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Department of Information Systems

Using Software as a Service to Support the Academic Activities of Students in Higher Education Institutions with a Relative Lack of Resources

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Thesis Presented for the Degree of

DOCTOR OF PHILOSOPHY

In the Department of Information Systems
Faculty of Commerce
University of Cape Town

February 2018

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DEDICATION

This thesis is dedicated to God almighty for the grace, wisdom, knowledge and understanding to complete this work.

I also dedicate this thesis to my late grandmother, Mrs Abigail Jemimusiyin Longe for her contributions towards my upbringing and for her love and support throughout her years, and to my late sister Mrs Aderonke Omojola for her love, encouragement and contributions towards my journey in life. May their gentle souls continue to rest in perfect peace.

ACKNOWLEDGEMENTS

I would like to express my gratitude to the following people and organisations who have contributed in one way or the other towards the success of this thesis. Their generous contributions have been highly beneficial to my journey over the years. I am highly grateful to them all:

A special thank you to Jesus Christ my Lord and saviour for giving me good health and the grace to complete this work. "*So, do not fear, for I am with you; do not be dismayed, for I am your God; I will uphold you with my righteous right hand*" (Isiah 41:10).

A big thank you to my parents, Chief Samuel Oladapo Akande and Mrs Florence Ajoke Akande for their unending love, support, prayers and encouragement. Thank you for always motivating me and for those frequent calls to find out when my thesis will be completed. You really encouraged and motivated me to complete this PhD successfully. This would not have been possible without your support.

My uncle, Dr Timothy Longe and his wife (Mrs Florence Longe), thank you for your financial support, advice and encouragement over the years. I am very grateful.

My primary school teachers, Mr Nana, Mr Appiah, and Mr Bob from Adesola Model School, Ibadan. The foundations that you gave me has brought me this far.

My high school teachers, Mr Lans, Mr Ogumodede, Mr Mudashiru and Mrs kings. Thank you for your contributions towards my journey.

Late Chief Babatunde Bankole Majekodunmi, your contribution will forever be remembered and appreciated

My Supervisor, Professor Jean Paul Van Belle, I will always be grateful for your dedication, advice, guidance, support and encouragement. You have facilitated my growth and development as a scholar through your mentorship, support and encouragement. Thank you for guiding me throughout this journey.

Professor Irwin Brown, thank you for your advice, support and encouragement. I am very grateful.

Professor Ojelanki Ngwenyama, thank you for all the knowledge you imparted on me during this journey and for teaching me how to unlearn the previously held perspectives. That gave me the courage to question ideas and beliefs with evidence. Your teachings allowed me to 'empty all the noise in my head' like you always asked us to do. That prepared my mind for a successful PhD journey. I am very grateful.

Members of the research proposal review committee at the University of Cape Town for their valuable and insightful feedback of my research proposal which contributed towards the improvement of this research project.

My lovely wife, Nozuko. Your sacrifices have paid off. You are a true blessing from God. Thank you for giving me the strength and encouragement to hold on and not give up on this difficult but enjoyable journey. I will always love you and I will forever be indebted to you.

To my lovely children, Junior, Abigail and Akintayo. Thank you for your prayers. There was no day that you did not remember to pray for the successful completion of my PhD. God has finally answered those prayers. I also thank you my lovely children for those sleepless nights that you stayed up to support me as if we were doing the PhD together. That means a lot to me and it really gave me hope and encouragement.

To my classmates, the intellectual discussions and advice we gave one another was useful. Thank you very much for being there.

To the National Research Foundation (NRF) of South Africa, thank you for your financial support that made this work a success.

To all the higher education institutions that gave me access to their students and staff for the data collection, I am very grateful.

To all who have contributed in one way or the other towards my PhD journey but have not been mentioned. You are not forgotten. Your contributions are highly appreciated. May God bless you all.

PEER-REVIEWED PUBLICATIONS BASED ON THIS RESEARCH

Akande, A. O., & Van Belle, J.-P. (2014). Cloud Computing in Higher Education: A snapshot of Software as a Service. 6th International Conference on Adaptive Science and Technology (ICAST) (pp. 134 - 138). Ota, Ogun State, Nigeria: Institute of Electrical and Electronics Engineers.

Akande, A. O., & Van Belle, J.-P. (2016). The use of software as a service by students in higher education institutions: a systematic literature review. Proceedings of the 18th Annual International Conference on Electronic Commerce: e-Commerce in Smart Connected World (pp. 1 - 6). Suwon, South Korea: Association for Computing Machinery.

