

https://dspace.org/

Factors that influence lecturers' internet use in teaching: an exploratory study of Gauteng public technical and vocational education and training (TVET) colleges

Mthembu, Vusumuzi

2018

https://hdl.handle.net/10539/27187

Mthembu, Vusumuzi (2018) Factors that influence lecturers' internet use in teaching :|ban exploratory study of Gauteng public Technical and Vocational Education and Training (TVET) colleges, University of the Witwatersrand, Johannesburg, https://hdl.handle.net/10539/27187

Downloaded from a DSpace repository. https://dspace.org/

Master of Arts in the Field of ICT Policy and Regulations

Factors that influence lecturers' Internet use in teaching: An exploratory study of Gauteng public Technical and Vocational Education and Training (TVET) colleges

Vusumuzi Mthembu
Student No: 9304770e
Supervisor: Dr Kiru Pillay

A research report submitted to the Faculty of Humanities, University of the Witwatersrand in partial fulfilment of Master of Arts in ICT Policy and Regulations

March 2018

Declaration

I declare that this report titled: **Factors that influence lecturers Internet use in teaching: An exploratory study of Gauteng public Technical and Vocational Education and Training (TVET) colleges** is my unaided work. It is submitted in partial fulfilment of the requirements for the degree of Masters of Arts in the field of ICT Policy and Regulations in the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination at any other University.

_____

Vusumuzi Mthembu

March 2018

Dedication

I dedicate this work to my family, friends and associates for their support and understanding, and the TVET colleges for their endeavour to address skills deficit in the country.

Acknowledgements

I wish to express my profound gratitude to my Supervisor, Dr Kiru Pillay who guided me patiently throughout the research process, thank you. I also wish to acknowledge the efforts of many lecturers at Wits University and professional guests who shared their knowledge, experience and expertise.

Lastly, I wish to thank my fellow student Kopano Monyetsane for unselfishly sharing his knowledge, information and support. He was a good comrade in my journey of developing this research report.

Abstract

The use of Internet is increasingly permeating across spheres of human activity, including the sphere of education and teaching. It is therefore important to locate the Internet as core medium for instruction at colleges to enhance the teaching and learning experience and better prepare students for the demands of the knowledge society that is largely driven by the Internet. The purpose of this mixed-method research is to explore factors that influence lecturer Internet use in teaching at public technical and vocational education and training (TVET) colleges in Gauteng. The study investigates the forms (what the Internet is used for) and the characteristics (how it is used) in teaching. Furthermore, the study investigates the extent of lecturer Internet use in teaching at the TVET colleges.

Literature shows that factors that Influence the Internet use in teaching at TVET colleges are multi-dimensional in nature. For this reason the research appropriate a combination of theoretical artefacts that include adapted TPACK framework, blended learning institutional development model, technology adoption model and institutional level factor theoretical framework to explore these factors.

The outcome of the research shows that Internet use in teaching public colleges in Gauteng is influenced by a confluence of factors that can be classified as lecturer level, institutional and macro-policy factors. The research further reveal that the use of the Internet in teaching at public TVET colleges is opportunistic and is at an embryonic stage.

List of abbreviations and acronyms

AIDS	Acquire Immune Deficiency Syndrome
DHET	Department of Higher Education and Training
DTPS	Department of Telecommunications and Postal Services
DDF	Digital Development Fund
Mbps	megabytes per second
Gbps	Giga bytes per second
FET	Further Education and Training
HIV	Human Immunodeficiency Virus
HSRC	Human Science Research Council
ICASA	Independent Communications Authority of South Africa
IT	Information Technology
ITU	International Telecommunications Union
INESI	Ikamva National e-Skills Institute
ICTs	Information and Communications Technologies
ISAT	Integrated Summative Assessment Task
LAN	Local Area Network
LSS	Lecture support system
NCV	National Certificate Vocational
NEMISA	National Electronic and Media Institute of South Africa
NQF	National Qualification Framework
OECD	Organisation for Economic Co-operation and Development
PICC	Presidential Infrastructure Coordinating Committee
RSA	Republic of South Africa
SANREN	South African National Research Network
SDGs	Sustainable Development Goals

SIP 15	Strategic Integrated Projects number 15
TPACK	Technology, Pedagogy and Content Knowledge
TVET	Technical and Vocational Education and Training
WEF	Word Economic Forum
TAM	Technology Adoption Model
UN	United Nations
UNESCO	United Nations Educational Scientific and Cultural Organisation
USAF	Universal Services Access Fund
VEOP	Vocational Education Orientation Program
WSIS	World Summit on Information Society

List of Figures

Figure 1: Gauteng province map
Figure 2: SANREN backbone map: geographical
Figure 3: The Technology, Pedagogy and Content Knowledge Framework (TPACK)
Figure 4: Adapted TPACK framework
Figure 5: Institutional level factor theoretical framework
Figure 6: The teacher development framework
Figure 7: Theoretical and conceptual framework
Figure 8: Data collection instruments
Figure 9: Research process timeline
Figure 10: Concurrent and sequential triangulation data analysis
Figure 11: Presentation of quantitative and qualitative data
Figure 12: Quantitative data presentation
Figure 13: Student- lecturer ratio
Figure 14: Student-computer ratio
Figure 15: Number of students and, computers with internet connectivity
Figure 16: Type of Internet connectivity
Figure 17: College Internet speed
Figure 18: Internet communication services
Figure 19: Technical support at the college
Figure 20: Availability of Internet and IT policies
Figure 21: Lecturer use of Internet services
Figure 22: Lecturer ICT skills ratings
Figure 23: Lecturer qualifications
Figure 24: Lecturer teaching experience
Figure 25: Lecturer practical experience
Figure 26: Lecturer Internet use experience in teaching
Figure 27: Subject taught by lecturers
Figure 28: Presentation of qualitative data
Figure 29: Pedagogical and content knowledge
Figure 30: ICT skills knowledge
Figure 31: Practical knowledge
Figure 32: Macro policy factors

Figure 33:Summery of factors that influence the Internet use at public TVET colleges

List of Tables

Table 1: Throughput rates

Table 2: Breakdown of academically qualified lecturers per province

Table 3: Student and head count learners enrolment trends

Table 4: Number of academic staff and students in Gauteng

Table 5: A typology of Web 2.0 learning technologies

Table 6: Identifiers for interview respondents

Table 7: Abridged Mapping of the research questions to the theoretical artefacts

TABLE OF CONTENT

Declaration II
Dedication III
Acknowledgements IV
Abstract V
List of abbreviations and acronyms VI
List of Figures VIII
List of Tables IX
Chapter 1: Introduction and background on Internet use in teaching at TVET colleges 5
1.1 Introduction 5
1.2 Internet use in vocational education 6
1.3 ICTs and the Internet as enablers for quality education 7
1.4 Overview of secondary education as a feeder to TVET college system 8
1.5 Overview of the state of education at TVET colleges 9
1.6 Pre 1994 historical background of the vocational and training sector 12
1.7 Post 1994 policy legislation and context on TVET colleges 14
1.8 Policy and legislative context on the Internet and education in South Africa 20
1.9 Overview of state of Internet access in the Gauteng Province 22
1.10 Gauteng TVET colleges 25
1.11 Research problem 27
1.12 Objectives of the study 29
1.13 Structure of the research report 32
Chapter 2: Literature review 34
2.1 Introduction 34
2.2 Definition of essential terminology for the study 35
2.3 Constructivism paradigm and use of the Internet in teaching 38
2.4 Use of internet in teaching and vocational education and training 40
2.5 Technology affordances and nuanced complexities 41
2.6 Factors that inform Internet use in teaching at colleges 42
2.6.1 Lecturer level factors 42
2.6.2 Institutional level factors 51
2.7 Macro-policy factors 56
2.7.1 Curriculum content policy and Internet use 56
2.7.2 Funding to support Internet use in teaching 57
2.8 The extent of the Internet use in Teaching in Vocational Education 58
Internet uses at TVET colleges 58

2.9 Theoretical and conceptual framework 61
2.10 Conclusion 62
Chapter 3: Research methodology 64
3.1 Introduction 64
3.2 Mixed-method research 64
3.2.1 Philosophical assumptions for the mixed-research methods 65
3.2.2 Rationale for quantitative data-collection method 65
3.2.3 Rationale for qualitative data-collection methods 66
3.3 Sampling for the study 67
3.4 Data collection instruments 68
3.5 Research procedure 71
3.6 The interview process 72
3.7 Data analysis 73
3.8 Generalisability of the study 75
3.9 Methodological considerations 75
3.10 Limitations of the study 76
3.11 Ethical considerations 76
3.12 Conclusion 76
Chapter 4: Presentation of findings 78
4.1 Introduction 78
4.2 Presentation of quantitative findings 78
4.3 Presentation of qualitative findings 92
4.3.1 Factors that influence on Internet use in teaching 94
4.3.2 Forms and characteristics of lecturer Internet use and extent of usage 103
4.4 Conclusion 108
Chapter 5: Data analysis 110
5.1 Introduction 110
5.2 The knowledge and skills domains for teaching with the Internet 110
5.2.1 Pedagogical and content knowledge 112
5.2.2 Lecturer teaching experience 115
5.2.3 ICT (Technology) knowledge in teaching 116
5.2.4 Internet use experience in teaching 118
5.2.5 Practical experience and Internet use 119
5.2.6 Lecturer attitudes on Internet use in teaching 121
5.3 Forms and characteristics of Internet use and the extent of Internet usage 122
5.3.1 Internet use to enhance curriculum 123

5.3.2 Internet use to promote practical skills 124
5.3.3 Use of Internet resources to communicate in teaching..... 125
5.3.4 Use of Internet resources for curriculum support 126
5.4 Institutional level factors that influence lecturer Internet use in teaching 128
5.4.1 Internet connectivity and usage..... 130
5.4.2 Internet affordability and usage 131
5.4.3 Access to end user equipment and devices 132
5.4.4 Technical and curriculum support..... 134
5.4.5 Internet policies and IT plans 135
5.4.6 Time availability and Internet use..... 136
5.5 Emerging themes..... 137
5.5.1 Curriculum content policy..... 138
5.5.2 Funding to support the Internet use in teaching. 139
5.6 Conclusion 140
Chapter 6: Conclusion and recommendations 143
6.1 Introduction..... 143
6.2 Summary of the key findings..... 143
6.2.1 Lecturer level factors..... 144
6.2.2 Institutional level factors..... 146
6.2.3 Forms and characteristics of Internet use and the extent of Internet use 147
6.2.4 Emerging macro-policy issues..... 147
6.3 Contribution to the body of knowledge..... 148
6.4 Recommendations..... 148
6.4.1 Recommendation 1: lecturers' professional development 148
6.4.2 Recommendation 2: Improve capital funding for ICT infrastructure and lecturer professional development 149
6.4.3 Recommendation 3: provision of high-quality reliable Internet connectivity to colleges. 150
6.4.4 Recommendation 3: establishment of provincial curriculum support resource units 150
6.4.5 Recommendation 6: strengthening of technical support through increased funding 151
6.4.6 Recommendation 7: institutionalisation of college policies and plans..... 151
6.4.7 Recommendation 8: access to equipment and devices..... 152
6.4.8 Recommendation 9: harmonisation of policy and legislation split between DHET and DTPS 152
6.5 Recommendations for future research 153
6.6 Limitations of the study..... 154
6.7 Conclusion **154**

Reference list 156
Annexure A: Covering letter to College Principals 178
Annexure B: Permission letters to conduct research 180
Annexure C: Lecturer interview guide 182
Annexure D: Interview Guide for College Management 187
Annexure E: Interview Guide for Training Providers 188
Annexure F: Mapping of the research questions to the theoretical frameworks and models 189
Annexure G: Ethics Clearance Certificate 193
Annexure H: Participant Information Sheet 194
Annexure I: College Census Questionnaire 196
Annexure J: Summary overview of course taught by respondents 198
Annexure K: Informed Consent Form 199

CHAPTER 1: Introduction and background on Internet use in teaching at TVET colleges

1.1 Introduction

Increasingly South African technical and vocational education and training (TVET) colleges are being positioned as post-schooling learning institutions of excellence that equip graduates with twenty-first century competencies, and the use of the Internet in teaching is critical in meeting this objective. The use of the Internet in post-school institutions exposes students to a tool that has become indispensable in the academic and work environments. According to Fox, Fletcher and Levin (2012), the Internet has become central in the workplace as most disciplines are dependent on it to conduct their work and grow their businesses; hence the need for lecturers to use the Internet at TVET in teaching to prepare employment-ready graduates. Baş, Kubiatko and Sünbül (2016, p. 176) illustrate the centrality of information communications technologies (ICTs) in teaching and cite the "growing demand on education institutions to use ICTs to teach the skills and knowledge students need for the 21st century", while Pelgrum (2001) cites the role of ICTs and the Internet in education as enablers for the transformation of the educational system and students for the knowledge society. According to Guile (2003), the emerging knowledge society is characterised by the penetration of knowledge in the social, economic and cultural aspects of life, and the predominance of knowledge over traditional forms of production as a key driver of the global economy. While the use of the Internet in teaching is important for the demands of the knowledge economy, the United Nations Educational Scientific and Cultural Organisation (UNESCO) argues that increasing fluidity of the mode of production necessitates that colleges should not be training students for particular skills but should rather train students who are adaptable to changing environments (UNESCO, 2012).

1.2 Internet use in vocational education

Franklin (2014) argues that the increasing use of the Internet in education is similar to the concept of disruptive innovations, which are innovations that challenge contemporary settings in learning institutions and displace well-established competitors. In order to remain relevant to the demands of the emerging knowledge society, colleges need to adapt to the disruptive innovation of the Internet or risk perishing. South Africa's TVET colleges are established by the FET College Act, No 16 of 2006, to provide post-school education and training, and prepare students with technical skills for work (RSA, 2006).

The Internet provides both lecturers and students with online access to a vast amount of educational content that can augment the curricula and can potentially improve the quality of learning and teaching at colleges, if used effectively (Gülbahar, 2007). Porter, Graham, Spring and Welch (2014) identify enhanced pedagogy, increased access, flexibility and cost effectiveness, as key strategic imperatives that underpin the concept of blended learning, which can be delivered by both face to face teaching approaches and the use of Internet-mediated teaching approaches.

They argue that the average cost per student of implementing technology in teaching is significantly lower than the costs of traditional classrooms and practical laboratories; furthermore, technology costs progressively decrease over time. The cost benefits of using the Internet in teaching at TVET colleges are pertinent to a resource constrained country like South Africa.

In South Africa which has high rates of inequality and poverty, HIV and AIDS as well as teenage pregnancy, the use of the Internet in vocational education should also equip students with skills to use and access information and opportunities to improve their social well-being. In addition, the use of ICTs and the Internet in particular has

the potential to also accommodate the learning needs of students with disabilities, since these technologies allow for the packaging of curriculum content in texts, videos and audio files.

1.3 ICTs and the Internet as enablers for quality education

Access to quality education is universally recognised as a fundamental human right that supports the socio-economic emancipation of people. In South Africa the Bill of Rights in the Constitution stipulates that citizens have a right to basic education, and further education and training (RSA, 1996a). At a global level, the United Nations General Assembly adopted seventeen Sustainable Development Goals (SDGs) with Goal Number Four focused on promoting inclusive and equitable quality education and life-long learning for all (UN, 2015a). The following targets identified by SDG Goal Number Four are particularly pertinent to this research: (i) ensuring equitable access for all women and men, people with disabilities and other vulnerable people to affordable quality technical, vocational and tertiary education and (ii) increasing the percentage of learners who have relevant technical , vocational and tertiary education by 2030 (UN, 2015b). In addition, the World Summit on the Information Society (WSIS) convened in both 2003 and 2005 adopted a ten-point plan, two of which relate to ICTs in education. The two targets are, firstly, connecting all the primary and secondary education institutions with ICTs, and, secondly, adapting the curricula to meet the demands of the Information Society. The former target encapsulates improvement of learner-to-computer ratios and Internet connectivity to schools, and the latter focuses on teacher training in the use of ICTs and Internet integration in instruction (ITU, 2003). The positioning of ICT usage in the promotion of quality education on the global agenda, via the UN SDGs and the WSIS ten-point plan,

illustrates the increasing recognition of the value of ICTs and the Internet in enhancing the quality of learning and teaching.

1.4 Overview of secondary education as a feeder to TVET college system

The South African government has identified access to primary and secondary education as one pivotal intervention to enhance the well-being of the population, encapsulated in a range of policies and legislation enacted post-1994 and to be discussed later in the chapter. This section articulate a broad overview of the state of primary and secondary education in South Africa.

South Africa was reported to have the highest literacy rate (98.78%) in comparison to Nigeria (66%), Brazil (97.51%), Turkey (98.71%), Kenya (82.39%) and Vietnam (97.07%). Secondary education enrolment, which is the primary feeder to the public TVET colleges, which are the focus of the study, was at 89% in 2012 (Knowledge Resources, 2014). The increase in literacy and enrolment in primary and secondary education is largely attributed to democratic-era policies that foster affordability and equity (Statistics South Africa, 2011a; Department of Basic Education, 2013). But increased enrolment in primary and secondary education has not been matched with quality education outcomes. Data on national Senior Certificate results indicate that a significant majority of the 922 000 learners out of 1.1 million who enrolled for Grade 10 in 2011 did not qualify to study at university (Knowledge Resources, 2014).

The census results of 2011 reveal that the primary and secondary education-throughput rate in South Africa has not been satisfactory, largely due to the imbalanced pupil-teacher ratios, poor school infrastructure, and inadequate learning material (Statistics South Africa, 2011a). Throughput rate refers to the percentage of students that successfully complete their studies within a specified study period (Statistics South Africa (2011a). The census further reveals a noticeably poor

progression from Grades 11 to 12, with learners with poor marks deviating towards TVET colleges (Statistics South Africa, 2011a). According to the World Economic Forum 2016 Global Information Technology Report, of the 139 countries surveyed, South Africa was rated 137 with respect to the quality of education, which is lower than Cape Verde (55), Ethiopia (68) and Mauritius (49) (World Economic Forum, 2016). The poor state of primary and secondary education impacts on the academic performance of the student cohort who provide a feeder to the TVET college system. The brief insight on the state of secondary education in South Africa forms a backdrop and provides important context into this study on Internet usage in teaching at Gauteng public TVET colleges.

1.5 Overview of the state of education at TVET colleges

Due to the challenges of quality education and improved learning outcomes at secondary education, this tier of the schooling level has produced inadequately prepared students to enrol in post-schooling institutions, including TVET colleges. (Sheppard, 2009). According to the then Minister of Higher Education and Training, Blade Nzimande, only 30% of Grade 12 students achieve university exemption (Interview, 5 March 2016). This trends combined with low throughput ratios suggest that the majority of potential TVET college students do not possess the adequate academic background needed for vocational education.

TVET college students have been underperforming academically-with the Human Sciences Research Council (HSRC) reporting an annual throughput average for diploma programmes at 47%, and 30% for National Curriculum Vocational (NCV) programmes (HSRC, 2011). The background information on the NCV programmes is discussed later in this chapter. Data on NCV results for 2014 indicate a 32% completion rate of the NCV programs (DHET, 2016a). Table 1 illustrates the latest

published NCV results for 2012 which indicates that the average throughput for the NCV programme in all nine provinces was 32%, whilst in Gauteng province the NCV throughput rate was 36%.

Table 1: Throughput rates for 2012

Province	Number Entered	Number Wrote NCV exams	Number passed	Throughput rate
Eastern Cape	2251	1901	803	36%
Free State	376	274	104	28%
Gauteng	3606	3215	1300	36%
KwaZulu-Natal	3842	2960	788	21%
Limpopo	3531	2938	1014	29%
Mpumalanga	1464	1307	675	46%
North West	1044	941	501	48%
Northern Cape	249	214	73	29%
Western Cape	2244	1584	760	34%
National	18607	15334	6018	32%

Source: Adapted from DHET (2013a)

In addition to the problem the weak secondary education, McGrath and Akoojee (2009) also cite the linking of college funding to the NCV programme which directs colleges to enrol Grade 9 learners with an average academic performance and who possess weak literacy and numeracy skills, which in turn adversely affects the throughput rate at TVET colleges.

In addition the TVET sector also experiences a problem of underqualified lecturers. According to HSRC, as illustrated in Table 2, only 28% of the TVET lecturers in Gauteng had higher degree qualifications, while 25% had a first degree or higher diploma and 23% were without a diploma (HSRC, 2011). The study was conducted in 2011, and it is unlikely that the findings would have improved significantly to date since the duration of teaching qualifications is a minimum of three years. In terms of the national policy framework for teacher education and development in South Africa, the minimum benchmark for teacher qualification is a degree or diploma (DoE, 2007).

The HSRC (2011, p. 25) highlights that this "requirement would seem to be equally, if not more, important in the context of technical and vocational education and training (TVET)…given that FET colleges now fall within the higher education and training band by virtue of their inclusion within the DHET."

Table 2: Breakdown of academically qualified TVET lecturers per province

Province	Lecturers with Artisan Skills	% Lecturers with Higher Degrees	% Lecturers with a First degree or higher diploma	%Lecturers without a Diploma
Eastern Cape	17	10	12	8
Free State	8	6	10	4
Gauteng	13	28	25	23
KZN	10	9	8	21
Limpopo	13	15	11	7
Mpumalanga	6	4	7	15
North West	3	6	6	7
Northern Cape	2	1	1	0
Western Cape	27	21	20	15

Source: Adapted from HSRC (2011)

The government, through a number of policy interventions and programmes, has identified the need to strengthen the TVET sector and locate the colleges at the centre in addressing the challenge of the skills deficit, and to promote access to post-schooling education in South Africa. The White Paper for Post-School Education and Training pronounced that "the college sub-system will therefore be expanded considerably, and a great deal of attention will be given to improving the quality of its programmes and the capabilities of its staff"(RSA, 2013a, p.11). According to the White Paper post-school education system refers to training and education institutions,

both private and public, that cater for those who have completed school, did not complete and never attended school, with TVET colleges forming part of the system. Meanwhile, the Commission of Inquiry into Higher Education Report highlights the need to improve and streamline the TVET sector and dedicate funding for curriculum improvement, infrastructure development and for the advancement of teaching capacity at TVET colleges (Commission of Inquiry into Higher Education and Training, 2017).

The benefits of Internet usage in learning and teaching resonate with the key strategic thrust of the White Paper on post-school education, which places emphasis on improving the quality of education in learning and teaching and increasing access for post-school education at TVET colleges (RSA, 2013a). The effective use of the Internet in teaching has the potential to mitigate gaps that exist in the delivery of curriculum and improve the quality of learning outcomes (Chigona, Chigona, and Davids, 2014).

1.6 Pre 1994 historical background of the vocational and training sector

Prior to 1994 the TVET sector was racially segregated and designed to address the skills needs of the rapidly industrialising economy of South Africa, and was largely supported by skills of immigrants from Europe. Mbatha, Wildschut, Mncwango, Ngazimbi, and Twalo (2014) highlight the emergence of mining in 1886 that drove the industrialisation that shaped the emergence of vocational education in South Africa. The authors also cite the job colour-bar policy and segregation laws such as the Mines and Works Act 12 of 1911, the Vocational Education Act 77 of 1955 and the Bantu Building Workers Act 27 of 1951 that institutionalised the segregation of black labour from acquiring skills at colleges and from occupying supervisory and skilled positions in labour. Until the enactment of the Manpower Training Act of 1981, Africans were

excluded from apprenticeship (McGrath, 2004). Further, the Bantu Self Government Act of 1959 and the Group Areas Act 41 of 1950 established non-college provisions and manpower centres in “homelands” and townships to cater for African students. These centres were often under-resourced, and not part of the National College Certification system and were de-linked from apprenticeship and geographically isolated from economic activity (Mbatha et al., 2014; McGrath, 2004).

In the mid-1990s, the South African economy experienced the dominance of the financial, communications and services sector, with 123% economic growth in financial intermediaries, insurance and business-service sectors, a 26% decline in the agriculture and forestry sector, and a 30% decline in mining (Mbatha et al.2014).These structural economic changes impacted on labour and skills trends from 1990 to 2005 as a consequence of jobless economic growth which contributed to unemployment amongst youth (Mbatha et al., 2014). Unemployment in South Africa is estimated at 25%, and 80% of the unemployed are between age 15 to 34 years, with only 3% of 20-to-24-year-olds enrolled for further education training programmes (DTPS, 2014a). These figures highlight the importance of improving the quality of teaching at TVET colleges, and the need to use the Internet in teaching in order to prepare employment-ready graduates with skills that fit the current economy demands.

The overview of the historical context that characterises vocational education and training in South Africa highlights two important overarching points for the study. First, historically vocational education colleges have occupied an important role within the training and skilling value chain that supports existing social and economic conditions in the country. In the current scenario, the predominance of the Internet in various facets of social and economic activity requires colleges to adopt the use of the Internet in the curricula in order to prepare students that are attuned to the demands of the

emerging knowledge economy and knowledge society driven by the Internet. According to Houghton and Sheehan (2000), knowledge-based economy is identified as an economy where knowledge is paramount in the creation, production, and distribution of goods and services.

Second, the negative historical discourse that characterises vocational training due to segregation laws, is important for the study, and highlights the context and legacy that continue to permeate technical and vocational training in South Africa. According to Akoojee (2008) public TVET colleges continue to experience huge infrastructure disparities due to this historical context. The author identifies a number of handicaps that constrain the spread of ICT use in education at colleges, and these include poor Internet connectivity and infrastructure, unreliable electricity supply and high telecommunication costs. This environment is likely to adversely impact on infrastructure for Internet use in teaching.

1.7 Post 1994 policy legislation and context on TVET colleges

Public TVET college policies and legislation pertinent to lecturers' professional qualifications, staff and student recruitment, funding and the curriculum reside within the Department of Higher Education and Training mandate, while policies and related legislation on telecommunications and the Internet reside within the mandate of the Department of Telecommunications and Postal Services. The following section discusses the broad set of policies and legislation on lecturers and Internet use at public TVET colleges.

There are currently 52 public TVET colleges in South Africa, with more than 250 satellite campuses. The FET College Act No 16 of 2006 mandates the establishment of public TVET colleges which are public institutions and private colleges. The Act further obligate private colleges to be registered with Department of Higher Education

and Training (DHET) (DHET, 2016a). TVET colleges are established to offer learning programmes that are “registered on the National Qualifications Framework from levels 2 to 4 and that will correspond with the present Grades 10 to 12 in the school system and N1 to N3 in the technical college system. ” (RSA, 1998a, p 8; RSA, 2006). In addition, colleges offer specialised national technical education certificates for engineering, business and general studies. These qualifications are offered in six sub-levels starting from N1 to N6 which culminate into a diploma after students comply with all the requirements, including work experience (DHET, 2016a). In addition, colleges offer vendor training programmes such as Cisco networking training, and an International Computer Driver’s Licence (ICDL), to provide IT students with supplementary qualifications that prepare students for real work. The White Paper introduced outcome-based education and introduced a new curriculum and set to include Grades 10 to 12 within the FET college band (RSA, 1998a). In 2007 the National and Provincial Education Departments introduced the NCV programmes to reposition the colleges to focus more on vocational training to address the shortage of skills in the country (HSRC, 2011). These NCV programme offerings are administered through the NCV curriculum policy statement and related assessment guidelines. The NCV curriculum is argued to be highly pitched academically for Grades 10 to 12 TVET students. Further, the curriculum and its related assessment guidelines has not been reviewed since it was introduced to align with the new curriculum and technology trends that have since emerged (FETI, 2013).

TVET colleges, technical colleges and universities are broadly referred to as post-schooling institutions; however, the mandate and scope of these institutions is vastly different. Universities and technical colleges are classified as higher education institutions in line with the Higher Education Act No 101 of 1997. According to the Act,

higher education qualifications occupy six levels - from Levels 5 to 10 - of the National Qualification Framework (NQF). Levels 5 to 7 are classified as undergraduate and levels 8 to10 are classified as post-graduate (RSA, 1997).

The White Paper for Post-School Education of 2013 and the Further Education and Training College Amendment Act pronounced that FET colleges be renamed training, vocational, education and training (TVET) colleges to reflect their main role and mandate (RSA, 2013a; RSA, 2013b). The newly defined mandate of the TVET colleges restates emphasis on vocational training as a core focus of the TVET college training system. Historically, as discussed in the previous section, the role and development of vocational education has been associated with employment and a socio-economic state of development in South Africa. According to Inayat, ul Amin, Inayat and Salim (2013, p.154), "The purpose behind VET is to equip the human capital with practical training to overcome employment issues, provide trained workforce and stabilize the economy." There are a number of policies and related legislation that are important towards understanding TVET sector transformation post-1994 to substantiate this point. The recapitalisation of colleges that commenced in 2002 was largely informed by the Further Education and Training (FET) College Act of 1998 and mainly focused on merging 150 racialised colleges into 50 new multi-site and multi-racial institutions (McGrath and Akoojee, 2009). The intent of this Act was also to ensure that the skills provided by colleges are aligned to the social and economic objectives of the country (RSA, 1998b). Akoojee and McGrath (2007) argue that at the time of the enactment of this Act, the key policy debates on recapitalisation of colleges were informed by a neoliberal discourse of college transformation that put emphasis on colleges' governance autonomy, financial autonomy, efficiency and conformity to the industry's needs. Also, the global discourse and government's policy

orientation of the early 80s and 90s that put emphasis on aligning vocational skills training and rapid industrial development seem to have shaped the lecturer's identity that emphasised specialised industry knowledge over specialised pedagogical competence (Papier, 2011). According to the Further Education and Training Institute (FETI) report, TVET colleges predominantly recruited lecturers from industry with occupational qualifications and industry experience to ensure training alignment with the industry's requirements, however the majority of these lecturers did not possess professional teaching qualifications (FETI, 2008). "Occupational qualifications refer to qualifications associated with a trade, occupation or profession resulting from work-based learning and consisting of knowledge unit standards, practical unit standards, and work-experience unit standards" (DHET, 2017a, p. 28). In this regard, the policy on minimum the requirement for teacher-education qualifications seeks to set minimum requirements for lecturers to teach at TVET colleges and address the problem of under-qualified lecturers in the recruitment standards for TVET lecturers (DHET, 2011). While the policy on professional qualifications for TVET lecturers stipulates the knowledge mix and competencies for lecturers teaching at colleges and provides a policy framework for developing TVET lecturer qualifications (DHET, 2013). These policies are relatively recent, and this suggests that TVET colleges currently do not have lecturers with the requisite skills competencies for being effective at TVET colleges, as outlined in the policies. This is also confirmed by an audit conducted in 2010 by HSRC on the profile of the TVET sector that found that only 32% of lecturers had first degrees or higher diploma, and only 11% had higher degree qualifications (HSRC, 2013).

The Further Education and Training Colleges Act of 1998 devolved the responsibility for the appointment and funding for lecturers to college councils, as a measure to

ensure some degree of autonomy and reduce state subsidies to colleges (Akoojee, 2008). The promulgation of this Act had far-reaching implications worth noting for this study. As a consequence of this Act, the college sector experienced a decline in staffing and a lack of enforcement of standards in the recruitment and payment of lecturers, since different governing bodies employed different standards for the recruitment and remuneration of lecturers. Colleges arbitrarily recruited lecturers, many of whom did not meet the minimum standard for teaching at colleges (Akoojee, 2008). As mandated by the Act, government withdrew colleges' subsidies and this financially constrained the colleges and limited their capacity to appoint and pay salaries for their lecturers at the same time colleges had to cope with the increasing inflow of students (Akoojee and McGrath, 2007; Akoojee, 2008). As shown in Table 3, from 1999 to 2005 colleges experienced a 39% increase in student enrolment and a 9% educator decline (Akoojee, 2008). The mismatch in student-lecturer ratios has a potential of putting a significant burden on lecturers who have to teach big numbers of students and who are inadequately prepared for vocational teaching.

Table 3: Staffing and headcount learners' enrolment trends

	Learners		Educators		Learner/Educator Ratio
Year	Headcount	% change over previous year	Total Numbers	% change over previous year	Ratio
1999	271900		7038		38.6
2000	337300	24%	7656	-4%	49.9
2001	356049	6%	7233	7%	49.2
2000	406145	14%	7088	-2%	57.3
2003	406145	0%	7088	0%	57.3
2004	394027	-3%	6477	-9%	60.8
2005	377584	-4%	6407	-1%	58.9
		39%		-9%	

Source: Akoojee (2008)

The White Paper for Post School Education and Training aims to increase students' enrolment at TVET colleges to 2,5 million by 2030 (RSA, 2013a). Students enrolment at TVET colleges was at 783 880 in 2015, and showed an increase of 35 497 students compared to 2014 (DHET, 2017a). The current staffing capacity at colleges is inadequate, and this increase requires huge investments in infrastructure and an improved skills capacity of lecturers. In 2007 the South African government allocated R1.9 billion to revive the college sector and overhaul the curriculum as part of the college recapitalisation programme aimed at repositioning into institutions for skills development and advance learning (Sheppard, 2009). Since then, the budget

allocation for colleges has progressively increased over time. The total budget for the colleges increased from R3.8 billion in 2010 to R5.4 billion in the 2014 financial year, while the college budget was further increased from R6.2 billion in the 2015/16 financial year to R6.5 billion in the 2016/2017 financial year (DHET, 2014a; Commission of Inquiry into Higher Education and Training, 2017). In spite of the progressive increase in funding in the last ten years, funding for colleges is inadequate due to the huge infrastructure backlog as a consequence of the historical legacy discussed earlier. In this regard, the Financial Fiscal Commission (FCC) report for the 2013/14 period stated that funding for colleges was insufficient, while the Commission of Inquiry into Higher Education and Training recommended that the R50 billion surplus from the Unemployment Insurance Fund be ring-fenced for infrastructure development at colleges (FFC, 2012; Commission of Inquiry into Higher Education and Training, 2017).

1.8 Policy and legislative context on the Internet and education in South Africa

To date the Government of South Africa has instituted a plethora of policies and legislation to provide access to ICT infrastructure and affordability, to promote the use of ICTs in educational institutions. This section provides an overview of policy and legislation on telecommunications and broadband Internet and the use of ICTs in education in South Africa.

The Telecommunications Act of 1996 makes provision for the establishment of an education network to provide access to Internet connectivity in schools and further training colleges (RSA, 1996b). The White Paper on e-Education underscores the role of ICTs in transforming the post-apartheid education system to: (i) improving access to learning opportunities, (ii) redressing the inequalities in the education sector, and (iii) promoting problem solving and critical thinking networking and collaboration skills

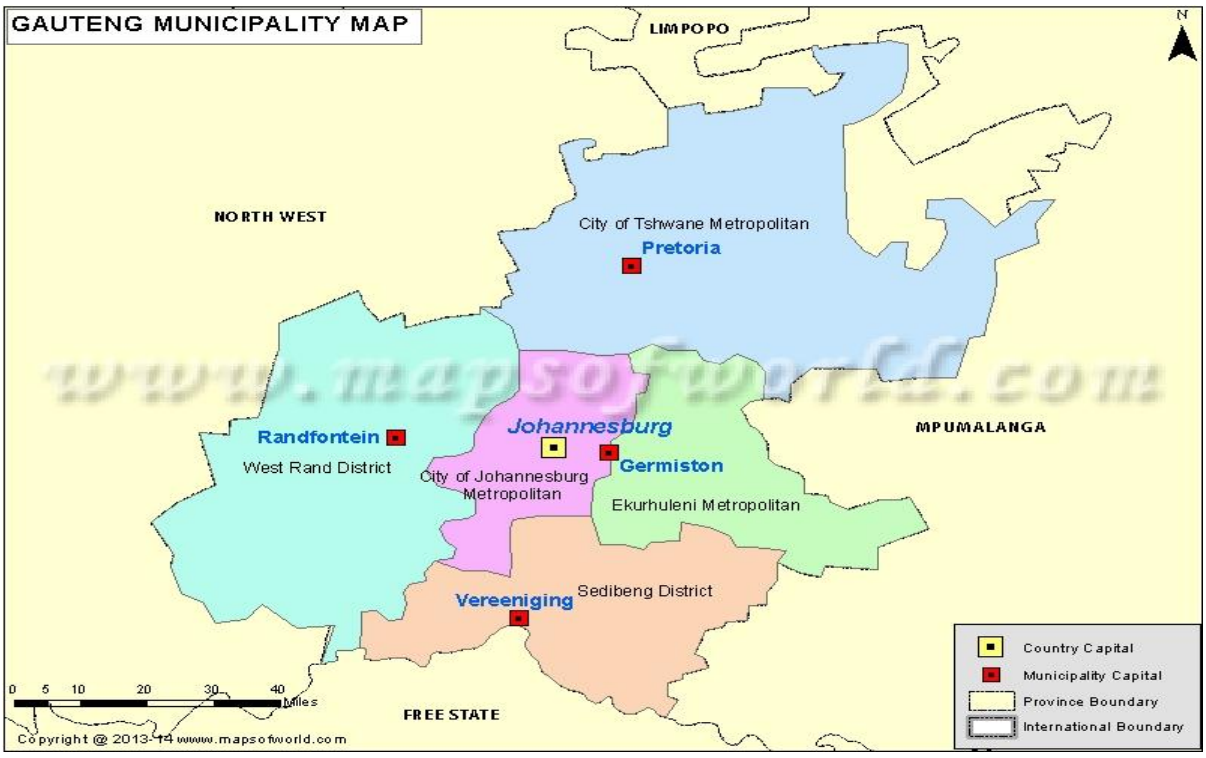
(RSA, 2004). In an effort to address the cost of connectivity in education, and promote Internet usage in education, the Electronic Communication Act No 36 of 2005 makes provision for private and public learning institutions to be provided with a minimum of a 50% discount rate of the total levy by the licensees providing Internet services in these institutions (RSA, 2005a). The National Development Plan of 2030 highlights the priority of e-Skills development in reducing poverty and inequality and broadening economic opportunities and employment through education and skills, while the National e-Skills Plan targets colleges and universities to embed e-Skill curricula and prepare students for knowledge society (RSA, 2011a; DTPS, 2014). Meanwhile the broadband policy also aims to stimulate demand for broadband in education and prioritises schools and colleges for broadband connectivity (RSA, 2013c). The National Infrastructure Plan that forms part of the Strategic Integrated Project (SIP) Plan 14 on higher education infrastructure, prioritises ICT connectivity for colleges, libraries and universities (PICC, 2012).

These policies and legislation illustrate how government prioritises ICT use in education at colleges and schools; however, Isaacs (2007, p 24) argues that the country "does not have a comprehensive policy that incorporates higher education, ABET, and technical vocational education". ABET refers to adult basic education and training. The policies and legislation on TVET college governance, lecturer recruitment, ICT infrastructure and funding for e-Education are mainly split between the DHET and DTPS mandates. Isaacs (2007) argues that this policy fragmentation presents challenges for coordination implementation, monitoring and evaluating a policy and legislation on e-Education.

1.9 Overview of state of Internet access in the Gauteng Province

Gauteng Province, often referred to as the economic powerhouse of South Africa since it contributes a third of the country's gross domestic product, is the host province of the eight colleges involved in my study. The colleges are spread within three of the country's biggest metropolitan municipalities – the cities of Johannesburg, Tshwane and Ekurhuleni – located in Gauteng province, as shown in the map in Figure 1.

Figure 1: Gauteng municipality map



Source: Maps of the world (2017) www.mapsoftheworld.com

According to the national census conducted in 2011, Gauteng province consists of 23.9% (12.2 million) of the South African population, the largest population size as compared to the other eight provinces. In comparison to other provinces, the province has the highest percentage (34.8%) of people above 20 years of age who have completed Grade 12 and higher education (18.1%) (Statistics South Africa, 2011a).

