and reservations about empowering women.

9.4 Conclusions of the Study

The purpose of the study was to explore whether ICT through higher education contributes to women’s empowerment in PNG society and how its potential could be realised and utilised in the future. Situated in the context of higher education and ICT, the study explored a number of areas pertinent to the study’s purpose: ICT’s presence in higher education; gender issues in access, application, and attitudes towards ICT; women in higher education; and ICT’s role in women’s empowerment through education. To attain the understanding of issues involved in all these areas, the research sought the perceptions and experiences of academic staff and students at PNG universities and OIHEs.

The study observed that the entire higher education sector was not adapting to the challenges of a knowledge society at a rate that might have been expected. A noticeable disparity existed between universities and OIHEs in terms of providing ICT services. While all university academics were provided with a desktop computer and Internet access, academics at OIHEs shared computers in a common computer lab with a few desktop computers only and had no or very limited access to the Internet. Likewise, availability of computer and Internet access differed among university and OIHE students with much more favourable conditions for the former.
The study concluded that gender-related issues strongly affected women’s access and use of ICT in IHEs. Women were disadvantaged in their access to computers due to socio-cultural norms. Female academics were restricted in the frequency and quality of time to work with computers due to their family obligations. When time permitted, women’s use of computers and the Internet was restricted to academic activities, while, as noted by women, men had more time to use computers for leisure activities. Female students were expected to allow male students access to computers first. Furthermore, the physical strength of male students and the lack of security on campuses limited female students’ availability of time to work with computers.

The study observed that the majority of activities done with ICT by staff and students were study-related. Academic staff used ICT to develop and to deliver academic courses and for research. Although students admitted the importance of ICT for study, they used it for entertainment as much as for academic purposes. The study also observed that despite the enthusiastic acceptance of ICT, the application of ICT for teaching and learning remained in initial stages, often just replacing what used to be done in the past with paper and pen. Computer use was limited to Word, Excel, and PowerPoint. A lot of time was spent using the Internet, but results were often disappointing. The more successful and wider adaptation of technology into curricula and to teaching/learning scholarship was constrained by lack of adequate training and an often techno-deterministic approach holding that merely providing equipment would improve the quality of teaching.

The study revealed numerous positive, negative and ambivalent attitudes towards ICT. Generally, participants demonstrated an enthusiastic approach to ICT. They appreciated ICT potential for communication, which is an important aspect of social life in Melanesia. They were also fascinated with the potential of ICT to improve their work efficiency and make it more enjoyable. Despite wholehearted acceptance of ICT, participants realised numerous negative aspects associated with the advent of technology into PNG society. Availability of pornographic materials, banned by PNG law but easily available through the Internet, was perceived as a threat to traditional values and traditional lifestyles. Technology replacing the traditional face-to-face way of communication was believed to loosen family ties. Some level of confusion about ICT was expressed in ambivalent attitudes. Although ICT was recognised as a beneficiary tool for everyday life, at the same time it was seen as an outlandish concept, alien to PNG culture. General lack of gender disparities in attitudes to technology was attributed to the novelty of ICT phenomena in PNG society. Relatively new, it has been available to all who can afford it regardless of gender.
Given the educational context of the study, the experience of the application of ICT was affected by the level of institutional adaptation and ICT policies.

The study observed that women’s traditional subordination to men remained an issue in the higher education environment. The gender divide in the educational sector reflected social stratification in society and seemed to remain socially acceptable, despite the existing government gender equality policy. In such a context, women’s access and use of technology was still affected by traditional female-male relationships. Despite such an unfavourable context, women believed that ICT held the power to improve their daily lives and to contribute to changing women’s status in PNG society. Inspired by women in other parts of the world, PNG women in academia took advantage of the opportunities created by ICT, such as social networks.

The study noted some initiatives of PNG women to be heard and to widen their area of influence through cyberspace. However, the study also noted that the huge disparity between urban and rural regions in ICT proliferation excluded women in rural areas from the possible benefits of the application of technology. Collective action of government, NGOs, and private businesses is required to diminish current hindrances that limit ICT proliferation throughout the country. The study concluded that despite limitations and challenges, ICT through education has the potential to significantly boost the empowerment of PNG women.

9.5 Contributions of the Study to the Body of Theory

This study is believed to be the first of its kind to investigate the extent of ICT provision within the PNG higher education environment and to explore issues embedded in technology-gender social interaction. It contributes to the body of theory by providing a multi-paradigmatic theoretical framework to analyse and critique complex issues pertaining to ICT, education, and gender areas from different perspectives.