Akande, A. O., & Van Belle, J.-P. (2017). The use of Software as a Service to Facilitate Quality Learning Experience for Students in Higher Education Institutions. 4th International Conference on Next Generation Computing and Communication Technologies (pp. 1 - 7). Dubai, UAE: Institute of Electrical and Electronics Engineers.

LIST OF ABBREVIATIONS AND ACRONYMS

ASPs	Application Service Providers
BPOS	Business Productivity Online Standard Suite
BYOD	Bring Your Own Device
C/LMSs	Course and Learning Management Systems
CC	Cloud Computing
CDs	Compact Disks
CPN	Computer Professionals Registration Council of Nigeria
CRM	Customer Relationship Management
DVC	Deputy Vice Chancellor
Ebooks	Electronic Books
ERP	Enterprise resource Planning
FET	Further Education and Training
FME	Federal Ministry of Education
GAFE	Google Apps for Education
GB	Gigabytes
Gmail	Google mail
HEI1	Higher Education Institution 1
HEI2	Higher Education Institution 2
HEI3	Higher Education Institution 3
HEI4	Higher Education Institution 4
HEIs	Higher Education Institutions
HESA	Higher Education South Africa
IaaS	Infrastructure as a Service
ICAST	International Conference on Adaptive Science and Technology
ICEC	International Conference on Electronic Commerce
ICNGCCT	International Conference on Next Generation Computing and Communication Technologies
ICT	Information and Communication Technology
ICTs	Information and Communication Technology's
IEIs	Innovative Enterprises Institutes
IEO	Input-Environment-Output
IS	Information Systems
IT	Information Technology
IT1	Information Technology Staff 1
IT2	Information Technology Staff 2
IT3	Information Technology Staff 3
IT4	Information Technology Staff 4
JAMB	Joint Admission Matriculation Board
L1	Lecturer 1
L2	Lecturer 2
L3	Lecturer 3
L4	Lecturer 4
LAN	Local Area Network
MS	Microsoft
NIALS	Nigerian Institute of Advanced and Legal Studies
NIST	National Institute of Standards and Technology

NITDA	Nigerian Information Technology Development Agency
NUC	National Universities Commission
OS	Operating Systems
OWA	Outlook Web Access
PaaS	Platform as a Service
PDAs	Personal Digital Assistants
QDA	Qualitative Data Analysis
RCCP	Rural Campus Connection Project
S1	Student 1
S2	Student 2
S3	Student 3
S4	Student 4
S5	Student 5
S6	Student 6
S7	Student 7
S8	Student 8
S9	Student 9
S10	Student 10
S11	Student 11
S12	Student 12
SA	South Africa
SaaS	Software as a Service
SADC	South African Development Community
SAn	South African
SCM	Supply Chain Management
SLA	Service Level Agreement
SLAs	Service Level Agreements
SPSS	Statistical Package for Social Sciences
TRD	Training and Research Development
TTF	Task-Technology Fit
TUN	Teradata University Network
UAE	United Arab Emirates
UK	United Kingdom
URL	Uniform Resource Locator
USA	United States of America
USAf	Universities South Africa
UTME	Unified Tertiary Matriculation Examination
VC	Vice Chancellor
VCL	Virtual Computing Lab
VEIs	Vocational Enterprises Institutes
VM	Virtual Machine
VMs	Virtual Machines
VOIP	Voice Over Internet Protocol
VRIN	Valuable, Rare, Inimitable and Non-Substitutable
WAN	Wide Area Network
WiFi	Wireless Fidelity
ZPD	Zone of Proximal Development

Using Software as a Service to Support the Academic Activities of Students in Higher Education Institutions with a Relative Lack of Resources

ABSTRACT

The contribution of Software as a Service (SaaS) towards improved access to software, cost reduction, better quality of learning and enhanced communication and collaboration in higher education institutions (HEIs) cannot be over emphasised. Some HEIs are faced with issues such as tight budget, lack of needed software, inadequate human resources and lack of adequate infrastructure. This research refers to such HEIs as those with a relative lack of resources because the resources intended for a single student are often shared among ten or more students. Hence many students are unable to cope with their academic activities and some end up failing or even dropping out.