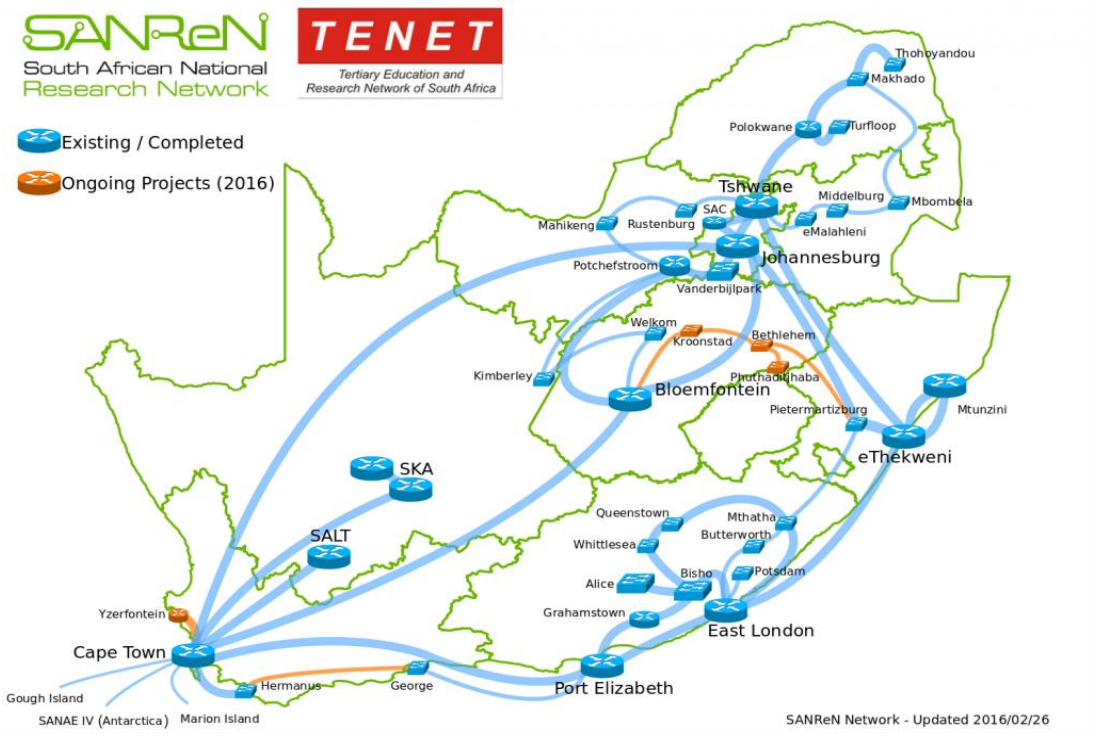
The general household survey of 2013 revealed that, in Gauteng province, 15.6% of households had Internet access, second to the Western Cape at 21% (Statistics South Africa, 2015), while mobile broadband penetration in Gauteng increased from 47.9% in 2015 to 50.5% in 2016, and Internet connection speed increased from 3.7 to 6.0 MBPS in the country (ICASA, 2017). It is estimated that 38.3% of households in Gauteng access the Internet through mobile means, while 15.6% access the Internet at work, and 15.1% of households access the Internet elsewhere (Statistics South Africa, 2011b). This brief insight on the forms of Internet access in Gauteng is important to understand, and highlight a dire state Internet access in the province which may adversely influence the extent of Internet used for learning and teaching beyond the classroom. Further, according to Abrahams and Goldstuck (2010), advanced fixed ICT networks are concentrated in six big cities, three (Johannesburg, Tshwane, Ekurhuleni) of which are located in Gauteng. Access and the proximity to this backhaul backbone infrastructure and Internet exchange points (IXPs) influence the cost and access to the Internet that may benefit the use of the Internet in learning and teaching in the province.

The Gauteng Department of Finance, through its Gauteng Broadband Network (GBN), is deploying a 4,500km fibre-optic transmission network with a ten-gigabyte connection speed that runs through Johannesburg, Tshwane, Ekurhuleni, Sedibeng and West Rand. This upgradable high-speed fibre-optic network is an endeavor to connect public buildings, schools and clinics, and Thusong community centres (IT News Africa, 2015). The city of Tshwane has connected 700 free Wi-Fi spots, while Johannesburg and Ekurhuleni has connected 408 free Wi-FI spots each (IT Web, 2016). Meanwhile there is general concern that the lack of access to a high-demand frequency spectrum 900MHz and 1800MHz, due to delays in broadcasting digital

migration, is hindering efforts to deploy new mobile broadband technologies, including 4G and LTE technologies, with adverse consequence on affordability, network quality and speed of the Internet (Mybroadband, 2016). The eight colleges involved in the study are located in three of the big cities that have access to the core network and are located in a province with an advanced telecommunications network, as compared to other provinces in South Africa.

In his budget-vote speech of 2017/18, the Minister of Higher Education and Training announced that the DHET plans to connect 267 TVET campuses around the country to the South African National Research Network (SANREN) high-speed network (RSA, 2017). The network shown in Figure 2 provides a ten-gigabyte-per-second (GBPS) connection speed, and connect universities in South Africa with research institutions around the world (Rasool, 2012).

Figure 2: SANREN backbone map: geographical



Source: SANREN (2017) http://www.sanren.ac.za/backbone/

1.10 Gauteng TVET colleges

There are eight public TVET colleges in Gauteng province considered in the study that are located in three major metropolitan municipalities in the province. A brief overview of the colleges is as follows:

Central Johannesburg College

Central Johannesburg College is a public TVET college and has campuses in Ellis Park, Park Town, Braamfontein, and the Alexander Township. The college offers 56 programmes and has a staff complement of 295, with 28 264 students.

Ekurhuleni East TVET College

Ekurhuleni East TVE college has five campuses in Kwa-Thema, Springs, Daveyton, Benoni, and Brakpan. The college offer a total of 46 program and have staff complement of 444 and 15 595 students.

Ekurhuleni West TVET College

Ekurhuleni West TVET colleges has six campuses in Alberton, Boksburg, Germiston, Kathorus, (Katlehong, Vosloorus, Thokoza) Kempton Park and Tembisa. The college offers 53 programmes and an estimated staff complement of 612, with 16 280 students.

Sedibeng TVET College

Sedibeng TVET College is situated south of Johannesburg and was formed in 2002; it has four campuses, in Vereeniging, Vanderbijlpark, Sebokeng and Heidelberg. The college offers 64 training programmes and has an estimated staff complement of 454, with 18 649 students.

South West TVET College

South West TVET College which is mainly located in Soweto, the largest township in South Africa and has campuses spread across Soweto, Roodepoort, Randburg and

Sterkfontein. The college offers a wide variety of vocational and training programmes and has a staff complement of 553, with 22 263 students.

Tshwane North TVET College

Tshwane North TVET college was established in 2001 and is situated in the Greater Tshwane Metropolitan area, with satellite campuses in Mamelodi, Pretoria Central, Temba Rosslyn and Soshanguve South and Soshanguve North. Tshwane North offers fifty programmes and an estimated staff complement of 68, with 22 820 students.

Tshwane South TVET College

Tshwane South TVET college was established in 2001, is situated in the Greater Tshwane Metropolitan area and has the Atteridgeville, Centurion, Odi and Pretoria West campuses. The college offers an estimated 61 courses and programmes and has a staff complement of 516, with 20 637 students.

Western College

Western TVET College has a number of campuses that are located in Krugersdorp, Amandelbult, Thabo Makote and Westonaria. The college provides a variety of programmes and has an estimated staff complement of 423, with 23 000 students.

As shown in Table 4, the total number of students enrolled in Gauteng TVET colleges is 167 238, and the number of lecturers is 3,365 (DHET, 2016a).

TABLE 4: Number of academic staff and students in Gauteng public TVET colleges in 2014

College	Academic Staff	Students
Central JHB	295	28 264
Ekurhuleni East	444	15 595
Ekurhuleni West	612	16 280
Sedibeng TVET College	454	18 649
South West Gauteng	553	22 263
Tshwane North	68	22 820
Tshwane South TVET	516	20 367
Western College	423	23 000
Total	**3, 365**	**167 238**

Source: DHET (2016a)

1.11 Research problem

Studies in OECD countries, Brazil and Lesotho, indicate that in spite of the availability of ICTs and access to broadband in schools, ICT integration and impact on education outcomes was still limited (Rolando, Salvador, Luz, 2013; Redekopp and Kalanda, 2015). However, Yasak and Alias (2015, p 89) argue that "the outcomes of the implementations of ICT in teaching and learning practices in TVET are yet to be fully explored." The authors further highlight that longitudinal studies on the efficacy of ICTs in TVET classrooms reveal that where the goal for teaching was cognitive

development, ICTs are less effective than when the learning goal was the acquisition of hands-on skills, and that the efficacy of ICTs in learning and teaching is subject-specific. While no specific data on the use of ICTs at TVET colleges is available, the data indicate that the use of ICTs in education in the majority of the countries in the Southern African region indicate is still at an embryonic stage (UNESCO – UIS, 2015).

According to Chigona et al. (2014) and Koehler and Mishra (2008), the quality usage of Internet in teaching at colleges is largely informed by the following key factors:(i) lecturer capacity; (ii) access to requisite ICT infrastructure; (iii) pedagogical and technical support; (iv) enabling policy environment; and (v) contextual nuances such as attitudes and values of lecturers towards the Internet). UNESCO (2011) asserts that while these factors are important for the effective use of ICTs in education, lecturers' skills and knowledge in using the Internet in learning and teaching are uppermost. There is an insufficient understanding of how these factors influence the use of the Internet in teaching at colleges, since the majority of the studies on the use of ICTs in education are focussed on primary, secondary and university education levels. The majority of TVET college lecturers lack the requisite professional qualifications essential for the effective use of the Internet in learning and teaching. According to the policy on minimum qualifications for teachers, knowledge and use of ICTs in instruction is an integral subject discipline for teacher qualifications (DHET, 2011). For this reason it can be reasonably inferred that lecturers who do not have teacher qualifications, also do not have requisite competencies to effectively employ ICTs in the delivery of curricula. Emerging from the survey conducted by DHET, which focussed on year 2009 to 2011, lecturers lack subject knowledge of the curriculum with more than two-thirds not possessing the professional teaching qualifications

necessary to assist students to improve their knowledge of their chosen subject (Koen, 2011).

This survey corroborates with the national survey conducted by the HRSC in 2010 that found that 57% of TVET lecturing staff do not have degree or diploma qualifications (HSRC, 2011). ICTs and the Internet afford learners and teachers with numerous possibilities for improving learning and teaching; however, these technologies also place extra demands on lecturers who often do not have the skills to leverage these opportunities effectively (DHET, 2007).

In addition to lecturers' competencies and skills, the quality use of ICTs and the Internet in teaching is also informed by accessing ICT infrastructure, affordable and reliable Internet connectivity and curriculum content (Becker,1999; Brazilian Network Information Centre, 2014) Equally important, institutionally based support, including access to technical and curriculum support and the availability of funding and time, are some of the key factors that inform effective Internet use in teaching (Ndlovu and Lawrence, 2012). It is not understood how these factors influence lecturers' Internet use in teaching at TVET colleges in South Africa; hence the need for this study.

It is also not understood how the factors impact on the forms (what lecturers use the Internet for) and characteristics (how they use the Internet) of Internet use in teaching. An understanding of these phenomenon will assist TVET colleges and policy makers to design interventions and policies that provide an integrated approach for ICT use and access for learning and teaching at TVET colleges.

1.12 Objectives of the study

This study seeks to examine factors that influence lecturers' Internet use at Gauteng public TVET colleges, and seeks to examine the extent to which lecturers use the

Internet in teaching in order to achieve improved teaching outcomes. The study seeks to expand on the TPACK theoretical framework which describes the key knowledge areas essential for the effective use of technology in teaching (Graham, 2011; Koh and Chai, 2014). The research examined the practical knowledge domain amongst college lecturers through the use of an adapted TPACK framework. The practical knowledge domain is not part of the original TPACK framework, but is an important competency for college lecturers whose primary role also include mediating the development of cognitive and practical competencies amongst students (Avis, 2014). Meanwhile, according to Worden (2015), one of the major critiques of the TPACK framework is failure to recognise the role of context in teachers' knowledge. In this regard the research examined key contextual factors influencing Internet use in teaching in Gauteng TVET colleges, but limited these to the availability of reliable Internet connectivity, access to computers, institutional policies and plans, and macro factors on funding availability and curriculum content.

The study further explored the forms (what the Internet is used for in teaching) and characteristics (how the Internet is used) by lecturers in teaching at colleges. Brown (2015) and Parchoma (2014) stress the importance of understanding how technology is used in learning and teaching in order to understand the factors that induce improvement in learning so that these could be replicated. The teacher-development framework in conjunction with a blended learning institutional development model, to be discussed in Chapter 2, is employed in the study to provide insight into the extent of Internet use in teaching at colleges. The teacher-development framework provides insight into how lecturers' competencies inform lecturers' Internet use in instruction, while the blended learning institutional development models highlight institutionally

based factors that enable lecturers use of the Internet in teaching (DHET, 2007; Garrison and Vaughan, 2013; Graham, Woodfield and Harrison, 2013).

The study only explored and analysed the impact of two macro-policy issues, on funding and curriculum content, that influence lecturers' Internet use in teaching. These macro-policy issues emerged through the research findings. The policy landscape on TVET colleges and telecommunications in South Africa which forms part of the background and context underpinning the study is presented in Chapter 1, and is used for the analysis presented in Chapter 5. The study did not examine the extent of lecturer integration of various knowledge domains in teaching, as articulated in the adapted TPACK framework, nor did it focus on the relationship amongst these factors, but focussed on lecturers' possession of these knowledge constructs. The parsimony versus comprehensiveness tension existed in reaching a decision amongst a myriad of potential factors for exploration that influence the use of the Internet within the vocation education setting. In this regard, factors such as the gender and age of lecturers' and students' academic profiles were not explored in the study.

This study on the factors that influence Internet usage amongst public TVET college lecturers in the province of Gauteng is an endeavor to understand the factors that underlie Internet use at TVET colleges and the extent of Internet use. The knowledge and insight gathered will contribute towards a body of knowledge on the effective use of Internet teaching in order to prepare students for the demands of the emerging knowledge society and economy. In summary, the key objectives of the study are as follows:

(1) To investigate factors that influence Internet use in teaching at public TVET colleges

(2) To explore the forms (what the Internet is used for) in teaching and characteristics (how the Internet is used) by lecturers in teaching

(3) To examine the extent of Internet use in teaching at public TVET colleges.

1.13 Structure of the research report

A brief outline of the five chapters of the research report is presented as follows:

Chapter 1

This chapter presented an introduction to the research and highlighted the research problem and objective of the study. The chapter also articulated background information and context that informs the phenomenon under investigation.

Chapter 2

Chapter 2 presented a set of five theoretical frameworks and models that constitute the theoretical and conceptual framework that informs the study. The frameworks and models used in this research included the adapted TPACK framework, teacher development framework, blended learning institutional development model, technology adoption model and the institutional level factor theoretical framework.

Chapter 3

This chapter provided the overall research methodology that underpinned the study and provided a description of the phenomena that were investigated. The chapter further reiterated the research problem and the objectives of the study. It also articulated the main research questions that informed the study.

Chapter 4

The main data findings of the study were presented in this chapter. Both qualitative and quantitative data are presented and categorised according to the main themes in line with the key objectives of the study.

Chapter 5

This chapter presented an analysis of the key findings arising from the study. Through the use of theoretical frameworks and models and the data-triangulation technique, quantitative and qualitative data were analysed to provide responses to the study's research questions.

Chapter 6

This chapter concluded the study and presented the recommendations and highlighted study limitations and also identified possible areas for future research.

Chapter 2: Literature review

2.1 Introduction

This chapter articulates the key literature and theories used in the study on factors that influence lecturer Internet use in teaching at Gauteng public TVET colleges. It further dedicates and defines the terminology on the use of ICTs in education since this discipline is replete with terms and definitions that are interrelated but may have different meanings and applications. The chapter briefly discusses the constructivism paradigm to learning teaching and its relevance in Internet use in promoting advanced 21st century skills such as collaboration, critical thinking and problem solving amongst others. In addition, the chapter also outlines lecturer-and institutional-level factors that underpin Internet use in teaching. There is wide consensus in literature that amongst the many factors that influence the use of ICT in teaching and learning, knowledge and skills competencies use of the technologies are paramount (Koehler and Mishra, 2008; UNESCO, 2011; Papier, 2011). For this reason the chapter discusses the widely used TPACK framework for teacher knowledge to effectively use the technology in teaching. The blended learning institutional development model, and the teacher development framework are discussed to provide a theoretical articulation on the forms, characteristics and extent of Internet use amongst college lecturers in teaching. The chapter also explores theories on the formulation of attitudes towards the use of technology in teaching. The technology adoption model is discussed in the study to provide a theoretical insight on the influence of lecturer attitudes on Internet use in teaching. In discussing the institutional level factors that influence Internet use in teaching, the Institutional level factor theoretical framework is employed as a basis for discussing these factors. The literature review chapter concludes by presenting a

theoretical and conceptual framework that guides the research process and informs the interpretation and analysis of data.

2.2 Definition of essential terminology for the study

The discipline of technology use in education is replete with a range of terms and concepts that are related and yet have nuanced different meanings and interpretations.

Defining concepts on use of technology in teaching

The interchangeable use of ICT terminology in education that includes Internet-blended learning and e-Learning use in education is important to define, as these terms are generally used interchangeably but have distinctly different meanings. E-learning is increasingly used to describe instruction delivery through the use of ICTs including Internet, Intranet, CD-ROM or DVD and virtual learning environments. However e-Learning is increasingly associated with web-based curriculum instruction, and the delivery of learning content through the web browser over networks (Assareh and Bidokht, 2011). While there are elements of this e-Learning definition that may be relevant to the study, the e-Learning concept, as described above, seems to be limiting as the study is focussed on Internet use in instruction and not the broad use of ICTs in learning. Furthermore blended learning is regarded as a form of learning in which curriculum delivery is presented through the use of both traditional face-to-face and online instruction methods. For this reason, this definition is also inadequate since the study in not addressing face-to-face instruction methods. The concepts and theories on e-Learning and blended learning are both relevant to the study, since the Internet is a subset of ICTs and forms part of the value chain for e-Learning and blended learning. Clear description and delineation of these terms and their use in pedagogy is a nebulous exercise. Loogma, Kruusvall and Ümarik (2012, p 808) highlight that

"the concepts of ICT use in teaching and learning and e-learning as overlapping concepts, considering the use of ICT as the inevitable precondition for the implementation of e-learning." Meanwhile Shea (2007) posits that the use of the Internet in all these forms of curriculum-delivery methods predominates. For the purpose of the study the terms "Internet use" and "ICT use" will be employed interchangeably to refer to the use of the Internet in teaching at colleges in any form, while the broad theories on blended learning and the use of ICT in education are employed to assist, explain and illuminate the fundamental theoretical concepts underpinning the study.

Defining vocational education

Vocational education is broadly defined as "a form of education involving, in addition to general education, the study of technologies and related sciences and the acquisition of practical skills, attitudes, understanding and knowledge relating to occupation in various sectors of economic and social life" (Peter, Abiodun and Jonathan, 2010, p 59), while Inayat et al. (2013, p 154) defines vocational education as "career based technical education and skills development training". The White Paper for Post-School Education and Training posits that technical and vocational education and training colleges aim to provide skills, knowledge and attitudes that are responsive to labour-market trends and employment (RSA, 2013a). On the other hand, Avis (2014) argues that beyond addressing the needs of the economy and employers, vocational education should also address socio-economic imperatives and personal development. The underlying similarity in these definitions and meanings is the emphasis on the mandate of the colleges to provide vocational training and practical skills training and knowledge that is responsive to labour-markets trends and socio-economic conditions in the country. These definitions are deemed relevant to the study

in light of the proliferation of the Internet in many careers and work opportunities, and to the need for TVET colleges to develop competencies amongst students that are responsive to the needs of the emerging knowledge economy and social-development imperatives.

Defining teacher and lecturer

The term “teacher” is used in the study interchangeably with the term “lecturer”, given the widespread literature on ICT use in primary and secondary education which is associated with the term “teacher”, and limited literature and studies on ICT integration in vocational education that are associated with the term “lecturer”. In line with the FET Act No 16 of 2006 that removed the term “educator” and replaced it with “lecturer” (RSA, 2006), for the purpose of this research the term “lecturers” will be used instead of “teacher” except if direct reference to literature is required.

Definition of the Internet

The online Wikipedia defines Internet as “a global system of interconnected computer networks that use the Internet protocol suite (TCP/IP), to link several billion devices world-wide” (Wikipedia, 2016). The Webopedia (2014) defines the Internet as a massive network that connects millions of computers globally, in which any computer can communicate with any other computer as long as they are both connected to the network. Often the term Internet is used interchangeably with World Wide Web (WWW); however Webopedia distinguishes the difference and says the Web is a form or a model for accessing and sharing information over the Internet. While these Internet definitions focus on functionality and services, the Broadband South Africa Connect policy defines broadband Internet “as an ecosystem of high capacity, high speed and high quality electronic networks, services, applications and content that enhances the variety, uses and value of information and communications for different

types of user" (RSA, 2013, p 18). Meanwhile Wolcott, Press, McHenry, Goodman and Foster (2001, p 5,) argue that "the Internet is not a single innovation but it is a cluster of related technologies that must be present together to support adoption decision by end user." The authors further cite other services linked to the Internet value chain that includes communications-networks, software and end-user devices and content, to mention a few. This definition of the Internet is relevant for the study that seeks to explore factors that inform Internet use in teaching beyond the technical definition of the Internet.

2.3 Constructivism paradigm and use of the Internet in teaching

This study on Internet use in teaching at TVET colleges is informed by the constructivism paradigm, which supports teaching through the use of the Internet that is student-focussed to advance problem-solving skills, collaboration innovation and practical skills amongst students (Tam, 2000). International studies conducted on the approaches to teaching and learning indicate that the emerging constructivism approach to teaching is far more superior in developing high-order cognitive skills amongst students as compared to the traditional teaching instructional approach (UNESCO, 2002). The following key constructivism-principles approach to learning and teaching is pertinent to enhancing the quality of learning and teaching at colleges through the use of the Internet: (i) deep knowledge acquisition, meaningful interaction and collaborative; (ii) knowledge construction and formulation of meaning from previous experience; (iii) fostering of critical thinking problem solving and negotiation skills; (iv) active collaboration and participation of teachers and learners in the teaching process (Tam, 2000; Ozkal, Tekkaya, Cakiroglu and Sungur, 2009). The constructivism paradigm of instruction is relevant for vocational education that aims to

provide students with 21st Century skills, and the Internet provides for enabling infrastructure to produce that outcome (Fox, et al., 2012).

The use of Internet-based resources, as exemplified in Table 5 teaching, provides synchronous or asynchronous interaction between students, lecturers and content, and facilitates for active learning by allowing students to input into the learning process, and engenders high cognitive skills (Woo and Reeves, 2007). Moreover the UNESCO ICT competency framework for teachers (UNESCO, 2011) and Bester and Brand (2013) highlight that the use of ICTs and the Internet in curriculum delivery deepens students' capabilities to solve real problems, collaborate and innovate new forms of knowledge.

Furthermore, Internet-based applications, including chat groups, email and social media amongst others, enable lecturers to collaborate and share knowledge on curriculum content, pedagogical support, and participate in the co-production of knowledge through adapting and improving the curriculum content (Brown, 1998; Tam, 2000; Hismanoğlu, 2010). These Internet-based affordances have the potential to enhance teaching and learning experiences at colleges.

As a consequence of the convergence of the technologies and services, the Internet enables the delivery of multiple forms of curriculum content such as voice, text, video, and graphics content, and can also be made available using a variety of devices. This capability to present and access educational content in these mediums and formats allows for learning and teaching to be customised for various learning styles of students and meaningful learning and teaching through interaction, application and reflection on content (McDonald et al., 2001).

2.4 Use of internet in teaching and vocational education and training

The use of Internet multimedia applications that provide for the integration of video, audio and texts, enables customised learning to students' learning styles, and therefore promotes the participation of lecturers and students in learning, and enhances the teaching process. The World Wild Web (WWW) provides students and lecturers with access to a wide selection of databases to facilitate access to a broad spectrum of knowledge and content to deepen the teaching process. Parchoma (2014) cites access to diverse ideas and theories, and online collaboration, as some of the affordances provided through Internet usage that have the potential to improve knowledge construction and solve real problems. The emergence of the Web 2.0 version of the Internet, with features that did not exist before, allows for enhanced participation, interaction and collaboration in knowledge creation (Rolando, Salvador, Luz, 2013).

Social media which is an integral part of Web 2.0 Internet technologies is increasingly used beyond sharing of personal information, and also used for knowledge sharing within and across organisations (Ahmad, Ahmad, Ahmad and Zakaria, 2018). Social media is defined as a set of Internet based technologies and applications such as Facebook, blogs, Wikis and instant messaging amongst others that enable enhanced interactivity, cooperation and sharing in content and knowledge creation between organisations, teams and individuals (Filo, Lock and Karg (2015). The affordances of social media have a potential to advance efforts of learning and teaching at colleges. Table 5 illustrates a range of Web 2.0 Internet technologies with various features that can potentially be used in curriculum delivery. The use of these Internet technologies in education promote the principle of lifelong learning that allows for learning and teaching that transcends the barriers of time and space, and facilitates knowledge

acquisition and construction outside the confines of traditional classrooms (ITU, 2013; Assareh and Bidokht, 2011).

Table 5: A typology of Web 2.0 learning technologies

Functionality	Technology	Example	Synchronicity
Online reflection	Weblog	Blogger, Edu blogs	Asynchronous
Online collaboration	Wiki	BP wiki, Wetpaint	Asynchronous
	Audio discussion board	Wimba voice, voice thread,	Asynchronous
Social spaces	Social network	Facebook, Twitter,	Synchronous
Interactive text messengers	Synchronous text discussion	WhatsApp, Facebook messenger	Synchronous
Repository	Video sharing	YouTube	Asynchronous
	Podcast	Houndbite, Chirbit	Asynchronous
Social bookmarking	Social bookmarking	Delicious, Dlingo, Simpy	Asynchronous
3D immersive virtual	Game virtual worlds, social virtual worlds	World of Warcraft, second Life, Active Worlds	Synchronous

Source: **Adapted from Hew and Cheung (2013)**

In a vocation educational context, Fox et al. (2012, p 1) state that high-speed broadband is essential in many spheres of lives, including work and personal, civic and professional lives, and most professions "from mechanics to accountants to physicians depends on technology to conduct their work, grow their business and collaborate with their colleagues – both locally and globally." Further, the Internet provides for the linkage of academic components of the curriculum to the workforce practices and the real world (Summak and Samancioğlu, 2011).

2.5 Technology affordances and nuanced complexities

Arguably, the majority of literature on ICTs use in education cites the benefits of Internet usage in teaching and learning (Conole, 2010; Shava, Chinyamurindi and Somdyala, 2016; Drent, M. and Meelissen, M., 2008). Notwithstanding the benefits of the Internet in teaching, Wijekumar, Meyer, Wagoner and Ferguson (2006) caution against the tendency to embellish affordances of technology in learning and teaching,

and cite a high expectation of technology benefits and assumptions that the use of digital resources, including the Internet, can improve teaching and learning. Informed by the perspectives on the ontology of technology affordances in learning and teaching, these authors argue that the properties of these technologies in themselves do not engender positive outcomes when appropriated in teaching. The authors further argue that the effectiveness of these technologies is contingent on the contextual nuances that surround the technologies and the ability to use them in teaching. It is therefore necessary to explore and understand key factors that inform the effective use of the Internet in teaching at colleges, and illuminate the context that may advance or undermine the effective use of the Internet in teaching.

2.6 Factors that inform Internet use in teaching at colleges

Literature identifies a myriad of factors that influence ICTs and Internet use in teaching. Key amongst these factors includes access to ICT infrastructure, skills competencies, lecturers' attitudes, the state of technical support, institutional policies and plans, and the availability of time, curriculum content and funding, amongst others (Chigona, et al., 2014; Koh, Chai and Tay, 2014; Drent and Meelisen, 2008). A study conducted by George (2014) on the impact of ICT use in teaching classifies the factors that influence ICT use in learning and teaching. The factors are classified into three broad categories that include teacher-level, institutional-level and learner-level factors. The leaner-level factors' category is not explored in this study due to the limited scope of the study, but two macro-contextual factors that include funding and curriculum-content policy that persistently emerged in the study findings are explored.

2.6.1 Lecturer level factors

This section presents the literature review on both the endogenous and exogenous lecturer level factors that influence Internet use in teaching at TVET colleges.

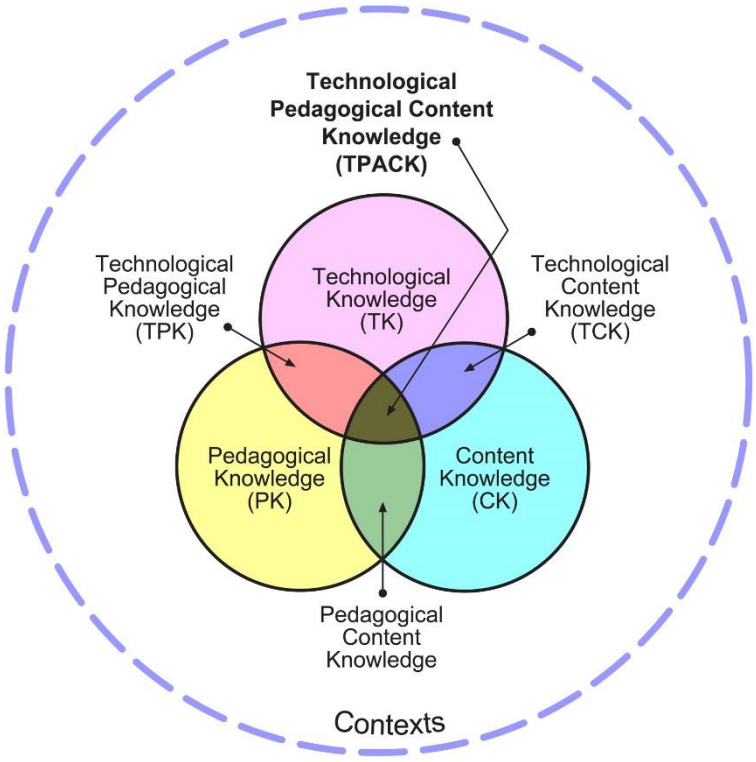
Lecturer competencies for internet use in teaching

Amongst the many factors that influence Internet use in teaching, inadequate lecturer skills and knowledge to use the Internet in learning and teaching are uppermost (UNESCO, 2011). Canole (2010) also corroborates on this viewpoint, and stresses that the reasons behind uptake and the usage of online educational resources are complex and multifaceted, but to a large extent are associated with the skills requisite amongst teachers. Meanwhile, according to the OECD (2016, p 49), "the use of digital technologies in formal education and vocational training has the potential to improve learning, although the outcomes depend on the capacity to link these tools to effective pedagogy." Furthermore, Loogma et al. (2012) stress that the sustainability of e-Learning interventions at vocational education institutions is dependent on lecturers' skills and competencies. Studies in Rwanda on Internet diffusion demonstrate that sophisticated use of the Internet is linked to high levels of education and skills (Mlay et al., 2013). The research on factors that influence Internet use in teaching at TVET colleges utilises the Technology Pedagogy and Content Knowledge (TPACK) framework for technology use in teaching. This framework was deemed appropriate for the study since it is a widely used framework for technology integration in teaching and it illuminates three sets of knowledge domains which include technology knowledge, pedagogical knowledge, and content knowledge for effective integration in pedagogy (Koh and Chai, 2014; McDonald et al., 2001). While it is a widely used framework, Tømte, Enochsson, Buskqvist and Kårstein (2015) caution that most studies on the implementation and validation of the TPACK framework are largely focused on primary and secondary education, and not vocational education. Nonetheless the TPACK framework has evolved and is widely regarded as a

theoretical tool for understanding and assessing a range of competencies on technology use in instruction (McDonald et al., 2001).

According to Koehler and Mishra (2008) who originally introduced the TPACK framework, teachers need to demonstrate a three dimensional level of knowledge constructs that include curriculum content and pedagogical knowledge as well as technology knowledge in order to develop higher levels of cognitive development amongst students through the use of technology. The authors further explain that, through an interactive application of the three knowledge domains, deeper levels of learning and teaching are promoted, as represented through a Venn diagram with overlapping circles in Figure 3.

Figure 3. The Technology, Pedagogy and Content Knowledge Framework and its knowledge components



Source: Koehler and Mishra (2008)

It is important to describe and explain the three components of the TPACK framework to illustrate the meaning and the context in which the elements of the framework are used in the study. The first knowledge construct, is the technology knowledge (TK), and refers to lecturers' ability to use and install hardware operating system software, and the ability to use basic applications such as Word, Excel, Internet navigation and email (Koh and Chai, 2014; Graham, 2011). Technological content knowledge (TCK) is the subset of the technology knowledge domain and it focusses on how content is presented through technology and how technology influences the representation of content. According to Graham (2011, p 1956), technology knowledge is implicit in the content knowledge since "curricular knowledge was defined as teachers' knowledge of the available educational tools and materials including software, programs, visual material and films." Loogma et al. (2012) points out that ICT-related competencies amongst lecturers suggest their levels of innovativeness and willingness to adopt technology for instruction. George (2014) argues that technology competence is the prerequisite for teaching a particular content through the use of technology.

The second knowledge construct, pedagogical knowledge (PK), refers to a teacher's knowledge of teaching methods which include knowledge of formulating clearly defined learning outcomes, competent use of relevant content, appropriate selection of learning strategies, and feedback and evaluation of the learners (Worden, 2015). The national policy on minimum requirements for teacher-education qualification also cites specialised pedagogical content knowledge which encapsulate the knowledge of how to present concepts, methods and subject discipline rules as an added dimension of the pedagogical knowledge (DHET, 2011). On the other hand, in the context of vocational education, Avis (2014) stresses the value of vocational pedagogy knowledge that puts emphasis on instructional practices and methods that

encapsulate work-based practical knowledge and disciplinary subject knowledge. The technology pedagogical knowledge (TPK) construct is a sub-set of pedagogy knowledge which entails the knowledge of various technologies and their use in various methods and strategies for curriculum delivery (Koehler and Mishra, 2008).

Sound pedagogical and content knowledge enables lecturers to assemble subject content and deliver meaningful instruction through the use of the Internet. (Ndlovu and Lawrence, 2012).

According to Graham (2011), the third knowledge domain refers to content knowledge (CK) which encompasses the knowledge of blending content and pedagogy, and the organisation and modification of content for instruction. The author states that the lecturer's knowledge of integrating content and pedagogy has the potential to assist the lecturer to navigate through multitudes of complex, multi-located and fragmented Internet content and to engender pedagogically grounded learning. Ndlovu and Lawrence (2012) argue that the quality use of technology is possible if teachers possess strong pedagogical and content knowledge to stimulate learners' thinking processes to an extent that learners are able to independently analyse and solve problems through the use of the technology.

Arguably the TPACK framework is complex because it does not only entail the lecturer knowledge of content, pedagogy and technology in isolation from one another in teaching, but also requires lecturers to understand the complex interaction of all the three knowledge constructs in various contexts (Graham, 2011; Koehler and Mishra, 2008). However, UNESCO (2003, p18) states that knowledge of technology use in teaching is about "appropriate selection, use, mix, fusion and integration of many sets of competencies including, but not exclusively, those in pedagogy and technology." The often cited critique of the TPACK framework is the difficulty to delineate and neatly

define the knowledge domains of the framework due to technological developments and contextual variations (Olofson, Swallow and Neumann, 2016).

The DHET policy on minimum requirements for teaching at colleges codifies pedagogical knowledge, specialised subject content knowledge, practical knowledge, and technology knowledge as minimum requirements for teaching at colleges (DHET, 2013b). For this reason a lecturer's professional qualifications are an important barometer for assessing that lecturer's competencies in these knowledge domains.

Is practical knowledge a missing link in the TPACK framework?

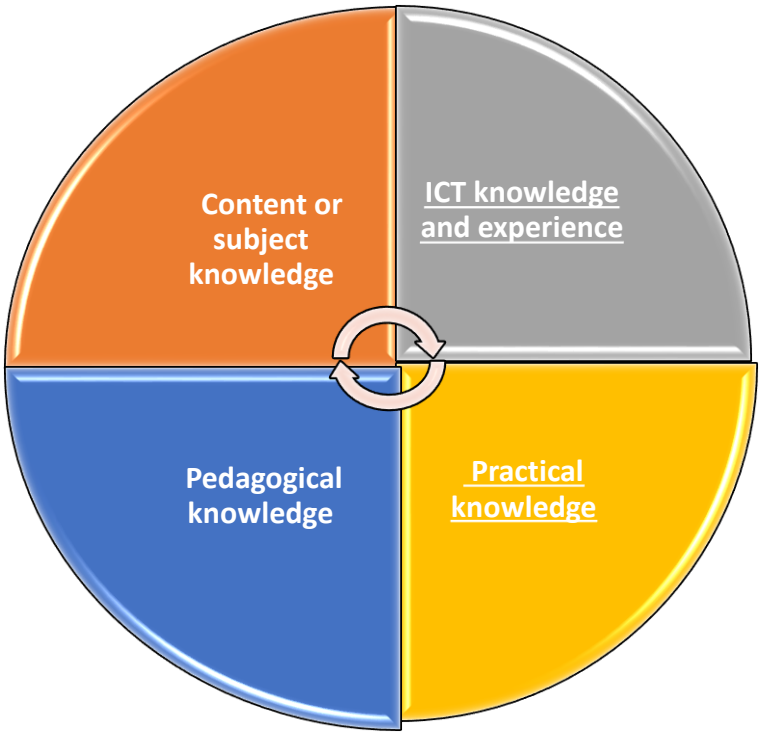
The TPACK framework provides a useful approach for understanding different competencies useful for the effective use of technology in teaching; however, within the context of vocation and training, the TPACK framework does not address practical knowledge, which is an essential prerequisite for lecturers teaching in a TVET college context. Papier (2011) posits that there are three sets of competencies that are important for lecturers to teach in vocational and training sectors, and these include subject content knowledge, pedagogic knowledge, and practical workplace knowledge, and the last-mentioned competency is not addressed in the TPACK framework. Practical knowledge refers to lecturers' applied knowledge and practical experience gained through industry or at teaching sites (Papier, 2011). According to Zillien and Hargittai (2009), time spent online and practical exposure signify competencies in the use of the Internet and equipment. Meanwhile Bathmaker (2013) refers to workplace-practice knowledge as an embodiment of practice-focused knowledge, technical knowledge which includes the ability to use equipment and the application of theoretical and practical knowledge. Furthermore the National Qualification Framework Act 67 of 2008 policy on the minimum requirements for

teacher-education qualifications identifies the following key elements in practical knowledge:

- Ability to analyse and use various context though the use of various resources in order to theorise practice
- Knowledge to use authentic and simulated classroom environments
- Ability to use workplace to stimulate learning through observation, and learning in practice.

The policy further identifies practical learning or work-integrated learning as one of the items of knowledge required for TVET lecturer qualifications. (RSA, 2011). It is clear that the original TPACK framework is silent on the practical knowledge, which is important in a vocational education setting. In acknowledging the centrality of practical knowledge for teaching in a vocational education setting, I adapted the original TPACK knowledge framework, as shown in Figure 4, to include the practical knowledge domain.

Figure 4: Adapted TPACK framework



Source: Adapted by researcher from Koehler & Mishra (2008)

The role of experience in strengthening the knowledge domains for effective teaching

Stevenson (2001) posits that tacit knowledge is acquired through experience and it manifests in various forms; hence the importance to understand the role of experience in various knowledge domains, and its influence on Internet use in teaching. While tacit knowledge may be difficult to codify and quantify, however it is largely acquired through experience and routinized procedures and constitutes an *aide memoire* upon which to build other forms of knowledge (Eraut, 2000; Stevenson, 2001). For this reason HSRC (2011) posits that qualification is not the only measure for lecturers' effectiveness; however, industry experience and teaching experience are as critical in determining lecturers' qualifications for the job.