The social construction of technology paradigm provides analytical tools to investigate and comprehend the complexity of participant-technology interaction. Guided by the assumption that interpretations given to technological artefacts are socially and culturally embedded (Bruun & Hukkinen, 2003), the study reveals PNG-specific constructs of technology: technology as a male domain, technology as a communication tool (a digital garamut), and technology as digital library. Although the constructs originate in Western societies, their meaning is renegotiated within the context of PNG society.
In PNG society, the construct of technology as a male domain is negotiated within the cultural implications of female-male relationships and does not carry a historical context; it is a novelty for both men and women. Women are just as attracted to technology as men, and their perception is not determined prior to their experience with technology – unlike in Western society, where women’s perception of technology as a male domain is determined by the socially acceptable stereotype of technology as a male domain. However, as a consequence of cultural female subordination, PNG women are expected to give men first access to computers or do computer work for men. Women’s use of computers is limited to work-related tasks due to their family obligations.

Although contemporary technology has been affecting and transforming communication worldwide, what distinguishes the meaning of the PNG-specific construct of technology as a communication tool from other parts of the world is the women-liberating effect of technology in the PNG context. In Papua New Guinea, traditional communication media were used only by men. Technology as a communication tool frees women and extends their means of communication, making women not only recipients of communication but originators of communication as well.

The specificity of the technology construct as a digital library lies in its implications in a wider context: in the context of PNG higher education, a digital library is not an extension of, but a substitute for, a traditional physical library.

Postcolonialism provides a lens for discussing issues in postcolonial education, such as dependency and the globalisation of postcolonial education. They are “residues of colonial and neo-colonial ... practices present in educational institutions that need to be dismantled” (Nongkas, 2007, p. 325). Postcolonial technoscience adds the context of technology to the discussion and provides a lens to explore the effects of technology in postcolonial realities. The study contributes to postcolonial theory by providing a comprehensive analysis and critique of postcolonial higher education in the context of gender issues and ICT. The cornerstone of postcolonialism – the postcolonial and cultural identity – emerged as the framework of discussion about cultural identification that is negotiated at the nexus of a desire to possess technology and to become part of a global movement, and the rejection of technology as a threat to traditional values and beliefs. The study also contributes to the theory by providing some examples of how ICT in higher education could be employed to safeguard cultural heritages with digital technology. The study contributes to postcolonial technoscience with a critical analysis of ICT adaptation to PNG socio-cultural reality. The study points out that local communities’ involvement and
indigenous beliefs have to be factored into implementing global technology at all levels, including in the educational context.

The feminist approach provides a theoretical framework to discuss women’s issues pertaining to the context of this study: women in higher education and empowering women through higher education and ICT. The study contributes to feminist theory by offering a critique of women’s issues in colonial and post-colonial higher education. The study acknowledges that male domination in society continues to be reflected in contemporary PNG higher education and women’s access to computers in the educational environment. However, the study concludes that higher education and ICT have the potential to empower women. A feminist study of technology provides a framework to discuss women’s empowerment through technology at personal and social levels. Given that this study was conducted in the early stages of ICT adaptation in the PNG higher education sector, the analysis provided here could be a starting point for future research.

9.6 Implications of the Research Findings

The findings of this study have implications for both theory development and practical applications. They are provided here in separate sections.

9.6.1 Recommendations for theory development

As noted earlier, the study initiated an analysis of the meaning of technology as constructed in a socio-cultural context. PNG-specific constructs of technology exemplify the notion that the meaning of technology is renegotiated within the technological frame of the relevant social groups and wider contexts. Thus, there is a need for further research in applying technology in contexts in and beyond higher education so more will be known about the meaning of technology in the PNG context.

As Hafkin (2006) strongly argued, “a major prerequisite for discussing ICT for women’s empowerment in developing countries is having clear knowledge of their situation” (p. 49). This study produces such a prerequisite and provides a comprehensive profile of access, application and attitudes to computers and the Internet among female and male students and academic staff at tertiary institutions in Papua New Guinea. Thus, although the study creates a foundation for further discussions of issues involving ICT in the educational environment and in society, and equal participation of women in a new knowledge society, it also acknowledges a complex and
fast changing ICT context. Therefore, it is imperative that ongoing research continues to examine how ICT impacts women’s lives and their social status.

**9.6.2 Recommendation for practice**

The research problem was situated at the nexus of higher education, ICT and gender issues. Consequently, the recommendations presented here emerged in these three areas.

**9.6.2.1 Recommendations towards the application of ICT for higher education**

ICT presence in the educational sector is a reality. The significance of ICT in higher education cannot be overstated. However, to fully deal with the challenges of employing ICT in the higher education landscape, university leadership should plan and encourage change in their institutions. Appropriate training is required so all stakeholders understand the transformative potential of ICT in the teaching/learning process. The changes are required at two interconnected levels. A huge need for adequate training was recognised in the study. Academic staff must be well equipped not only with technological skills but also with the knowledge of how these skills can be used for technology mediated-teaching. They should also be provided with ongoing in-service and assistance. Only with such support will academic staff confidently meet the challenges of changes in the educational sector and be prepared for their new role. The second level relates to students’ learning. To assist them in technology-assisted learning, a prerequisite is to understand how people best learn and then prepare technology-supported models of course and program design. The study recommends research to identify PNG higher education students’ learning styles; the ways they use technology for academic purposes and for purposes other than study-related. This research will help to prepare instructional materials more relevant to students in the PNG context and utilise technology in ways comfortable and acceptable for students.