Finding alternative ways to provide the necessary software for students is therefore a priority for HEIs with a relative lack of resources. SaaS offers a possible alternative for them and it is gaining their attention. The goal of this research was to empower HEIs, their students, lecturers and Information Technology (IT) staff by providing them with a better understanding of SaaS and to provide them with a tool to manage the adoption and implementation of SaaS. Also, the intention was to make practical, theoretical and methodological contributions to the scientific body of knowledge in the area of Software as a Service. To achieve the goals, this research investigated the use of SaaS in HEIs with a relative lack of resources and found SaaS to be effective in providing wider access to software for students in HEIs with a relative lack of resources. This research also identified benefits and limitations of SaaS and how SaaS can help in addressing the barriers to learning and contribute towards the creation of a conducive learning environment for students. The different SaaS offerings available for education and the issues and contradictions associated with the use of SaaS in HEIs were also identified. Furthermore, a set of propositions and an integrated framework were developed using the data from the literature, books, institutional documents and interview data.

Although HEIs are continuously introducing SaaS offerings into their academic activities and SaaS promises to improve the learning experience of students in HEIs by improving access to software, improving the sharing of documents and files, improving collaboration as well as communication, this research found that the use of SaaS by students in HEIs is still relatively low and uncovered the reasons for this. The HEIs in Nigeria and South Africa were used as exemplars and the problems they face with regards to resource availability were identified using the activity theory (AT) as a theoretical lens. The Astin's IEO model and the Students involvement theory were also used to explain some issues relating to the importance of student participation in academic activities involving the use of SaaS.

Although the study was focused on students, data from lecturers and IT staff was used for triangulation to increase the credibility and validity of the data obtained from the students. This research found that students

believe that SaaS can improve their learning experience and there is an unwavering support for the campus wide implementation of SaaS among students. In the Nigerian HEIs, software piracy was found to be a major problem as students cannot afford to buy the original software needed for academic activities. Another major finding from the Nigerian HEIs is the rampant claims that corruption affects the implementation of SaaS and other Information and Communication Technology (ICT) initiatives as funds meant for implementation are often diverted for personal gains.

In both Nigeria and South Africa, this research found that there is limited or no internet access in some areas and the students who come from such areas are unable to access SaaS from home. This limits their ability to enjoy the anytime, anywhere access advantage of SaaS. This research concluded by suggesting the need for the government and education institutions to provide training for learners and encourage them to be computer literate from an early stage as this could improve their confidence in using technologies such as SaaS when they get to higher education level.

Keywords: Cloud computing, adoption, implementation of SaaS, information technology resources, higher education institutions, HEIs, students, software, software as a service, SaaS, South Africa, Nigeria, academic computing.

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1. INTRODUCTION

The use of Software as a Service (SaaS) is common in higher education institutions (HEIs) because it can help to address learners' academic, social and emotional needs. SaaS is the most common ICT learning support service used in HEIs. Support is an additional service provided in conjunction with already available services. It could be in the form of extra equipment, additional staff or more financial resources (Mittler, 2006). This can help create a conducive learning environment and enhance learners' self-esteem. It can also lead to improved academic performance of learners (Bojuwoye, Moletsane, Stofile, Moolla, & Sylvester, 2014; Mushtaq & Khan, 2012). Academic support may be human, material or other resources (Department of Education, 1997) and it may be directed towards students, lecturers, teaching activities of any other member or group in an academic setting (Steyn & Wolhuter, 2008). In recent times, HEIs have been faced with tight budgets because of reduction in government funding (Famade, Omiyale, & Adebola, 2015) and the increasing cost of purchasing and maintaining ICT resources (Ndukwe & Amadi, 2013). There is also an unequal distribution of resources among HEIs as some HEIs have better access to needed resources than the others (Jansen, 2003). In this research, HEIs that are resources constraint with limited or no access to resources such as computer and software needed to support academic activities are referred to as "HEIs with a relative lack of resources". This research focused on academic support directed towards the students.