Lecturer attitudes and technology use in education

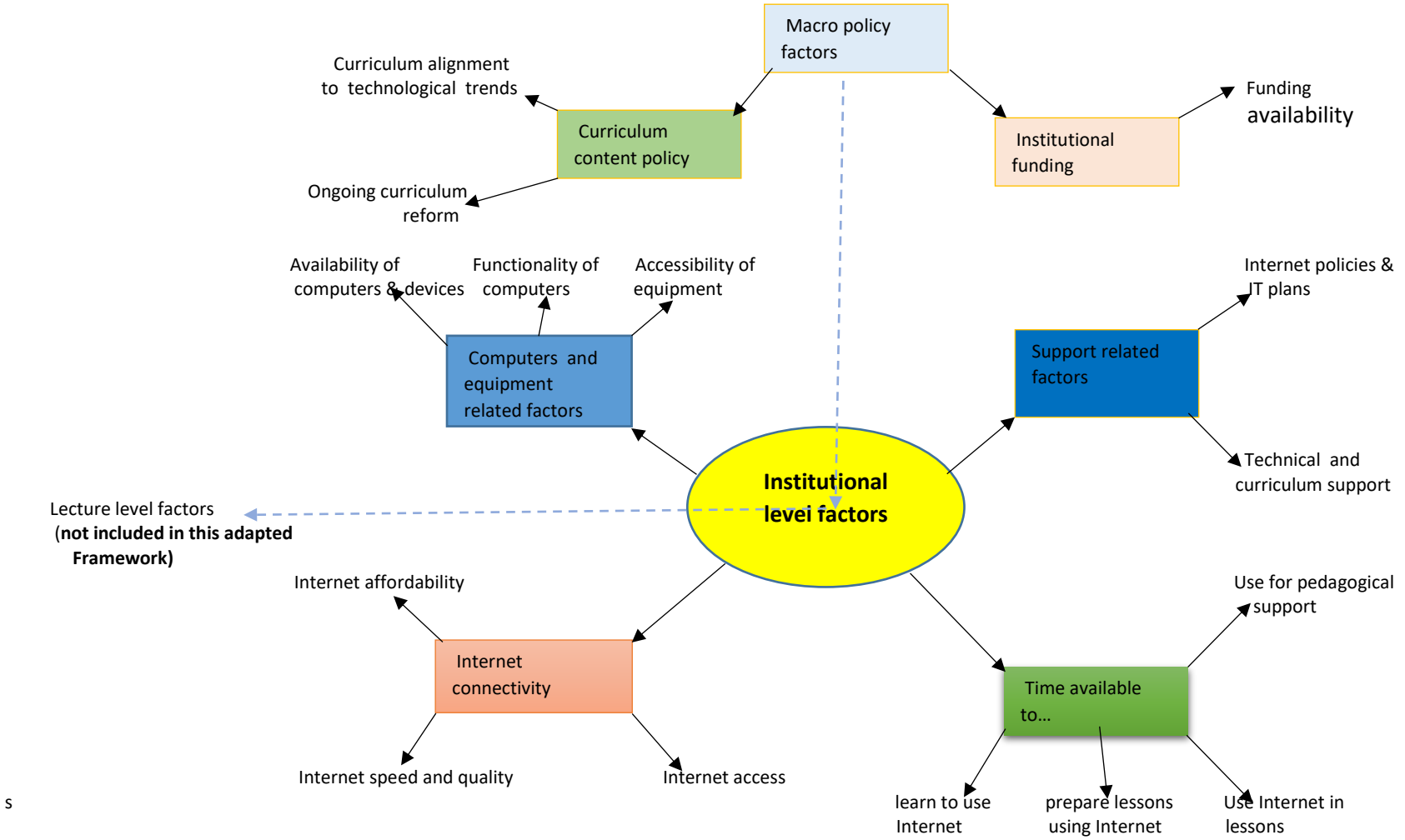
A number of studies highlight the significant role of positive attitudes in the adoption and appropriation of ICTs in teaching (Baş, Kubiatko, Sünbül, 2016; and Hew and Brush, 2007). According to Baya'a and Daher (2015), the values and attitudes of teachers and lecturers constitute a substantial influence on the adoption and meaningful usage of ICTs and the Internet in learning and teaching. John (2015, p 238) defines attitudes as "a disposition to respond favourably or unfavourably to an object, person, institution, or event". Literature identifies different perspectives of the formulation of attitudes in technology use in teaching. According to the behavioural theory, the impetus for an individual action is generated by the effect of a positive attitude on individual behaviour, and that attitudes are rooted in individual beliefs (John, 2015). The technology acceptance model (TAM), used in the research as one of the five conceptual models, posits that individual beliefs and perceptions about the usefulness and ease of use of technology inform their attitudes and general behaviour towards the use of technology innovation in learning and teaching (Baş, et al., 2016; Porter and Donthu, 2006; Hismanoğlu, 2010). The model also proposes a number of key constructs that inform attitudes towards technology use in teaching, and these include (i) teacher perception of their skills to use technology in teaching, (ii) perceived compatibility of the technology to teachers values, beliefs, needs and past experiences, (iii) teacher perceived relative advantage of the new technology innovation to the traditional method of learning and teaching, and (iv) computer experience (John, 2015). Meanwhile Koh, Chai and Tay (2014) and Wetzel (2001) argue that lecturers with strong beliefs in the value of innovation generally possess positive attitudes towards technology innovation in learning and teaching and are more

resilient to navigate both personal and institutional barriers that may deter them from introducing new and innovative technology solutions in the delivery of the curriculum.

2.6.2 Institutional level factors

The study employs the adapted institution-level factor theoretical framework from George's (2014) theoretical framework of factors affecting teachers' use of technology to examine institutional level factors that influence Internet use in teaching at colleges. The usefulness of this framework for the study is derived from rigorous research process employed to arrive at the body of evidence encapsulated in the framework. The research rigour that George (2014) appropriated in developing the framework includes a review of 48 research papers, and the presentation of 43 factors affecting teacher use of the technology through clustering the factors, and frequency counts to show the extent of the categories. The following section discusses the key institutional-level factors of the theoretical framework as shown in Figure 5.

Figure 5: Institutional level factor theoretical framework



Source: Adapted from George (2014)

Computer equipment devices and Internet connectivity

The literature on ICT integration in education highlights that access to ICT hardware, including computers, is one of the key institutional factors that promotes the use of the Internet in teaching (Chigona, et al., 2014). According to George (2014), a lack of infrastructure and devices, including a skewed students-to-computer ratio, creates difficulties for teachers to facilitate teaching and discourages lecturers from using technology in teaching. Computer density is measured through student-to-computer ratios and refers to the mean number of students using computers for instruction in aggregate student populations (UNESCO–UIS, 2015; NCES, 2002). George (2014) further highlights that computers must be reliable and not outdated in order to promote computer use for pedagogy, and the location and that scheduling for computer laboratory access must be carefully planned to ensure accessibility. The proliferation of smartphones, tablets and laptops provides alternative options for curriculum delivery through the use of the Internet, which transcends the confines of time and space, and at lower costs (Conole, 2010; Shava, Chinyamurindi and Somdyala, 2016; and Franklin, 2015). On the other hand, Laxman and Holt (2017) caution that the use of mobile devices has the potential to disengage and distract students, but stress that, overall, mobile devices can improve students' motivation to engage in learning tasks and enhance the teaching experience.

In addition to access to devices, equipment and computers, literature identifies access to Internet connectivity as fundamental to its effective use in curriculum delivery (Brazilian Network Information Centre, 2014; Ndlovu and Lawrence, 2012). Becker (1999, p 27) says that 'by far the most important variable in predicting teachers' Internet use is the teacher's level of classroom connectivity'. The quality

of Internet connection is dependent on a number of variables, including the type of connectivity, cabling, type of devices and equipment used, such as servers, computer processing capacity, the number of users, and software and network configuration (Wang, 2015). Ndlovu and Lawrence (2012) and Akoojee (2008) acknowledge that educational settings with better or advanced digital equipment are more inclined to use ICTs for learning and teaching, while a lack of qualified lecturers, minimal ICT infrastructure and a high cost of connectivity, may constrain the spread and use of the Internet at colleges.

Technical and curriculum support and Internet use

The availability of technical support and curriculum support is important to advance the use of technology in instruction. Blignaut et al. (2010) state that amongst the many variables that influence the use of ICT in teaching and learning is access to technical and pedagogical support. Chigona et al. (2014) say that inadequate technical support may discourage lecturers from using technology as they would not tolerate a lack of technical support to resolve a simple technical fault. A study on the factors affecting teachers' use of technology in education has revealed that, amongst the institutional level factors informing ICT use in teaching, the accessibility of equipment and technical support is jointly rated as uppermost (George, 2014). These forms of support can be provided through direct face-to-face mediation or mediated through technology, as shown in lecturers' support system (LSS) offered by DHET or through the Cisco Networking curriculum which provide these forms of support (DHET, 2014b; Cisco, 2010). Meanwhile online support is vital for supporting the use of technology as a medium of instruction (George, 2014). Blignaut et al. (2010) emphasize the importance of the availability of onsite pedagogical advisors to provide curriculum support.

Institutional policies and plans to support Internet use

The literature locates the prevalence of institutional policies and plans as an important indicator in an institution's efforts to adopt technological use in education, and illustrates institutional commitment to routinize technology use and foster the assessment and evaluation of its usage (Wetzel, 2001; Garrison and Vaughan, 2013; Graham, Woodfield and Harrison, 2013). Furthermore Porras-Hernandez and Salinas-Amescua (2013) posit that institutional policies and plans must encapsulate, amongst other things, procedures on Internet access and usage, ICT infrastructure planning, training and professional development to support the innovative use of technology in teaching. In addition, Vanderlinde, Braak and Dexter (2012); NCES (2002); and Graham, Woodfield and Harrison (2013) identify curriculum support, IT security, budgets, upgrading and the maintenance of equipment, and an incentive scheme for lecturers, as the key elements of the institutional policies and plans that support Internet use in learning and teaching. George (2014) highlights that the plan must detail the strategies of what the institution hopes to achieve through the policies and plans. Ananiadou and Claro (2009) further argue that plans and policies must include clearly defined assessment policies for both learners and students on technology use as an essential incentive for teachers and students to prioritise the use of technology (Internet) in learning and teaching. Institutional plans and policies are important in providing and enabling a college environment to advance the innovative use of technology in teaching; however, these must be developed with a sufficient adaptation and coherence, and not be over-burdensome so as to stifle the use of the Internet for education.

Time factor and Internet use in instruction

The time factor is regarded as one of the major factors that influence technology integration in teaching (George, 2014; Ghoord, 2013; Ndlovu and Lawrence, 2012). These authors highlight that lecturers need time to experiment with technology use and learn to use technology for pedagogical support and lesson preparations. Moreover, Wallace (2004), MacDonald et al. (2001), and Shea (2007) argue that use of the Internet in teaching is a complex process that requires lecturers to spend a significant amount of time to prepare and navigate multitudes of Internet resources and content for pre-lesson activities and curriculum-content design. In addition, George (2014) argues that, while time is an important factor in technology integration, it is often cited as proxy for other time-related concerns such as a vast syllabus, and high student-to-teacher ratios and administrative workloads. Notwithstanding these concerns, Ghoord (2013) argues that it is important that institutions invest time for technology use and integration in instruction due its importance, and Graham, Woodfield and Harrison (2013) suggest that time investment and related incentives must be institutionalised in policies and plans to advance technology use in instruction.

2.7 Macro-policy factors

Following data gathering and analysis in Chapter 4 and Chapter 5 respectively, two themes emerged on the curriculum and funding that are mainly a policy domain of national government, and this section provides theoretical perspectives on these thematic areas.

2.7.1 Curriculum content policy and Internet use

There are numbers of key elements that underlie an effective curriculum for learning and teaching through the use of technology in the 21st Century. According

to Chung, Ledger and Shields (2017), Alismail and McGuire (2015), and Adepoju (2017), the curriculum must be relevant and should endeavour to promote and prepare students to deal with real-world problems, and provide students with skills that are relevant to the labour market and technology trends. Additionally, Baş, Kubiatko, and Sünbül (2016) argue that it is important to design and adapt a curriculum that positions the Internet at the core of learning and teaching for the skills and knowledge output that is responsive to contemporary society. According to Albashiry, Voogt and Pieters (2015, p 601) “TVET curriculum requires continuous renewal and constant involvement of stakeholders and the redesign process”. The authors also cite challenges of a lack of capacity, curriculum-support resources, and a lack of coherence between programme design and guidelines set by the Ministry of Education for the lack of curriculum reform. Moreover, Bathmaker (2013) cites challenges of burdensome and bureaucratic regulatory frameworks for procrastinating the process of curriculum-content design and related procedures for evaluation. Notwithstanding these intricacies, the literature is unanimous that ongoing curriculum-content policy reform, which is within the purview of national government, is critically important to promoting the integration and use of the Internet in teaching and curriculum relevance.

2.7.2 Funding to support Internet use in teaching

The availability and maintenance of the computers, access to technical support, access to reliable Internet connectivity, and ongoing professional development are some of the institutionally related factors that are contingent on the availability of sustainable funding. According to Porter et al. (2014), investment in technology infrastructure for learning and teaching may add significant costs onto the implementation of technology in instruction. George (2014, p. 35) argues that

"Without funding for adequate resources, teachers will not be able to integrate ICT into their teaching." The author further identifies a lack of funding for initial financing for the deployment of ICT infrastructure, ongoing maintenance costs, funding for technical support and ongoing training and professional development as the key factors that prohibit the effective use of ICT in education.

As discussed in Chapter 1, TVET colleges source funding for e-Learning initiatives from multiple sources that include state grants for infrastructure (including ICT), labour costs and student subsidies. Private public partnerships also provide additional sources of financing for the deployment and use of ICTs in education. For this purpose the White Paper on e-Education recognizes the magnitude of funding requirements for the implementation of e-Education initiatives, and proposes both government and private-sector investments (RSA, 2004).

2.8 The extent of the Internet use in Teaching in Vocational Education

This section discusses the forms and characteristics of Internet use in teaching at colleges, and explores the teacher-development framework and blended learning institutional development model on enablers and competencies that drive the extent of Internet use in teaching. The teacher-development framework explores the teacher level that determines the forms and characteristics of the Internet, while the blended learning institutional development framework explores both lecturer-level competencies and the institutional enablers that inform the extent of Internet-use instruction (DHET, 2007; Garrison and Vaughan, 2013)

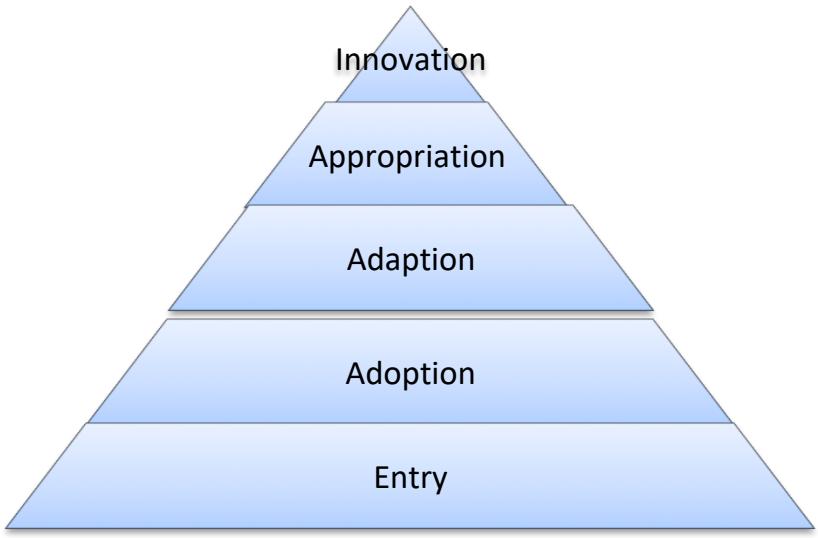
Internet uses at TVET colleges

According to UNESCO (2003) there are four broad uses of ICTs, including the Internet, in vocational education settings. The first is the use of technology as a curriculum to develop ICT literacy skills. The second form of usage refers to ICT as

a delivery mechanism which entails the packing of course material for instruction through the use of ICTs. The third use encompasses the use of technology to augment instruction and provide opportunities for students and lecturers to practise and routinize instruction through the use of tool simulators and online videos, and improve student subject-curriculum contact times (Dzvapatsva, Mitrovic, and Dietrich, 2014). The fourth use refers to leveraging technology to stimulate senses (touch, seeing and hearing senses) for effective learning and teaching to occur (UNESCO, 2003). In addition, Yasak and Alias (2015) posit that the advanced use of technology in teaching includes the adaptation and innovation of the curriculum to create new forms of knowledge and promote the development of problem-solving skills. Within the context of Internet use in vocational education settings, the additional use of the Internet at TVET "provides opportunities for developing more innovative ways to bridge the gap between laboratories and workplaces" UNESCO (2003, p 74). Brown (2015) and Parchoma (2014) cite the importance of understanding how technology is used in learning and teaching in order to understand the factors that induce improvements in the teaching process through the use of technology. In this regard, the teacher-development framework, shown in Figure 6, provides a useful theoretical tool to illustrate the characteristics and levels of ICT use in instruction. The framework characterises five levels of teacher competencies when using ICT in the process of learning and teaching, explaining the extent of Internet use in teaching. The levels are as follows: (i) the entry level, which is characterised by a lack of skills, low confidence, and frustration amongst teachers when using ICTs; (ii) the adoption level is characterised by the ability to use various ICTs and the ability to teach learners to use ICTs; (iii) the adaptation, ability to use ICTs in every classroom activity in line with the curriculum level; (iv)

the appropriation level, reflected by the holistic understanding of ICT usage in learning and teaching, and teachers demonstrate their experience and confidence at this level in the use of ICTs in learning and teaching; (v) and lastly the innovation level is demonstrated through the teachers' ability to develop new learning environments to enable interactive and collaborative learning (DHET, 2007).

Figure 6: The teacher development framework



Source: DHET (2007)

Meanwhile, the blended learning institutional adoption framework illuminates the institutional support elements that enable the advanced use of technology in teaching (Garrison and Vaughan, 2013; Wetzel, 2001). The authors summarise the four key stages of the framework as follows: (i) the first stage is characterised by creating awareness, establishing structures or committees, and development of policies and plans on technology use for instruction; (ii) the second stage includes the exploration, and the experimental use of technology by teachers; (iii) the third stage involves the integration of new ideas and information into a blended learning curriculum; (iv) the fourth stage is characterised by the use of technology in the curriculum to generate new ideas and continuous learning. The authors also cite the provision of incentives, which may include salary promotion, release time, and

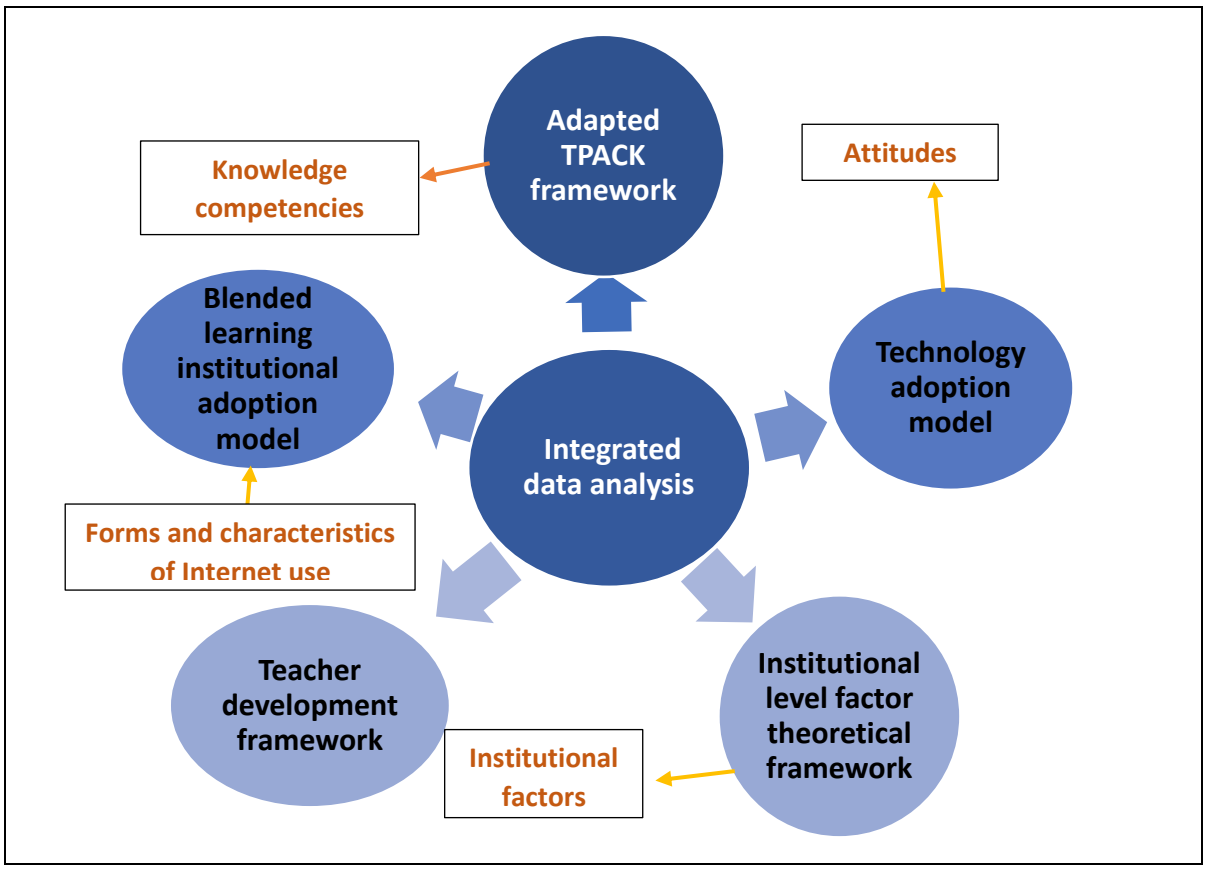
access to equipment and technical support, as essential to promoting ICT use in teaching.

The teacher-development framework and the blended learning institutional development model are complementary as both identify levels of lecturer competencies to characterise the extent of technology use in education. The latter model also illuminates institutional variables as key in determining the extent of ICT use for instruction.

2.9 Theoretical and conceptual framework

George (2014, p 23) states that "a framework provides evidence that a researcher has reviewed the literature, selected relevant theories and /or concept and organised them into a structure which shows the boundaries of the present study". In the following literature review discussed in this chapter, the theoretical and conceptual framework, as demonstrated in Figure 7, is formulated based on theoretical frameworks and models relating to use of the Internet in teaching. The framework guides the research process towards understanding the phenomenon under investigation on factors that influence lecturers' Internet use in teaching.

Figure 7: Theoretical and conceptual framework



Source: developed by researcher

2.10 Conclusion

In conclusion, this chapter presented key theoretical artefacts underpinning the conceptual and theoretical frameworks that guided the study and later informed the analysis. In exploring the lecturer-level factors underlying effective Internet use in teaching, this chapter explored the adapted TPACK framework on knowledge and skill domains that inform Internet use in teaching within the context of a TVET institution.

In addition, the technology-adoption model was presented to provide a theoretical insight into how attitudes on technology use in instruction influence Internet use in teaching. In exploring the extent of Internet use in teaching, the chapter explored

theories on blended learning institutional adoption-model the teacher-development framework and Institutional level factor theoretical framework to understand theoretical insights into institutional level factors that inform the extent of lecturers' Internet use at colleges.

Chapter 3: Research methodology

3.1 Introduction

This chapter articulates the research methodology employed in the study on factors that influence lecturer Internet use in teaching at Gauteng public TVET colleges. The mixed-method research used in the study and its philosophical assumptions and the research process is also discussed. The research problem, research context, research objectives and rationale for the study was discussed in chapter 1.

Main research question

The following research questions are posed:

Research question

Which factors promote the Internet usage by college lecturers in teaching?

Sub-questions

1. How do these factors promote Internet usage amongst college lecturers?
2. To what extent do public TVET college lecturers use the Internet for teaching?
3. How do lecturers use the Internet in teaching?
4. To what extent do attitudes promote lecturers' usage of the Internet?

3.2 Mixed-method research

The study employs a mixed-method research for the entire research process. According to Johnson and Onwuegbuzie (2004), mixed-method research combines both qualitative and quantitative research methods within the study, and uses a combination of research instruments for data collection, presentation and analysis. Mixed methods provides the most complete analysis, enhanced explanatory power and deeper interpretation and understanding of the phenomenon under investigation (Castro, Kellison, Boyd, and Kopak, 2010; Vathsala, 2014).

3.2.1 Philosophical assumptions for the mixed-research methods

The philosophical paradigm that underpins the study is referred to as a third wave or third research movement that seeks to encapsulate the strengths of both qualitative and quantitative research methods in one research. This research paradigm seeks to bridge the philosophical paradigm schisms of purists and objective quantitative research methods versus the context-specific and subjective qualitative research methods (Johnson and Onwuegbuzie, 2004). The literature review in Chapter 2 of the study identifies a multiplicity of factors associated with the use of the Internet in teaching at TVET colleges that require the use of both qualitative and quantitative procedures for data collection, presentation and analysis. As Gorard and Taylor (2004) argue, the primary criteria for selecting the one method should not be based on methodological differences but on their strength to answer the research question; hence the researcher's choice of mixed-method research. While the study employed both quantitate and qualitative research methods, the study is qualitatively dominant as both quantitative and qualitative data are converted into qualitative data to analyse and present the key findings on the phenomenon under investigation (Vathsala, 2014). In addition, the study also employs the constructivism paradigm to enable the researcher to access multiple participants' perspectives and meanings, and develop a deeper understanding of the phenomenon under investigation (Creswell, 2009).

3.2.2 Rationale for quantitative data-collection method

According to Powell (2011); Ndlovu and Lawrence (2012); and George (2014), access to ICT infrastructure is regarded as one of the major factors that influences the usage of the Internet in teaching. For this reason it was important for the study to gather data on the state of basic ICT infrastructure in Gauteng's public colleges

through a survey questionnaire. The survey questionnaire was also used to gather data on lecturers' skills, the lecturer-students ratio, Internet connectivity, students-computer ratios, and the availability of technical support as well as institutional policies. According to Rolando, Salvador and Luz (2013), there is a myriad Internet technologies and devices, for which data on a study of Internet use in teaching could be gathered. However, data collected was limited to basic computer access and connectivity due to infrastructure gaps and the lack of educational resources that prevail in public TVET colleges as a consequence of the historical legacy discussed in Chapter 1.

3.2.3 Rationale for qualitative data-collection methods

In gathering qualitative data, interview protocols were used to gather in-depth information with lecturers, representatives of college management, and training providers on Internet use in teaching. The interviews gathered data on the forms (what the Internet is used for) and characteristics and (how lecturers use the Internet) in learning and teaching, and the extent of Internet use in teaching.

According to Koh et al., (2014), qualitative methods are effective for capturing contextual nuances such as values and attitudes that are important in the integration of ICT in teaching, and which cannot be effectively explored through quantitative methods. Also, qualitative methods are effective for understanding participants' shared experiences and meaning in order to develop a deeper understanding of the phenomenon under study (Creswell, 2003; Creswell, 2007).

The collection of qualitative data from multiple participants enhances data triangulation and assists in providing a deeper meaning, and leads to other layers of data critical for a deeper understanding of the phenomenon (Creswell, 2007; Vathsala, 2014; Vanderlinde et al., 2012). Additionally, the use of multiple data

sources assisted in minimising researcher bias and providing a better assessment and generalisability of the study.

3.3 Sampling for the study

This section presents the survey and purposive sampling methods considered in the study.

Survey questionnaire to collect quantitative data

There are eight public TVET colleges (Central Johannesburg, Ekurhuleni East, Ekurhuleni West, Sedibeng, South West, Western College, Tshwane North and Tshwane South) in Gauteng Province, which represents the population of colleges in the province that participated in the study. All eight of the public TVET colleges in Gauteng Province, which represent the population of colleges in the province, were targeted to complete a survey questionnaire for the study.

Purposive sampling for the qualitative interviews

Through purposeful sampling, the study identified nine lecturers – three each from three of the eight colleges. The lecturers from college IT departments who made use of the Internet for teaching were identified by college principals for in-depth interviews. The use of the purposive sampling technique assisted in achieving the objectives of the study which is focussed on lecturer Internet usage as it purposively selected lecturers for in-depth interviews and who mostly use the Internet in teaching. According to Palys (2008), it is fundamental to identify informants who are well positioned to provide insight into the phenomenon under investigation in order to achieve the objectives of the research. Furthermore, three college management representatives were interviewed to provide a managerial perspective on the use of the Internet in teaching at colleges. Further, three training providers, who coordinate internet-based training programmes at public TVET colleges, were identified for interviews.

A total of fifteen interview respondents participated in the study, as shown in Table 6.

Table 6: Identifiers of interview respondents

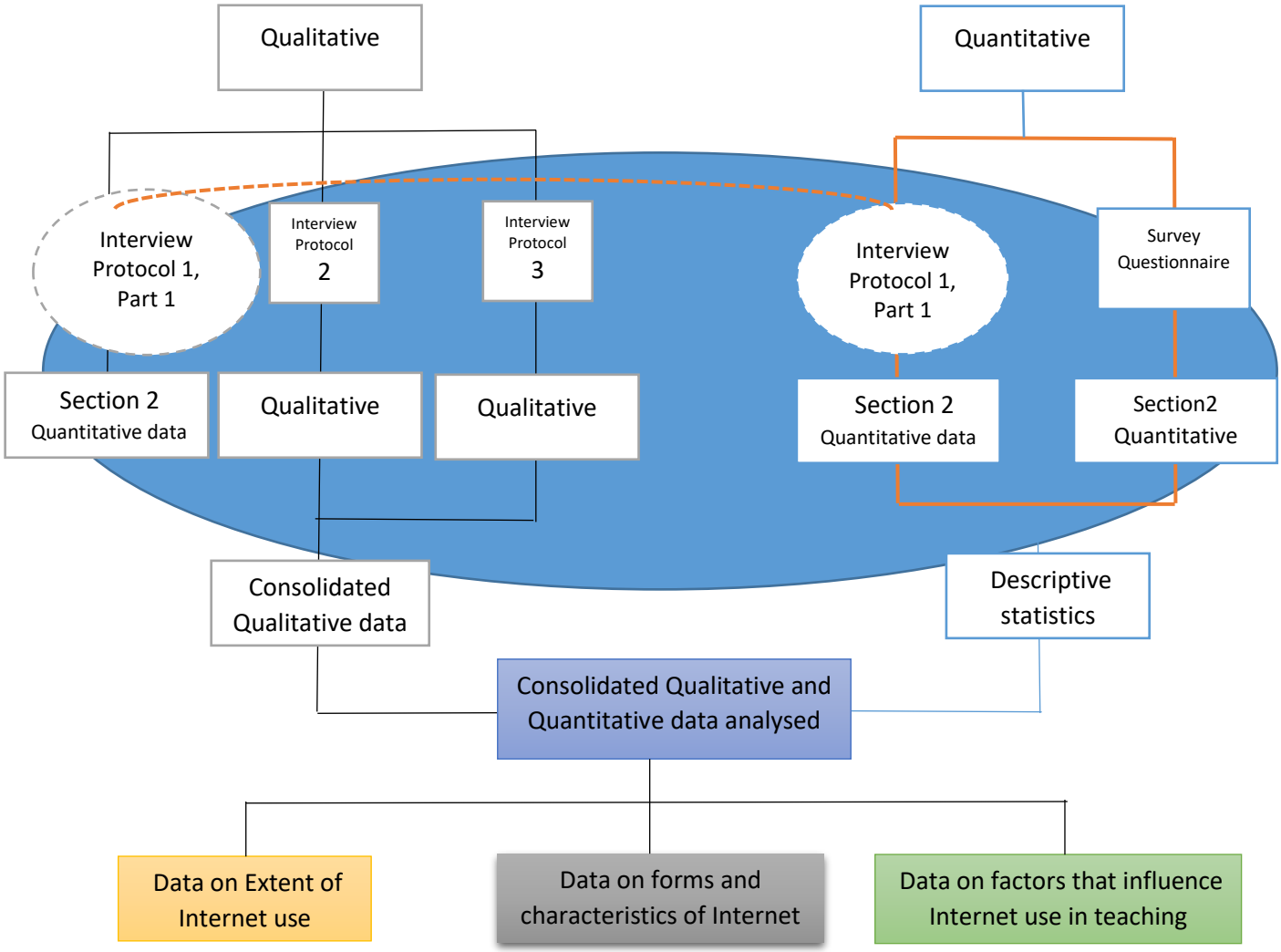
TVET College	Interview method	Interview date	Identifiers
College lecturers			
Central JHB	Face to face , recorded	31.08.2016	LECTR1
Central JHB	Face to face , recorded	31.08.2016	LECTR2
Central JHB	Face to face , recorded	31.08.2016	LECTR3
Ekurhuleni East	Face to face , recorded	05. 09.2016	LECTR4
Ekurhuleni East	Face to face , recorded	05. 09.2016	LECTR5
Ekurhuleni East	Face to face , recorded	05. 09.2016	LECTR6
South West Gauteng	Face to face , recorded	30.08 .2016	LECTR7
South West Gauteng	Face to face , recorded	30.08. 2016	LECTR 8
South West Gauteng	Face to face , recorded	30.08. 2016	LECTR 9
College management			
Central JHB	Face to face , recorded	31.08.2016	MANR1
Ekurhuleni East	Face to face , recorded	05.09.2016	MANR2
South West Gauteng	Face to face , recorded	03.11.2016	MANR3
Training providers			
Cisco Networking	Face to face , recorded	23.09.2016	TPR1-
NEMISA	Face to face , recorded	28.09.2016	TPR2
Siyafunda Community Centre	Face to face , recorded	21.09.2016	TPR3

Source: developed by researcher

3.4 Data collection instruments

The process of data collection was designed to ensure that data collected was complimentary but not overlapping (Vathsala, 2017). Figure 8 highlights a pictorial presentation of the mixed-method data collection instruments.

Figure 8: Data collection instruments



Source: developed by researcher

Survey questionnaire

After piloting the questionnaire to ascertain its validity and reliability, the survey questionnaire attached to the covering letter shown in Annexure I was sent through email to all the eight public TVET colleges in Gauteng to complete. All the eight TVET colleges completed the survey questionnaire. According to Creswell (2003), a survey questionnaire is useful for gathering mainly quantitative data and is quick to administer.

Interview protocols

The interview protocols were developed following review literature on the use of technology in teaching, as outlined in Chapter 2 (Nastasi, et al., 2007). The interview questionnaires (see Annexures C, D and E) were semi-structured to enable respondents to provide a diverse and deeper insight into the phenomenon under investigation (Creswell, 2003; Creswell, 2007). As shown in Table 7, the researcher conducted a due-diligence mapping of the research methods, research instruments, and theoretical artefacts employed in the study to ensure that the data gathering, and integrative analysis, respond to the main research question and sub-questions. A detailed mapping of the research questions, research instruments, operational questions and theoretical artefact is provided in Annexure F.

Table 7: Abridged Mapping of the research questions to the theoretical framework

Research questions	Research method	Research Instrument	Theoretical frameworks and models
Main research question: Which factors promote Internet usage by college lecturers in teaching?	Quantitative and qualitative	Survey questionnaire Interview guides	Adapted TPACK framework Institutional level factor theoretical framework
Sub-question 1. How do these factors promote Internet usage amongst college lecturers?	Qualitative	Interview guides	Adapted TPACK framework The Teacher Development Framework
Sub-question 2: To what extent do public TVET college lecturers use the Internet in learning and teaching?	Qualitative	Interview guides	adapted TPACK framework The Teacher Development Framework Blended learning institutional adoption model

Sub-question 3: How do lecturers use Internet for learning and teaching?	Quantitative	Survey questionnaire	adapted TPACK framework Blended learning institutional adoption model
Sub-question 4: To what extent do attitudes promote lecturers usage of the Internet	Qualitative	Interview guides	Technology adoption model (TAM)

Source: developed by researcher

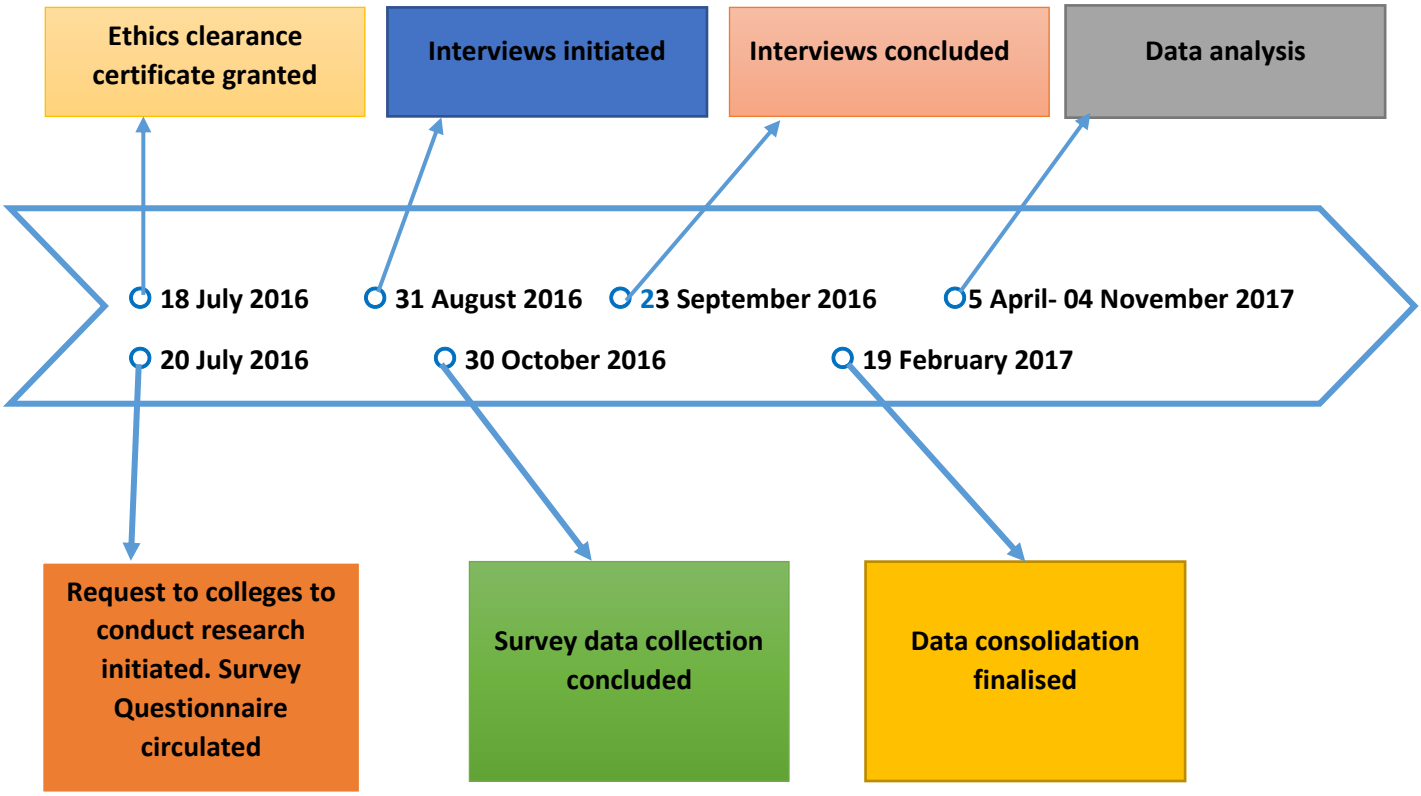
3.5 Research procedure

A pre-test interview was conducted with one of the college lecturers to test the reliability validity, while the survey questionnaire was validated and tested in a peer review, and feedback received was used to further modify the research tool.

The university ethics committee granted the ethics-clearance certificate (see Annexure G) for the study on 18 July 2016: this was an important milestone that paved the way for the college principals to grant approval for conducting research at the colleges in line with the DHET approval policy for conducting research in public colleges (DHET, 2016b).

The survey questionnaire was sent through email to the heads of the eight colleges, who either provided the data themselves or assigned the task to the relevant person. The process of collecting survey-questionnaire data from the eight public colleges took longer than anticipated due to incomplete data being submitted from the colleges and the due process of validating the data. The response rate on the survey questionnaire was 100%. Figure 9 highlights the research process timeline.

Figure 9: Research process timeline



Source: developed by researcher

3.6 The interview process

Following introduction, respondents were provided with the research-information sheet (see Annexure H). Issues on confidentiality and the anonymity of respondents participating in the study were explained, after which participants were give a consent form (Creswell, 2003). Creswell (2003) suggests that the privacy and confidentiality of respondents can be achieved through the coding of names and titles of respondents, and dissociating names from the responses, as shown in Table 6.

The interviews were administered; each interview took approximately 50 minutes and was audio recorded with the respondents consent, and later transcribed. To

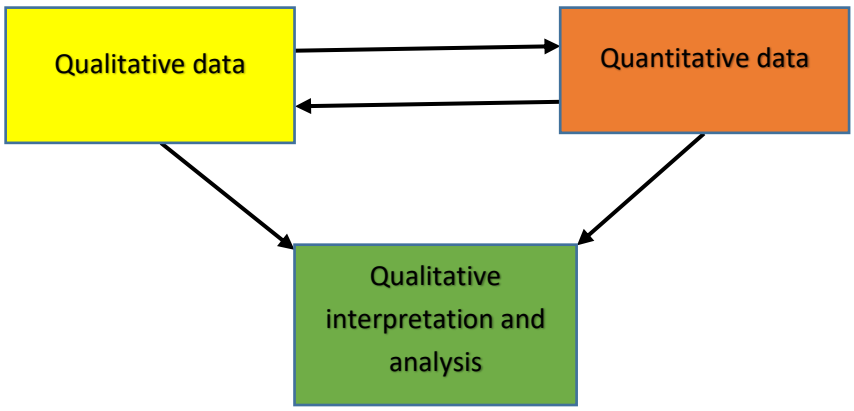
ensure effective interview data-collection, probing questions were used to gather additional data to enhance the responses and derive additional thematic variables (Castro et al., 2010). The response rate was 100%, and all lecturers, college management representatives, and training providers participated in the interviews.

3.7 Data analysis

In analysing the results of the study, a mixed set of strategies was employed that included induction (identifying patterns), deduction (testing hypothesis) and abduction (uncovering new explanations) (Johnson and Onwuegbuzie, 2004). Following the interviews with lecturers, training providers and college-management representatives, the recordings were transcribed and preliminary data developed. The researcher then classified data into pre-identified codes developed by the researcher and organised into themes and thematic variables in line with constructs derived from theoretical and conceptual frameworks. The codes were further broken down into sub-categories on institutional and lecturer-level factors that influence Internet use in teaching, and the adapted TPACK framework, technology adoption model and the institutional level factor theoretical framework was used to analyse these sets of factors. While analysing the extent of Internet use in teaching at colleges, the researcher identified codes on lecturers' Internet use patterns, from qualitative data and through the teacher-development framework and the blended learning institutional development model, an analysis was conducted on the extent of Internet use in teaching at colleges. Two inductively derived thematic variables that include the availability of funding and curriculum design-policy guidelines were also analysed (Castro et al., 2010; Johnson and Onwuegbuzie, 2004). The qualitative data was presented in a narrative format.