The study also recommends that institutions undertake the discussion, which involves all stakeholders, to identify what kind of institution they want to be in the 21st century. The discussion could be guided by questions suggested by Bates (2010):

- What should be the institution’s cyber presence and how will this be manifested through research, teaching and learning, and administration?
- How should certain curriculum be shaped to meet the changing demands of a knowledge-based society?
- What are the physical and spatial boundaries of our activities? (p. 22)
Exploring the vision of an ICT presence in the future of a higher education institution would protect from a techno-determinist approach and ensure that financial commitments in technology are translated into educational success.

**9.6.2.2 Recommendations towards fair access to ICT in educational environment**

The study revealed that the ‘open computer labs’ policies existing at IHEs in Papua New Guinea do not ensure fair access to computers for females. Thus, it is recommended that the higher education sector opens its practices, not just its policies, to gender analysis. There is an urgent need to create a venue for further intervention and, one hopes, unbiased access to ICT in educational institutions. Disparities discussed especially in the socio-cultural aspects that influence the access to computers and the Internet in student labs, lead to a strong recommendation that some computers/computer labs be set aside for female use only to provide easy access to necessary resources. It is also recommended that awareness campaigns be organised to bring the gender equity, equality and empowerment of women into centre stage to encourage appreciation of women’s contribution to society.

**9.6.2.3 Recommendations towards bridging the digital gap and application of ICT for women’s empowerment**

The study revealed huge disparities between rural and urban regions of Papua New Guinea. Although the importance of ICT for development is acknowledged in the PNG Government Development Strategic Plan 2010-2030 (2010), to experience the benefits of ICT providing equipment is just a first step. Recognised in other parts of the world, the key to successfully bridging the social digital gap is literacy. Given the high level of illiteracy in PNG, improving the literacy level should be a priority.

As demonstrated in this study, examples of successful use of ICT to empower women in other developing countries show the way for similar projects to be initiated in Papua New Guinea. It is recommended that such places as computer community centres be initiated to ensure easy access for women in rural as well as urban areas. The study also recommends that computer literacy training programs be organised in communities for women to address women’s socio-economic needs and prepare them for challenges in the new knowledge society. Such initiatives require not only that the government, NGOs, and businesses be involved, but also communities and individuals. The study also revealed that successfully empowering women could happen only with the support of the entire community. Given that PNG society is male-dominated, it will require a sustained and vigorous awareness campaign to ensure that the future changes in women’s status are understood as beneficial to society as a whole. Educational institutions play a
special role as leaders in promoting and practising equal opportunities for men and women within their boundaries and communities at large.

9.7 Epilogue

I am truly excited to start this last section. It has been a long journey. Sometimes lonely and challenging, it was most of all an enriching experience. I feel blessed to have been allowed to touch the lives of so many people who shared their stories. I feel humbled by being invited into the lives of many women who imparted their daily struggles and who shared their hopes for a better tomorrow. I do truly hope that this study acknowledges their efforts and most of all will contribute to empowering PNG women.
LIST OF REFERENCES


Collis, B., & van der Wende, M. (2002). Models of technology and change in higher education: An international comparative survey on the current and future use of ICT in higher


Department of Communication and Information. (2008). *National information & communication technology (ICT) policy*. Port Moresby: Department of Communication and Information.


Doucet, A. (2007). “It’s almost like I have a job, but I don’t get paid”: Fathers at home reconfiguring work, care and masculinity. In N. Cook (Ed.), *Gender relations in global perspective: Essential readings* (pp. 97-108). Toronto: Canadian Scholars’ Press.


National Telecommunications and Information Administration. (2011). *Exploring the digital nation – computer and Internet use at home*. Washington, DC: National Telecommunications and Information Administration


APPENDICES

Appendix 1 Survey Questionnaires

Survey Questionnaires for staff

Survey Questionnaire for students

Appendix 2 Interview Protocol

Appendix 3 Narrative listing of items for a computer attitude scale.

Appendix 4 Consent Form

Appendix 5 Sample of letter sent to IHEs
Appendix 1 Survey Questionnaires

Survey Questionnaire for Academic Staff

Survey Questionnaire for Students
The study topic:

**Gender Issues in Access, Application and Attitudes Toward Information Communication Technology in Higher Education Institutions in Papua New Guinea**

This questionnaire aims to collect data in order to create a profile on Information Communication Technology application by academic staff at institutions of Higher Education in Papua New Guinea.

Participation in this questionnaire is strictly voluntary.

Your name is not to be indicated on this form.

All contributed information will remain anonymous.