Before the introduction of SaaS, the existing traditional software was expensive and many HEIs could not afford to provide all their students with access to needed software. Also, the traditional software requires the users to physically install the software on a computer and upgrade it as soon as the manufacturer makes updates available. The high cost of the software makes it impossible for the students to afford it. The maintenance of the software is also time consuming and valuable time that the students could have used for academic activities are used to install and upgrade the software. This is because even in some cases where the installations are performed by the IT staff, the students still need to take their devices to the IT staff and wait while the software is being installed. The students who do not have their own personal computers or cannot afford the traditional software depend mainly on the institution to provide them with access to computer and software needed for their studies. Such students are sometimes unable to access the institutions computers and software because they are being used by other students. This could lead to frustration for the students who are unable to access the resources. It could also have a negative effect on their performance. Although HEIs are trying to keep up with the demand by establishing more computer laboratories for the students to access the needed resources, they are not able to provide adequate number of computers to meet students' demand (Sharma & Ganpati, 2013). The reduction in government funding and the ever-increasing student population further prevents HEIs from meeting the resource needs of their students (Famade, Omiyale, & Adebola, 2015). Technology changes and the frequent need to upgrade makes it important for HEIs to find a way to take the burden of software upgrades off the students. Some HEIs try to achieve these by installing the software on the institutions server which gets updated centrally by the IT

staff. The issue with this is that the installation, maintenance and upgrades of the software needs to be performed by the IT staff and the institution is liable for paying the license fees and salaries of the IT staff. SaaS has the capability of providing solutions to this issue as the upgrades are performed by the service providers. The time needed for upgrades can therefore be used for important academic activities.

There is a substantial increase in the use of cloud based applications for conducting research, teaching and learning in HEIs (Adeoye, 2015). Although the interest in using information and communication technologies (ICTs) in education is increasing, the expected benefits have not been fully realised (Demiraslan & Usluel, 2008). Since the introduction of SaaS, more and more HEIs are adopting and introducing SaaS to their students to resolve the problem of inadequate access to resources. In this research, the use of SaaS in HEIs was investigated. SaaS is a cloud computing (CC) service model that has the capability to provide the needed learning support services to HEIs with a relative lack of resources often at an affordable price. CC is an emerging technology that has gained confidence among various organisations (Ercan, 2010). In literature, different definitions of CC are used (Sultan, 2010) depending on the scope and type of CC being investigated. This research adopts the definition of CC by the National Institute of Standards and Technology (NIST) which defines CC as a model for supporting convenient, on-demand network access to computing resources which can be shared among several users. Examples include networks, servers, storage, applications, and services which can be made available with little management effort or service provider interaction (Canedo, de Sousa Junior, & de Oliveira, 2010; Zhang, Cheng, & Boutaba, 2010; Zissis & Lekkas, 2012). There are different cloud delivery models. The most common ones are Software as a Service (SaaS), Platform as a Service (PaaS) and Infrastructure as a Service (IaaS). Among the different delivery models, the most common one used in HEIs is SaaS (Akande & Van Belle, 2016).

1.1 Identified Gaps

The reduction in government funding and the continuous change in ICT puts the budgets of HEIs under pressure as they often lack funds to provide learning support tools and to meet the demands of constant software and hardware upgrades (Sultan, 2010; Kourik & Wang, 2012). Thus, the available software needed to support learning is often not enough to provide access to all students. This often means that some of the students are unable to complete their assignments and other tasks on time due to the lack of access to needed resources. This affects the quality of education offered by the affected HEIs. Research has shown that a conducive academic environment leads to better academic performance of students (Mushtaq & Khan, 2012) and it is difficult for HEIs to provide a conducive learning environment for students without providing them with adequate access to needed ICT resources.

1.2 Problem Statement

HEIs with a relative lack of resources are not able to provide many of their students with the necessary software (applications) because of their tight budget, inadequate human resources and lack of adequate infrastructure. The applications are also expensive to buy and maintain. The lack of necessary software prevents the students from doing their academic work efficiently. This can constitute learning barriers and can affect the student's ability to perform as expected. The availability of resources can enhance students' information literacy, enrich their academic work and lead to higher academic achievement by improving their grades but the lack of resources can lead to a lower achievement for students (Soria, Fransen, & Nackerud, 2014). With the reduction in government funding, the HEIs with a relative lack of resources find it even harder to provide students with needed resources. To overcome this problem, there is a need for HEIs with a relative lack of resources to find alternative ways to provide students with necessary resources at a cheaper cost (Ghilic-Micu & Stoica, 2011) to the institution without reducing the quality of learning and without putting a strain on the budget of the institution.