After the collection and validation of quantitative data, descriptive statistics were generated through frequency counts, and data was presented in percentages, through the use of an Excel programme (Summak and Samancioğlu, 2011). Charts were used for a pictorial display of data and a narrative format was used to describe the quantitative data (Bazeley, 2009). The study employed an integrative analysis and data-triangulation technique to analyse both qualitative and quantitative data through the use of the conceptual and theoretical framework and its artefacts in line with the study objectives (Leedy and Ormrod, 2012; Bowen, 2009; Castro et al., 2010). Through the use of a blending and meshing approach, the study integrated analysed data from multiple strands of data sources (Bazeley, 2009). While both qualitative and quantitative data was analysed concurrently and sequentially in other variables, the analysis presentation of data was predominantly qualitative as shown in Figure 10.

Figure 10: Concurrent and sequential data triangulation analysis



Source: adapted from Creswell, (2009)

3.8 Generalisability of the study

According to Creswell (2009), generalisability refers to the extent to which the study can be applied to another population or sample, and yield similar results. The key contention points on the generalisability of a qualitative study is unrepresentative sampling and the context-specific nature of a qualitative study (Falk and Guenther, 2007). The use of purposeful sampling in the study assisted to mitigate the potential limitation of unrepresentative samples since the study can be replicated in a study with similar purposeful samples. Also, the use of both qualitative and quantitative research methods, coupled with the use of multiple sets of samples that included lecturers, management representatives and training providers, increased the generalisability of the study (Vathsala, 2014). Further, the generalisability of the study can be inferred from the fact that all public TVET colleges are established by the Further Education and Training Act of 2006 that informs their establishment, governance, administration, funding and staff recruitment (RSA, 2006).

3.9 Methodological considerations

A few questions that were originally in the research protocols, that was part of the submission for ethics clearance were subsequently restated and eliminated due to the redundancy, ambiguity and irrelevance. Also the question, on whether college management provided incentives for Internet use, was also removed as it was implied in most of the questions. While question gender and the age of lecturers was also omitted on the lecturers Interview guide as it was not directly linked to the study.

3.10 Limitations of the study

Creswell (2007) caution from generalising an exploratory studies because the contexts of the studies may differ. The urban context of Gauteng public TVET colleges is one main differentiation amongst public colleges that may influence a similar study in rural context differently (HSRC, 2011). Also the study focussed on lecturers who teach ICT and IT related subjects, and who presumably possess ICT skills and are Internet savvy, while lecturers from other departments within the college may not have the same levels of ICT competencies, and use Internet with the same level of intensity compared to lecturer from IT department involved in the study.

3.11 Ethical considerations

The study was approved by the Wits Ethics Committee, and ethics certificate was issued (see Annexure G). In conducting the study, the researcher abided by a number of protocols and ethical considerations to protect the privacy and integrity of participants. Firstly, the informed consent of respondents was acquired prior to data collection and the recording of interviews, and an informed consent form as shown in annexure K was provided to participants to confirm their rights to participate in the study (Creswell, 2003). Secondly, the privacy of respondents and the confidentiality of information was secured through the coding of names and titles of respondents to anonymise their identity, as shown in Table 4, (Creswell, 2003).

3.12 Conclusion

The study employed both qualitative and quantitative methods of data gathering in order to gather an in-depth understanding of the phenomenon under study. Through the use of integrative analysis and data-triangulation techniques, the study

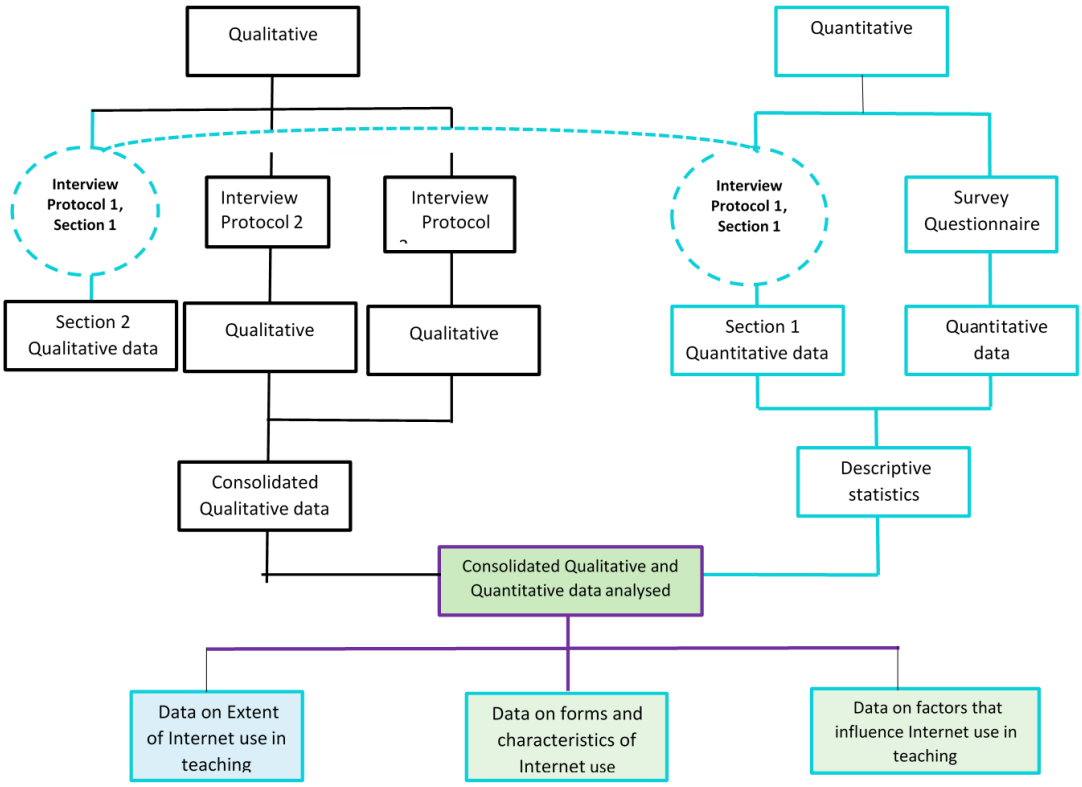
gathered, presented and analysed data from multiple sources on factors that influence lecturer Internet usage, forms and characteristics of Internet use and the extent of lecturer Internet use in teaching.

Chapter 4: Presentation of Findings

4.1 Introduction

This chapter presents findings from the data collected through the research. In order to make better sense of multiple forms of data collected in the study, Figure 11 illustrates the research instruments used and the nature of data collected, in alignment with the key objectives of the study.

Figure 11: Presentation of quantitative and qualitative data



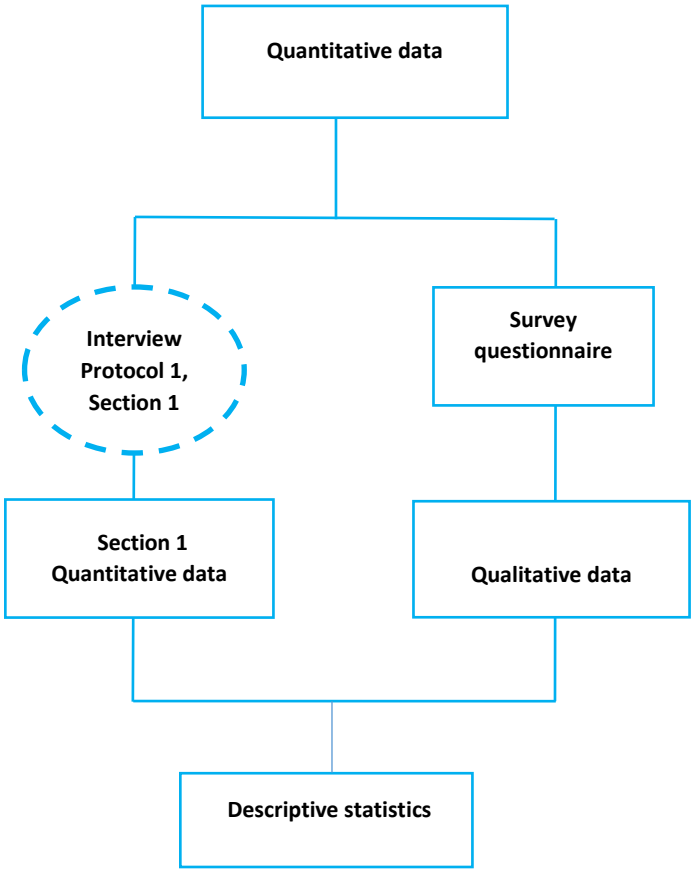
Source: developed by researcher

4.2 Presentation of Quantitative Findings

This section provides a presentation of the quantitative data collected through the survey questionnaire, as shown in Annexure I, which was administered to all eight public TVET colleges in Gauteng. Descriptive statistics, charts and an explanatory text are used to present survey data on the number of students, lecturers,

computers connected to the Internet, type of Internet connectivity, access to technical support, availability of Internet policies, and lecturers' Internet usage. Figure 12 illustrates the quantitative data presented in this section on the objective of the study concerning factors that influence Internet use in teaching.

Figure 12: Quantitative data presentation



Source: developed by researcher

Section 1: Presentation of quantitative findings

The quantitative data from the survey questionnaire presented in this section include inter alia:

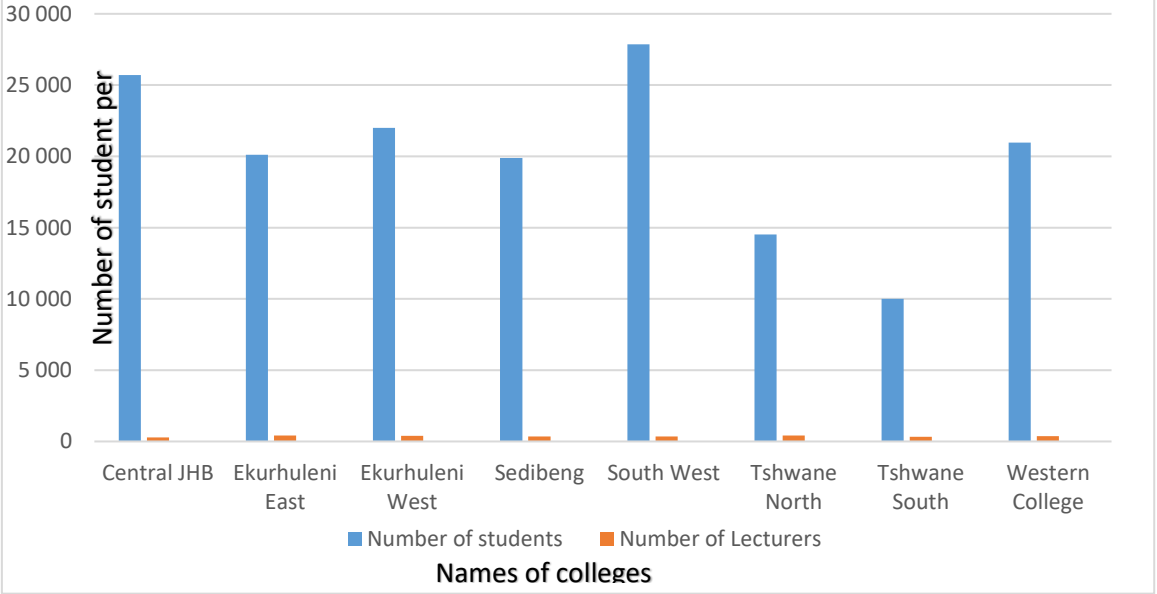
- Student-lecturer ratio
- Student-computer ratio
- Number of students versus computers with Internet connectivity
- Type of Internet connectivity

- Colleges' Internet speeds
- Access to Internet services
- Access to technical support
- Availability of Internet and IT policies
- Lecturer use of Internet tools to communicate
- Internet use dimensions
- Lecturer ICT skills ratings.

Student-lecturer ratio

The data presented in Figure 13 is in response to the survey questionnaire relating to the number of lecturers and students at the college. The students to lecturer ratio for colleges is: Central JHB, 1: 89; Ekurhuleni East, 1:48; Ekurhuleni West, 1:56; Sedibeng, 1:56; South West, 1:77; Tshwane North, 1:35; Tshwane South, 1:30; Western College, 1:55 . The average student-lecturer ratio at Gauteng public TVET colleges is highly skewed at 1:56.

Figure 13: Student-lecturer ratio



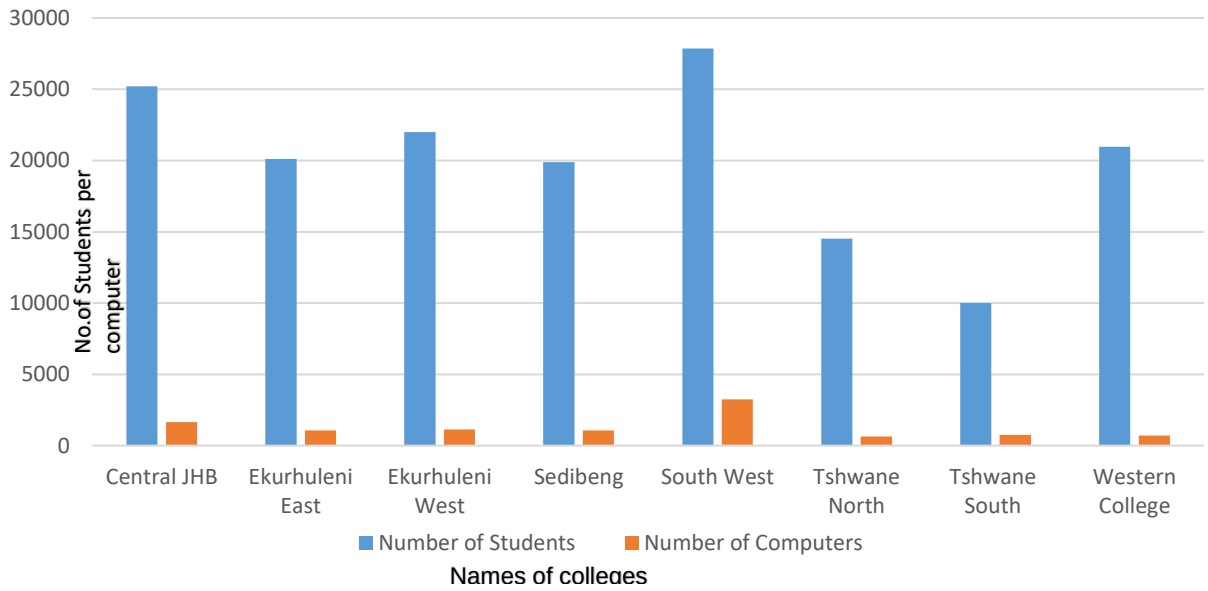
Source: developed by author

Student-computer ratio

The data presented in Figure 14 is in response to the survey questionnaire relating to computers and the number of students. The students-to-computer ratios for

colleges is: Central JHB, 1:15; Ekurhuleni East, 1:18; Ekurhuleni West, 1:19; Sedibeng, 1:19; South West, 1:25; Tshwane North, 1:23; Tshwane South, 1:14; Western College, 1:30. The average students-to-compute ratio is 1:20 and suggests that the number of computers for teaching was inadequate.

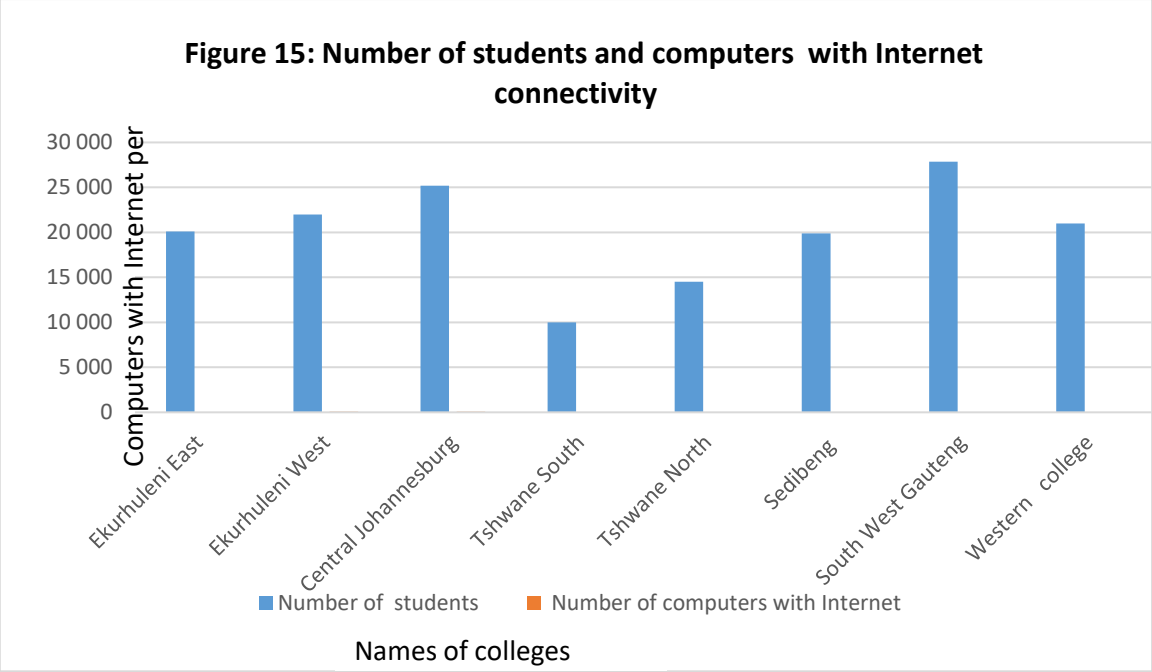
Figure 14: Student-computer ratio



Source: developed by author

Number of students versus computers with Internet connectivity

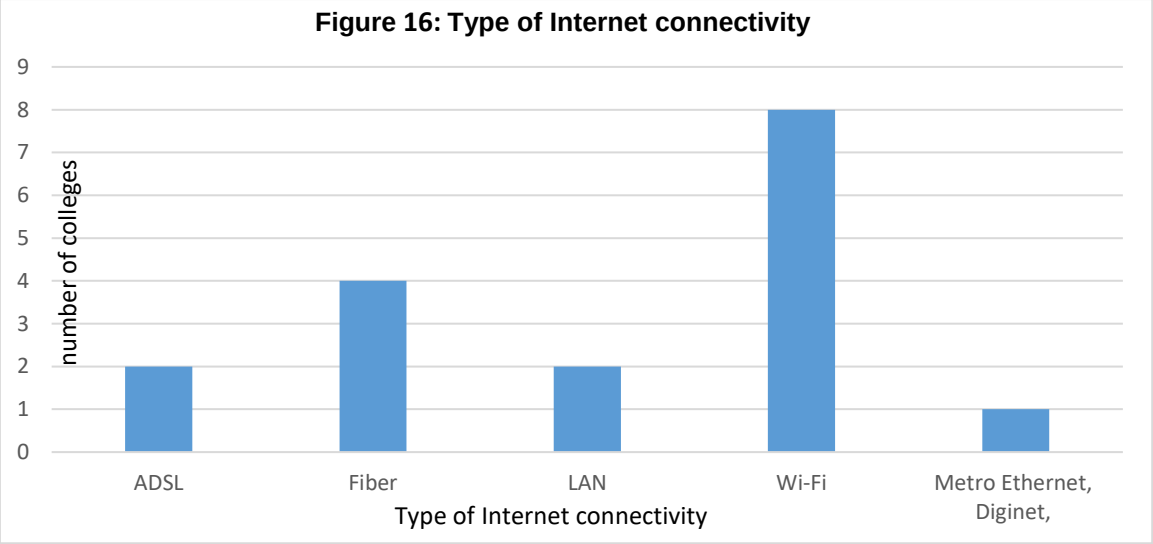
The data presented in Figure 15 is in response to the survey questionnaire relating to the number of students and the number computers with Internet connectivity at the college. The students versus Internet-connected computer ratio for colleges is: Central JHB, 1:89, Ekurhuleni East, 1:693; Ekurhuleni West, 1:431; Sedibeng, 1: 452; South West, 1:606; Tshwane North, 1: 54; Tshwane South, 1:270; Western College, 1:599. The data on computers connected to the Internet underlie the immense challenge of Internet connectivity at colleges.



Source: developed by author

Type of Internet connectivity

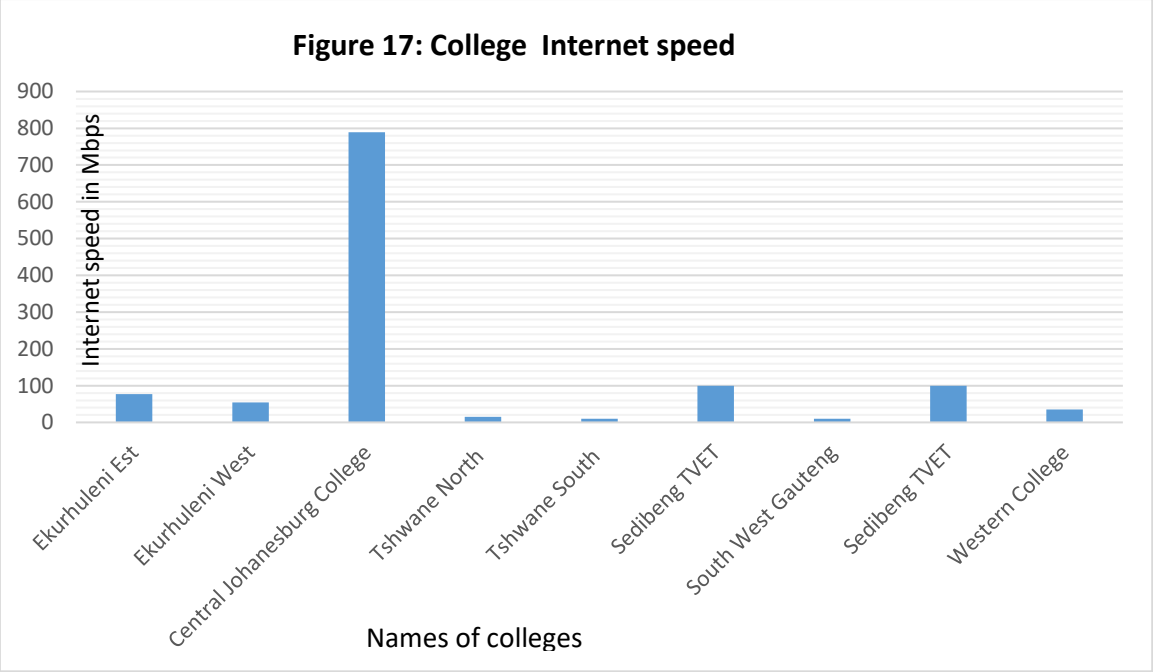
The data presented in Figure 16 is in response to the survey questionnaire on the type of connectivity. The majority, six (75%), of the colleges indicated having access to Wi-Fi Internet connectivity, and two (25%) did not have it. Four (50%) colleges reported having fibre connection to the Internet, and two (25%) have access Internet connection through ADSL, while two (25%) access the Internet through LAN connection. Two (25%) of the colleges reported to also use additional Internet connections such as Metro Ethernet, and Diginet. Wi-Fi is predominant for Internet connectivity, and fibre is emerging as the preferred form of Internet connectivity at the colleges.



Source: developed by author

Colleges' Internet speed

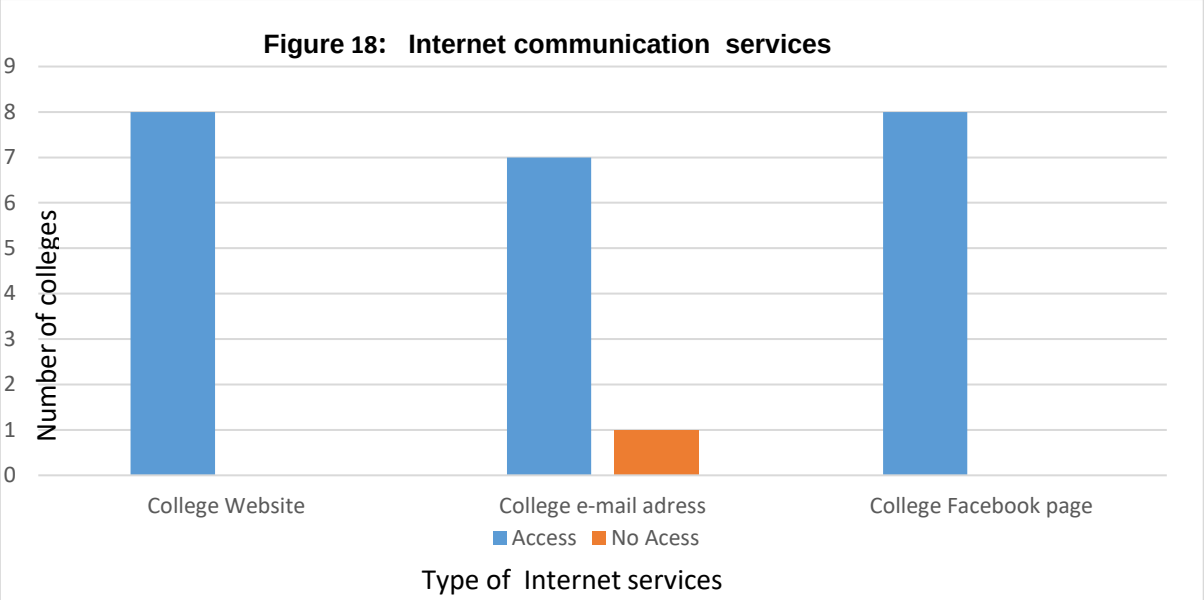
The data presented in Figure 17 was in response to the survey questionnaire on Internet speed. The Internet speed at colleges was as follows: Ekurhuleni East College, (77 mbps); Ekurhuleni West, (54mbps); Central Johannesburg College, (789 mbps); Tshwane North, (15mbps); Tshwane South, (15 mbps); Sedibeng, (100 mbps); South West Gauteng, (10 mbps); and Western College, (35 mbps). Except for CJC, which reported to have an exceedingly high Internet speed of 789 mbps, the average Internet speed for Internet connectivity is 43mbps. It should also be noted that Internet speed is dependent on other variables, including the processing capacity of computers, number of users at any given point, and network and software configuration (Wang, 2015).



Source: developed by researcher

Access to Internet services

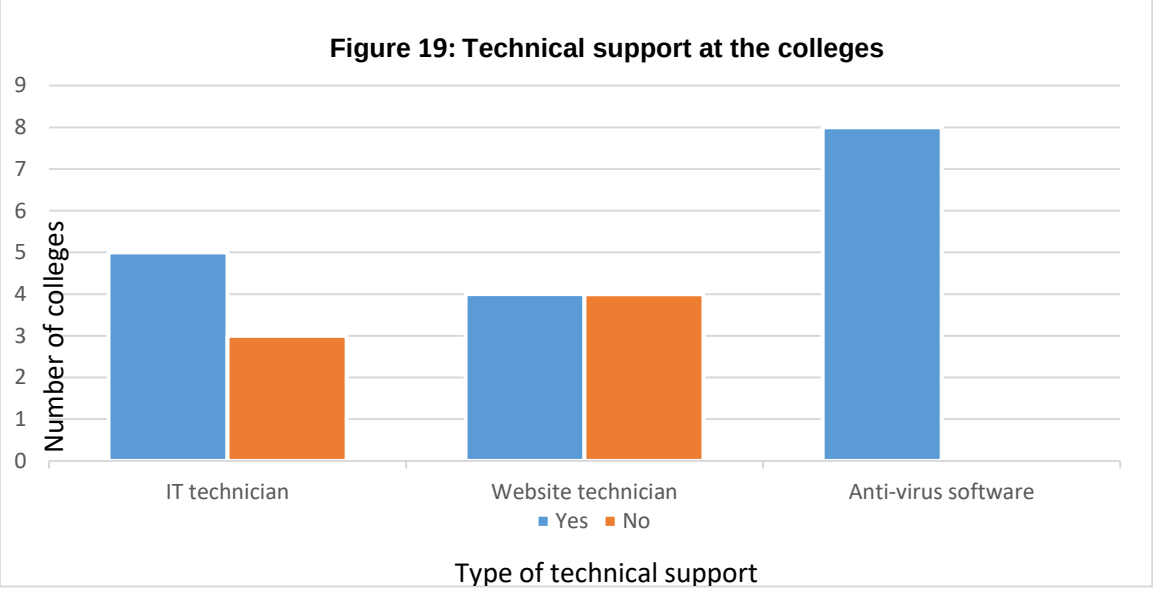
The data presented in Figure 18 is in response to the question relating to college access to Internet services. The majority of colleges surveyed have access to Internet services such as Website, Wi-Fi, email addresses and Facebook pages. All colleges have access to Website and Facebook pages. Of the eight public colleges in Gauteng, six have access to Wi-Fi, while seven colleges have email addresses.



Source: developed by researcher

Access to technical support

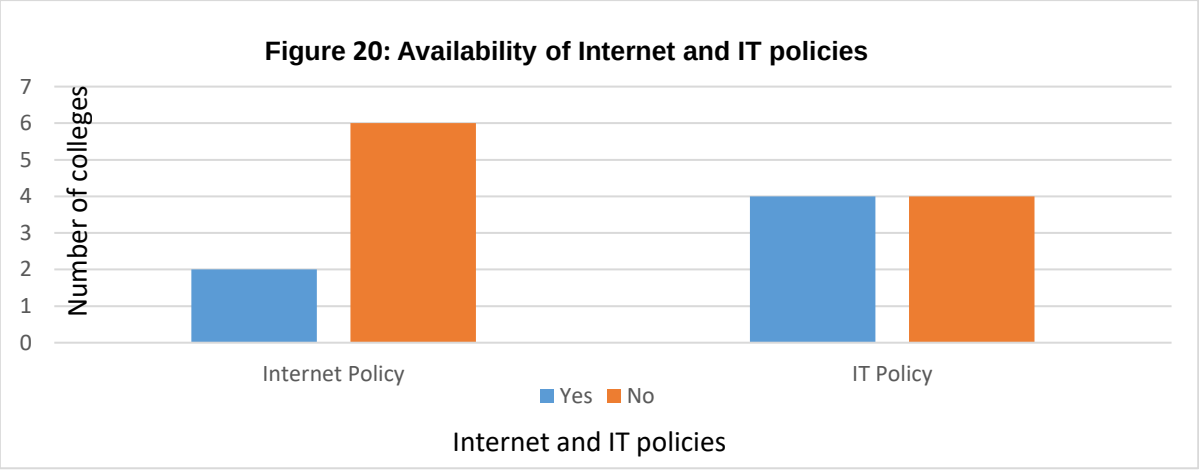
The data presented in Figure 19 is in response to the question relating to the survey question relating to the availability of technical support. The majority, five (63%), of the colleges have access to onsite technicians, and three (37%) colleges do not have onsite technicians. Four (50%) colleges have access to website technicians, and the remaining four (50%) colleges do not. All eight (100%) colleges reported to having anti-virus software, which is a positive effort as the software provides an additional layer of technical support and security, essential where the equipment is exposed to multiple users with high risk for virus attacks. Whilst a slight majority (63%) of lecturers has access to a dedicated technician for technical support, this may be inadequate in view of the large student-to-computer ratio discussed earlier.



Source: developed by researcher

Availability of Internet and IT policies

The data presented in Figure 20 is in response to the survey question relating to the availability of college Internet and IT policies. The majority, six (75%) of the colleges do not have Internet policies, while two (75%) have Internet policies. Four (50%) colleges indicated having IT policies and the other half do not have IT policies. A perusal of Internet policies indicated that the policies were mainly Internet-use guidelines, while IT policies focused mainly on equipment replacement and security and privacy-related issues.

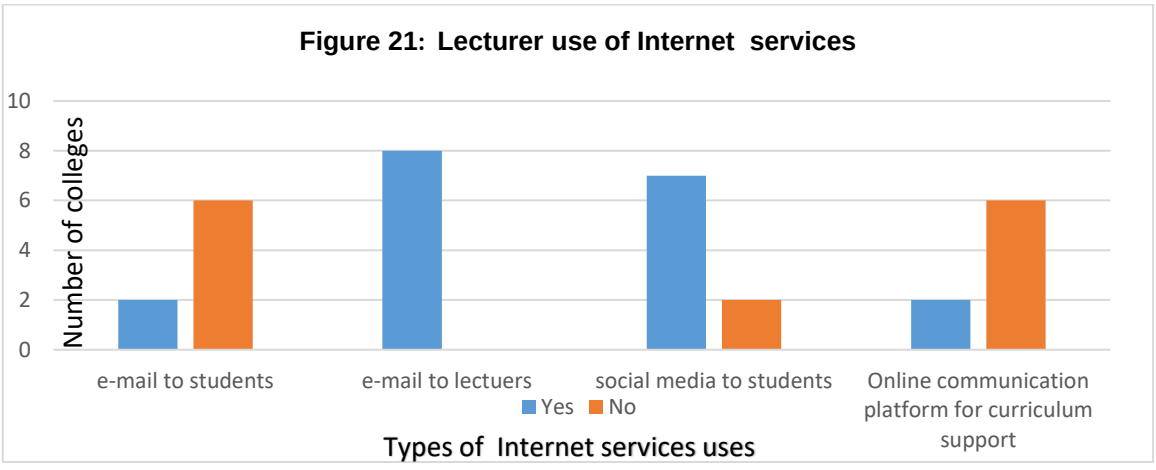


Source: developed by researcher

Lecture use of Internet tools to communicate

The data presented in Figure 21 is in response to the question relating to use of email and social media to communicate. Two (22%) colleges reported that lecturers use email to communicate with other lecturers, while six (75%) colleges indicated not using emails to communicate with students. All eight (100%) colleges indicated using emails to communicate with lecturers. Meanwhile seven (88%) colleges indicated that lecturers use social media (Facebook and WhatsApp) to communicate with students, and one (13%) college indicated that it did not use social media to communicate with students. Few, two (25%), colleges indicated lecturer use of the Internet for online curriculum support, while the majority, six (75%), of the lecturers do not use the Internet for curriculum support. A Facebook page for Multimedia lecturers and lecturer support systems is available to provide curriculum support for lecturers, but it was reported by college management and training providers that it is underutilised by lecturers.

Figure 21: Lecturer use of Internet services

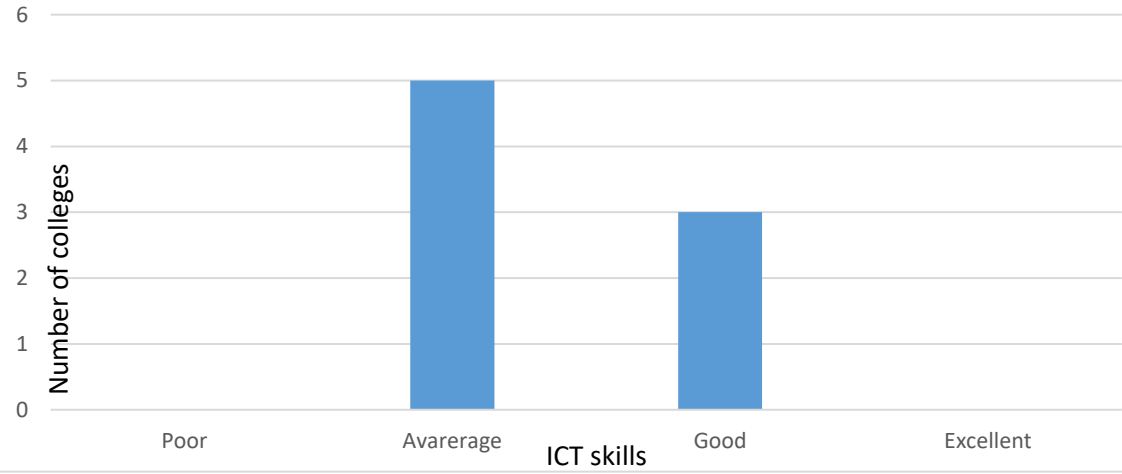


Source: developed by researcher

Lecturer ICT skills ratings

The data presented in Figure 22 is in response to the question relating to college ratings of their lecturers' skills. The majority, five (63%), of the colleges rated their lecturers' ICT skills to be at an average level, and three (38%) rated lecturers' ICT skills to be good.

Figure 22: Lecturer ICT skills ratings



Source: developed by researcher

Section 2: presentation of quantitative data

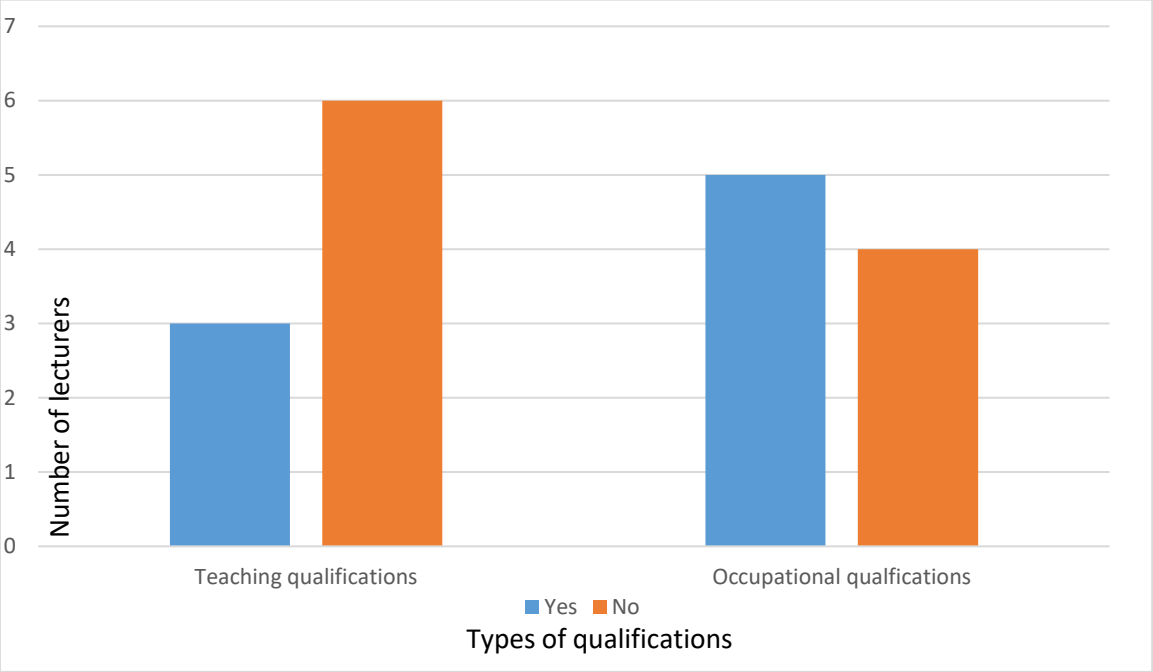
This section focusses on quantitative data presentation collected through Section 1 of the interview protocol 1 as illustrated in Figures 11 and 12 respectively. The data presented in this section include inter alia:

- Lecturer academic qualifications
- Lecturer teaching experience
- Practical experience
- Internet usage experience
- Subjects taught by lecturer respondents.

Lecturer academic qualifications

The data presented in Figure 23 is in response to the question relating to lecturer academic qualifications at the TVET College. Data reveal that six (67%) of the lecturers involved in the study did not have teaching qualifications, while five or 56 % of the lecturers surveyed reported to have occupational qualifications.

Figure 23: Lecturer qualifications

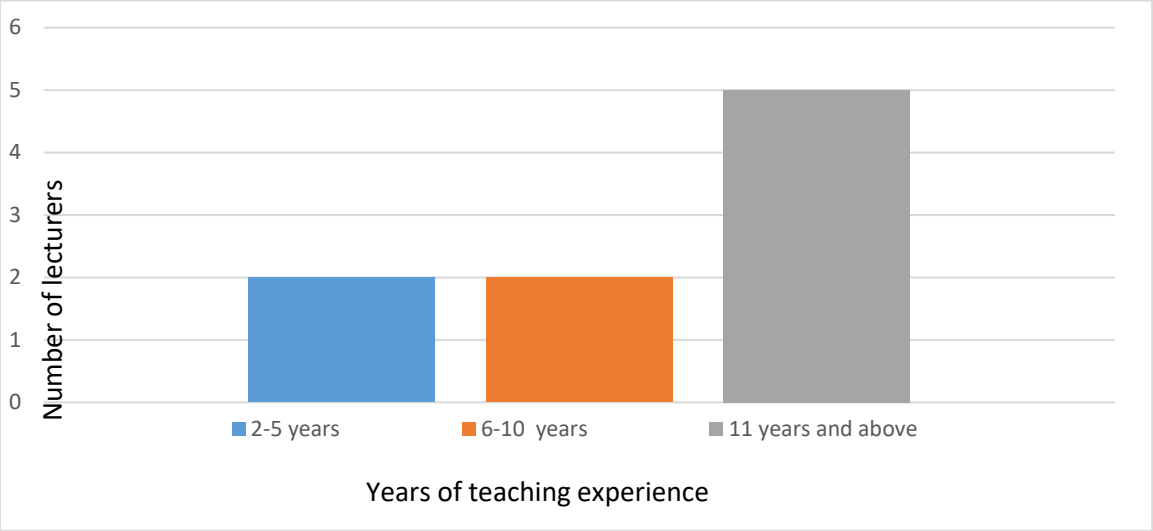


Source: developed by researcher

Lecturer teaching experience

The data presented in Figure 24 is in response to the question relating to lecturer teaching experience. Five (56%) of the lecturers surveyed had more than 11 years of teaching experience, while two (22%) had between six to ten years of experience, and two (22%) had under two years of experience.