I thank you for your cooperation and participation

Ms Iwona Kolodziejczyk
PhD Student
Divine Word University
Part 1 Socio-Demographic Information

Some of the statements and questions in this questionnaire are preceded with □ others with O. Select only one from the available options if the statement or question is preceded with □; if the statement or question is preceded with O, select none, one, few, or all of the options.

1. Your gender □ Female □ Male

2. Your age (Please write your age) ________ years

3. You are currently a lecturer at:

□ University □ Other Institution of Higher Education

4. How many years are you working at the institution of higher education?

□ It is my first year □ 2 or less than 2 years □ Between 3 to 5 years
□ Between 6 to 10 years □ More than 10 years Please state the number of years in the profession ________ years.

Part II invites you to share your attitude toward computer and Internet

To what extent do you believe the following statements express your attitude towards computers? Please circle the letter of your choice.

<table>
<thead>
<tr>
<th>Statement</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Computers make it possible to speed up scientific progress and achievements.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Computers help to bring about a better way of life to the average person.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Computers are extremely accurate and exact.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Using a computer at university/college is significantly increasing my satisfaction at work.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. I like the idea of learning how to better use a computer.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Computers make you feel that machines can be smarter than people.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Someday in the future, these machines may be running our lives.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. These machines can make important decisions better than people.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Computers are so amazing that they stagger your imagination.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Computers make preparing material for students more fun.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Computers are difficult to understand and frustrating to work with.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
12. Using computers save time and work.  A B C D E
13. Computers make me uncomfortable because I don’t understand them.  A B C D E
14. Life is becoming easier and faster with computers.  A B C D E
15. I do not feel I have control over what I do when I use a computer.  A B C D E
16. Computers are superior to humans in processing information.  A B C D E
17. Given a little time and training anybody could learn to use computers.  A B C D E

In the following section of this part of the questionnaire you are asked to express your attitude toward the Internet.

To what extent do you believe the following statements express your attitude toward the Internet? Please circle the letter of your choice.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly agree</th>
<th>Strongly disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>18. The Internet has changed the world into a “global village”.</td>
<td>A B C D E</td>
<td></td>
</tr>
<tr>
<td>19. Access to the Internet became a necessity of a daily routine for many people.</td>
<td>A B C D E</td>
<td></td>
</tr>
<tr>
<td>20. The Internet makes easier contact with my family and friends.</td>
<td>A B C D E</td>
<td></td>
</tr>
<tr>
<td>21. The Internet is a great source of information I need for my work and research.</td>
<td>A B C D E</td>
<td></td>
</tr>
<tr>
<td>22. Having a permanent access to the Internet will definitely improve my professional performance.</td>
<td>A B C D E</td>
<td></td>
</tr>
<tr>
<td>23. People are becoming slaves of the Internet.</td>
<td>A B C D E</td>
<td></td>
</tr>
<tr>
<td>24. The Internet intimidates me because it seems so complex.</td>
<td>A B C D E</td>
<td></td>
</tr>
<tr>
<td>25. Life would be more enjoyable without the Internet.</td>
<td>A B C D E</td>
<td></td>
</tr>
<tr>
<td>26. Access to the Internet makes me feel part of a global community.</td>
<td>A B C D E</td>
<td></td>
</tr>
<tr>
<td>27. I cannot imagine life without the Internet.</td>
<td>A B C D E</td>
<td></td>
</tr>
<tr>
<td>28. I think the Internet is fascinating.</td>
<td>A B C D E</td>
<td></td>
</tr>
<tr>
<td>29. A lot of harmful information, like images, text and other files, is coming to the community through the Internet.</td>
<td>A B C D E</td>
<td></td>
</tr>
<tr>
<td>30. I feel confident when browsing the Internet.</td>
<td>A B C D E</td>
<td></td>
</tr>
<tr>
<td>31. Using the Internet is fun.</td>
<td>A B C D E</td>
<td></td>
</tr>
<tr>
<td>32. I love to learn more about the Internet and its usage.</td>
<td>A B C D E</td>
<td></td>
</tr>
</tbody>
</table>

308
Part III surveys your experience with computers and the Internet.

*Please select one option if the statement or question is followed by □; if the statement or questions is followed by O select none, one, few, or all of the options.*

1. Do you own a computer? □ Yes □ No

*If Yes, what type of a computer do you own?*

☐ Desktop computer ☐ Laptop
☐ Both ☐ Other Please write the type ____________

2. How often do you use a computer?

☐ Every day ☐ Few times a week ☐ Once a week
☐ Few times a month ☐ Less than once a month

3. On an average day, how much time do you spend using computers?

☐ Less than 1 hour ☐ Between 1 to 2 hours ☐ Between 2 to 3 hours
☐ Between 3 to 4 hours ☐ Between 4 and 5 hours ☐ More than 5 hours

4. What are your main activities when using a computer?

☐ Doing administrative work ☐ Doing research ☐ Listening to the music
☐ Marking students papers ☐ Preparing my lectures ☐ Playing games
☐ Reading literature ☐ Watching videos ☐ Writing letters
☐ Other Please list ____________________________

5. On an average day, what type of software application do you use more often? Please select up to three most often used software application categories.