1.3 Prior Solution

In the past, several applications were purchased by HEIs but the number of students that can access them is restricted based on the type of license purchased by the HEIs. These applications had to be installed on local computers in the computer laboratory or on servers owned by the institution. The students had to go physically to the laboratory to access and use the applications from the local computer. There were also restrictions based on the number of computers available in the laboratories. This means that even when the licences purchased by the institution can accommodate more students, they might still be restricted because of the inadequate number of computers in the laboratory. Although HEIs are trying to meet the increasing need to provide wider access to a larger number of students, they are unable to meet the demand because of the other costs such as the cost of maintaining the computers which further put a strain on their limited budgets. The problems with the prior solutions continuously put a strain on the budgets of HEIs and this has created the need for a more cost-effective solution that will allow more students to access the applications at a reduced cost.

1.4 Research Motivation

Among the legacies of apartheid in South Africa (SA) is the inequality among HEIs because of the unequal distribution of resources during apartheid. This has left some HEIs with limited access to resources needed to provide their students with quality education (Jansen, 2003). It is a different case with the Nigerian HEIs where most of the HEIs don't have access to resources such as computers and internet facilities which are needed for effective teaching and learning (Akpan, 2012; Egoeze, Misra, Akman, & Colomo-Palacios, 2014). Most of the public HEIs in Nigeria are resource constrained due to the limited government funding and corruption (Halidu, 2015). In both Nigeria and South Africa, most HEIs have tight budgets and are unable to meet the demand for resources by their students (Jansen, 2003). This affects the quality of education offered to students. Thus, HEIs continue to look for opportunities that will assist them in providing their students

with the needed resources at affordable prices (Sultan, 2010). The need for a cheaper and affordable solution to the problem of lack of access to needed resources in the HEIs with a relative lack of resources created the need to conduct this research. This research classified the HEIs in Nigeria and South Africa into two categories (1) the HEIs with adequate resources and (2) the HEIs with a relative lack of resources. The reasons why a HEI falls into either of the categories could be different depending on the country or the institution. For example, the difference in access to resources among the South African HEIs is mainly the legacy of apartheid while the difference in access to resources among the Nigerian HEIs is mainly the nature of ownership in which privately owned HEIs which are funded by the owners are well resourced than government owned HEIs (Idumange & Major, 2006). This research acknowledges that the reasons for the differences in access to resources among other HEIs in other African countries may be different from that of the Nigerian and South African HEIs but suggests that regardless of what the differences may be, the HEIs could be classified into either of the two categories. Based on that, this research argues that although the sample size is small, the result of this study may be generalizable and applicable in other HEIs from other African countries.

1.5 Proposed Solution

To overcome some of the problem of lack of access to ICT resources such as software, SaaS is a proposed solution to the existing problem of lack of access to needed ICT resources. SaaS can allow access to the needed software via any internet enabled device such as desktop computer, smart phones, personal digital assistants (PDAs) and laptops. Since most of the students have internet enabled smart phones, they would be able to access their course materials and other software via their phone. This will give them access to the needed software at anytime from anywhere. It will also reduce the burden on the HEIs to continuously build more computer laboratories.

1.6 Research Objective and Contribution

The main objective of this research is to identify the issues and contradictions associated with the use of SaaS in HEIs from the perspectives of the students, lecturers and IT staff. This research also unpacked the benefits and drawbacks of using SaaS in HEIs with the intention of creating awareness of SaaS in HEIs so that the HEIs can reap the expected benefits of SaaS. This research also aims to identify ways in which SaaS can contribute towards addressing the barriers to learning and creating a conducive learning environment which will consequently contribute to the improvement of the academic performance of students. It is important to note that the adoption of SaaS by HEIs does not translate to its use and the use of SaaS cannot automatically create a conducive academic environment unless it is used effectively for academic activities. Thus, this research identified ways in which the students in HEIs can use SaaS effectively for academic purposes to enjoy a conducive academic environment. This research also provided guidelines for selecting a relevant SaaS application and a credible service provider. Furthermore, this research developed a framework that HEIs can use for adoption and continued use of SaaS. The framework will help to uncover the dynamics and complexities involved with the use of SaaS in HEIs and guide the HEIs from the pre-implementation phase through to the post implementation phase.