Figure 24: Lecturer teaching experience

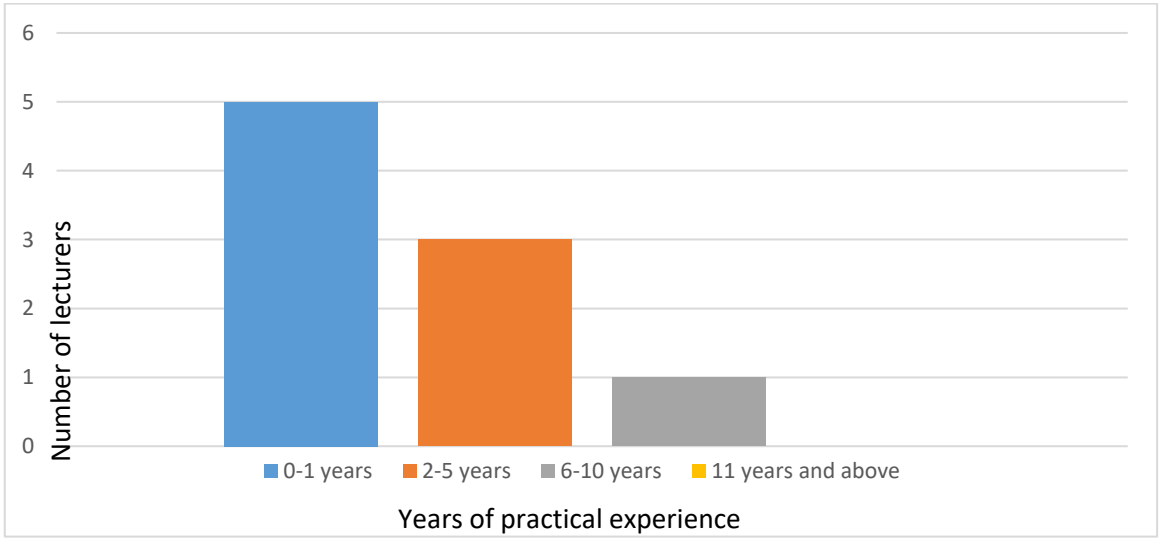


Source: developed by researcher

Practical experience

Figure 25 shows data relating lecturers' practical experience in teaching and industry in their subjects. Five (56%) of respondents reported to have less than one year of practical experience, while three (33%) of the lecturers had under five years of practical experience, and only one (11%) lecturer had more than six years.

Figure 25: Lecturer practical experience

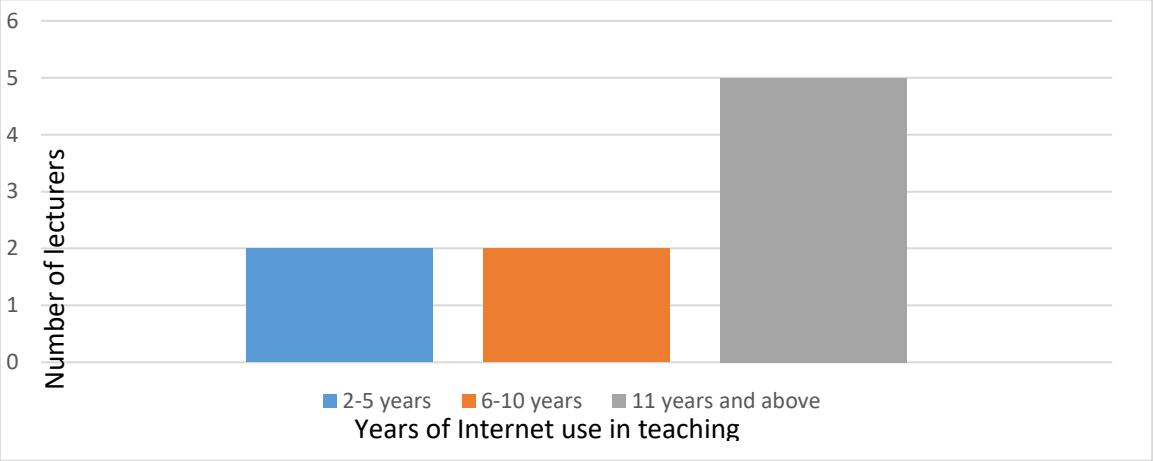


Source; developed by researcher

Internet-use experience in teaching

Figure 26 provides data on lecturers' Internet-use experience in teaching. Five (56%) of the respondents surveyed indicated having used the Internet for more than 11 years in teaching, while two (25%) had less than ten years of experience, and two (25%) had less than five years of experience.

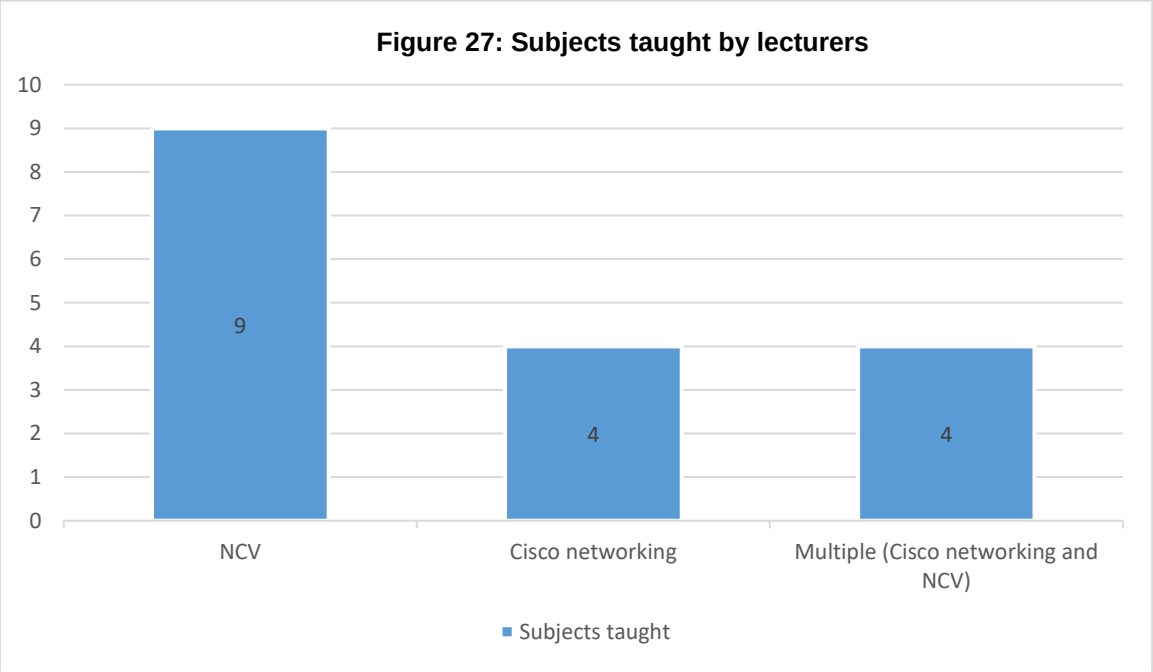
Figure 26: Lecturer Internet use experience in teaching



Source: developed by researcher

Subjects taught by lecturer respondents

Figure 27 shows a presentation of data in response to the question relating to subjects taught by lecturers involved in the study. All nine lecturer respondents involved in the study teach NCV curriculum that include computer programming, multimedia teach computer hardware and introduction to systems development. In addition, four lecturers teach Cisco networking, four lecturers reported teaching both NCV and Cisco Networking training and teach across NQF levels 2, 3 and 4; this suggests a huge workload placed on the lecturers. A detailed outline of subject taught by lecturers involved in the study is shown in Annexure J.

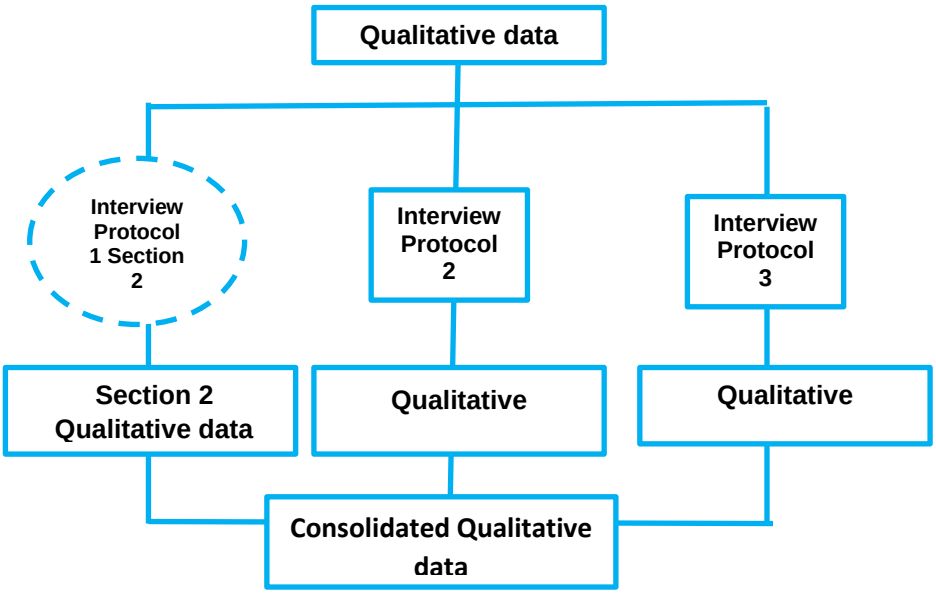


Source: developed by researcher

4.3 Presentation of Qualitative Findings

This section provides a presentation of qualitative data as illustrated in figure 28 collected through the use of Interview Protocol One, Two and Three from multiple sources.

Figure 28: Presentation of qualitative data



Source: developed by researcher

The primary purpose of using three protocols was to gather data on the forms and characteristics of Internet use and the extent of its usage at the colleges, lecturer attitudes, and the underlying factors that impact on Internet usage in teaching. The researcher used the data triangulation technique and gathered data from multiple sources to corroborate data and ensure its validity (Vathsala, 2014; Vanderlinde et al., 2012).

An in-depth interview (Protocol 1) was administered amongst nine lecturers from the three TVET colleges (three per college) in Gauteng Province through the use of a purposeful sampling technique. The Interview (Protocol 2), as shown in Annexure C, was administered amongst three representatives of college management (one per college) to gather data on college management perspectives on the forms and characteristics of Internet use in teaching, and their perceptions on the institutionally related factors that influence Internet use in teaching. Meanwhile, data was also gathered on training providers through the use of Interview Protocol 3 for similar purposes. In this regard, three training co-ordinators were interviewed who are providing Internet mediated training at colleges.

The qualitative data is presented as follows:

Section 4.3.1: Factors that influence Internet use in teaching that include inter alia:

- Internet use and quality of Internet connectivity
- Internet use and availability of technical support
- Internet use and availability of curriculum support
- Access to end-user devices and equipment
- Availability of funding and Internet use in teaching
- Time availability and Internet use in teaching

- Internet use and college Internet policies and plans
- Lecturer attitudes and Internet use in teaching.

Section 4.3.2 Forms and characteristics of lecturer Internet use and the extent of its use that include intern alia:

- Internet use and curriculum
- Internet use for curriculum support
- Internet use for problem solving and practical skills
- Internet use to communicate

4.3.1 Factors that influence on Internet use in teaching

The section focusses on the presentation of qualitative data on the factors that influence on Internet use in teaching, as identified through the interview process with lecturers, college management and training provides.

Internet use and quality of Internet connectivity

Data indicate that colleges experience a number of challenges relating to Internet connectivity that impact on the use of the Internet for delivery of the curriculum. Shared access to the Internet at the colleges where at a given point, a big number of students and lecturers simultaneously log in to the Internet, affects Internet speed, and lectures indicated this discourages them from using the Internet for teaching. Respondent LECTR2 indicated: “We don’t have reliable connectivity and therefore I cannot access Cisco networking tutorials since most of our computer labs are not connected to the Internet.” LECTR 9 states:

> “It’s just that we don’t have enough bandwidth; a lack of bandwidth is a problem, especially for subjects such a Multimedia that require us to use bandwidth-intensive applications and software for teaching.”

The other dimension highlighted on Internet connectivity was the lack of access to the Internet due to data for students and lecturers being outside college campus-premises, and this discourages lecturers from using the Internet for activities outside normal teaching hours. Respondent LECTR7 also highlighted how the lack of access to the Internet affected learning and teaching, and said:

> "I don't use lecturer support system (LSS) portal, the problem with LSS system is that students need to have access to Internet, if you share assignment through the LSS, the majority of students will not know about it since they don't have access to computers and Internet at home."

Respondents also highlighted that unavailable or unstable Internet access results in lecturers reverting to traditional ways of teaching by using textbooks.

Internet use and availability of technical support

The data presented here is in response to the question relating to the availability of technical support essential for Internet use in learning and teaching. Respondents indicated that they have onsite technicians for each campus and who provide technical support, but they raised concerns on the poor turnaround time for addressing technical problems. Lecturer respondents also expressed concerns about a lack of onsite technical support and the bureaucratic process of outsourcing of technical service at colleges. This process require technical support requests to be processed through IT help-desk which collect all the requests for the college and only then process requests for outsourcing of technical support. Lectures expressed concerns that this process was protracted and did not address their immediate technical support needs and this adversely impact on their Internet use in teaching. Some respondents expressed dissatisfaction at the capacity of onsite technical support, where it existed, as respondent LECTR9 indicated: "Only one

technician is responsible for ten labs and also assists the administration offices and he is unable to cope with the volume of work." Respondent LECTR9 also said: "For Cisco Networking programme we get online support all the time, but it is dependent on the availability of the Internet."

The management respondent, MANR1, explained the rationale for outsourcing technical support and said, "We outsource technical support; we think that to hire permanent staff for technical support will cost too much for the college." Some respondents indicated that they identify the best IT students and provide them with in-service training placement at the college for basic troubleshooting, if it is a complex technical problem, and it is then outsourced. Respondent TPR3 affirmed the approach of using college internal capacity for technical support and said, "The college should be self-supportive; the lecturers should be empowered to be at a technical level to do troubleshooting and do the first line of technical support." Respondent TPR2 said, "Most technical support systems put in place at colleges to provide technical support usually assist in the administrative functions of the college and do not help much in the daily work of learning and teaching."

Data indicates that colleges had access to different forms of technical support, including online technical support, outsourcing or support through a dedicated technician and through the use of IT students to provide elementary technical support. The technical support provided was grossly inadequate due to protracted approval processes and a lack of financial resources to employ additional technicians.

Internet use and the availability of curriculum support

The data presented here is in response to the question relating to the availability of curriculum-content support needed to use the Internet in learning and teaching.

Respondents indicated that DHET has introduced a lecturer-support system (LSS) portal to provide curriculum-support lecturers, not fully functionally. The portal provides lecturers access to lesson plans, PowerPoint presentation slides, and videos for use during teaching. MANR1 highlighted that:

> "TVET colleges were still under provincial government competence we had a dedicated office for curriculum support that provided curriculum support for colleges in the province, now that we are under DHET that support no longer exist, the curriculum support central office located at DHET head offices seems to be unable to cope with the curriculum support requirements for 52 TVET with 250 satellite campuses in nine provinces."

The lack of curriculum support was also raised by respondent MANR2 who said, "That is a gap in our institution. We only provide technical support and not do not provide curriculum support. We need to have dedicated persons in the institution who will take care of curriculum-support issues."

Access to end-user devices and equipment

Lecturer respondents provided the following responses on the lack of access to end-user devices and equipment:

> "Computer are old, some more than five years old, and outdated, and have low specifications and therefore are slow to process and unable to run programming applications that require high specifications. Also the lecturer respondents reported that few computers are in good working order at the computer lab."

Respondents highlighted that most students have access to smartphones, and respondent MANR3 indicated that his college:

> “introduced a programme in 2014 to provide learners with tablets, and we started with Level 4 students, in 2014, then introduce tables to Level 3 in 2015, and this year we have introduced tables to Level 2. The college also provides lecturers with laptops, and has invested in procuring smartboards for each and every class.”

Also respondent TPR3 cited “traditional ways of accessing the Internet through laptops and desktops falling way and getting replaced by mobile devices such as tablets and mobile phones”. Overall the access to end user devices to access Internet was limited at colleges due to skewed computer ratios and obsolete computers. A number of lecturers reported to have access to smart phones with Internet capability.

Availability of funding and Internet use in teaching

Data indicate a lack of funding and competing priorities, as one of the key factors that impact on the use of the Internet in teaching. Respondent MANR2 cited contestation between budget savings and the need to procure and upgrade-advance equipment as reasons for using outdated computers, which constrain the speed of Internet connectivity. The respondent also highlighted that: “Our chief financial officer thinks about the budget savings and from the IT department we think about new technology features to keep abreast with the technology developments.” Lack of funding seems to also impact on access to onsite technical support A number of colleges do not have adequate curriculum and technical support and the reasons cited were financial constraints and administration hurdles to get approval to secure technical support services onsite.

Data also reveal that lack of funding also adversely affect access to Internet connectivity as respondent TPR3 highlighted that:

> “The cost of Internet connectivity is a big issue; we need to lower the costs of Internet access and until we lower these costs it would be difficult for lecturers and students to access and use the Internet at colleges.”

Respondent LECTR7 also corroborate this point and said:

> “Our students come from poor household background, and cannot afford the cost of Internet connectivity cost high costs of devices and equipment. I cannot post my lesson on the blog because my student will not be able to access the lessons due to unaffordability of internet at home.”

Data indicate that colleges are confronted with a severe lack of funding, which consequently affects the Internet value chain for instruction delivery through the use of the Internet. Specific areas that were reported to be affected by the lack of funding included upgrade and procurement of equipment such as computers, software licenses upgrades. Furthermore, data also reveal that lack of funding at colleges constrain the availability of technical support and Internet connectivity.

Time availability and Internet use in teaching

Respondents cited a number of issues that impact on their time available to use the Internet in teaching. Key amongst these was low levels of student computer-literacy which demands that lecturers dedicate extra time to teach students computers basics amidst students with poor academic background. Respondent LECTR5 also mentioned inconsistent recruitment criteria as a key reason for registering students that are academically weak in mathematics. The criteria for enrollment in Information Technology courses is pure mathematics, and if colleges do get sufficient student numbers the colleges become lenient and recruit Grade 10 students with good mathematics-literacy results in order get the bigger slice of government funding.

In addition, the respondent also mentioned that they don't spend much time on the Internet because of a congested NCV curriculum schedule which that requires sometime students spend seven periods per day. Respondent LECTR3 who teach computer programming also highlighted that:

> "the NCV curriculum is highly pitched and set according to university level and we are teaching Grade 9 to 12 students, and the syllabus deals with digital calculations and binary concepts, and these are complex concepts for lower-grade students."

A combination of factors, including low levels of computer literacy and a congested and high-pitched syllabus, academically unprepared students and high student-to-lecturer ratios exert pressure on a lecturers' time available to use the Internet for teaching.

Internet use and college Internet policies and plans

Data analysis indicates that the majority of colleges have weak internal systems and controls to facilitate the effectiveness of the Internet in teaching, as corroborated by data shown in Figure 20 that illustrates that six (75%) of Gauteng's TVET colleges don't have Internet policies, and only half of the colleges have IT policies. As an example, respondents cited the absence of control measures on the use of the Internet and computers as the reason behind the misuse of data bundles and equipment as students and lecturers download music, videos and games, and have minimal use of the Internet for learning and teaching. Management respondents highlighted that lecturers do not use the Internet for teaching, as they should, as is shown in the analysis of the proxy server which indicates that lecturers spent a great deal of time on entertainment and job-seeking related sites. A perusal of available college policies indicates that they did not address the key elements of Internet use

in instruction, including infrastructure and equipment upgrades, connectivity and professional development for their lecturers. College management respondents cited that colleges were unable to implement some of their policies and IT plans due to financial constraints. IT policies on the replacement of laboratory computers and software upgrades every four years was not implemented due to financial constraints.

Respondents also highlighted that some Internet services such as Facebook, YouTube and WhatsApp were blocked and cannot be accessed through college networks, and these sites are useful for learning and teaching. These internal college policies directives are the antithesis to the adoption and use of the Internet in learning and teaching.

Lecturer attitudes and Internet use in teaching

The data presented here is in response to the question relating to the value of the Internet in learning and teaching. Respondent LECTR8 acknowledged the value of cloud computing which provides the benefits of additional computer-storage capacity and eases the burden of computer systems from the colleges. Respondents also recognized the benefits of ready-made online tutorial video lessons that can be accessed through YouTube. LECTR3 mentioned the use of Dropbox to upload tutorials and then ask students to go through them so that by the time students come to class “I can ask them to do something as opposed to introducing them to something new.”

Lecturer respondents cited the value of the Internet in maximizing teaching experience since they cannot teach everything in one hour in the class, and that with Internet access students can do some schoolwork at their own time beyond the classroom. According to the respondents, the Internet allows for studying beyond

classroom settings. Respondent LECTR5 said, “When I use online video tutorials to introduce a lesson students become more interested as compared to when I introduce a lesson through a traditional textbook.”

Respondent LECTR1 highlighted that the Internet makes it easier to research information on subject content and it provide more than the textbook can provide. Respondents also mentioned that textbooks are delivered late in the year, and they are expected to be teaching from the beginning of the year, and they can mitigate this problem by downloading subject information from the Internet and teach while awaiting textbook delivery. LECTR4 cited the value of the Internet in teaching and associated it with improved student academic performance and said, “Last year we did not have the Internet and the results of my students went down, and when we had the Internet the results improved again.”

Some respondents had different views on the value of the Internet in learning and teaching. Respondent TPR2-NEMISA was critical of lecturers’ reluctance to use the Internet, and said:

> “I found that the TVET college lecturers are very comfortable from teaching from a textbook, they read to students as opposed to allowing students to experience the learning on their own through the Internet. In Multimedia you have to experience what you are doing, and it cannot be taught theoretically.”

Respondent MANR2 mentioned that lecturers get intimidated by the amount of new skills they will need to make this work. “They are intimidated by the things they will have to let go to have this thing work.”

MANR2 highlighted that lecturers are reluctant to use the Internet in teaching because they are evaluated on how learners perform in written tests, and stressed that “final exam papers are written and assess on paper, and not online”.

In summary, lecturers expressed positive attitudes towards the use of the Internet and believe that the use of the Internet had the potential for instruction. This was shown by continued use of the Internet in spite of the challenges experienced at colleges and which include inadequate Internet connectivity, lack of equipment and computers, and minimal technical support.

4.3.2 Forms and characteristics of lecturer Internet use and extent of usage

The data presented in this section seeks to respond to the objective of the study on the forms (what they use internet for) and characteristics (how they use the Internet) of Internet use at public TVET college. By implication, this also provided an indication on the extent of Internet use in teaching at public colleges.

Internet use and curriculum

Respondents who participated in the research reported that Gauteng TVET colleges use the Internet in various forms and for a variety of teaching activities; however, there were nuanced differences in how they use the Internet when teaching NCV subjects, and when they teach Cisco training. Respondents LECTR8-LECTR3 TPR1 and LECTR1 highlighted that for NCV, lecturers use the Internet to augment the curriculum and get additional information on subject concepts and terminology, downloading video tutorials, and for lesson preparations. In this regard LECTR 9 highlights the value of using Internet resources to augment the delivery of the curriculum, and emphasised that:

> “There is no one way of teaching, some students learn by visualising, some by doing, so I use online video clips, to simulate a learning environment,

and make lessons interesting and my students enjoy that, so the use of Internet in learning and teaching is very effective."

In addition to these forms uses, Cisco instruction lecturers exhibited more advanced forms of usage, and RespondentTPR1, said:

"… the entire Cisco networking curriculum is embedded on line and I use Internet for various simulations including network configuration and for network trouble activities, and for this reason it compels lecturers and students to use Internet in learning and teaching."

Respondents also indicated that their use of the Internet for NCV courses was limited due to 'rigid' assessment guidelines and subject guidelines for these courses prescribed by the Department of Higher Education and Training. To amplify this point, respondent LECTR2 said:

"For programming NCV computer hardware and software, I don't usually deviate too much from the subject guidelines and assessment guidelines set by DHET, I follow the textbook as is. The guidelines are rigid and do not offer flexibility to complement the curriculum through the use of the Internet … external moderators use assessment guidelines and prescribed textbook for moderating and anything that is outside the guidelines is treated as incorrect."

Respondent MANR2 reported that the NCV subject guidelines were developed in 2007, and minor amendments were introduced in 2009, but to a large extent the programming syllabus has not changed and further highlighted:

"(the) classic example of outdated NCV curriculum is the absence cloud computing innovation in NCV computer programming course and that is a

not in synch with technological developments in the ICT sector given the importance of cloud computing."

Internet use for curriculum support

The data presented here is in response to the question relating to extent to which lecturers collaborate with other professionals on line to share and discuss information on curriculum content issues. Respondents across various disciplines indicated that they use the Internet for collaborative learning activities to share information, keep abreast with curriculum trends, and get answers from experts on complex subject enquiries. Data also reveal underlying trust concerns that informs that informs participation in online collaborative platforms as respondent LECTR7 explained that "It is important for me to participate in seminars and meet with other lecturers, I need to know them first before I can collaborate with them online."

Respondents also cited a lack of time and work overload as reasons for the lack of participation in online collaboration. Respondent LECTR5 also confirmed this point and said, "I have too much workload, one lecturer has resigned, and I am the only one teaching computer programming for all three levels." Most respondents indicated a preference to using email to collaborate and share information with other professionals, as compared to using social-media tools such as Facebook and WhatsApp. Respondents preferred using social-media tools when communicating with students on curriculum content. Respondent TPR2 reported that, in spite of lectures' to access to webpages and sites such as Multimedia Facebook page, Google Plus subject content platforms to share curriculum content information with other lecturers and subjects experts online, few lecturers use these Internet resources.

Lecturer respondents also cited that their use of the online lecturer support (LSS) system portal provided by DHET to access curriculum-content support and learning material was limited due to lack of Internet connectivity and their inability to use the system. Some respondents indicated that they used cloud computing for lesson-plan storage purposes, which assists to complement storage capacity for their computer labs.

Internet usage to promote problem solving and practical skills

The data presented here is in response to the question relating to how lecturers promote problem solving amongst students through use of the Internet. Respondent LECTR1-CJC said,

> "I give students research projects on what they have learned, I then refer them to the Internet for their ISAT (Integrated Summative Assessment Task) project, and I will ask them to find other programs on the Internet to solve that scenario and to gather additional information."

ISAT refers to the practical assessment of students' ability to apply knowledge and competence in their area of study (DHET, 2017b).

LECTR4, who teaches Multimedia, said the following on use of the Internet to promote problem solving and practical skills:

> "I give them real life examples for their assignments, for an example we had a request from a South African writer who wanted college students to design book cover for his book or when we have events at the college such career open day, I would assign Multimedia students to design the poster for these events, and I refer students to Internet sites to get ideas for the book covers and posters."

In general, lecturers reported that they use the Internet in teaching to enhance problem-solving skills and practical skills amongst their students through the use of online resources, including videos and simulations that complement the practical component of the syllabus, and for the assessment of students' practical skills. Lecturer use of the Internet was diverse, ranging from basic information, and use of Internet resources to augment the NCV curriculum. For the Cisco networking curriculum, which is entirely embedded in the Internet, lecturers use the Internet for network simulation, configuration and troubleshooting, as well as for student assessments. Practical training is a vital component of vocational education and training at TVET colleges, and lecturers respondents also indicated to use the Internet on a limited scale for Integrated Summative Assessment Task (ISAT) activities, to complement the practical component of the NCV program that is not fully covered in the textbooks.

Internet use to communicate

Respondent LECTR8 indicated that access to Wi-Fi at the campus allows students to communicate and access the Internet anywhere in the campus; they do not have to be confined to computer classrooms, since most students have smartphones.

Respondents also cited that they use WhatsApp chat groups to communicate with students on subject-matter content, and this was a useful means of communicating since most students have access to smartphones. Lecturer respondents also cited their preference to use emails to communicate with other lecturers, instead of using social media. For the Cisco Networking training, lecturers reported that they use online collaboration platforms such as WebEx and an online packet tracer for curriculum and technical support. Data on lecturer interviews also reveal that lecturers mainly use social media platform for communicating with students on

learning activities from their own personal data costs due to college policies that prohibit and block the use of social media from college networks.

4.4 Conclusion

The results of the eight public TVET colleges surveyed demonstrate the extent of Internet use and highlight the diverse characteristics and forms of Internet use amongst lecturers. Data indicates that lecturers teach a wide spectrum of NCV-related course. In addition lecturers also teach Cisco Networking training, which is an additional vendor training qualification that is not part of the NCV curriculum policy. An outline of course taught by lecturer that participated in the study is shown in annexure J. For the NCV curriculum, lectures mainly use the Internet in teaching for basic information search through Internet engine search-platforms to access online learning material to augment the curriculum. Llecturers use the Internet to advance problem solving skills amongst students in ISAT activities which are designed to enable students to acquire practical skills across the NCV curriculum. Data analysis suggests that lecturers did not use the Internet to adapt the curriculum and create new forms of knowledge in teaching. Respondents cited inflexible assessment guidelines and an outdated NCV curriculum that is rooted in prescribed textbooks as some of the reasons that constrain their Internet use in instruction. While for the Cisco Networking, whose curriculum is embedded in the Internet, lecturers use the Internet for network configuration, trouble-shooting, and for online student assessments. Overall data suggest that the use of the Internet in teaching was largely elementary.

Few college lecturers use the Internet for curriculum support; only two of the eight colleges surveyed participate in online community of practice for curriculum support. Three reasons were cited for not participating in online community of practice:

firstly, the reluctance to collaborate with other professionals without prior face-to-face contact; secondly, lack of time due to work overload and thirdly, the blocking of access to social network sites by colleges due to college policies that block the use of social media on college networks.

Respondents highlighted unreliable Internet connectivity and obsolete computers, and inadequate technical support for undermining their Internet use in teaching, while the majority of the students and lecturers were reported to have access to smartphones, laptops and tablets, and these devices provided the potential for Internet access and usage. Data also indicated limited Internet use outside college premises due to the high cost of Internet connectivity. Colleges do not seem to have adequate technical support and curriculum support, and the reasons cited were financial constraints and administrative hurdles to get approval to secure these services onsite. Meanwhile, for the Cisco Networking training programme, online technical support is available; however it is dependent on Internet access which is invariably unreliable in most of the colleges. Lastly, data collected on lecturer skills and qualifications indicate the majority of lecturers do not have the requisite skills and qualifications essential for Internet use in teaching in a TVET setting. While lecturers reported to have extensive teaching experience, this experience is undermined by their lack of important skills in pedagogy, curriculum content and basic ICT skills which are important for curriculum for instruction through the use of the Internet.

Chapter 5: Data analysis

5.1 Introduction

This chapter presents an analysis and interpretation of the primary data presented in Chapter 4. The analysis is presented as follows:

- Section 5.2 focusses on the analysis of knowledge and skills factors that influence Internet use in instruction at colleges through the use of the adapted TPACK framework and technology adoption model (TAM). Lecturer competencies and attitudes are the main lecturer-level factors that are analysed in this research.
- Section 5.3 is centred on analysing the forms and characteristics of Internet use and the extent of Internet use in teaching. The study employs the teacher development framework and the blended learning institutional adoption framework for this purpose.
- Section 5.4 addresses the analysis of institutional level factors and for this purpose employs an institutional level-factor theoretical framework.
- Section 5.5 presents an analysis of ‘new’ emerging themes.
- Section 5.6 presents the conclusion and summery of all the factors that influence Internet use in teaching at TVET colleges.

5.2 The knowledge and skills domains for teaching with the Internet

Recalling from Chapter 2, the enhanced TPACK framework proposed from this research describes the key sets of knowledge and skill domains essential for lecturers to employ the Internet in teaching, as illustrated in Figure 4. There are four domains of knowledge that are relevant:

(1) Pedagogical knowledge is the first domain, which encompasses lecturer knowledge relating to methods of instruction and strategies for the delivery of the curricula; the ability to formulate clearly defined learning outcomes; and feedback and evaluation of learners (McDonald et al., 2001).

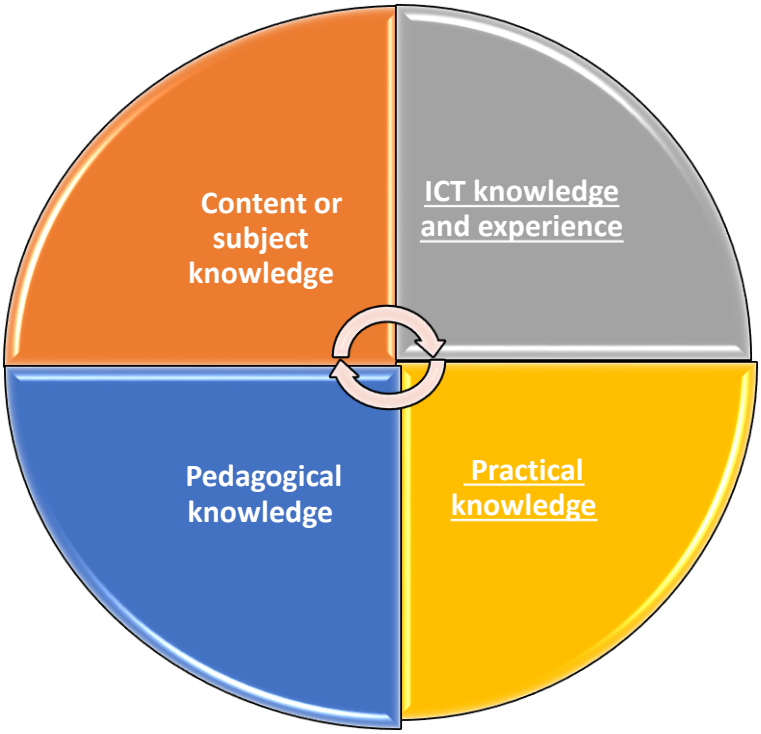
(2) Curriculum knowledge is the second set of knowledge and refers to lecturer knowledge of discipline and subject content taught.

(3) ICT knowledge is the third set of knowledge which includes lecturer competencies to use a range of ICTs in teaching (Mishra, 2008; Koh et al., 2014; McDonald et al., 2001).

(4) Practical knowledge is the fourth set of the knowledge domain added on the adapted TPACK framework. Practical knowledge refers to the practical exposure of lecturers through occupational or college exposure in a subject domain, and includes lecturers' applied knowledge and practical experience gained through hands-on exposure in industry or teaching (DHET, 2011; Zillien and Hargittai, 2009).

This section articulates, analyses and interprets lecturer knowledge, experience and related competencies that underpin effective Internet usage in teaching at TVET colleges, as illustrated in the adapted TPACK framework and illustrated in Figure 4 as shown in Chapter 2. The adapted framework extends the original framework by the addition of the practical knowledge domain.

Figure 4: Adapted TPACK framework

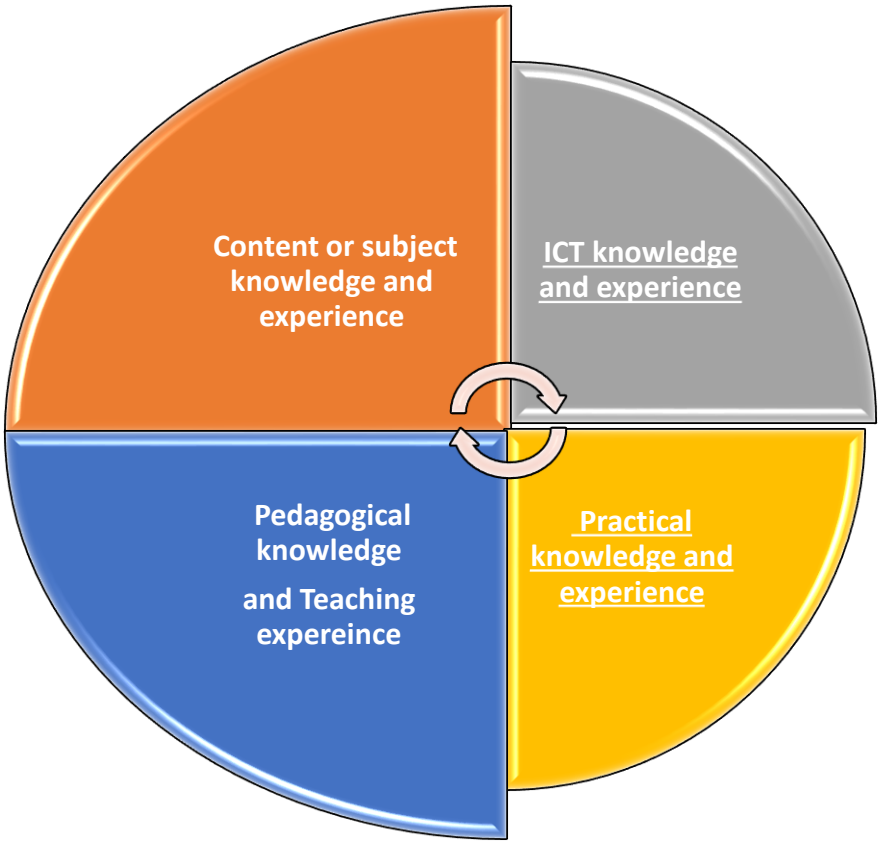


Source: Adapted by researcher from Koehler & Mishra (2008)

5.2.1 Pedagogical and content knowledge

This section articulates an analysis and interpretation of the pedagogical and content knowledge domain, as shown in Figure 29 on the adapted TPACK framework.

Figure 29: Pedagogical and content knowledge



Source: Adapted by researcher from Koehler & Mishra (2008)

The two domains are jointly analysed, as suggested by George (2014, p.54) who notes that "pedagogical content knowledge and their pedagogical knowledge (knowledge of appropriate general pedagogical strategies) should not be regarded as two separate domains".

Data on lecturer skills and qualifications indicates that the majority (67%) of lecturers that took part in the study do not have professional teaching qualifications. The DHET policy on teacher qualifications, describes the minimum pedagogical, content, and practical knowledge required for each subject per qualification (DHET, 2011). The policy codifies pedagogy and subject-content knowledge in teachers'

professional qualification, and by implication the opposite is also true i.e. a lack of qualifications implies a lack of said knowledge domains. According to Graham (2011) and Koh et al. (2014), pedagogical knowledge is impaired when lecturers lack formal teaching qualifications. These findings corroborate the results of the DHET survey which found that two thirds of the lecturers that do not have qualifications also lack subject knowledge of the curriculum (Koen, 2011).

Pedagogy knowledge is the hallmark construct of the TPACK framework, and according to Wallace (2004), lecturers who lack pedagogical skills may also be unable to navigate the complexities of selecting and using appropriate Internet resources to adapt curriculum content, and connect the student with the subject matter to achieve learning goals. Lack of pedagogical knowledge and subject-content knowledge amongst lecturers may undermine their ability to appropriate the Internet in teaching. The pedagogical competency weaknesses amongst lecturers suggested that lecturers have not transitioned from basic use of the Internet for information search and communication activities to advanced levels of usage that entail curriculum modification and knowledge creation through the use of Internet resources.

While studies by Graham (2011) and Koh et al. (2014) point to the importance of pedagogical knowledge, a study by Drent and Meelissen (2008) finds no strong relation between the pedagogical competencies and the innovative use of ICT in teaching, and that the impact of pedagogy on ICT in teaching is limited.

The FETI report of 2008 posit that lack of qualified TVET lecturers is partly attributed to the absence of university teaching qualifications for TVET college lecturer as it is not financially viable for universities to spend resources to develop TVET teaching qualifications as compared to basic education-teaching

qualifications due to the big demand for primary and secondary teachers, and less demand for TVET lecturers because of the economies-of-scale factor (FETI, 2008). The report further states that, historically, TVET college lecturers were largely recruited from industry and possess technical skills and industry experience, with minimal teaching qualifications.

As a response to a lack of challenge of professional teaching qualifications amongst TVET lecturers, the DHET initiated the vocational education-orientation programme (VEOP) short course designed to improve the quality of teaching at colleges in partnership with local universities (Jacobs and De Wet, 2013). In addition, the budget speech made in Parliament by the Minister of Higher Education and Training, Blade Nzimande, on 16 May 2017 highlighted the intervention of supporting ten universities, through a European Union grant, to build capacity to train TVET college lecturers (RSA, 2017).