☐ Communication ☐ Database ☐ Desktop Publishing
☐ Educational/Training ☐ Entertainment ☐ Paint/Image Editing
☐ Presentation Graphics ☐ Spreadsheet ☐ Web browser
☐ Word Processing ☐ Other Please list ____________________________

6. Which of the listed above software categories is your favourite one? Please name it.

_____________________________________________________________________

7. On an average day, do you think you spend more time using computer for professional purposes or more entertaining purposes. *Please select one of the options below.*
☐ I spend more time using computer for professional purposes.
☐ I spend more time using computer for entertaining purposes.
☐ I spend equal amount of time using computer for both purposes.

8. Could you please summarise your attitude toward computers?


9. Do you have access to the Internet at home? ☐ Yes ☐ No

10. How often do you access the Internet?

☐ Every day ☐ Once a week ☐ Few times a week
☐ Less than once a month ☐ Few times a month ☐ Few times a month

11. On an average day, how much time do you spend on the Internet?

☐ Less than 1 hour ☐ Between 1 to 2 hours ☐ Between 2 to 3 hours
☐ Between 3 to 4 hours ☐ Between 4 to 5 hours ☐ More than 5 hours

12. Are you required to pay a fee for using the Internet? ☐ Yes ☐ No

If Yes, how much of money are you willing to spend for the access to the Internet fortnightly?

☐ K 5 ☐ K 10 ☐ K 20
☐ K 50 ☐ Other amount Please state the amount K____________

13. What is the purpose of your access to the Internet?

☐ Banking ☐ Email ☐ Entertainment
☐ Online meeting people ☐ Research ☐ Shopping
☐ Other Please write it down _______________________

14. What kind of Information are you looking for on the Internet?

☐ Games ☐ Hobby-related ☐ Music and videos
☐ News ☐ Research ☐ Other Please write it down _______________________

310
15. Which of the search engine/s do you use to browse the Internet?

- O Alta Vista
- O Google
- O Hotmail
- O MSN
- O Yahoo
- O Other Please list them down

16. Are you using online databases to complete your research?  □ Yes  □ No

If Yes, please list two databases you accessed last week:

______________________________________________________________________________

17. How often do you open your email box on an average day?

- □ Once a day
- □ Between 2 to 3 times
- □ Between 4 to 5 times
- □ More than 5 times
- □ I am not checking email every day

18. What is the content of your emails? Please select one of the statements below

- □ The content of my emails is mostly professional.
- □ The content of my emails is mostly other than professional.
- □ The content of my emails is equally professional and other than professional.

15. Please justify why you chose the paper, not the Web-based, questionnaire?

______________________________________________________________________________

______________________________________________________________________________
You are very welcome to include your comments on the topic of research, the questionnaire or the way it was administered. I shall also appreciate your opinion on other gender-related issues in ICT that were not included in this questionnaire but you consider important.

____________________________________________________________________________

____________________________________________________________________________

____________________________________________________________________________

____________________________________________________________________________

____________________________________________________________________________

____________________________________________________________________________

THE END OF QUESTIONNAIRE

THANK YOU VERY MUCH FOR YOUR CONTRIBUTION TO THIS STUDY
The study topic:

Gender Issues in Access, Application and Attitudes Toward Information Communication Technology at Higher Education Institutions in Papua New Guinea

This questionnaire aims to collect data in order to create a profile on Information Communication Technology application by students at institutions of higher education in Papua New Guinea.

Participation in this questionnaire is strictly voluntary.

Your name is not to be indicated on this form.

All contributed information will remain anonymous.

I thank you for your cooperation and participation

Ms Iwona Kolodziejczyk
PhD Student
Divine Word University
Part 1 Socio-Demographic Information

Some of the statements and questions in this questionnaire are preceded with □ others with O. Select only one from the available options if the statement or question is preceded with □; if the statement or question is preceded with O, select none, one, few, or all of the options.

1. Your gender □ Female □ Male

2. Your age (please write your age) __________ years

3. You are currently a student at:
   □ University □ Other Institution of Higher Education

4. You are currently enrolled in:
   □ 1st year □ 2nd year
   □ 3rd year □ 4th year of studies

5. Your home is in a:
   □ City
   □ Remote Village □ Village along the Highway

6. Your home society is a:
   □ Patrilineal society □ Matrilineal society

7. Occupation of your father:
   □ Public Servant □ University/ School teacher
   □ Farmer □ Employed in Private Sector
   □ Politician □ Other (please name) _____________