This research operationalized an HEI's relative lack of resources by looking at the number of computer per students, the number of IT staff, the availability of trained personnel to handle ICT equipment (Oye, Salleh, & Iahad, 2011; Momoh & Abdulsalam, 2014), the fluctuating budget from government, the lack of expertise in purchasing the right resources, improper plan to maintain resources, access to the internet and access to software (Bingimlas, 2009; Monobe, 2011). The reasons why the use of SaaS among students in HEIs is low were also identified. A thorough review of the literature was conducted to gain more knowledge of the research area and to further understand the problem and available solutions to develop a better solution to the problem. The interviews were conducted with the students, lecturers and IT staff from the selected HEIs. The interviews were recorded with the permission of participants and later transcribed. This research used the activity theory (AT), literature and the data obtained from the interviews to develop the guidelines and framework that would serve as a tool which HEIs can use to identify the benefits, drawbacks, critical success factors, use cases, adoption paths and maturity levels of their SaaS adoption and continued use. The Astin's input, environment and output (IEO) model and the student involvement theory were also used to guide the researchers understanding of the phenomenon under investigation.

This research makes both an explorative and prescriptive contribution. The researcher explored the use of SaaS in HEIs. The research questions are relevant and persisting because ICTs are important in facilitating and delivering quality standards of education in HEIs (Sultan, 2010). Unfortunately, some of the HEIs are unable to deliver the expected quality of education because of their relative lack of resources as a result of their tight budgets. Most of the HEIs are also faced with the problem of maintaining software and other resources that are available and this has been a persisting problem (Basal & Steenkamp, 2010; Yadav, 2014). SaaS can help HEIs to eradicate the problem of installation, upgrades and maintenance as the installation, upgrade and maintenance are carried out by the service provider (Farooqui, 2008; Dhingra, Goyal, & Malik, 2014; Asniar & Budiawan, 2016). This research aims to close the identified gaps by providing an integrated framework that will help to uncover the dynamics and complexities involved with the use of SaaS in HEIs. The framework can also assist HEIs with a relative lack of resources to identify the benefits and barriers of using SaaS and provide them with some recommendations on how they can reduce the risks and maximise the benefits of their SaaS adoption.

1.6.1 Practical contributions

This research contributed to practice by identifying the available SaaS offerings for HEIs to enable HEIs to know about the available offerings to be able to choose the right one that will provide them with needed features. This research also made a practical contribution by developing a set of guidelines which will assist HEIs in their adoption, implementation and continued use of SaaS. The study further made a practical contribution by developing a framework that would serve as a tool to guide HEIs towards a successful adoption, implementation and continued use of SaaS which can contribute towards the creation of a

conducive academic environment for students in HEIs. This research also provided a list of recommendations that will guide HEIs on how best to implement SaaS in HEIs. This research also makes contribution to practice by providing some guidelines for users of SaaS in HEIs to help them maximise their use of SaaS for optimal benefit.

1.6.2 Theoretical contributions

This research made theoretical contribution by enhancing our understanding of how SaaS can be used as a delivery mechanism in HEIs to improve learning outcomes. This study also made theoretical contributions by questioning and validating the assumptions of previous studies on SaaS in HEIs. This study also confirmed the applicability of the activity theory, the IEO model and student involvement theory in this particular-problem domain. Another contribution of this research is that there is limited research in this area especially in the Nigerian and South African context, hence this research contributes to the existing body of knowledge on SaaS. This research also contributes to the continued use and development of AT by demonstrating that it is applicable in educational setting to examine the use of SaaS. Furthermore, this research provided a good understanding of the activity theory and how it can be operationalised.

1.6.3 Methodological contributions

This research adopted a multi-method approach to examine the activities involved in the usage of SaaS by the students in HEIs. The use of institutional documents, literature and interviews was employed to encourage triangulation and increase the validity of the research outcome. This research also obtained data from multiple participants (students, lecturers and IT staff) to gain the different perspectives on the usage of SaaS in HEIs. This research demonstrated how to investigate a phenomenon of interest from multiple data sources and multiple participants to provide a better understanding of the phenomenon of interest.

1.6.4 Anticipated contributions and benefits of the research

1.6.3.1. For students

This research will provide the students with a better understanding of SaaS and enable them to use it effectively for their academic activities. This research has the capability to motivate the students and encourage them to be actively involved in the use of SaaS. This research can also change the way in which the student's view SaaS as it provides a better understanding of the benefits and limitations of SaaS. This will increase the interest of students in the use of SaaS and assist them to find ways to minimise the limitations and maximise the benefits of using SaaS. Furthermore, this research provided some guidelines for the students to assist them in using SaaS effectively.