5.2.2 Lecturer teaching experience

Data on teaching experience reveal that the majority of lecturers have a significant teaching experience, with 56% reporting to have more than 11 years of teaching experience. Research conducted by Alonzo (2007) supports the explicit relationship between lecturer experience in years and the effective transmission of knowledge to learners, and argues that pedagogical content knowledge (PCK) is largely accumulated through teaching experience. Yasak and Alias (2015) suggest that lecturers do not only apply teaching theories when using ICTs in teaching, but also appropriate their personal theories accrued over teaching experience. Rice (2010) argues that experience in teaching is an important factor in effective teaching but, after 25 years of teaching, its effectiveness may start to decline. Meanwhile MacDonald et al. (2001) posit that sound pedagogical knowledge, and not

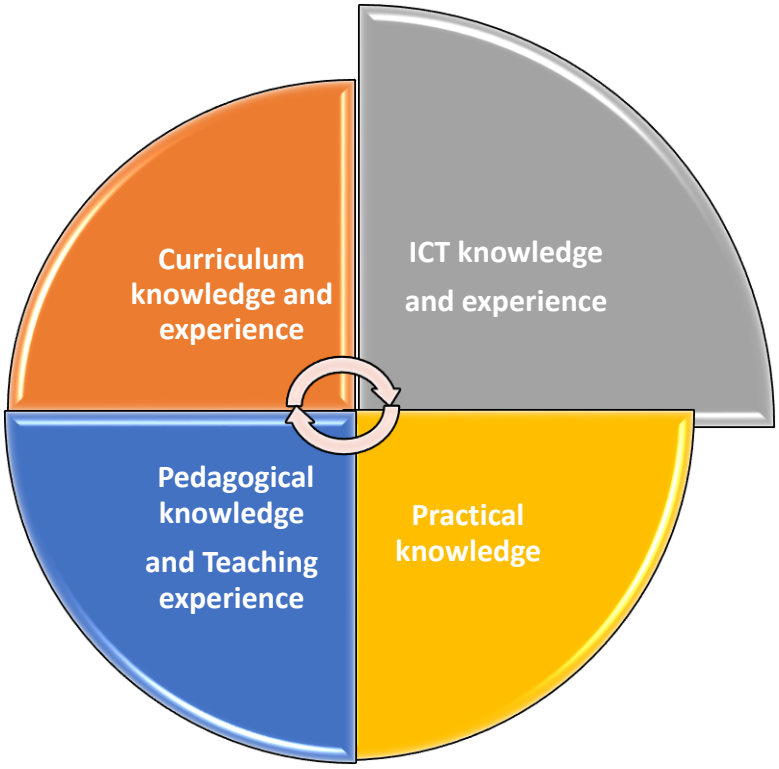
experience, is the principle factor for effective curriculum delivery through the use of technology. The different perspectives' role of experience in Internet use in teaching suggest that the role of experience in teaching and Internet use is not definitive.

The lecturer teaching experience may be insignificant with regard to Internet appropriation for instruction since the majority of them do not have the requisite teaching qualifications and Becker (1999) supports this observation argues that the duration of teaching experience is insignificant to the valuation and use of the Internet in teaching. Historically TVET lecturer-identity has been shaped by industrial economy which the TVET is expected to supply with skills that put emphasis on artisans and technical skills over professional teaching qualifications (Chappel, 1999). This identity continues to permeate TVET lecturers to date. As discussed earlier, DHET has initiated a number of interventions to address the lack of professionally qualified lecturers at TVET colleges.

5.2.3 ICT (Technology) knowledge in teaching

This section articulates an analysis and interpretation of lecturer ICT (technology) knowledge that informs lecturers of Internet use in teaching at colleges, as illustrated in Figure 30.

Figure 30: ICT skills knowledge



Source: Adapted by researcher from Koehler & Mishra (2008)

All the lecturers involved in the study teach ICT-related subjects, and while it can be reasonably assumed that they possess generic ICT skills, the data shows that 63% of colleges rated their lecturers as having 'average' ICT skills. Graham (2011) cites the importance of not only the competence to use ICTs but also to underscore the knowledge process of applying technology in teaching. Wallace (2004) argues that the attainment of advanced forms of Internet use requires a deep knowledge of using Internet resources to adapt curriculum content and knowledge of pedagogical strategies that connect students to the subject content.

The average ICT skills and the lack of pedagogical skills amongst lecturers implies that lecturers' ability to effectively appropriate the Internet applications to modify and create the curriculum is significantly impaired. In addition to the lack of ICT skills,

“the ICT training the educators get is implemented in such a way that it hardly equips them with the Technological Pedagogical Content Knowledge (TPCK)” Chigona et al. (2014, p. 2).

The rapidly changing ICT landscape implies that lecturers must regularly update their ICT skills and knowledge in order to teach effectively in their chosen subjects through use of the Internet. Insufficient ICT skills amongst lecturers reflect the generally low ICT skills competencies in South Africa. This is shown in World Economic Forum network-readiness index that assesses, amongst other things, the state of readiness of countries to capitalise on ICTs for social transformation. South Africa is ranked 95, lower than Mauritius (53) and Tunisia (85) in the ICT skills domain (WEF, 2016).

In an attempt to address the ICT skills gap amongst lecturers at public TVET colleges, the national policy on the minimum requirement for teacher-education qualification mandates that minimum lecturer qualifications include a learning stream on effective integration of ICTs and the Internet in teaching (DHET, 2011). In addition, DTPS and DHET implemented TVET lecturer ICT skills and professional development to improve the quality of learning and teaching through technology (INESI, 2014).

5.2.4 Internet use experience in teaching

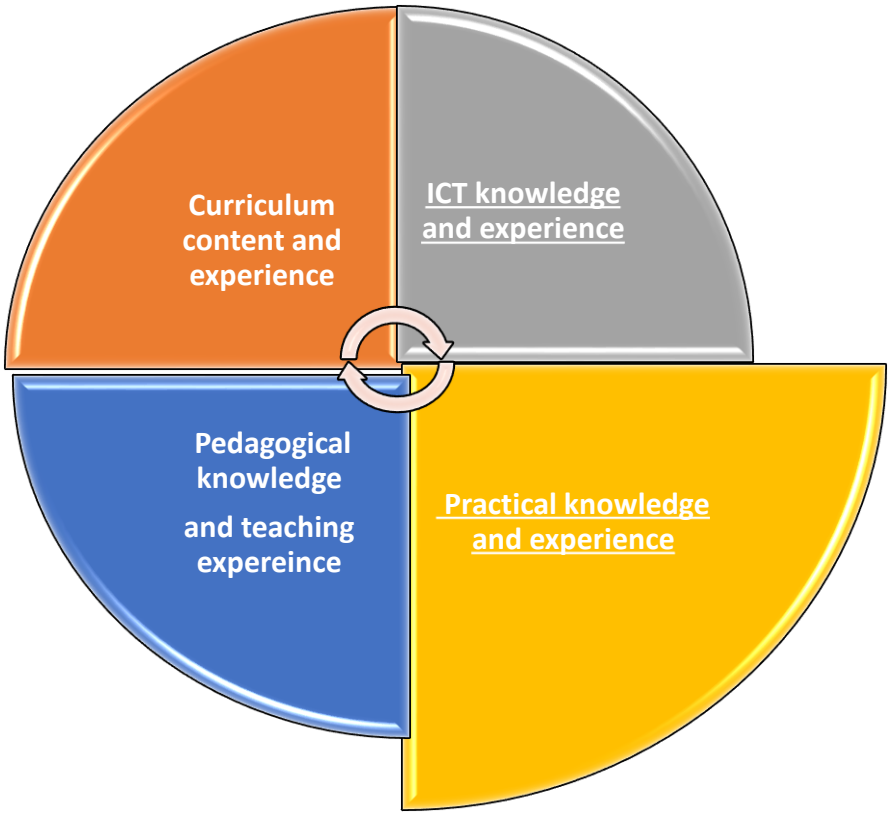
The analysis of findings on Internet-use experience indicates that the majority (56%) of lectures have significant years of experience of using the Internet in teaching. Literature indicates a positive impact of Internet-use experience in teaching. According to Oster-Levinz and Klieger (2010), the length of time in using the Internet in teaching is directly related to the ability of lecturers to use technology to effectively design, adapt and deliver the curriculum through the Internet medium. Baş et al.,

(2016) highlight the role of experience in technology use as essential for improving attitudes towards the use of technology in teaching. However, due to a lack of technology and pedagogical skills amongst lecturers, it may be suggested that lecturer experience in using the Internet in teaching may not meaningfully advance the teaching experience through Internet use. South Africa is lagging behind in ICT adoption and usage in education, as shown in the World Economic Forum's 2016 Global Information Technology Report that ranks South Africa lower (97) when compared to Senegal (72), Kenya (52) and Seychelles (72) (World Economic Forum, 2016).

5.2.5 Practical experience and Internet use

This section articulates an analyses and interpretation of lecturers' practical knowledge and experience, as illustrated in Figure 31 of the adapted TPACK framework.

Figure 31: Practical knowledge



Source: Adapted by researcher from Koehler & Mishra (2008)

Data on lecturers' practical competencies present nuanced variations. Data indicate that the slight majority (56%) of the lecturers do not have practical experience in their respective teaching fields, as illustrated in Figure 25. A slight majority (56%) of the lecturers reported having occupational qualifications. Historically, as explained in chapter one, TVET colleges predominantly recruited lecturers from industry with technical qualifications and industry experience to align their qualifications with the industry requirement (FETI, 2008). This historical development continues to shape lecturer qualifications to date, as shown by study findings on lecturers' occupational qualifications that illustrate that 56% of lecturers have professional qualifications. The slight majority of lecturers with occupational qualifications may suggest that

lecturers have sufficient knowledge of content of their teaching subject, which is an important knowledge-set for Internet use in teaching; however, their practical knowledge may be sub-minimal.

The adapted TPACK framework suggests that practical skills are a vital component of vocational lecturer-skills composition. Practical knowledge in additional pedagogy subject-content knowledge is codified in the DHET (2011) policy on minimum teacher qualifications, as a fundamental competency essential for effective teaching in a vocational college setting. Papier (2011), Bruijn and Leeman (2011) also highlight that vocational teacher competencies must also include practical or workplace knowledge which can be acquired at a work or college setting.

A lack of practical experience and knowledge may suggest that lecturer knowledge and use of the Internet in teaching, to contextualise and simulate practical learning environments during teaching, is impaired. These findings further compound the perennial problem of the NCV curricula at colleges which are seen as largely academic and theoretical and lacking practical orientation, as established in the FETI survey findings of 2013 (FETI, 2013). The review of the NCV curriculum, announced in the budget speech of 2017/18 by Minister Nzimande, will be inadequate if it does not also address the lack of practical orientation of the NCV curriculum, and the development of practical skills amongst lecturers (RSA, 2017).

5.2.6 Lecturer attitudes on Internet use in teaching

This section provides an analysis of attitudes that influence Internet use in teaching amongst lecturers. The study revealed that lecturers expressed positive attitudes on the use of the Internet in teaching and believes that the Internet adds value to the teaching experience. The technology-adoption model (TAM) highlight lecturers'

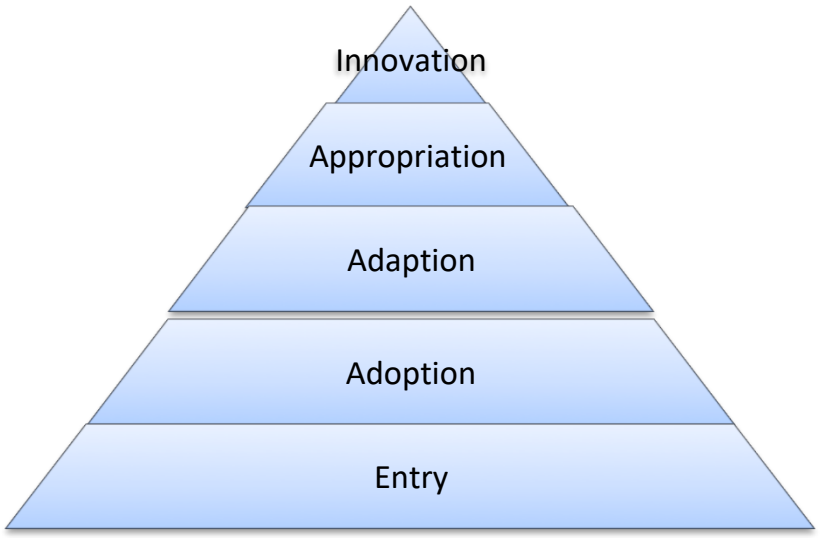
perceived value of the Internet in teaching, and Internet use and experience in teaching to signify positive attitudes towards the use of the Internet in teaching (Porter and Donthu, 2006). Positive attitudes to technology-use in teaching is a strong indicator of a willingness to use ICT in teaching (Baş et al., 2016; Tømte et al., 2015; John, 2015; Baya'a[a],Daher[ab], 2015). Baş et al. (2016) argue that having experience of using computers and the extensive use of technology in lessons generate positive attitudes towards the use of technology in teaching.

The positive attitudes amongst lecturers in using the Internet explain the continued use of the Internet in teaching amongst lecturers amidst the challenges experienced at the colleges, including a lack of incentives, institutional support and unreliable Internet connectivity. Also a positive attitude provides for a platform upon which interventions to advance the use of the Internet in teaching at colleges can be built.

5.3 Forms and characteristics of Internet use and the extent of Internet usage

Recalling from Chapter 2, the teacher-development framework shown in Figure 6 is employed in this section to analyse the forms and characteristics of Internet use, and consequently the extent of usage. The framework articulates five levels that describe the extent of Internet appropriation in teaching that include the entry, adoption, adaption, appropriation, and innovation stages (DHET, 2007). Through the use of the framework, this section articulates an analysis of factors that underlie the forms (what lectures use the Internet for in teaching), and the characteristics (how they use the Internet in teaching) and highlight how a confluence of factors impacts on Internet use in instruction.

Figure 6: The teacher development framework



Source: DHET (2007)

5.3.1 Internet use to enhance curriculum

A data analysis on the forms and characteristics of Internet usage in teaching indicates diverse Internet-user patterns amongst lecturers. Lecturers teaching NCV-related subjects reported using the Internet largely for information search and for practical learning activities, while lecturers teaching Cisco networking use the Internet for network-simulation activities, access to online learning content, online tests and examinations, and for online collaboration with the subject-matter experts. According to the teacher-development framework (DHET, 2007), as shown if Figure 6 lecturer Internet use in Cisco Networking training exhibits some adaptation-phase features, while user patterns for the NCV curriculum exhibit adoption-phase features. The entire Cisco Networking curriculum is embedded in the Internet and this partly explains the slightly advanced level of Internet usage and illustrates that Internet use in instruction can potentially advance and promote Internet use in teaching. According to Hosseini (2015) and UNESCO–UIS (2015), studies

conducted on technology use in education suggest that ICT integration into the curriculum enhances technology usage in the delivery of the curriculum. Meanwhile Gülbahar (2007) argues that technology integration into the curriculum is essential for the diffusion of technology use in teaching.

The analysis of Internet user-patterns also illustrates different levels of Internet use for the NCV and Cisco Networking training curriculum. The integration of the Cisco Networking curriculum into the Internet seems to foster Internet use in teaching and learning amongst lecturers and students, largely because all the lessons, assessments, curriculum content, and curriculum support is embedded in the Internet.

5.3.2 Internet use to promote practical skills

Data gathered from lecturers on the forms and characteristics of Internet usage suggest limited use of the Internet to advance problem-solving skills amongst students. The limited use of the Internet in teaching to advance practical competencies amongst students seems to be due partly to the theoretical orientation of the NCV curriculum. According to the Further Education and Training Institute (FETI) survey on the professional development programme for lecturers, the disconnect of the NCV curriculum from practical lessons is largely attributed to the inflexible and theoretically oriented NCV curriculum (FETI, 2013). Meanwhile, the Cisco Networking training curriculum provides for teaching that stimulates students and lecturers to engage in practical problem-solving activities such as network configuration and network trouble-shooting through online network simulations (FETI, 2013).

Studies on the efficacy of ICTs and Internet use in vocational education and the curriculum are not unanimous. According to Yasak and Alias (2015), some studies

reveal that Internet-mediated teaching is more effective where the goal for learning is cognitive development and less ineffective where the goal for learning and teaching is practical skills development, and vice versa. These studies emphasise that it is mainly the curriculum format that determines the extent of Internet use. The analysis findings highlight limited use of the Internet by lecturers to promote practical competencies amongst students, and the elementary use of the Internet for basic information search suggests an entry-level stage in the appropriation of the Internet in teaching, as outlined in the teacher-development framework and the blended learning institutional adoption framework development in ICT (DHET, 2007; Garrison and Vaughan, 2013; Graham et al., 2013).

This analysis is in line with the study findings on the use of ICT in education in sub-Saharan countries, which indicates that the use of ICTs in education was at an "embryonic stage in majority of countries in sub-Saharan Africa" (UNESCO–UIS, 2015, p.20).

5.3.3 Use of Internet resources to communicate in teaching.

Data reveal that the majority (75%) of colleges use Internet-based communication tools, social media (WhatsApp and Facebook) to communicate with students on curriculum content, and few (22%) lectures use e-mails to communicate amongst each other on curriculum content. According to Dzvapatsva, Mitrovic, and Dietrich (2014), the proper use of social media can benefit the teaching process and enhance the contact time required for the subject, which is often lacking at TVET colleges due to the high student-lecturer ratio in a tightly congested NCV curriculum. Furthermore, the use of social media and access to mobile devices gives expression to the concept of ubiquitous access to learning and teaching.

The use of social media amongst students and lecturers at TVET colleges, provides a viable communication tool for lecturers and students to share educational content beyond the confines of a physical classroom and time. Correa (2016) argues that most young people that constitute target groups at TVET colleges, use social media including Facebook as a point of entry into the Internet. For this reason the predominant social media for curriculum content at colleges is in line with this trend. TVET colleges have not adequately appropriated social media as a tool for instruction, largely due to the misaligned college internal Internet policies that prohibit the use of social media on the college network, and the work overload.

South Africa has witnessed the proliferation of over-the-top technology (OTT) use driven by increased access to mobile Internet, and this is expected to reach 72% of mobile Internet users by 2018 (SACF, 2016). In their submission to Parliament, SACF argued that these disruptive innovation applications, such as instant messaging services or WhatsApp and Facebook, drive user demands and satisfaction, and TVET colleges have not fully exploited the benefits of these innovations. Colleges, like other sectors that fail to embrace innovation, may risk irrelevance.

5.3.4 Use of Internet resources for curriculum support

The data analysis reveals limited use of Internet platforms such as blogs, Facebook pages for online curriculum support. The reasons cited for limited Internet use include lack of time, poor Internet connectivity, lack of trust, and inadequate pedagogical and ICT skills amongst lecturers. According to Loogma, Kruusvall and Ümarik (2012), the use of ICT and Internet in pedagogy requires co-construction and mutual adaptation through the use of Internet-based resources to collaborate and share curriculum-content information. Meanwhile the UNESCO ICT

competency framework for teachers posits that teachers knowledge and competency to use web-based resources for collaboration, and improves prospect for lecturers to collaborate and access information to advance teaching (UNESCO, 2011). Lack of lecturers' participation in online community of practice deprives lecturers of the possibility for lecturers to strengthen their pedagogical content knowledge and keep abreast of curriculum developments. It may also be inferred that a lecturer may not have the confidence to participate in collaborative online forums, largely due to their lack of fundamental TPACK competencies to contribute meaningfully in curriculum innovation. Furthermore, as a consequence of a pedagogical knowledge deficit, lecturers probably participate as recipients of knowledge and expertise as compared to contributing in curriculum innovation and adaptation. According to Yasak and Alias (2015), lecturers' capacity to innovate is dependent on their ICT and pedagogical competence. On the other hand Assareh and Bidokht (2012) and Redekopp and Kalanga (2015) argue that curriculum innovation is a team effort that requires collaboration, and a lack of participation in online collaborative activities may potentially limit lecturers' prospects to accumulate local and global perspectives in their teaching subjects.

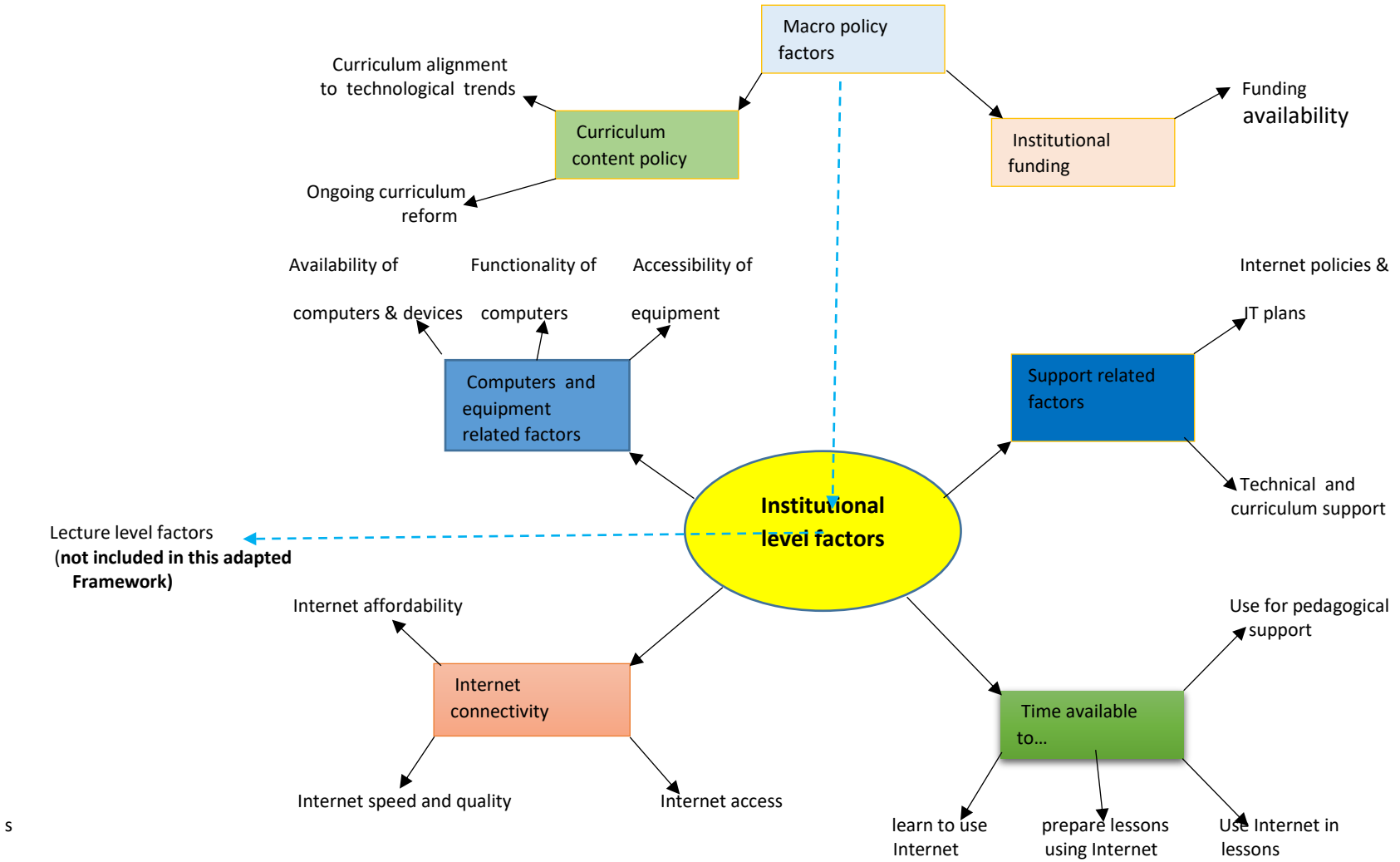
In an effort to address these challenges, DHET has introduced an online lecturer-support system portal (LSS) that provides learning material and lesson plans in support of the curriculum (DHET, 2014b). However the system is not optimally utilized invariably due to poor Internet connectivity and a lack of skills amongst lecturers. The findings corroborate the studies conducted on teaching students on Internet use, and in Lesotho and Canada it was found that candidate teachers' use of the Internet was limited within their social circles and comfort zones, mainly due

to information overload and underdeveloped pedagogical competencies (Redekopp and Kalanga, 2015).

5.4 Institutional level factors that influence lecturer Internet use in teaching

Recalling the institutional level factor theoretical framework shown in Figure 5, this section articulates and analyses and interpretation of institutional level factors that influence Internet use in teaching at colleges through the use of this framework.

Figure 5 : Institutional level factor theoretical framework



Source: Adapted from George (2014)

5.4.1 Internet connectivity and usage

This sub-section provides an analysis on Internet connectivity as one of the key factors that influence Internet usage in instruction. According to the literature, quality Internet connectivity is arguably the uppermost predictor for lecturers' Internet use in teaching (Becker, 1999; Brazilian Network Information Centre, 2014; Ndlovu and Lawrence, 2012). Despite access to fiber connection for 50% of the colleges and Wi-Fi connectivity to 75% of the colleges, data analysis on the state of Internet connectivity indicates that lecturers experience poor Internet connectivity at colleges, and this may discourage them from using the Internet for teaching. Quality of Internet connectivity is informed by a confluence of variables quality of equipment, number users, network configuration and availability of frequency spectrum to mention a few (Wang, 2015). Data also reveal that equipment and software, which enable quality Internet connectivity, are not regularly upgraded and replaced, largely due to funding constraints at colleges.

The study findings highlight that public TVET in Gauteng has not benefitted from the province's increase in Internet connection speed from 3.7 to 6.0 mbps, as reported in an ICASA report on the state of the ICT sector in South Africa (ICASA, 2017). Unreliable Internet connectivity has the potential to undermine the effective use of the Internet for instruction at colleges. The effect of poor Internet connectivity in teaching the Cisco Networking curriculum may be severe since the entire curriculum is embedded online, while for the NCV curriculum where lecturers primarily use the Internet for information searches to augmenting textbooks content, the impact of poor Internet connectivity may not be severe.

The Broadband SA Connect policy targets aim to achieve Internet speeds of ten mbps in 100% of the schools and colleges by 2020 and one GBPS in 100% of the schools

by 2030 (RSA, 2013). In his budget speech made in Parliament, the Minister of Higher Education and Training, Blade Nzimande, made a pronouncement that, “One of the biggest interventions we intend to make this year is that of implementing a TVET connectivity project through the South African National Research Network (SANReN). Through this project all the 267 college campuses will operate on the same ICT network environment as universities”. (RSA, 2017).

5.4.2 Internet affordability and usage

The high cost of Internet connectivity emerges from the analysis of data as one of the factors that adversely impact on Internet usage in teaching at colleges. Also, the majority of students enrolled at TVET colleges come from poor households and therefore financial provision for data may not take precedence due to other competing basic necessities.

Notwithstanding the centrality of skills and connectivity, Mendoça, Crespo and Simões, (2015) and Birba and Diagne (2012) argue that the cost of connectivity and people’s economic status are two of the major factors that underlie the adoption of Internet access. The availability of Wi-Fi connectivity in the majority (seven or 88%) of the colleges suggests that while both students and lecturers can access these, they may be limited to accessing the Internet outside the college premises. Municipality interventions in Tshwane, Ekurhuleni, and Johannesburg metros to provide free Wi-Fi in designated public spaces may ameliorate the challenge of affordable Internet connectivity. However, the principle of ubiquitous learning and teaching is undermined when lecturers and students are unable to access affordable Internet outside these public spaces.

A study conducted by Research ICT Africa confirmed that South Africa is the most expensive country in the broadband African price index (Calandro and Rademan,

2014). While South Africa may have costly data prices, RIA (2015) argue that using the value for a money index, which measures the costs in relation to the quality of service (average upload and download speeds), the South African mobile-operator rate favourably compares to its African counterparts.

There is a number of interventions that seeks to address the challenge of the cost of communication services in educational institutions. The ECA Act (No. 36 of 2005, as amended) makes provision for a 50% discounted rate for TVET colleges, schools and health facilities, for Internet costs levied on licensees in these institutions (RSA, 2005a; RSA, 2005b). ICASA developed e-Rate regulations in 2009 to specify the procedures for the implementation of e-Rate (ICASA, 2009). While e-Rate legislation and regulations have good intentions of providing affordable Internet connectivity in education institutions, Mooketsi (2015) cites a number of e-Rate implementation challenges including a lack of monitoring, lack of coordination, lack of awareness by beneficiaries and lack of administration. The National Integrated ICT Policy White Paper seeks to phase out the e-rate and replace it with the g-rate to provide subsidies to all public institutions over and above educational institutions rendering public services (RSA, 2016).

In addition, the ECA of 2005 makes further provision for the Universal Services Access Fund (USAF) which the National Integrated ICT Policy White Paper announced would be replaced by the Digital Development Fund (DDF) to provide subsidies to needy persons accessing affordable communication services, and address the access gap (RSA, 2005b; RSA, 2016).

5.4.3 Access to end user equipment and devices

This section articulates an analysis and interpretation of computer-related factors that underlie Internet use in teaching at colleges. The data findings on access to end-user

devices highlight severe shortages of access to computers, the basic device for accessing Internet. The student/computer ratio and the ratio of computers connected to the Internet, as shown in Figures 10 and 11 respectively, reflect skewed ratios on access to computers and Internet connectivity. In addition to the lack of access to end-user devices and equipment, the data also reveal that most of the computers and equipment installed at college laboratories and in classrooms are old and the software used is not regularly upgraded due to inadequate budgets and high costs. Meanwhile the majority of the lecturers and students have access to smartphones, while lectures also have access to smartphones and personal laptops.

According to Ndlovu and Lawrence (2012); Akoojee (2008); and Oyelaran-Oyeyinka and Lal (2005), a lack of access to quality ICT infrastructure and equipment may deter lecturers from using the Internet in teaching. Meanwhile Chigona, et al. (2014) cite that poor students-computer ratios create difficulties for lecturers to manage classrooms, and may discourage lecturers' use of technology in teaching, and stifle students' meaningful interaction with learning material and content. George (2014) cites that studies on ICT integration in education indicate that a lack of hardware and equipment is a significant barrier to the use of ICT in education. Meanwhile Conole (2010); and Shava, et al. (2016) argue that the increasing access to sophisticated mobile phones, mobile computing, laptops and tablets has made the idea of mobile learning possible and can potentially mitigate the challenges of high student computer ratios. Lynch (2015) cautions that alongside the benefits of mobile devices is a host of other challenges including privacy issues as a consequence of cookies in mobile devices, and costs of mobile devices and the potential for class disruption and theft.

Abrahams and Goldstuck (2010) argue that high computer hardware and bandwidth prices make the Internet inaccessible and limit its widespread usage in education in

South Africa. The high cost of equipment is largely attributed to the high import duties and taxes levied on these equipment lessons and can be drawn from countries like Kenya, Ghana and Tanzania that took bold steps to zero-rate tax on all ICT equipment. Also, through the Kenyan ICT Board, laptop subsidies are provided for university students (Msimanga, 2012). The Integrated ICT Policy White Paper of 2016 seeks to boost locally manufactured devices and ICT equipment, and promote SMME development and provide subsidies through the digital development fund for Internet access in public institutions, including TVET colleges (RSA, 2016).

The effect of obsolete equipment and software includes slow Internet speeds, may constrain access and use bandwidth-intensive applications including access to online video tutorials, and the use of Skype services for teaching amongst other things. Access to equipment and devices constitutes an important link within the Internet value chain, and a lack of access can potentially collapse initiatives to promote use of the Internet in teaching.

5.4.4 Technical and curriculum support

This section articulates an analysis and interpretation of support-related factors that underlie Internet use in teaching. Quantitative data on technical support revealed that the majority (88%) of the colleges have access to technical support. However, qualitative data from respondents highlight that available technical support at the colleges is often ineffective, unsustainable and skewed towards college administration-activities and not for teaching and learning. Chigona, et al. (2014) and Koh, et al., (2014) argue that a lack of technical support may discourage lecturers from using the Internet in learning. Inadequate technical and curriculum support at public TVET colleges has the potential to undermine use of the Internet in teaching at colleges. This may be further compounded by a skewed lecturer-student ratio (1:56),

coupled with a student target that is not academically prepared, and the heavily congested and highly pitched NCV curriculum. A survey in Brazil on barriers towards the use of ICT and the Internet in education, identified a lack of technical support as the third most predominant factor, after Internet speed and students' computer ratios that influence ICT use in learning and teaching (Brazilian Network Information Centre, 2014). Considering the limited use of the Internet for NCV programmes by lecturers, the lack of technical support may not have a significant bearing on the delivery of the NCV curriculum, while for the Cisco networking the impact may likely be severe since its entire curriculum and assessments are embedded on the Internet. As a consequence of the Further Education and Training Colleges Amendment Act, No. 3 of 2012, the governance and administration of TVET colleges was removed from the provincial education departments and assigned to the Minister of Higher Education and Training (RSA, 2012). This institutional arrangement meant that curriculum support that was previously accessible at a provincial level is currently centralised at DHET and the latter is unable to cope with curriculum-support needs of multitudes of lecturers from 52 TVET colleges and more than 250 satellite campuses around the country. The DHET introduced an online lecturer-support system (LSS) to provide subject-specific support to lecturers and access to teaching tools and lessons to enable lecturers to upgrade teaching and professional skills (DHET, 2014). Meanwhile Cisco networking training provides lecturer teaching networking and training with online curriculum support; however, this Intervention may be inadequate due to the challenges of Internet connectivity and the lack of skills in the majority of the lecturers.

5.4.5 Internet policies and IT plans

The analysis finding of college Internet policies and plans reveals that the majority (75%) of colleges do not have college-based Internet policies and 50% of the colleges

do not have IT plans. Perusal of the existing policies and plans reveals that the policies are mainly focussed on end-user policies and procedures for the replacement of equipment, and do not address the core ingredients for promoting the Internet use in teaching. According to Porras-Hermàndez and Salinas-Amescua (2013) institutional policies provide for routinized use of the technology, institutionalized incentives for Internet use and set up the mechanisms to assess and evaluate the extent of Internet use. According to these authors the absence of policies and plans is inimical for an environment and culture for effective Internet use in teaching. A lack of internal policies and plans, and incoherent policies and plans at TVET colleges suggests that use of the Internet by lecturers is opportunistic and unplanned, and lectures are not subject to assessment and evaluation on Internet use at colleges. According to Porter, Graham, Spring, and Welch (2014), there are few studies that have looked at an institutional level of blended learning-adoption issues, and the role of institutional policies and strategies to support the adoption and use of the Internet, and for this reason future research is suggested in this area.

5.4.6 Time availability and Internet use

This section focuses on analysing and interpreting data on time-availability constructs and the influence on lecturers' use of the Internet in teaching. Data analysis reveals that the NCV curriculum is congested and complex, and requires lecturers to spend a significant amount of time for lesson-preparation, and they are expected to spend a significant amount of time guiding academically unprepared students. Work overload amongst lecturers is further expressed by huge discrepancies in lecturer-student ratios, as illustrated in Figure 13.

According to Wallace (2004); MacDonald et al. (2001); and Shea (2007),the use of the Internet in teaching is a complex process that demands of lecturers to invest a

significant amount of time to prepare and navigate multitudes of Internet resources and content, and for pre-lesson activities that include planning and curriculum-content design. Furthermore, George (p.43, 2014) argues that teaching and administration "demands on teachers' time leave little time available for teachers to carry out activities required to integrate ICT into their teaching". Time constraints, coupled with work overload, and huge numbers of students who are academically unprepared, may undermine lecturers' efforts to meaningfully use the Internet in instruction.

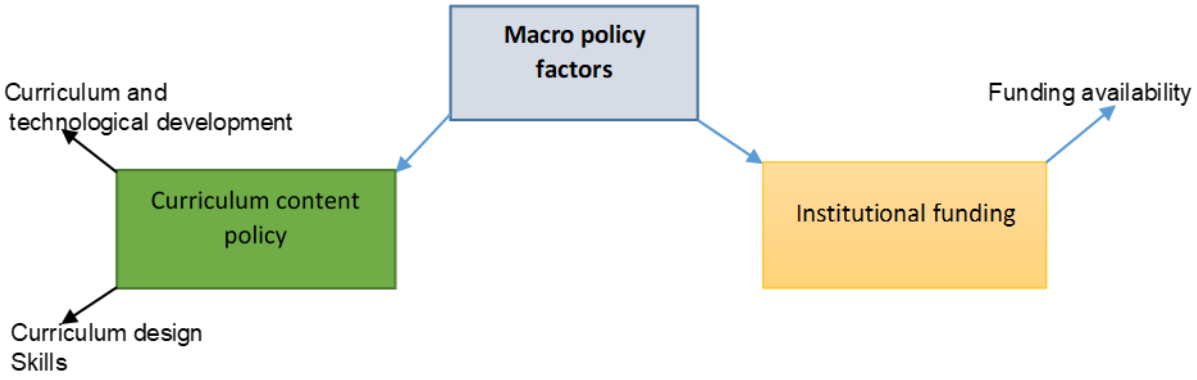
Graham (2013) argues that the use of e-Learning in particular can mitigate against the challenges of work overloads and a lack of time through introducing students' progress-performance measures that are mastery based instead of time based. The author further suggests introducing release times for online lesson preparations as a part institutional policy-incentive regime for e-Learning. Despite these benefits of technology on time, in general, studies indicate that the use of ICT in learning and teaching increases the work overload for teachers (George, 2014). The myriad factors that contribute to the lack of time for such a work overload, academically unprepared students and a vast syllabus, suggest that multiple interventions are necessary to address time-related challenges.

5.5 Emerging themes

Data analysis reveals that over and above lecturer level and institutional level factors, there were new emerging macro-policy issues on curriculum reform for TVET and funding that seems to have a profound influence on Internet use in teaching at colleges. This section presents the two macro-policy issues at colleges, as illustrated in Figure 32. These emerging themes on availability funding and curriculum content are analysed through the use of the adapted institutional-level factor theoretical framework. These themes are not institutionally-confined, but are part of the macro-

policy context that influence institutional-level factors that impact on lecturer Internet use in teaching at colleges. For this reason broken lines are used to illustrate the relationship between the themes and the institutional-level factors as shown in figure 5.

Figure 32: Macro policy factors



Source: Researcher

5.5.1 Curriculum content policy

A lack of curriculum reform and an outdated curriculum emerged from the data analysis as some of the factors that limit lecturers' Internet usage in teaching. Baş, Kubiatko, and Sünbül (2016) posit that curricula that position technology at the core of teaching is important in supporting the uptake and usage of the Internet in teaching, while Alismail and McGuire (2015) argue that the curriculum must be relevant and should endeavor to promote skills amongst students that are relevant to the labor market and will prepare students to deal with real-world problems.

The lack of NCV curriculum reform seems to restrict lecturers' use of the Internet curriculum-content and resources in teaching that are outside the ambit of the NCV curriculum and related assessment guidelines. On the other hand, the Cisco curriculum cannot also be freely adapted due to restrictions associated with propriety

curriculum, consequently diminishing the capacity of lecturers to innovate and create new forms of knowledge through the use of the Internet. In the light of these factors, it can be inferred that inflexible and outdated curriculum policies and the restrictive propriety licence conditions associated with vendor-training programmes undermine the extent of Internet usage in teaching at TVET colleges.

With the exception of Multimedia, the NCV curriculum was introduced at TVET colleges in 2011; the NCV curriculum has not been reviewed since inception in 2007, while new technologies and innovations that inform the curriculum have since emerged and these have created curriculum misalignment and irrelevance in the NCV curriculum. In his budget speech of 2017/18, Minister Nzimande announced that DHET has undertaken a review of the NCV curriculum (RSA, 2017). The emerging open-education resources (OER) provide an alternative avenue for lecturers and students to access, use and adapt curriculum content without intellectual property restrictions (UNESCO, 2013). Currently South Africa does not have a policy framework on the use of open-education resources in teaching in the basic, secondary and vocational education sector. To address curriculum-content challenges, Kenya established an institute for curriculum development to develop an ICT-enriched curriculum (UNESCO-UIS, 2015).

5.5.2 Funding to support the Internet use in teaching.

The lack of funding emerged from the qualitative data analysis as the perennial theme of access to equipment, computers, upgrades of equipment software, and access to technical support at the colleges involved in the study. Studies on ICT use in education identify the lack of funding as one of the major barriers hindering the implementation of an e-Learning initiative due to its high capital cost for ICT infrastructure, equipment, technical-support software licences, and skills programmes (Graham, 2013; George,

2014). Lack of capital investment for ICT infrastructure, technical support and ongoing skills-competency development can potentially prohibit the uptake and use of the Internet in teaching. Colleges receive funding through the Department of Higher Education and Training that is currently estimated at R6.6 billion and Gauteng colleges receive a 23% (R1.5 billion) share of the budget. In spite of the progressive increase of TVET budget allocation, there still remains a shortfall of R10 billion in the 2016/17 financial year and is projected to increase to R18 billion in the 2018/19 financial year (Commission of Inquiry into Higher Education and Training (2017). Abrahams and Sibanda (2012) proposed in their submission to the Financial and Fiscal Commission for division of revenue for 2013/14, a funding model that include a public-private partnership, philanthropy, equipment subsidies, and grants for funding e-Learning initiates. Often funding sources are for various elements of technology use in teaching and come from various revenue streams and require astute TVET college leadership to harness the funding for the benefit of e-Learning interventions.