Part II invites you to share your attitude toward computer and Internet

To what extent do you believe the following statements express your attitude towards computers? Please circle the letter of your choice.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly agree</th>
<th>Strongly disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Computers make it possible to speed up scientific progress and achievements.</td>
<td>A B C D E</td>
<td></td>
</tr>
<tr>
<td>2. Computers help to bring about a better way of life to the average person.</td>
<td>A B C D E</td>
<td></td>
</tr>
<tr>
<td>3. Computers are extremely accurate and exact.</td>
<td>A B C D E</td>
<td></td>
</tr>
<tr>
<td>4. Using a computer at university/college is significantly increasing my satisfaction at work.</td>
<td>A B C D E</td>
<td></td>
</tr>
<tr>
<td>5. I like the idea of learning more how to use a computer.</td>
<td>A B C D E</td>
<td></td>
</tr>
<tr>
<td>6. Computers make me feel that machines can be smarter than people.</td>
<td>A B C D E</td>
<td></td>
</tr>
<tr>
<td>7. Someday in the future, these machines may be running our lives.</td>
<td>A B C D E</td>
<td></td>
</tr>
</tbody>
</table>
8. These machines can make important decisions better than people.  
9. Computers are so amazing that they stagger your imagination.  
11. Computers are difficult to understand and frustrating to work with.  
12. I would rather have a computer instruct me than a teacher.  
13. Computers make me uncomfortable because I don’t understand them.  
14. Life is becoming easier and faster with computers.  
15. I do not feel I have control over what I do when I use a computer.  
16. Computers are superior to humans in processing information.  
17. Given a little time and training anybody could learn to use computers.

In the following part of the questionnaire you are asked to express your attitude toward the Internet.

To what extent do you believe the following statements express your attitude toward the Internet? Please circle the letter of your choice.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly agree</th>
<th>Strongly disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>18. The Internet has changed the world into a “global village”.</td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>19. The access to the Internet became a necessity of a daily routine for many people.</td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>20. The Internet makes easier contact with my family and friends.</td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>21. The Internet is a great source of information I need for my study.</td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>22. Having a permanent access to the Internet will definitely improve my academic performance.</td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>23. People are becoming slaves of the Internet.</td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>24. The Internet intimidates me because it seems so complex.</td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>25. Life would be more enjoyable without the Internet.</td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>26. Access to the Internet makes me feel part of a global community.</td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>27. I cannot imagine life without the Internet.</td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>28. I think the Internet is fascinating.</td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>29. A lot of harmful information, like images, text and other files, is coming to community through the Internet.</td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>30. I feel confident when surfing the Internet.</td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>31. Using the Internet is fun.</td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>32. I love to learn more about the Internet and its usage.</td>
<td>A</td>
<td>B</td>
</tr>
</tbody>
</table>
Part III surveys your experience with computers and the Internet.

Please select one option if the statement or question is followed by ☐; if the statement or question is followed by O select none, one, few, or all of the options.

1. Do you own a computer? ☐ Yes ☐ No

If Yes, what type of a computer do you own?
☐ Desktop computer ☐ Laptop
☐ Both ☐ Other Please write the type __________

2. How often do you use a computer?
☐ Every day ☐ Few time a week ☐ Once a week
☐ Few times a month ☐ Less than once a month

3. On an average day, how much time do you spend using computers (excluding scheduled computer classes)?
☐ Less than 1 hour ☐ Between 1 to 2 hours ☐ Between 2 to 3 hours
☐ Between 3 to 4 hours ☐ Between 4 and 5 hours ☐ More than 5 hours

4. What are your main activities when using a computer?
O Listening to the music O Playing games O Reading lecture notes
O Reading literature O Reading Power Point presentations O Searching for new information
O Watching videos O Writing assignments O Writing letters to friends
O Other Please list _______________________

5. On an average day, what type of software application do you use more often? Please select up to 3 most often used software application categories.

O Communication O Database O Desktop Publishing
O Educational/Training O Entertainment O Paint/Image Editing
O Presentation Graphics O Spreadsheet O Web browser
O Word Processing O Other Please list _______________________

6. Which of the listed above software categories is your favourite one? Please name it.

_____________________________________________________________________

7. On an average day, do you think you spend more time using computer for academic purposes or more entertaining purposes. Please select one of the options below.

☐ I spend more time using a computer for academic purposes.

☐ I spend more time using computer for entertaining purposes.

☐ I spend equal amount of time using computer for both purposes.
8. Could you please summarise your attitude toward computers.

______________________________________________________________________________

______________________________________________________________________________

______________________________________________________________________________

9. Do you have access to the Internet at home?  □ Yes    □ No

10. How often do you access the Internet?

□ Every day    □ Few times a week    □ Once a week
□ Few times a month    □ Less than once a month

11. On an average day, how much time do you spend on the Internet?

□ Less than 1 hour    □ Between 1 to 2 hours    □ Between 2 to 3 hours
□ Between 3 to 4 hours    □ Between 4 to 5 hours    □ More than 5 hours

12. Are you required to pay a fee for using the Internet?  □ Yes    □ No

If yes, how much of money are you willing to spend for the access to the Internet fortnightly?

□ K 5    □ K 10    □ K 20
□ K 50    □ Other amount Please state the amount K ________

13. What is the purpose of your access to the Internet?

O Banking    O Email    O Entertainment
O Online meeting people and chat    O Research    O Shopping
O Other Please write it down ___________________________________

14. What kind of information are you looking for on the Internet?

O For my study    O Games    O Hobby-related
O Music and videos    O News    O Other Please write it down
___________________________________________________________________________

15. Which of the search engine/s do you use to browse the Internet?

O Alta Vista    O Google    O Hotmail
O MSN    O Other Please list them down
16. Are you using online databases to complete your research? □ Yes □ No

If Yes, please list two databases you accessed last week:
______________________________

17. How often do you open your email box on an average day?

□ Once a day □ Between 2 to 3 times □ Between 4 to 5 times
□ More than 5 times □ I am not checking email every day

18. What is the content of your emails? Please select one of the statements below

□ The content of my emails is mostly study-related.
□ The content of my emails is mostly other than study-related.
□ The content of my emails is equally study and other than study-related.

19. Can you please summarise your attitude toward the Internet?

____________________________________________________________________________________
____________________________________________________________________________________
____________________________________________________________________________________

20. Please justify why you chose the paper, rather than Web-based, questionnaire?

____________________________________________________________________________________
____________________________________________________________________________________
____________________________________________________________________________________
You are very welcome to include your comments on the topic of research, the questionnaire or the way it was administered. I shall also appreciate your opinion on other gender related issues in ICT that were not included in this questionnaire but you consider important.

____________________________________________________________________________
____________________________________________________________________________
____________________________________________________________________________
____________________________________________________________________________

THE END OF QUESTIONNAIRE

THANK YOU VERY MUCH FOR YOUR CONTRIBUTION TO THIS STUDY
Appendix 2 Interview Protocol

Research topic: Gender issues in access, application and attitudes toward Information Communication Technology in higher education institutions in Papua New Guinea.

Time of interview:

Date:

Place:

Interviewer:

Interviewee:

Gender:

Type of society (matrilineal or patrilineal):

Type of institutions of higher education (university or other institution of higher education):

[Describe here the project to the Interviewee]

The purpose of the study is to determine whether ICT and higher education can contribute to the empowerment of women in PNG society.

Female and male students and academic staff at selected universities and colleges are invited to participate in this study. In order to assure anonymity of all participants, aliases will be assigned to them to use in the processes of analysing and reporting data.

The interview should take about 30-40 minutes. It is conducted only upon your informed consent.

[Have the interviewee read and sign the consent form]

[Turn on the tape recorder and test it]

Questions:
1. Please tell me when your first contact with computers took place and describe your experience from this time.

2. How have your contacts with computers and relations to them changed since your first experience?

3. How do you perceive the role of computers in your academic achievements and career?

4. How do you see the advent of computing in relation to your traditional values and beliefs?

5. How do you think computers can help in empowerment of women in traditional society like Papua New Guinea?

[Thank you very much for your participation in this interview and your valuable insights.

Once again I would like to assure you that confidentiality of your responses is safeguarded.]
Appendix 3 Narrative listing of items for a computer attitude scale.

All authors listed here are quoted from Brock and Sulsky (1994).

Lae (1970) – Beneficial tool items

Computers make it possible to speed up scientific progress and achievements
Computers are very important to our space program
Computers are becoming necessary to the efficient operation of large business companies
Computers will help bring about a better way of life for the average person
Computators are extremely accurate and exact
Computers will free people to do more interesting and imaginative types of work
Computers work at lightning speed

Lae (1970) – Autonomous entity items

Computers can think like human beings think
With these machines, the individual person will not count for very much anymore
Computers make you feel that machines can be smarter than people
Someday in the future, these machines may be running our lives
There is no limit to what these machines can do
These machines can make important decisions better than people
Electronic brain machines are kind of strange and frightening
Computers are so amazing that they stagger your imagination
These machines help to create unemployment

Rafaeli (1986) – Beneficial tool items

I would like to see all or part of my work done by a computer
Computerizing part of my job would make me more competitive in the job market
Using a computer at work/school would (has) significantly increase(d) my satisfaction at work.

Using a computer at work/school would (has) significantly increase(d) my productivity.

I like the idea of learning to use a computer.

**Rafaeli (1986) – Autonomous entity items**

I would discourage anyone from allowing a computer to be placed on their desk.

I would not feel comfortable using a computer instead of a letter or a telephone.

I think that the introduction of computers will result in a loss of people’s privacy.

I am concerned that I might lose my job or a job in the future because of the introduction of computers.

**Dambrot et al. (1985) – Positive attitude items**

I think computers are fascinating.

If I use(d) a computer, I can (could) save time and work.

Computers can (could) make learning more fun.