5.6 Conclusion

In conclusion, the analysis of data provided a response to the following key objectives of the study:

Objective 1: The factors that influence Internet usage in teaching

Lecturer-level factors that influence Internet use at TVET colleges are complex and multi-layered. The analysis reveals that lecturers have critical knowledge and skills, and this seems to undermine the extent of Internet usage. On the other hand, the majority of colleges do not fare favourably on institutional level factors. Factors such the lack of reliable Internet connectivity and inadequate infrastructure undermine the effective use of the Internet in instruction. The analysis findings of emerging themes reveal that macro-level policy factors on the curriculum and funding have the potential

to adversely impact on the use of the Internet in teaching; however, further research is recommended to examine the full extent of the impact.

Objective 2: The forms and characteristics of Internet usage in teaching

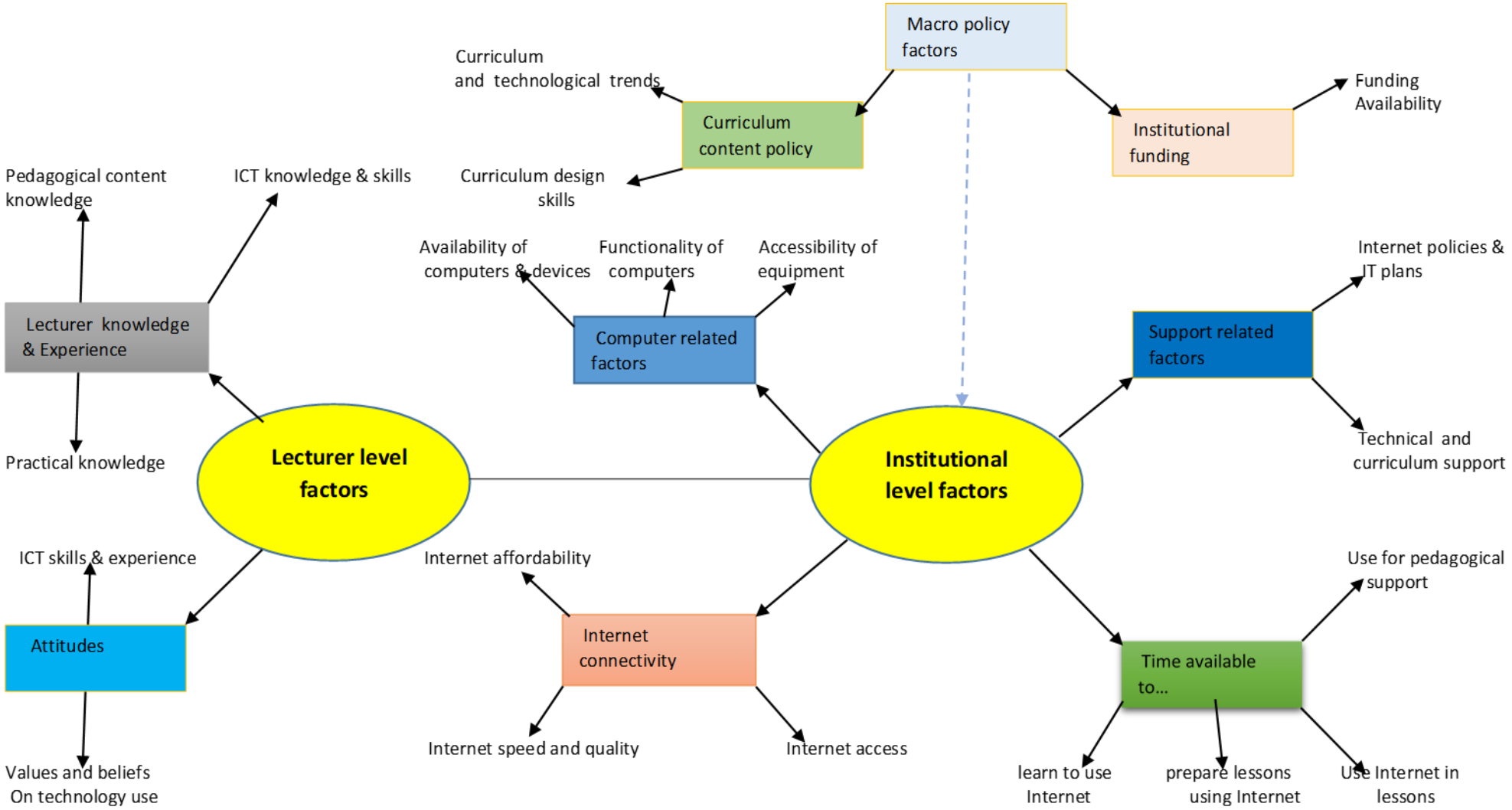
An analysis of forms and characteristics of Internet usage further reveals that lecturers' Internet use, for teaching at colleges, is largely elementary due to the skills deficit in requisite skills and knowledge. Furthermore, as a consequence of an interplay of factors, including a lack of essential skills for Internet use in instruction, sub-minimal Internet connectivity, and institutional policies and plans, the study reveals that lecturers' use of the Internet in teaching at colleges is largely opportunistic and not institutionalised.

Objective 3: To what extent do lecturers use the Internet for teaching a colleges?

Data and analysis of the characteristics and forms of the lecturer Internet use illustrate diverse lecturer Internet uses for teaching NCV and Cisco vender training courses at colleges. On the Cisco networking training courses, lecturers' Internet use for teaching exhibited advance forms of use while for the NCV training, lecturer Internet use for teaching was largely elementary. The analysis of the forms and characteristics of Internet use also reveals that Internet use in teaching at Gauteng public colleges is still at an embryonic stage and opportunistic.

Arising from the data analysis and interpretation, in conjunction with the theory and research on Internet use in teaching, a summary of the factors that influence Internet use at public TVET colleges is presented, as illustrated in Figure 33.

Figure 33: Summery of factors that influence Internet use at public TVET colleges



Source: Adapted from George (2014)

Chapter 6: Conclusion and recommendations

6.1 Introduction

This chapter concludes the study on factors that influence lecturer Internet use at public TVET colleges and discusses how the objectives of the study were met in light of the data collected. The chapter further discusses the limitations of the study and proposes areas for future research. Chapter 1 introduced the study and its objectives and discussed the background information on TVE colleges and macro-policies and legislation underlying telecommunication and the Internet in South Africa. The literature review, which presented underlying concepts on factors that impact on ICT and Internet use in pedagogy as well as the theoretical frameworks on the extent of Internet use at colleges, is also discussed in Chapter 2. Arising out of the literature review explored in Chapter 2, a theoretical and conceptual framework was developed that guided the data collection and analysis in subsequent chapters. Chapter 3 discussed mixed-research methods and data collection protocols used in the study, and outlined the process for primary data collection and ethical considerations addressed in the study. Chapter 4 presented both qualitative and quantitative data. Chapter 5 discussed the analysis and interpretation of data through the use of the theoretical artefact, and revised the theoretical and conceptual framework. Chapter 6 presented the study conclusion, and articulated the research findings in light of the data collected, and suggested potential areas for future research.

6.2 Summary of the key findings

The study sought to explore the factors that influence lecturers' Internet use in teaching at public TVET colleges, and addressed to the following objectives of the study that included inter alia:

(1) Investigating factors that influence Internet use in teaching at public TVET colleges;

(2) Exploring the forms (what the Internet is used for in teaching) and characteristics (how use the Internet) of Internet use by lecturers in teaching;

(3) Examining the extent of Internet use in teaching at public TVET colleges.

6.2.1 Lecturer level factors

The adapted TPACK framework points out the knowledge and skills domain that is essential for effective teaching through the use of the Internet. The study revealed that the majority (67%) of lecturers had a significant teaching experience but did not have professional teaching qualifications, and these findings corroborated DHET and HSRC studies that established that the majority of lecturers lacked professional teaching qualifications. The implications for this are plural, including the following:

- Lecturers were unable to apply advanced forms of Internet use that enhance the teaching experience. While the study did not closely examine the relationship between different factors underpinning Internet use, it may be suggested that the study findings established that elementary use of the Internet in teaching may be partly due to the lack of requisite teaching qualifications amongst lecturers.
- Lecturers did not have practical knowledge to enable applying and contextualising use of the Internet in teaching within the context of vocational education. According to FETI (2008), one of the reasons for the lack of professionally qualified lecturers at TVET colleges is that it is financially unviable for universities to offer specialised vocational teaching qualifications for a small cohort of lecturers in favour of offering teaching qualifications for primary and secondary education where the demand for teaching programmes is larger than for the colleges. Historically, college lecturers have been mainly recruited from industry and this has shaped the lecturers' identity to date that is

more oriented towards artisan skills over professional teaching qualifications (Papier, 2011; FETI, 2008). Also the national policy on minimum requirements for teacher-education qualifications was only enacted in 2011; prior to that there was an absence of a policy framework that guides college lecturers' professional qualifications, and the absence of policy enforcement has led to and contributed to a prevalence of huge skill deficits amongst lectures.

- Regarding ICT skills, the research findings indicate that while lecturers use the Internet in teaching, their ICT skills were largely 'average', notwithstanding that these lecturers were sampled from the IT department as this may impair their ability to integrate ICT and Internet resources into the curriculum.

The study also found that lecturers largely had positive attitudes towards the use of the Internet in teaching, and this partly explained their resilience to continue using the Internet for instruction at colleges in spite of the challenges including a lack of reliable quality Internet connection and a lack of technical support at colleges.

6.2.2 Institutional level factors

The study findings on institutional level factors reveal a number of institutional level deficits that hinder lecturers' effective use of the Internet is teaching at colleges. While TVET colleges had access to Internet connectivity, the quality and speed of the Internet was not at a satisfactory level as required for bandwidth-intensive applications and simultaneous mass use. The impact of poor Internet connectivity for NCV programmes in which lecturers use the Internet largely for elementary and ad hoc reasons may not be as significant as compared to the Cisco Networking training curriculum which is entirely embedded on the Internet. Costs for Internet connectivity seems to be a key factor that hinders lecturers from using the Internet in instruction since the majority of lecturers and students access the Internet through Wi-Fi provided at colleges, or at community WI-FI public spots which minimise their Internet connectivity costs. As a consequence of this, the concept of ubiquitous learning that transcends classrooms and laboratories is undermined since Internet-based instruction is not possible where Internet connectivity is inaccessible. Access to computers was largely inadequate due to high students-to-computer ratios and a lack of computer maintenance, irregular software and equipment upgrades, and a lack of technical support. The quantum effect of these factors has the potential to discourage lecturers from using the Internet in instruction.

Furthermore, a tightly congested syllabus, high student-lecturer ratios and a lack of time seem to have had an impact on lecturers' use of the Internet in teaching, since use of the Internet requires time for lesson preparation and academically unprepared students. Lastly, the majority (75%) of TVET colleges did not have Internet policies and 50% of the colleges did not have IT plans. Colleges that had policies were focussed mainly on Internet-user policies and did not address the objectives of Internet

use to improve the quality of teaching and learning. Restrictive college policies that prohibit the use of applications such as YouTube, WhatsApp and Facebook on the college also undermine the use of these online resources for educational goals. A lack of institutional policies on incentives, equipment-upgrade replacement, scheduling for computer labs, budgeting, technical support, ongoing skills development, and monitoring and evaluation, suggest that Internet use in teaching at TVET was largely opportunistic and not institutionalised.

6.2.3 Forms and characteristics of Internet use and the extent of Internet use

The study revealed that the Internet use in teaching amongst lecturers was largely elementary, and opportunistic due to the lack of requisite skills and absence of institutional policies and plans to advance the Internet use in teaching. The study further revealed that the use of the Internet to adapt the curriculum and augment vocational training for students' acquisition of practical skills was minimal. Few lecturers, who participated in online community of practice, were more likely to be recipients of information and knowledge as opposed to contributing to curriculum adaptation and knowledge production. The "outdated" NCV curriculum and propriety curriculum of the Cisco networking training seem to restrict the extent to which lecturers adapt and use the Internet when lecturers teach these courses.

6.2.4 Emerging macro-policy issues

The study further revealed that two macro-policy issues, which included curriculum policy and the availability of funding, have impacted on the delivery of teaching through the use of the Internet. Availability of funding was identified as a perennial factor that impacted on the entire value for the provision of Internet-mediated instruction. It emerged that the lack of funding had a direct bearing on access to computers and equipment, upgrades of and maintenance of equipment, and access to technical

support, as colleges were unable to procure these services due to a lack of funding. The lack of funding for colleges critically undermines the implementation of interventions to advance lecturers' use of the Internet in teaching.

6.3 Contribution to the body of knowledge

The study made the following contribution to the body of knowledge:

The study identified knowledge gaps in the original TPACK framework used for assessing teachers' knowledge competencies for integrating technology in teaching. The original TPACK framework does not address practical knowledge and its relevance in teaching using the Internet, and for this reason the study reviewed literature and gathered data on practical knowledge, and subsequently adapted the TPACK framework. Practical knowledge is an important knowledge domain within the context of TVET college settings where the focus of learning and teaching also include the transmission and acquisition of practical knowledge.

In South Africa there seems to be few studies focussing on the use of technology in teaching in a TVET college setting, with most studies being focussed mainly on ICT use in primary, secondary and tertiary education. This study seeks to make a contribution on the use of technology at colleges to promote the quality of learning and teaching at TVET colleges.

6.4 Recommendations

This section presents key recommendations arising from the main findings of the study.

6.4.1 Recommendation 1: lecturers' professional development

The Department of Higher Education and Training needs to enforce the existing policy White Paper on the minimum requirement for teachers to ensure that lecturers

recruited to teach at TVET colleges meet the minimum professional teaching qualifications, as stipulated in the policy. This should be possible to enforce since the given promulgation of the Further Education and Training Colleges Amendment Act, No. 3 of 2013, assigns the governance-administration appointments of lecturers from college governing bodies to the DHET Minister.

While the DHET formulated guidelines for teacher training and professional development in ICT, it is important that use of the Internet in teaching be an integral part of the lecture-training qualifications. Levinz and Klieger (2010) recommend that the correct integration of TPACK should be emphasised when planning professional development for teachers.

In order to incentivise universities to develop lecturer-qualification programmes for TVET colleges, DHET must source funding from National Treasury to provide funding subsidies for universities that provide TVET college teaching qualifications.

Ongoing professional lecturers' development should be integrated into key performance agreements for lecturers and college principals to ensure that lecturers appropriate the Internet and apply those skills as part of their pedagogical tools.

Strategic partnerships between colleges and different sectorial industries are required for the placement of both students and lecturers to acquire practical skills and experience, and get apprised of new emerging technology trends to ensure that these experiences are part of the teaching and learning process.

6.4.2 Recommendation 2: Improve capital funding for ICT infrastructure and lecturer professional development

The current debates on funding for post-schooling education is skewed in focus, with more emphasis on providing funding for disadvantage students to access tertiary

education; debates seem to neglect funding for the capitalisation of the post-schooling institutional infrastructure that would allow colleges to improve their infrastructure and, in particular, Internet infrastructure, and recruit and retain well-qualified lecturers. In line with the Skills Development Amendment Act of 2012, the levy-grant system, through which the ICT sector contributes towards skills development through SETA, must be mobilised towards funding the lecturer-capacity development programmes at colleges (RSA, 2012b).

6.4.3 Recommendation 3: provision of high-quality reliable Internet connectivity to colleges

It is recommended that the intervention to connect TVET colleges to be part of the SANREN high-speed research network that connects research institutions in South Africa and universities, as announced by Minister Nzimande in a budget-vote speech be expedited to ameliorate challenges of Internet connectivity in TVET colleges.

In order to escalate the challenge of ICT infrastructure and Internet connectivity at colleges on a list of national priorities, it is recommended that college connectivity and ICT infrastructure access be registered as part of the SIP 15 programme on expanding access to ICT infrastructure under the auspices of the Presidential Infrastructure Coordinating Committee (PICC).

6.4.4 Recommendation 3: establishment of provincial curriculum support resource units

The complexity of teaching through the use of the Internet and the complex mix of skills required for this purpose places additional demands on lecturers; therefore it is recommended that a dedicated resource unit be established to provide curriculum support in each province for accessibility to colleges. Instead of centralising this service at the national office, as is currently the practice, this service should be

decentralised to provincial level to ensure that it can timeously respond to lecturers' requirements for Internet use in teaching. It is further recommended that the resource units should be staffed with curriculum experts, and instructional designers to design NCV curriculum content for online delivery, in order to provide lecturers with the necessary curriculum support. Furthermore, universities as part of their outreach programme, may 'adopt' at least two TVET colleges where they provide expert assistance for curriculum-resource units at their respective colleges. DHET has an oversight role over both TVET colleges and universities, and should facilitate the strategic partnerships between universities and TVET colleges and mobilise funding and support for universities for this intervention.

6.4.5 Recommendation 6: strengthening of technical support through increased funding

The study identified a lack of technical support as one of the barriers that undermine lecturers efforts to use the Internet in the delivery of the curriculum. It is recommended that access to technical support at TVET colleges be strengthened through making available funding resources for recruitment and the employment of technical support staff for colleges to complement the existing lecturer-support system. Students studying IT can be roped in to provide desktop technical support which will help them gather necessary work experience.

6.4.6 Recommendation 7: institutionalisation of college policies and plans

It is recommended that DHET must develop policy guidelines on Internet use in instruction and guide colleges to develop their own internal plans and policies to support the use of the Internet in teaching. The development and implementation of policy guidelines should be part of a college's principal-performance agreement with clearly defined targets and time-lines to address the use the Internet in teaching. The

guidelines should also incorporate mechanisms for monitoring and evaluating the use of the Internet in teaching, and stipulate incentives for lecturers to use the Internet in teaching, including the time lecturers must spend in teaching and using the Internet. In addition, the guidelines must also include incentives on access to equipment and connectivity as well as professional development opportunities. A participatory process and buy-in from key stakeholders, including teacher unions, is important to ensure the successful implementation of these plans and policies.

6.4.7 Recommendation 8: access to equipment and devices

The State Information Technology Agency (SITA) Act of 1998 provides for the establishment of SITA Agency to provide information technology, ensure system maintenance, and to function as a procurement agency, government department, and organ of state (RSA, 1998c). Through an aggregation of IT and ICT equipment procurement in government that creates economies of scale, SITA can derive bargaining that includes procurement of ICT equipment and software for colleges at a reduced cost. It is recommended that SITA and DHET leverage these benefits for public TVET colleges to get access to state-of-the-art computers, equipment and maintenance at reduced costs.

6.4.8 Recommendation 9: harmonisation of policy and legislation split between DHET and DTPS

The policy and legislative interventions that inform the Internet in teaching at TVET colleges are split between the DTPS and DHET departments. The supply-side policy and legislation on Internet connectivity and ICT infrastructure, forms part of the DTPS mandate. Meanwhile, the demand-side policy and legislation on the use of the Internet in teaching, such as policies and legislation on lecturer recruitment, professional development, colleges' institutional arrangement, and governance and funding are

located within the DHET mandate. It is recommended that an institutionalised mechanism, through a committee chaired by the Directors General of DHET and DTPS that reports to the Presidential Infrastructure Coordinating Committee, be established to ensure alignment and synergy in the development and implementation of policies and legislation on the use of ICTs and the Internet at colleges.

6.5 Recommendations for future research

The study was primarily focused on lecturer teaching within the IT departments, whose ICT skills are presumably more developed as compared to lecturers teaching in other departments due to the IT intensity of the nature of subjects that they teach. For this reason it is recommended that future research be initiated that will look at the extent of Internet use in the other college faculties, such as hospitality and tourism, public administration, finance, economics, tourism, human resource, electrical and civil, and mechanical and occupational programmes.

Due to the limited scope of the study and time constraints, the study was mainly focused on Internet use in teaching, and did not address learner-related factors and Internet in use in teaching. Learning and teaching are symbiotically related, and an understanding of Internet use in learning is also important and future research is recommended in this regard.

On the macro-policy factors, the study only explored curriculum and funding policies as they were sharply raised by respondents. There is an array of macro-policy factors that may impact on TVET colleges and Internet use that require further exploration, and for this reason future research is recommended.

6.6 Limitations of the study

While the study identified a lack of practical knowledge in the TPACK framework as a knowledge gap in the framework, the study did not fully crystalize the set of competencies that constitute the practical knowledge domain and its relationship with the other domains from the original TPACK framework, due to limited research and literature in this area; therefore future research is recommended in this regard.

The study examined lecturer skills that are identified in literature and adapted a theoretical conceptual framework which includes lecturer competencies in pedagogy, subject content, technology (ICT) skills and the new domain on practical knowledge, and the impact of these knowledge sets on Internet use in teaching. However, the study did not interrogate the integrated use of all the knowledge domains in teaching amongst lecturers; hence future research is recommended as literature on TPACK illuminate the importance of integrative use of all the knowledge domains to yield effective results in teaching (Koehler and Mishra, 2008; Graham, 2011; Koh, et al., 2014).

The study was largely focussed on the availability of institutional policies and plans, and how the absence of these could potentially influence the use of the Internet in teaching. The study did not examined the content of these policies and implementation strategies for these policies and plans, since document analysis was not part of the methodology. For this reason, further research is recommended to analyse the content and implementation of institutional policies on the extent of Internet use in teaching.

6.7 Conclusion

In conclusion, the study identified a number of weaknesses at TVET colleges that undermine the effective use of the Internet in teaching, including inadequate lecturer skills, poor Internet connectivity and ICT infrastructure, and a lack of technical support.

The ad hoc use of the Internet illuminates the lack of institutional accountability mechanisms to institutionalise the use of the Internet in teaching. The sum total of these factors suggests that the use of the Internet in teaching at TVET colleges was opportunistic and at an exploratory level of development, and that lecturers and public TVET colleges are not adequately prepared to employ the Internet tool for teaching that can enhance the learning and teaching experience.

Reference list

Abrahams, L. & Goldstuck, A. (2010). The state of e-development in South Africa: A view from the end of the first decade of the 21st century. *LINK Public Policy Paper No 11,* July 2010. Wits University: Johannesburg.

Abrahams, L. & Sibanda, D. (2012) Submissions for 2013/14 division of revenue, Chapter 2, financing e-education and achieving policy goals in public ordinary schools in South Africa, Johannesburg: Financial and Fiscal Commission, Midrand, Republic of South Africa.

Adepoju, T.L. (2017). Planning and policy implications for renewal and paradigm shifts in the curriculum contents of vocational contents of vocational and technology education program in Nigeria, *Bulgarian Journal of Science and Education Policy (BJSEP),* 11 (1), 28-50.

Ahmed, Y. A., Ahmad M. N., Ahmad, N. & Zakaria, N. H. (2018). Social media for knowledge sharing, *Telematics and Informatics.* Retrieved on 07 February 2018 from https://doi.org/10.1016/j.tele.2018.01.015.

Akoojee, S. (2008). FET college lecturers: the “devolving” link in the South African skills development equation. *Journal of Vocational Educational and Training,* Vol. 60, 297-313. Retrieved on 03 April 2016 from http://www.tandfonline.com/doi/abs/10.1080/13636820802305645

Akoojee, S. & McGrath, S., (2007). Public and private Further Education and Training in South Africa: a comparative analysis of the qualitative evidence, *South African Journal of Education,* Vol 27(2), 209-222.

Albashiry, N. M., Voogt, J. M. & Pieters, J. M .(2015). Teacher collaborative design in technical vocational colleges: a strategy for maintaining curriculum consistency? *The Curriculum Journal*, 26 (4), 601-624. Retrieved on 23 August 2015 from http://dx.doi.org/10.1080/09585176.2015.1058281.

Alismail, H. A. & McGuire P. (2015). 21st century standards and curriculum: current research and practice, *Journal of Education and Practice*, 6(6) 150-154'.

Alonzo, A. C. (2007). Challenges of simultaneously defining and measuring knowledge for teaching, *Measurement: Interdisciplinary Research and Perspectives*, 5(2-3) 131-137. Retrieved on 16 March 2017 from http://dx.doi.org/10.1080/15366360701487203.

Ananiadou, K.& Claro, M. (2009). 21st century skills and competences for the new millennium learners in OECD countries", OECD Education Working Paper, No 41, OECD Publishing, Retrieved on 20 June 2017 from http://dx.doi.org/10.1787/218525261154.

Assareh, A. & Bidokht, M. H. (2011). Barriers to e-teaching and e-learning. *Procedia Computer Science*, 3. 791-795. Retrieved on 12 November 2016 from https://www.sciencedirect.com/science/article/pii/S1877050910005041.

Avis, J. (2014). Work place learning, VET and vocational pedagogy: the transformation of practice, *Research in Post Compulsory Education*, 19 (1), 45-53. Retrieved on 19 July 2017 from http://www.tandfonline.com/doi/abs/10.1080/13596748.2014.872920.

Bathmaker, A. (2013). Defining "knowledge" in vocational education qualifications in England: an analysis of key stakeholders and their construction of knowledge, purposes and content, *Journal of Vocational Education*, 65(1), 87-107, Retrieved on 23 August 2017 from http://dx.doi.org/10.1080/13636820.2012.755210.

Baş, G., Kubiatko, M. & Sünbül, A. M. (2016). Teachers' perception towards ICTs in teaching-learning process: scale validity and reliability study, Computers in Human Behaviour, 61, 176-185. Retrieved on 15 April 2016 from https://www.sciencedirect.com/science/article/pii/S0747563216301832.

Baya'a[q], N., & Daher[ḏb], W. (2015). The development of college instructors' technological pedagogical and content knowledge. *Procedia – Social and Behavioural Sciences*, 174, 1166 – 1175.

Bazeley, P. (2009). Integrating data analysis in mixed methods research , *Journal of Mixed Methods Research*, 3 (3), 203-207.

Becker, H., J. (1999). Internet use by teachers: conditions of professional use and teacher directed student use, teaching, learning, and computing: national survey report # 1, Centre for research on information technology and organizations, University of California, Irvin and University of Minnesota, Retrieved on 14 March 2017 from ttp://files.eric.ed.gov/fulltext/ED429564.pdf.

Bester, G. & Brand, L. (2013). The effect of technology on learner attention and achievement in the classroom. South African Journal of Education, 33, (2) 1-15. Retrieved on 31 October 2017 from http://www.scielo.org.za/pdf/saje/v33n2/01.pdf.

Birba, O. & Diagne, A. (2012). Determinants of adoption of Internet in Africa: Case of 17 Sub-Saharan Countries, *Structural Change and Economic Dynamic*, 23, 463-472.

Blignaut, A.S., Hinostroza, J.E., Esl, C.J.& Brun, M. (2010). ICT in Education policy and practice countries: South Africa and Chile compared through SITES 2006. *Computers & Education,* 55, 1552 – 1563.

Bowen, G. A. (2009). Document analysis as a qualitative research method. *Qualitative Research Journal*, 9(2), 27-40. Retrieved from http://dx.doi.org/10.3316/QRJ0902027.

Brazilian Network Information Centre, (2014). ICT Education 2013, A survey on the use of information and communication technologies in Brazil, Sάo Paulo, Brazil.

Brown, B. L. (1998). Applying constructivism in vocational and career education. Information Series No. 378, ERIC Clearing House on Adult, Career, and Vocational

Education Centre on Education And Training For Employment. The Ohio State University, Columbus, Ohio. Retrieved from http://hdl.voced.edu.au/10707/36133.

Brown, J. P. (2015). Complexities of digital technology use and the teaching and learning of function*, Computers & Education, 87*, 112-122.

Bruijn, E. & Leeman, Y. (2011). Authentic and self-directed learning in vocational education: challenges to vocational educators, *Teaching and Teacher Education*, 27, 694-702.

Castro, F.G., Kellison, J. G., Boyd, S. J. & Kopak, A. (2010). A methodology for conducting integrative mixed methods research and data analyses, *Journal of Mixed Methods Research,* 4(4), 342-360.

Calandro, E, & Rademan, B. (2014). Operators recycle spectrum for LTE data, Research ICT Africa broadband Policy brief, No3, 2014, Retrieved on 21 march 2017 from http://www.researchictafrica.net/docs/RIA%20Broadband%20Policy%20Brief%20No%203,%202014.pdf.

Chappel, C. (1999). Issues of teacher identity in restructuring VET system, Working paper 99-42, UTS Research Centre for Vocational Education and Training, University of Technology, Sydney.

Chigona, A., W. Chigona, & Davids, Z. (2014). Educators' motivation on integration of ICTs into pedagogy: case of disadvantaged areas. *South African Journal of Education*, 34 (3), 1-8.

Chugh, R., Ledger, S. & Shields, R. (2017). Curriculum design for distance education in the tertiary sector, *Turkish Online Journal of Distance Education – TOJDE*, 18 (2), 4-15.

Cisco, (2010). IT essentials: PC hardware and software, Cisco Networking Academy.

Creswell, J. W. (2003). *Research design: qualitative, quantitative and mixed method approaches* (2nd edition), London: Sage Publications.

Creswell, J. W. (2007). *Qualitative Inquiry and research design, choosing among five approaches* (2nd edition), London: Sage Publications.

Creswell, J. W. (2009). *Research design: qualitative, quantitative and mixed method approaches* (3rd edition), London: Sage Publications.

Commission of Inquiry into Higher Education and Training (2017). Report of the Commission of Inquiry into Higher Education and Training to the President of the republic of South Africa, Pretoria, South Africa. Retrieved on 30 November 2017 from http://www.thepresidency.gov.za/sites/default/files/Commission%20of%20Inquiry%20into%20Higher%20Education%20Report.pdf

Conole, G. (2010). Bridging the gap between policy and practice: a framework for technological intervention, *Journal of e-Learning*, (1), 13-27.

Correa, T. (2016). Digital skills and social media use: how Internet skills are related to different types of Facebook use among "digital natives", *Information, Communication & Society*, 19 (8), 1095-1107.

Department of Basic Education. (2013). Education for All: 2012 Country Progress Report SA. Department of Basic Education, Republic of South Africa, Pretoria.

DHET. (2007). Guidelines for teacher training and professional development in ICT, Republic of South Africa, Pretoria.

DHET. (2011). National policy on the minimum requirements for teacher education qualification, Department of Higher Education and Training, Republic of South Africa Pretoria.

DHET. (2013). Policy on professional qualifications for lecturers in technical and vocational education and training, Department of Higher Education and Training, Pretoria

DHET. (2014a). Department of Higher Education and Training Annual Report (2013/14). Department of Higher Education and Training, Pretoria.

DHET. (2014b). TVET lecturer support system, college subscriber induction to the LSS, guidelines and tools, “what is the LSS and how to use it”, Department of Higher Education and Training, Pretoria.

DHET. (2016a). Statistics on post-school education and training in South Africa: 2014. Department of Higher Education and Training, Republic of South Africa, Pretoria.

DHET. (2016b). Policy standard on approval to conduct research in public colleges, no 18, Department of Higher Education and Training, Republic of South Africa Pretoria.

DHET. (2016c). DHET submission on TVET college funding to the Commission of Enquiry into Higher Education (Fess Commission), Republic of South Africa Pretoria

DHET (2017a). Statistics on post-school education and training in South Africa: 2015. Department of Higher Education and Training, Pretoria. Department of Higher Education and Training, Republic of South Africa, Pretoria.

DHET. (2017b). National certificate (vocational) NQF level 4, practical assessment tasks for vocational subjects – ICASS and ISAT, lecturer guide, Department of Higher Education and Training, Republic of South Africa, Pretoria.

DoE. (2007). National policy framework for teacher education and development in South Africa, Republic of South Africa, Pretoria.

DTPS. (2014a). Integrated ICT Policy Green Paper of January 2014. Department of Telecommunications and Postal Services, Republic of South Africa, Pretoria.

Dzvapatsva, G. P., Mitrovic, Z. & Dietrich, A. D. (2014).Use of social media platforms for improving academic performance at Further Education and Training colleges, South African Journal of Information Management 16 (1),1-7, Retrieved on 05 April 2017 from http://dx.doi.org/10.4102/sajim.v16i1.604.

Drent, M. & Meelissen, M. (2008). Which factors obstruct or stimulate teacher educators to use ICT innovatively? *Computers and Education,* 51, 187-199. Retrieved on 02 June 2016 from http://www.sciencedirect.com/science/article/pii/S0360131507000474.

Eraut, M. (2000). Non-formal learning and tacit knowledge in professional work, *British Journal of Educational Psychology,* 70, 113–136, Retrieved 26 August 2017 from https://www.researchgate.net/profile/Michael_Eraut/publication/12550117_Non-formal_learning_and_tacit_knowledge_in_professional_work/links/553236370cf2f2a588ad7b57.pdf.

FCC. (2013). Submission for the division of revenue 2014/15. Financial and Fiscal Commission, Midrand, Republic of South Africa.

Falk, I., & Guenther, J., (2007). Generalising from Qualitative Research: Case studies from VET in Context .Paper presented at the 10th Australian Vocational Education and Training Conference, Crow's Nest, New South Wales, Australia.

FETI. (2008). Report on the training of FET college lecturers in South Africa, England and other International contexts, Further Education and Training Institute, University of the Western Cape, Cape Town , South Africa.

FETI. (2013). Report on impact assessment of the professional development program for FET college ICT lecturers, Further Education and Training Institute, University of the Western Cape, Cape Town , South Africa.

Filo, K., Lock, D. & Karg, A. (2015). Sports and social media research: A review. *Sport Management Review*, 18(2), 166-181. Retrieved on 07 February 2018 from https://www.researchgate.net/publication/269730038_Sport_and_social_media_research_A_review

Fox, C., Waters, J., Fletcher, G., & Levin, D. (2012). The broadband imperative: recommendations to address K-12 Education infrastructure need. Washington, DC: State Educational Technology Directors Association (SETDA).

Franklin, D.S. (2015). "Will the Internet ever replace colleges and universities as we know it today?" An Internet discussion about the future of higher education, *Procedia – Social and Behavioural Sciences*, 176, 738 – 744.

Gauteng Municipality Map, Retrieved on 13 January 2017 from http://www.mapsofworld.com/south-africa/provinces/gauteng.htmlm.

Garrison, D. R. & Vaughan, N. D. (2013). Institutional change and leadership associated with blended learning innovation: Two case studies, *Internet and Higher Education,* 18, 24-28. Retrieved on 16 October 2016 from https://www.sciencedirect.com/science/article/pii/S1096751612000589

Ghoord, E. (2013). Policy lessons from assessing computer-use in secondary school in a provincial capital, Polokwane. Master Arts research report, University of Witwatersrand, Johannesburg.

George, A.Z. (2014). Factors affecting teachers' use of computer technology for promoting meaningful learning, PhD Research Report, University of Witwatersrand, Johannesburg.

Gorard, S., & Taylor, C. (2004). A third methodological movement: Challenging the dominance of single methods. In Combining Methods in Educational and Social Research (pp. 1–12). Berkshire: Open University Press.

Graham, C. R., (2011). Theoretical consideration for understanding technological pedagogical content knowledge (TPACK), *Computers and Education, 57, 1953-1960*

Graham, C. R., Woodfield, W., Buckley Harrison, J. (2013) A framework for Institutional adoption and implementation of blended learning in higher education, *Internet and Higher Education, 18, 4-14.*

Guile, D. (2003). From "credentialism" to the "practice of learning": reconceptualising learning for the knowledge economy, *Policy Futures in Education,* 1(1), 83-105. Retrieved on 28 April 2016 from http://journals.sagepub.com/doi/pdf/10.2304/pfie.2003.1.1.10

Gülbahar, Y. (2007). Technology planning: A roadmap to successful technology integration in schools, *Computers & Education*, 49, 943-956.

Hew, K. & Brush, T. (2007). Integrating technology into K-12 teaching and learning: current knowledge gaps and recommendations for future research. *Educational Technology Research and Development*, 55(3), 223-252.

Hew, K.F. & Cheung W. S. (2013). Use of Web 2.0 technologies in K-12 and higher education: the search for evidence-based practice, *Education Research Review,* 9, 47-64.

Hismanoğlu, S. (2010). Attitudes of L2 teachers towards Internet-based foreign language teaching, *Procedia Social and Behavioural Sciences*, 3, 106-111. Retrieved on 02 February 2016 from https://www.sciencedirect.com/science/article/pii/S1877042810013935

Houghton, J. & Sheehan, P. (2000). A Primer on the Knowledge Economy. Proceedings of Summit held in Melbourne. Melbourne: Centre for Strategic Economic Studies. Victoria University 9-11 February 2000, available at http://eprints.vu.edu.au/59/1/wp18_2000_houghton_sheehan.pdf.

Hosseini, Z. (2015). Development of technological pedagogical content knowledge through constructionist activities, *Procedia – Social and Behavioural Sciences*, 182, 98-103.

HSRC, (2011). Education and skills development, further education and training (fet) colleges at a glance in 2010, fet colleges audit, May-July 2010, Human Sciences Research Council, Pretoria.

HSRC, (2013). Profile of the TVET sector. Project: study on programmes identified and prioritised by the TVET colleges technical task team and its work streams, Human Sciences Research Council, Pretoria.

ICASA, (2009). Electronic Communications Act (36/2005): Regulations in terms of section 4 read with section 73. Notice 9045 of 2009, No. 31979. ICASA, Sandton.

ICASA, (2017). 2nd Report on the state of the ICT sector in South Africa, ICASA, Republic of South Africa. Retrieved on 13 June 2017 from http://www.ellipsis.co.za/wp-content/uploads/2017/05/ICASA-Report-on-State-of-SA-ICT-Sector-2017.pdf.

INESI, (2014). Ikamva National e-Skills Institute Newsletter, Edition 32, November 2014, Parktown, Johannesburg.

International Telecommunications Union (ITU). (2003). World Summit on the Information Society, plan of action, Geneva 2003 – Tunis 2005ITU, Geneva, Switzerland, Retrieved on 11 February 2016 from http://www.itu.int/net/wsis/docs/geneva/official/poa.html.

IT Web. (2016). Gauteng target 100% broadband connectivity. Retrieved on 21 July 2017 from

http://www.itweb.co.za/index.php?option=com_content&view=article&id=150061:Gauteng-targets-100-broadband-connectivity&catid=147

IT News Africa. (2015). South Africa: Gauteng Broadband Network roll out reaches milestone. Retrieved on 21 July 2017 from http://www.itnewsafrica.com/2015/08/south-africa-gauteng-broadband-network-roll-out-reaches-milestone/

Inayat, I., ul Amin, R., Inayat, Z. & Salim, S. S. (2013) Effects of collaborative web based vocational education and training (vet) on learning outcomes. *Computers and Education*, 68, 153-166.

Isaacs, S. (2007). Survey of ICT and Education in Africa: South Africa Country Report. *InfoDev ICT and Education Series*, World Bank, Washington, DC. © World Bank. Retrieved on 05 October 2017 from https://openknowledge.worldbank.org/handle/10986/10659.

Jacobs, L. & De Wet, C. (2013). Evaluation of the vocational education orientation programme (VEOP) at a university in South Africa, *The International Review of Research in Open and Distance Learning,* 14 (4), 68-89, Retrieved on 10 June 2017 from http://www.irrodl.org/index.php/irrodl/article/view/1568/2683.

John, S., P .(2015). The integration of information technology in higher education: a study of faculty's attitude towards IT adoption in the teaching process, *Contaduría y Administration,* 60 (S1) 230-252.

Johnson, R. B. & Onwuegbuzie, A. J. (2004). Mixed methods research: a research paradigm whose time has come, *Educational Researcher*, 33 (7), 14-26.

Knowledge Resources. (2014). African Human Capital and Labour Report: South Africa, Knowledge Resources, Knowres Publishing (Pty) Ltd.

Koen, M. (2011). Lecturer competence and capacity development. Department of Higher Education Training (DHET) presentation at ICT Career Expo, Telkom Learning Centre, Olifantsfontein.

Koehler, M. J. & Mishra, P. (2008). Introducing Technological Pedagogical Content Knowledge. Paper presented at the Annual Meeting of the American Educational Research Association in New York City, March 24-28, 2008.

Koh, J. H. L. & Chai, C.S. (2014). Teacher cluster and their perception of technological content knowledge (TPACK) development through ICT lesson design, *Computers and Education*, 70, 222 – 232.

Koh, J. H. L., Chai, C.S & Tay, L. Y. (2014). TPACK-in-Action: Unpacking the contextual influences of teachers' construction of technological pedagogical content knowledge (TPACK), *Computers in Education,* 78, 20-29.

Laxman, K. & Holt, C. (2017). Do mobile devices increase learners' access to learning opportunities and enhance learning institution? A case study of two schools in New Zealand, *International JI. on E-Learning* , 16 (3), 245-263.

Leedy, P.D. & Ormrod, J.E. (2012). Practical research: Planning and design (10th edition) New Jersey: Pearson Education Limited.

Lynch, M. (2015). Do mobile devices in the classroom really improve learning outcomes?, the conversation, academic rigour, journalistic flair. Retrieved on 07 August 2017 from https://theconversation.com/do-mobile-devices-in-the-classroom-really-improve-learning-outcomes-38740.

Loogma, K., Kruusvall, J. & Ümarik, M. (2012). E-learning as innovation: exploring innovativeness of the VET teachers' community in Estonia, *Computers & Education*, 58, 808-817.

Mbatha, N., Wildschut, A., Mncwango, B., Ngazimbi, X. & Twalo, T. (2015). Towards understanding the distinctive nature of artisan training: Implications for skills planning in South Africa. HSRC/LMIP: Cape Town. Available online from: http://www.lmip.org.za/document/lmip-report-2-towards-understanding-distinctive-nature-artisan-training-implications-skills.

McGrath, S. (2004). The state of the South African further education and training college sector. Mcgrath, S., Badroodien, A., Kraak, A., Unwin, L. (Eds.) *Shifting understanding of skills in South Africa, overcoming the historical imprint of a low skills regime* (pp 158- 174) Human Science Research Council Press, Cape Town.

McGrath, S. & Akoojee, S. (2009). Vocational education and training for sustainability in South Africa: the role of public and private provision. *International Journal of Educational Development,* 29, 149-156.

McDonald, C. J., Stodel, E.J., Farres, L.G.; Breithaupt, K. & Gabriel, M. A. (2001). The demand –driven learning model: A framework for web-based learning. *Internet and Higher Education, 4, 9-30.*

Mendoça, S., Crespo, N. & Simões, N.(2015). Inequality in the network society: An integrated approach to ICT access, basic skills, and complex capabilities. *Telecommunications Policy*, 39, 192-207.

Mlay, S., Balunywa, L., Mbarika, V., Moya, M., Ngnitedem, N., & Vegah, G.(2013). Global diffusion of the internet: The internet in Rwanda, *The African Journal of Information and Communication 13,* 14-29. Retrieved from http://www.wits.ac.za/files/p9sed_100268001387533866.pdf.

Mooketsi, T. R. (2015). Factors affecting internet and broadband penetration in South African ordinary school, Master Arts research report, University of Witwatersrand, Johannesburg.

Msimanga, M. (2012). The more things change, the more they stay the same: strategies for financing universal broadband access, *Trends in Telecommunications Reform*, Chapter 4, 79-110.

Mybroadband, (2016). South Africa need extra spectrum now for better mobile Internet speeds. Retrieved on 24 October 2017 from https://mybroadband.co.za/news/broadband/152729-south-africa-needs-extra-spectrum-now-for-better-mobile-internet-speeds.html.

Nastasi, B. K., Hitchcock, J., Sarkar,S., Burkholder, G., Varjas, K. & Jayasena, A. (2007). Mixed methods in intervention research, theory to adaptation, *Journal of Mixed Methods Research*, 1(2), 164-182.

Ndlovu, N. S. & Lawrence, D. (2012). The quality of ICT use in South African classrooms. Paper presented at "Towards Carnegie 111", a conference held at the University of Cape Town, from 3-7 September 2012.

NCES, (2002). Technology in schools: suggestions tools, and guidelines for assessing technology in elementary and secondary education, U.S. Department of Education, National Centre for Education Statistics, Washington DC.

OECD, (2016). Skills for digital economy, 2016 Ministerial meeting on the digital economy, background report, OECD Publishing, OECD digital economy papers, no. 250.

Olofson, M. W., Swallow, M. J. C. and Neumann, M. D. (2016). TPACKing: a constructivists framing of TPACK to analyze teachers' construction of knowledge, *Computers & Education,* 95, 188-201.

Oyelaran-Oyeyinka, B. & Lal, K. (2005). Internet diffusion in sub-Saharan Africa: A cross-country analysis, *Telecommunications Policy*, 29, 507-527.

Ozkal, K., Tekkaya, C., Cakiroglu, J. & Sungur, S. (2009). A conceptual model of relationships amongst constructivist learning environment perceptions, epistemological beliefs, and learning approaches, *Learning and Individual Differences*, 19, 71-79.

Oster-Levinz, A. & Klieger, A. (2010). Online tasks as a tool to promote teachers' expertise within the technological pedagogical content knowledge (tpack), *Procedia Social and Behavioural Sciences,* 2, 354-358.

Paly, T. (2008). Purposive sampling. In L.M Given (Ed.) *The Sage Encyclopaedia of Qualitative Research Methods. (Vol.2)*. Sage: Los Angeles, pp. 697-698.

Papier, J. (2011). Vocational teacher identity: Spanning the divide between the academy and the workplace. *South African Review of Education*, 17, 101 – 119.

Parchoma, G. (2014). The contested ontology of affordance: implications for researching technological affordances for collaborative knowledge production, *Computers in Human Behaviour*, 37, 360-368.

Pelgrum, W.J. (2001). Obstacles to the integration of ICT in education: results from a worldwide educational assessment. *Computers and Education*, 37, 163-178.

Peter, O. I., Abiodun, A. P.& Jonathan O., O. (2010). Effect of constructivism instructional approach on teaching practical skills to mechanical related trade students in western Nigeria technical colleges, *International NGO Journal,* 5 (3), 059-064.

PICC, (2012). A summary of South African national infrastructure plan, Presidential infrastructure coordinating commission report 2012, Republic of South Africa, Pretoria.

Porter, C. E. & Donthu, N. (2006). Using the technology acceptance model to explain how attitudes determine Internet usage: The role of perceived access barriers and demographics*, Journal of Business Research,* 59, 999-1007.

Porter, W.W., Graham, C. R., Spring, K.A. & Welch K. R. (2014). Blended learning in higher education: Institutional adoption and implementation, *Computers & Education*,75, 185-195.

Powell, A., (2011). A case study of e-learning initiatives in New Zealand's secondary schools (doctoral dissertation). Retrieved on 20 March 2017 from http://pepperdine.contentdm.oclc.org/cdm/ref/collection/p15093coll2/id/120#img_view_container.

Porras-Hernάndez, L. H. & Salinas-Amescua, B. (2013). Strengthening TPACK: a broader notion of context and the use of teacher's narratives to reveal knowledge construction, *Educational Computing Research*, 48(2), 223-244.

Rasool, F. (2012). 10Gbps broadband for universities, IT Web, IT in government, retrieved on 26 June 2016 from http://www.itweb.co.za/index.php?option=com_content&view=article&id=51040.

Redekopp, R. & Kalanda, K. (2015). Internet use: a study of preservice education students in Lesotho and Canada, *Procedia – Social and Behavioural Sciences*, 182, 529 – 534.

RIA. (2015). Consumers benefit from lower mobile termination rates*, Research ICT Africa.net*, Policy Brief No. 1, 1-8.

Rice, J. K. (2010). The impact of teacher experience examining the evidence of policy implications, National Centre for Analysis of Longitudinal Data in Education Research, Urban Institute, 11, 1-7.

Rolando, L. G. R., Salvador, D. F. & Luz, M. R.M. P. (2013). The use of Internet tools for teaching and learning by in-service biology teachers: A survey in Brazil, *Teacher and Teacher Education*, 34, 46-55. Retrieved on 10 June 2016 from https://www.sciencedirect.com/science/article/pii/S0742051X1300067X

RSA, (1996a). Constitution of the Republic of South Africa*.* Pretoria: Government Printing Works.

RSA, (1996b). Telecommunications Act (Act 106 of 1996), Government Gazette 17581. Government Printers. Pretoria.

RSA, (1997). The Higher Education Qualification Framework, Higher Education, Act No 101 of 1997.

RSA, (1998a). Education White Paper 4. A program for the transformation of Further Education and Training, Preparing for the Twenty – First Century through Education and Training and Work, Republic of South Africa, Pretoria.

RSA, (1998b). Further Education and Training Act No. 98 of 1998. Pretoria: Government Printers.

RSA, (1998c). State Information Technology Act No.88 of 1988, Republic of South Africa, Pretoria.

RSA, (2004). White Paper on e-Education, Republic of South Africa, Pretoria.

RSA, (2005a). Electronic Communications Act, No 36 of 2005. Republic of South Africa, Pretoria.

RSA, (2005b). Electronic Communications Act, No 36 of 2005, as amended in Government Gazette 37536 dated 7 April, 2014. Republic of South Africa, Pretoria.

RSA. (2006). FET Act of 2006 as amended by the Higher Education and Training Laws Amendment Act 25 of 2010. Republic of South Africa, Pretoria.

RSA. (2011a). National Development Plan, Republic of South Africa, Pretoria.

RSA .(2012).The Further Education and Training Colleges Amendment Act, No. 3 of 2012, Republic of South Africa, Pretoria.

RSA, (2013a). White Paper for Post School Education and Training, Republic of South Africa, Pretoria.

RSA. (2013b). The Further Education and Training Colleges Amendment Act, No. 3 of 2013, Republic of South Africa, Pretoria.

RSA. (2013c). South Africa Connect: Creating opportunities, ensuring inclusion, South Africa's Broadband Policy: 2013, Republic of South Africa, Pretoria: Government Printers. Available at www.gpwonline.co.za

RSA. (2016). National Integrated ICT Policy White Paper, Republic of South Africa, Pretoria: Government Printers. Available at www.gpwonline.co.za.

RSA. (2017). Minister Blade Nzimande: Higher Education and Training Budget Vote 2017/18, Republic of South Africa, Pretoria. Retrieved on 22 June 2017 from http://www.gov.za/speeches/advancing-higher-education-16-may-2017-0000.

SANREN backbone map: geographical, retrieved on 20 July 2017 from http://www.sanren.ac.za/backbone/

SACF,(2016). Industry briefing on the over the top (OTT) services in South Africa. Presentation to the Portfolio Committee on Telecommunications and Postal Services, Parliament of the Republic of South Africa.

Stevenson, J. (2001). Vocational knowledge and its specification, *Journal of Vocational Education & Training*, 53 (4) 647-662. Retrieved on 23 August 2017 from http://dx.doi.org/10.1080/13636820100200182.

Shava, H., Chinyamurindi, W & Somdyala, A. (2016). An investigation into the usage of mobile phones among technical and vocational training students in South Africa, *South Africa Journal of Information Management*, 1-8. Retrieved on 13 March 2017 from http://www.sajim.co.za/index.php/SAJIM/article/viewFile/716/pdf_1

Shea, P. (2007). Bridges and barriers to teaching online college courses: A study of experienced online faculty in thirty -six colleges*. Journal of asynchronous learning networks, 11, (2)* 73-128.

Sheppard, C. (2009). The state of youth in South Africa: trends in education attainment, Centre for poverty, employment and growth, Human Science Research Council. Retrieved from http://www.hsrc.ac.za/en/research-outputs/view/4973.

Statistics South Africa (2011a). Census 2011, A profile of education attainment, enrolment and progression in South Africa, Republic of South Africa, Pretoria.

Statistics South Africa (2011b) Census 2011, Census in brief, Republic of South Africa, Pretoria.

Summak, M., S. & Samancioğlu, M. (2011). Assessment of technology integration in vocational education and training schools, *International Journal of Education and Development using Information and Communication Technology (IJEDICT),* 7 (1), 68-85.

Tam, M. (2000). Constructivism, instructional design, and technology: implications for transforming distance learning, *Educational Technology & Society*, 3, (2), 1-27

Tømte,C., Enochsson, A., Buskqvist, U. & Kårstein, A. (2015). Educating online student teacher to master professional digital competence: the TPACK-framework goes online, *Computers and Education,* 84, 26-35.

UN. (2015a). Resolution adopted by the General Assembly on 25 September 2015, 70/1. Transforming our world: the 2030 Agenda for sustainable development, United Nations General Assembly, New York.

UN. (2015b). Report of the Inter–Agency and Expert Group on Sustainable Development Goal Indicators, UN Economic and Social Council, New York.

UNESCO. (2002). Information and Communication Technology in teacher education. A Planning Guide, UNESCO, Paris.

UNESCO. (2003a). Information and communication technology in Education, UNESCO, Paris.

UNESCO. (2003b). The use of ICTs in technical and vocational education and training, UNESCO Institute for Information Technologies in Education, Moscow.

UNESCO. (2011). UNESCO ICT competency framework for teachers, UNESCO, Paris.

UNESCO. (2012). General report on third international congress on technical and vocational education and training on “Transforming TVET: Building skills for work and life”, Shanghai, People’s Republic of China.

UNESCO. (2013). Technology, broadband and education: advancing the education for all agenda. A report by the broadband commission working group on education. UNESCO, Paris, France.

UNESCO – UIS. (2015). Information and Communication Technology (ICT in Education in Sub-Sharan African, A comparative analysis of basic –readiness in schools. UNESCO Institute for Statistics, Montreal, Canada.

Vanderlinde, R., Braak, J. & Dexter, S. (2012). ICT policy planning in a context of curriculum reform: disentanglement of ICT policy domains and artefacts, *Computers & Education*, 58, 1339 – 1350.

Vathsala, S. (2014). *Mixed methods research: a new approach, International Journal of Nursing Education,* (6.1), 254-260.

Wang, A. (2015). What factors affect your Internet speed? Retrieved on 28 March 2017 from http://www.opera.com/blogs/news/2015/06/what-affect-internet-speed/

Wallace, R. M. (2004). A framework for understanding teaching with the Internet, *American Educational Research Journal*, 41 (2), 447-488.

Webopedia. (2014). The difference between the Internet and the World Wide Web. Retrieved in May 21, 2016 from http://www.webopedia.com/DidYouKnow/Internet/Web_vs_Internet.asp

Wikipedia. (2016). Internet. Retrieved in May 21, 2016 from https://en.wikipedia.org/wiki/internet

Wijekumar, K. J., Meyer, B. J. F., Wagoner, D., & Ferguson, L. (2006). Technology affordances: the "real story" in research with K-12 and undergraduate learners, *British Journal of Education and Technology,* 37(2), 191-209.

Wolcott, P., Press, L., McHenry, W., Goodman, S. & Foster, W. (2001). A framework for assessing the global diffusion of the Internet, *Journal of the Association for Information Systems,* 2 (6), 1-52.

Woo, Y. & Reeves, T. (2007). Meaningful interaction in web-based learning: a social constructivist interpretation, *Internet and Higher Education*, 10, 15- 25. Retrieved on 26 April 2016 from http://0-x.doi.org.innopac.wits.ac.za/10.1016/j.iheduc.2006.10.005.

Wetzel, D. R., (2001). A model for pedagogical and curricular transformation with technology. *Journal of Computing in Teacher Education,* 18(2) 43-49. Retrieved on 13 September 2017 from http://www.tandfonline.com/doi/abs/10.1080/10402454.2001.10784432.

World Economic Forum. (2016). The Global Information Technology Report 2016: Innovating in the digital economy, Geneva, Switzerland.

Worden, D. (2015). The development of content knowledge through teaching practice*, Ilha do Desterro,* 68,(1) , 105 -119, Retrieved from https://periodicos.ufsc.br/index.php/desterro/article/view/2175-8026.2015v68n1p105.

Yasak, Z. & Alias, M. (2015). ICT integration in TVET: Is it up to expectation? 4th World Congress on Technical and Vocational Education and Training (WoCTVET),

5th-6th, November 2014, Malaysia, *Procedia –Social and Behavioural Sciences*, 204, 88-97, Retrieved on 26 April 2016 from https://ac.els-cdn.com/S1877042815047680/1-s2.0-S1877042815047680-main.pdf?

Zillien, N. & Hargittai, E. (2009). Digital distinction: status-specific types of Internet usage, *Social Science Quarterly*, 90 (2) 274-291.

Annexure A: Covering letter to College Principals

Boardwalk Faerie Glen 0081
20 July 2016

Mr. D.L. Nkosi Principal
SWG TVET College
Private Bag X33 Tshiawelo 1818

Email: nkosidl@swgc.co.za Dear Mr. Nkosi

Request for approval to conduct research at Ekurhuleni East TVET College in partial fulfilment of Masters Arts degree

Introduction

My name is Vusumuzi Mthembu, I am a student at the University of the Witwatersrand. I am conducting a research on factors that influence lecturer Internet usage at public Gauteng Technical Vocational and Education Training (TVET) colleges. This research study is being conducted in partial fulfilment of the requirements for the Masters of Arts (ICT Policy and Regulation) degree at the University of the Witwatersrand.

Purpose of the study

The research will gather information on the factors that influence lecturer Internet usage in learning and teaching at colleges. It will also seek to understand how lecturers use Internet and for what purposes. This information will be gathered from the interviews with the lecturers, Principals and respondents from the training providers. The data gathered from lecturers will relate to how, and for what purposes lecturers use the Internet in learning and teaching. Principals will provide data on the management imperatives that inform Internet usage at TEVT colleges. The research will also gather information from Training providers on their perspective on factors that influence internet usage in learning and teaching.

Study methodology

The process of data collection will employ a mixed method approach using both qualitative and quantitative research methods. Fifteen participants will be identified for in-depth interviews. The participants fa!! into three groups: one set represent TVET lecturers and three lecturers from three colleges will be interviewed; the Principals from these colleges will also be interviewed; three interviews will be conducted with representatives from the training providers. All eight of the colleges in Gauteng are targeted to complete a survey questionnaire for a census study. **(See attached copy)**

The interviews will be conducted at college premises at a time suitable to college lecturers without disrupting academic activities of the lecturers and will take between 30- 60 minutes.

Kindly complete attached copy of survey questionnaire and identify three lecturers who use the Internet in teaching who can participate in in depth interviews. I will appreciate if the completed questionnaire can be submitted by 29 July 2016. I will contact your office to schedule appointments for the interviews with the Principal or college management representative and the three identified lecturers.

Completed questionnaire and contact details of lecturers can be forwarded to Vusi Mthembu to the following contact details:

Email:bravusi.mthembu@gmail.com

Mobile number: 0082 896 3003

I will greatly appreciate of the approval is granted to conduct this research at the college

Kind regards,

Vusi Mthembu

Annexure B: Permission letters to conduct research

higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

SEDIBENG TVET COLLEGE
"GROW WITH THE FLOW"

www.sedcol.co.za
E-mail: info@sedcol.co.za

CENTRAL OFFICE:
Tel: (016) 422-6645/8
Fax: (016) 422-6646
37 VOORTREKKER ST
VEREENIGING
PRIVATE BAG X020
VEREENIGING 1930

SEBOKENG:
Tel: (016) 988-1276/1287
Fax: (016) 988-1288
4 SAMUEL ST
SEBOKENG
PRIVATE BAG X085
VEREENIGING 1930

VANDERBIJLPARK:
Tel: (016) 933-5644/5
Fax: (016) 931-9406
6 FRIKKIE MEYER BLVD
PRIVATE BAG X05
VANDERBIJLPARK 1900

VEREENIGING:
Tel: (016) 421-1150/51
Fax: (016) 422 – 0746
33 VOORTREKKER ST
VEREENIGING
PRIVATE BAG X035
VEREENIGING 1930

11 August 2016

ATTENTION: MR V MTHEMBU

RE: REQUEST FOR PERMISSION TO CONDUCT RESEARCH

Dear Mr V Mthembu

I hereby grant permission for you to conduct research at Sedibeng TVET College between 01 August and 20 October 2016 on your research topic:
Factors that Influence Lecturers Internet Usage: An exploratory Study of Gauteng Technical Vocational and Educational Training (TVET) Colleges.

Good Luck with your research.

Kind Regards

DR AE MASHELE
PRINCIPAL/CEO

higher education
& training
Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

TSHWANE NORTH TVET COLLEGE
Technical and Vocational Education and Training College

Mr Vusumuzi Mthembu
Wits University
Johannesburg
2000

Dear Mr Vusumuzi Mthembu

RE: REQUEST FOR PERMISSION TO CONDUCT RESEARCH AT TSHWANE NORTH COLLEGE

Permission is hereby granted to conduct research at Tshwane North College, regarding the research topic (**Factors that influence lecturer Internet usage: An exploratory study of Gauteng Technical Vocational and Education Training (TVET) colleges**) as part of your Masters of Arts (ICT Policy and Regulation) degree at the University of the Witwatersrand. It will be appreciated if you could share the findings of the study with us.

We wish you success with your research study.

Regards

Mr S Sethusha
Principal
Date: 05/08/2016

Central Office
Cnr. Kgosi Mampuru (former Potgieter Street) & Pretorius Streets
Tel: (012) 401 1727/1961
Fax: (012) 323 8683

Mamelodi Campus
19403 Serapeng Road, Mamelodi East
Tel:(012) 801 1010/1/ (012) 4011860/ (012)0001284
Fax:(012) 801 1179

Pretoria Campus
420 Helen Joseph Street (former Church Street), Pretoria
Tel:(012) 401 1600/ (012)401 1633/45
Fax:(012) 326 5298

Soshanguve South Campus
College Road, Block L, Soshanguve
Tel:(012) 793 2675/ (012) 401 1818/ (012) 0000231/245/238
Fax:(012) 793 1383

Rosslyn Campus
Ernest Oppenheimer Street, Rosslyn
Tel:(012) 541 1590/ (012) 401 1920/ (012) 0000274
Fax:(012) 541 1398

Soshanguve North Campus
1973 Phirima Road, Block G, Soshanguve
Tel: Tel:(012) 797 2624 (012) 401 1839/ (012) 0000197/198
Fax:(012) 799 1858

Temba Campus
3477 Jubilee Road, Temba

Annexure C: Lecturer interview guide



INTERVIEW GUIDE – COLLEGE LECTURERS

Research Topic:

Factors that influence lecturer Internet usage in teaching: An exploratory study of Gauteng Public Technical Vocational and Education Training (TVET) colleges.

Researcher:

Vusi Mthembu

Maters of Arts (ICT Policy and Regulation) Student - University of the Witwatersrand.

Email: bravusi.mthembu@gmail.com

Research Study supervisor:

Dr. Kiru Pillay

University of the Witwatersrand, Link Centre

Email: Kiru2010@gmail.com

Date:

Time:

Location:

Interviewer: Vusi Mthembu

Interviewee: DHET official

Consent form signed? Y/N

Participant Information Sheet provided? Y/N

Appreciation/Welcome Notes:

Thank you for taking time to participate. My name is Vusi Mthembu and I am a student at the University of the Witwatersrand conducting a research study in partial fulfillment of the requirements for the degree of Master of Arts in ICT policy and Regulation. This questionnaire is one of many that

forms part of an academic exercise towards the completion of study. The questionnaire asks questions about Internet usage amongst lecturers and how lecturers use Internet in learning and teaching. The questionnaire also ask general questions about the state of the internet and ICTs at your college I believe your input will be valuable in this research and in helping understand the factors that influence Internet usage amongst college lecturers, and provide insight on the extent to which lecturers use Internet during the process of learning and teaching. Information gathered from this interview will be treated as confidential and the anonymity is guaranteed.



PARTICIPANT INFORMATION SHEET

MASTERS RESEARCH

RESEARCH TITLE: FACTORS THAT INFLUENCE LECTURER INTERNET USAGE: AN EXPLORATORY STUDY OF GAUTENG PUBLIC TECHNICAL VOCATIONAL AND EDUCATION TRAINING (TVET) COLLEGES.

My name is Vusumuzi Mthembu, I am a student at the University of the Witwatersrand.
I am conducting a research on factors that influence lecturer Internet usage at Gauteng Public Technical Vocational and Education Training (TVET) colleges. This research study is being conducted in partial fulfilment of the requirements for the Masters of Arts (ICT Policy and Regulation) degree at the University of the Witwatersrand. The research gathers information on the factors that influence lecturer Internet usage in learning and teaching at colleges. It also seeks to understand how lecturers use Internet and for what purposes.

This information will be gained from the interviews with the lecturers, Principals and respondents from the training providers. The data gathered from lecturers will relate to how, and for what purposes lecturers use the Internet in learning and teaching. Principals will provide data on the management imperatives that inform Internet usage at TEVT colleges. The research will also gather information from Training providers on their perspective on factors that influence internet usage in learning and teaching.

The interviews will be conducted on college or company premises at a time suitable to the respondents and will take between 30 and 60 minutes.

Background and overview of the study

The purpose of the study is to investigate the factors that influence Internet usage amongst public TVET college lecturers in Gauteng. The study will examine the extent to which lecturers use the Internet for learning and teaching. It will examine the forms (what the Internet is used for in college education) and characteristics (how lecturers use the Internet) of lecturers Internet usage at Gauteng TVET colleges.

Right to participate

Participation in this study is completely voluntary. You are entitled withdraw from participating at any time and the decision will not affect you negatively in any way. If you have any concerns or questions you would like answered before participating you are welcome to contact the student supervisor or the researcher. If you decide to take part, you will be given this information sheet to keep and you will be asked to sign a consent form. The interview may be recorded to assist the researcher to accurately capture responses on the interview questions. There will be no direct risk to you for participating in the study. There will also be no monetary benefits for your participation in study.

Anonymity and Confidentiality

Any personal information collected about you will be kept strictly confidential. Identifiers will be removed from data when the research findings are consolidated into a report and will not be included in any subsequent publications. The anonymised data generated in the course of the research will be kept securely in paper or electronic format for a period of five years after the completion of the research. It may be used for further research and analysis. This report can be made available to you upon your request.

Research Ethics

If you have concerns about the research, its risks and benefits or about your rights as a research participant in this study, you may contact the program director or supervisor, see contact details below.

Contact for Further Information

Program Director:	Supervisor:	Researcher:
Lucienne Abrahams	Dr Kiru Pillay	Vusi Mthembu
luciennesa@gmail.com	kiru2010@gmail.com	bravusi.mthembu@gmail.com
+27 (0) 82 569 7675	+27 (0) 82 602 7261	+27 (0) 82 896 3003

Section 1.

With respect to your qualifications and experience, please provide me with the following information:

1. Do you have the following qualification /s? [Please tick one box - X]

Occupational qualification/s
☐ Yes ☐ No

Teaching qualification/s
☐ Yes ☐ No

2. How long have you been teaching? [Please check one box - X]
☐ 0 - 1 year
☐ 2- 5 years
☐ 6- 10 years
☐ 11- 15 years
☐ 15+ years

3. How long have you been using Internet in teaching? [Please check one box - X]
☐ 0 - 1 year
☐ 2- 5 years
☐ 6- 10 years
☐ 11- 15 years
☐ 15+ years

4. **With respect to experience and subject taught, please provide the following information:**

How many years of relevant practical experience in industry or college teaching in your chosen subject	
What subject do you teach?	

Section 2
With respect to use Internet for learning and teaching, please provide the following information:

5. What do you use the Internet for in teaching?

6. How do you use the Internet in teaching?

7. Do you think the use of Internet add value in teaching? Please explain?

8. How do you use Internet for practical training in teaching?

9. To what extent do you collaborate with other professionals online to share and or discuss information on curriculum content issues?

10. How do you use Internet to promote practical training in teaching?

11. How does the college provide curriculum and technical support for lecturers to use Internet in teaching?
12. What is your experience of using the Internet in teaching at the college?

Annexure D: Interview Guide for College Management

With respect to college management on lecturer Internet usage, please provide the following information:

1. What are the goals of the college in using Internet for teaching?
2. Do you think the use of Internet add value in teaching? Please explain?
3. How does the college promote Internet in teaching amongst lecturers
4. How do lecturers use the Internet in teaching
5. Which factors promote the use of the Internet in teaching amongst lecturers at colleges?
6. What challenges are faced by the college in relation to the deployment and provisioning of the Internet for learning and teaching? How can these challenges be addressed? Please elaborate.
7. What are the attitudes of lectures in using Internet in teaching?
8. Does the college have an Internet policy and or IT plans
9. What are the key focus areas of that Internet policy or IT plans if available?
10. How does the college, provide curriculum and technical support for lecturers to use Internet for learning and teaching?

Annexure E: Interview Guide for Training Providers

With respect to the training program you offer at colleges, please provide the following information:

1. Briefly explain the key focus areas of your training programs at colleges
2. How do your training programs promote Internet usage in teaching at TVET colleges
3. What do lecturers use the Internet for in teaching?
4. Which factors promote the use of the Internet in learning and teaching amongst lecturers at colleges?
5. To what extent do college lecturers use Internet in teaching at colleges?
6. What are the challenges faced by college lecturers in using Internet? How can these challenges be addressed? Please elaborate.
7. To what extent do colleges provide for infrastructure and resources such as, connectivity, technical support, hardware, software to enable lecturers to use Internet in learning and teaching?
8. What are the values and attitudes of lectures in using Internet for learning and teaching?

Annexure F: Mapping of the research questions to the theoretical frameworks and models

Research questions	Research method	Research Instrument	Theoretical artefact
5. Main research question: Which factors promote Internet usage by college lecturers in teaching?			
a) Number of enrolled students number of lecturers, and number of computers b) Number of computers with Internet connectivity c) Type of Internet connections d) Does the college have a Website? e) Does your college have an email address? f) Does the college have Wi-Fi within campus? g) Does the college have a Facebook page? h) Does the college have online learning management system? i) Do you have a technician who manages your website? j) Are your computers installed with anti-virus software? k) Do you have the following qualification /s? a) How long have you been teaching? b) How long have you been using Internet in teaching? c) Do you have practical experience on the subject you teach? d) If yes how many years of relevant practical experience in industry or college? l) What subject do you teach? m) Does the college have a college IT plan?	Quantitative	Survey questionnaire	Adapted TPACK framework Institutional level factor theoretical framework

Research questions	Research method	Research Instrument	Theoretical artefact
n) Does the college have an Internet policy and or IT plans? o) How would you rate the ICT skills of lecturers to use Internet in teaching?			
p) Which factors promote the use of the Internet in teaching amongst lecturers at colleges? q) How does the college provide curriculum and technical support for lecturers to use Internet in teaching? r) Does the college provide curriculum support needed for you to use Internet in teaching?	Qualitative	Interview guides	adapted TPACK framework, Institutional level factor theoretical framework
Sub question 1: How do these factors promote Internet usage amongst college lecturers?			
a) Does the college provide curriculum support needed for you to use Internet in learning and teaching? b) What is your experience of using the Internet for teaching? c) How does the college provide curriculum and technical support for lecturers to use Internet in teaching? d) What are the challenges faced by college lecturers in using Internet for teaching? How can these challenges be addressed? Please elaborate. e) Does the college have an Internet policy and or plans and what are the key focus areas of that policy or plans?	Qualitative	Interview guides	Adapted TPACK framework The Teacher Development Framework

Research questions	Research method	Research Instrument	Theoretical artefact
f) Do you have a technician who manages your website? g) Are your computers installed with anti-virus software?			
h) Do you have a technician who manages your website? i) Are your computers installed with anti-virus software? J) Do you have the following qualification /s? j) How long have you been teaching? k) How long have you been using Internet in teaching? l) Do you have practical experience on the subject you teach? **m)** What subject do you teach?	Quantitative	Survey questionnaire,	
Sub question 2: To what extent do public TVET college lecturers use the Internet in learning and teaching?			
a) What do you use the Internet for in teaching? b) How do you use the Internet in teaching? c) To what extent do you collaborate with other professionals online to share and or discuss information on curriculum content issues? d) How do you use Internet to promote practical training in teaching? e) What are the goals of the college in using Internet for teaching f) What challenges are faced by the college in relation to the deployment and provisioning of the Internet for learning and teaching? How can these challenges be addressed? Please elaborate?	Qualitative	Interview guides	adapted TPACK framework, The Teacher Development Framework Blended learning institutional adoption framework

Research questions	Research method	Research Instrument	Theoretical artefact
Sub question 3: How do lecturers use Internet for learning and teaching?			
a) Do lecturers use email to communicate with students? b) Do lecturers use email to communicate with lecturers c) Do lecturers use social media (Facebook, WhatsApp) to communicate with students? d) Do lecturers use online communication platforms for curriculum support?	Quantitative	Survey questionnaire	adapted TPACK framework,
e) How do you use Internet for practical training in teaching? f) How do you use the Internet in teaching? g) How do lecturers use Internet in teaching? h) How does the college promote Internet in teaching amongst lecturers? i) What are the goals of the college in using Internet for teaching? 11. What are the key focus areas of that Internet policy or IT plans if available?	Qualitative	Interview guides	The Teacher Development Framework Blended learning Institutional adoption framework
Sub question 4: To what extent do attitudes promote lecturers usage of the Internet in teaching?			
Do you think the use of Internet add value in teaching? Please explain? What is your experience of using the Internet in teaching? What are attitudes of lectures in using Internet in teaching?	Qualitative and Quantitative	Interview guides	Technology adoption model (TAM)

Source: developed by researcher

Annexure G: Ethics Clearance Certificate

Research Office

HUMAN RESEARCH ETHICS COMMITTEE (NON-MEDICAL)
R14/49 Mthembu

CLEARANCE CERTIFICATE	**PROTOCOL NUMBER: H16/06/23**
PROJECT TITLE	Factors that influence lecturers internet usage: An exploratory study of Gauteng technical vocational and educational training (TVET) colleges
INVESTIGATOR(S)	Mr V Mthembu
SCHOOL/DEPARTMENT	SLLM/
DATE CONSIDERED	24 June 2016
DECISION OF THE COMMITTEE	Approved unconditionally
EXPIRY DATE	17 July 2019

DATE 18 July 2016 **CHAIRPERSON** _____ (Professor J Knight)

cc: Supervisor : Dr K Pillay

DECLARATION OF INVESTIGATOR(S)

To be completed in duplicate and **ONE COPY** returned to the Secretary at Room 10005, 10th Floor, Senate House, University.

I/We fully understand the conditions under which I am/we are authorized to carry out the abovementioned research and I/we guarantee to ensure compliance with these conditions. Should any departure to be contemplated from the research procedure as approved I/we undertake to resubmit the protocol to the Committee. **I agree to completion of a yearly progress report.**

_____ 21 / 07 / 2016
Signature **Date**

PLEASE QUOTE THE PROTOCOL NUMBER ON ALL ENQUIRIES

Annexure H: Participant Information Sheet



MASTERS RESEARCH

RESEARCH TITLE: FACTORS THAT INFLUENCE LECTURER INTERNET USAGE: AN EXPLORATORY STUDY OF GAUTENG TECHNICAL VOCATIONAL AND EDUCATION TRAINING (TVET) COLLEGES.

My name is Vusumuzi Mthembu, I am a student at the University of the Witwatersrand.

I am conducting a research on factors that influence lecturer Internet usage at Gauteng Public Technical Vocational and Education Training (TVET) colleges. This research study is being conducted in partial fulfilment of the requirements for the Masters of Arts (ICT Policy and Regulation) degree at the University of the Witwatersrand. The research gathers information on the factors that influence lecturer Internet usage in learning and teaching at colleges. It also seeks to understand how lecturers use Internet and for what purposes.

This information will be gained from the interviews with the lecturers, Principals and respondents from the training providers. The data gathered from lecturers will relate to how, and for what purposes lecturers use the Internet in learning and teaching. Principals will provide data on the management imperatives that inform Internet usage at TEVT colleges. The research will also gather information from Training providers on their perspective on factors that influence internet usage in learning and teaching.

The interviews will be conducted on college or company premises at a time suitable to the respondents and will take between 30 and 60 minutes.

Background and overview of the study

The purpose of the study is to investigate the factors that influence Internet usage amongst public TVET college lecturers in Gauteng. The study will examine the extent to which lecturers use the Internet for learning and teaching. It will examine the forms (what the Internet is used for in college education) and characteristics (how lecturers use the Internet) of lecturers Internet usage at Gauteng TVET colleges.

Right to participate

Participation in this study is completely voluntary. You are entitled withdraw from participating at any time and the decision will not affect you negatively in any way. If you have any concerns or questions you would like answered before participating you are welcome to contact the student supervisor or the researcher. If you decide to take part, you will be given this information sheet to keep and you will be asked to sign a consent form. The interview may be recorded to assist the researcher to accurately capture responses on the interview questions. There will be no direct risk to you for participating in the study. There will also be no monetary benefits for your participation in study.

Anonymity and Confidentiality

Any personal information collected about you will be kept strictly confidential. Identifiers will be removed from data when the research findings are consolidated into a report and will not be included in any subsequent publications. The anonymised data generated in the course of the research will be kept securely in paper or electronic format for a period of five years after the completion of the research. It may be used for further research and analysis. This report can be made available to you upon your request.

Research Ethics

If you have concerns about the research, its risks and benefits or about your rights as a research participant in this study, you may contact the program director or supervisor, see contact details below.

Contact for Further Information

Program Director:	Supervisor:	Researcher:
Lucienne Abrahams	Dr Kiru Pillay	Vusi Mthembu
luciennesa@gmail.com	kiru2010@gmail.com	bravusi.mthembu@gmail.com
+27 (0) 82 569 7675	+27 (0) 82 602 7261	+27 (0) 82 896 3003

Annexure I: College Census Questionnaire

General Information

With respect to student and lecturer numbers at the college, please provide the following information:

Name of College	
Number of enrolled students	
Number of lecturers	

2. Computers and Internet

With respect to Internet connectivity and access to computers at the college, please provide the following information:

Number of computers	
Number of computers with Internet connectivity	
Type of Internet connections	
Does the college have a Website?	
Does your college have an email address?	
Does the college have Wi-Fi within campus?	
Does the college have a Facebook page?	
Does the college have online learning management system?	

With respect to Internet technical support at the college, please provide the following information:

3. Maintenance and technical support

Does your college have an IT technician?	
Do you have a technician who manages your website	
Are your computers installed with anti-virus software?	

With respect to Internet usage at the college, please provide the following information:

4. Internet use, plans and policies

	Yes	**No**
Does the college have a college IT plan?		
Does the college have a college Internet policy?		
Do lecturers use email to communicate with students?		
Do lecturers use email to communicate with lecturers		
Do lecturers use social media (Facebook, WhatsApp) to communicate with students?		
Do lecturers use online communication platforms for curriculum support		

With respect to the ICT skills of lecturers to use Internet at the college, please provide the following information

5. How would you rate the ICT skills of lecturers to use Internet in teaching?

☐Poor

☐ Average

☐ Good

☐ Excellent

Annexure J: Summary overview of course taught by respondents

Name of the course	Brief description	Course delivery medium	Year of implementation
Information Systems			
Introduction to systems development NQFL 2 -	Introduction to systems development principles and related concepts	Primarily delivers through face to face contact and use of textbook.	Introduced in 2007 and not reviewed to date
Systems analysis and design NQFL 4	Provides an understanding of on conducting systems analysis and designing and implementing systems	Primarily delivers through face to face contact and use of textbook.	Introduced in 2007 and not reviewed to date
Computer programming			
Principles of computer programming NQFL 2 -	It underlies the development of computer solutions to problems m	Primarily delivers through face to face contact and use of textbook.	Introduced in 2007 and not reviewed to date
Computer Programming NQFL 4	It involves designing and programming of computer based solution to meet specific requirement	Primarily delivers through face to face contact and use of textbook.	Introduced in 2007 and not reviewed to date
Multimedia subject			
Multimedia Basics NQFL 2	This subject teaches digital media basic skills for Multimedia content development and applications	Primarily delivers through face to face contact and use of textbook.	2011
Multimedia Content NQF L 3	Teaches core skills for Multimedia content such as designing , video editing electronic publication developing Multimedia products	Primarily delivers through face to face contact and use of textbook.	2012
Multimedia Service NQFL 4	Provides skills and knowledge for creating multimedia products on Internet	Primarily delivers through face to face contact and use of textbook.	2013
Cisco Networking training			
Cisco IT Essentials 1 and 2	Provides training to lecturer on introduction to computers, computer hardware maintenance and trouble shooting	The curriculum is embedded online and mode for delivery include both face to face and e-learning	2008
Cisco Networking training CCNA 1 and2	Teaches students networking based technology focusing routing, switching, network based protocols for entry level networking careers	The curriculum is embedded online and mode for delivery include both face to face and e-learning	Introduced in 2008 and curriculum is regularly updated

Annexure K: Informed Consent Form

Faculty of Humanities

University of the Witwatersrand, Johannesburg

P O Box 601, Wits, 2050

Title of Study: Factors that influence lecturer Internet usage: An exploratory study of Gauteng Technical Vocational and Education Training (TVET) colleges.

Please initial box

1. I confirm that I have read and understand the information sheet for the above study and have had the opportunity to ask questions. ☐
2. I understand that my participation is voluntary and that I am free to withdraw at any time without giving a reason. ☐
3. I understand that the researcher will not identify me by name in any reports using information obtained from this interview and that the views I express will remain confidential; **OR** ☐
4. I agree to my name being listed as a participant in this study in the annexure to the report, but not to be referenced in the main body of the report. ☐
5. I agree to the interview being audio recorded. ☐
6. I agree to the use of anonymised quotes in the dissertation. ☐
7. I agree that data gathered from me in this study may be stored (after it has been anonymised) and may be used for future research. ☐

Name of Research Participant Date: Signature:

Name of Researcher: Date: Signature**:**