Given a little time and training anybody could learn to use computers.

Using a computer can (could) be enjoyable.

If I had the money I’d buy a (new) home computer.

I look forward to computers taking over routine tasks of my home and job.

I would rather have a computer instruct me than a teacher.

Computers are superior to humans in processing information.

**Nickell and Pinto (1986) – Positive attitude items**

Computers will never replace human life.

Computers are responsible for many of the good things we enjoy.

There are unlimited possibilities of computer applications that haven’t even been thought of yet.

Computers are bringing us into a bright new era.

Life will be easier and faster with computers.

Computers can eliminate a lot of tedious work for people.
The use of computers is enhancing our standard of living

Computers are a fast and efficient means of gathering information

Nickell and Pinto (1986) – negative attitude items

Computers make me uncomfortable because I don’t understand them

People are becoming slaves to computers

Soon our lives will be controlled by computers

I feel intimidated by computers

The overuse of computers may be harmful and damaging to humans

Computers are dehumanizing to society

Computers turn people into just another number

Computers are lessening the importance of too many jobs now done by humans

Computers will replace the need for working human beings

Soon our world will be completely run by computers

Computers are difficult to understand and frustrating to work with

Popovich et al. (1987) – Negative attitude items

Whenever I use something that is computerized, I am afraid I will break it

I know that I will never understand how to use computers

Using a computer is too time consuming

I have had bad experiences with computers

I do not like using computers because I cannot see how the work is being done

I do not feel I have control over what I do when I use a computer

I do not like to program computerized items such as VCR’s
Appendix 4 Informed Consent Form

Informed Consent Form

Dear ________________________________

I am a PhD student at Divine Word University in Madang. I am researching gender-based issues in Information Communication Technology (ICT) application in higher education in Papua New Guinea (PNG). The purpose of this study is to explore whether ICT through higher education can contribute to empowering women. The study also examines if there are any gender related differences in the use of computers and Internet by female and male users. I am looking for the information about your experience with computers and the Internet, your attitudes towards them and your perception of the importance of technology for your academic career as well as presence of ICT in the PNG context.

You are kindly invited to participate in the study which will be conducted through a semi-structured interview. The interview is planned for about 45 minutes and will be recorded on audiotape. All information obtained from you or about you in connection with this project will remain strictly confidential and will be disclosed only with your permission. The audiotape with the recorded interview and any notes related to it will be kept in a locked filing cabinet to which I alone have access. The results of this study will be written up in a doctoral thesis and form part of professional journal articles.

Your participation in this study is strictly voluntary. You may withdraw your participation at any time. For answer to questions pertaining to the research, or research participant’s rights, you may contact me directly at 852 3609 or through email: ikolodziejczyk@dwu.ac.pg.
Sincerely yours,

Iwona Kolodziejczyk, PhD Student

Please indicate your consent by signing a copy of this letter and returning it to me. The other copy is for you to keep.

I have read this letter and consent to participate.

Signature:

Date:
Appendix 5 Sample of Letter Sent to IHEs

Divine Word University

P. O. Box 483, Madang, Madang Province, Papua New Guinea
Tel: (675) 852 2937 Fax: (675) 852 2853

[Name]
Vice Chancellor
[Name of IHE]
[Address of IHE]

Iwona Kolodziejczyk
Divine Word University
P. O. Box 483 Madang
Fax: 852 2812
Email:ikolodziejczyk@dwu.ac.pg
Madang, 25.04.2007

Dear [Name]

Re: Seeking permission to conduct the data collection for PhD research.

I am a PhD student at Divine Word University in Madang. My academic research supervisor is Professor Roger Vallance.

I would like to request your permission to conduct the data collection for my PhD research at the University of Goroka.

I am researching gender based issues in Information Communication Technologies (ICTs) application in higher education institutions in Papua New Guinea. The purpose of this study is to explore if there are any gender related differences in relation to access to and use of computers and the Internet by female and male academic staff and students.

It is anticipated that data will be collected with mixed methods, which will involve the use of survey questionnaires and semi-structured interviews. Respondents will be offered the option of completing a survey electronically or on hard copy form.

The research proposal has been accepted by the DWU Research Committee. The ethics clearance has been obtained from DWU Ethics Committee.
All participation will be completely voluntary. Student and staff responses to surveys will be anonymous and interviews will be completely confidential. The University name will be kept confidential when reporting the data. I am writing to you and seeking your permission to contact individual lecturers and course organisers. With your permission, I will ask course coordinators if they are happy that their students be asked to volunteer to participate in this research. I will then arrange with these course coordinators and lecturers to administer the research instruments.

Due to my duties as a lecturer in the Information Systems Department at Divine Word University, the most suitable time for me to visit your institution is the period May 30 till June 15, 2007.

Thank you very much for your time and consideration of my proposed research.

Yours sincerely,

Ms Iwona Kolodziejczyk

PhD Student