1.6.3.2. For higher education institutions

This research will provide HEIs with a better understanding of SaaS. This will allow HEIs to maximise the benefits of implementing SaaS such as scalability, faster deployment of software and applications, less infrastructure requirement and less skilled IT staff requirement. This research will also provide HEIs with a framework that will help them to easily identify the benefits and drawbacks of using SaaS and guide them

towards choosing a relevant SaaS application and selecting a trustworthy service provider. This research also has the potential to encourage the HEIs to provide the students with adequate access to the resources that aid SaaS such as internet access.

1.6.3.3. For Nigeria and South Africa

This research also offers benefits for Nigeria and South Africa. Both Nigeria and South Africa will benefit from this research because this research can help to improve the quality of education offered by HEIs in both countries. This can contribute to a positive economic growth (Ahmed, 2015) in both countries in the long run. If the quality of education is improved because of conducive academic environment, it means that the quality of graduates produced will also be improved. Thus, the workforce would be equipped with qualified graduates who will contribute positively to the economic growth in their respective countries. This research also identified options for significant ICT infrastructure and capital expenditure savings on computing equipment and software as well as ICT staff for selected HEIs. The identified benefits may encourage other HEIs to adopt SaaS and that would lead to improved collaboration among HEIs. The resources would also be easily shared (i.e. using community cloud) among several institutions thereby leading to a huge saving on cost and improved collaboration (Katzan, 2010). The outcome of this research will be generalizable to other HEIs in South Africa, Nigeria and to some extent, to other HEIs in other African countries because most HEIs in Africa can be classified as either having access to needed resources of being resource constrained. This is because the African countries share a similar history of either colonisation or apartheid. The issue of corruption which is one of the reasons for the differences in access to resources in the Nigerian HEIs is also prevalent in most African countries. Because of the similarity among the African HEIs in terms of access to resources, if the result of this research is applied to other HEIs with similar conditions in Nigeria, South Africa or any other African country, a similar result should be obtained. Thus, this research argues that the result of this study would be generalizable and applicable in the other Nigerian and South African HEIs and to some extent, to the other HEIs in other African countries.

1.6.3.4. For research community

This research will benefit the research community by contributing to the current body of knowledge, especially on the use of SaaS in higher education. This research also adds academic value by developing a framework that could be used to uncover the relationships and complexities involved with the use of SaaS in HEIs. In this instance, the contribution is that the researchers can apply a new framework in operationalising and analysing SaaS adoption, implementation and continued use in future studies. This can create an avenue for further research and encourage researchers to further investigate SaaS and its potential contributions to education.

1.7 Research Questions

1. What forms of information and communication technologies are used in resource constrained higher education institutions and how assessible are they for the students?
    1.1. What forms of ICT-based academic support services are available to students in the selected HEIs?
    1.2. What are the challenges faced by the students in accessing and utilising the ICT-based academic support services?
2. How can the investigated resource constrained higher education institutions fully utilise Software as a Service to improve academic activities?
    2.1. What are the SaaS options for higher education institutions and what is the level of SaaS adoption by the higher education institutions in the study area?
    2.2. What are the benefits associated with the adoption of SaaS by students from the higher education institutions in the study area?
    2.3. What are the challenges and the constraining features to the successful adoption and use of SaaS by the students from the higher education institutions in the study area?
    2.4. How can activity theory help understand the adoption, use or lack thereof of Software as a Service?
    2.5. How can the contradictions within the activity systems in the selected higher education institutions be avoided to ensure the desired outcome?
    2.6. Can a generalizable set of best practices and governance protocols be identified to maximize benefits and minimize the challenges of SaaS?

1.8 Research Method and Approach

To answer the research questions, this research employed a qualitative approach. Although researchers often use activity theory in an interpretivist way, this research used activity theory in a positivist way. A detailed discussion on how this research used activity theory in a positivist way is provided in section 4.1 (Research methodology). The use of qualitative approach allowed the researcher to identify the benefits of using SaaS in higher education from the perspectives of the interview participants. For research to be effective, it is important to collect reliable and valid data. Chisnall, (1997) and Saunders, Lewis, & Thornhill, (2007) noted that valid and reliable data which are relevant to the research questions and objectives can be obtained during interviews. This research collected and analysed both primary and secondary data. Primary data was collected during the interviews while the secondary data was collected from institutional documents and similar studies (Chisnall, 1997). The interviews were arranged with the academic staff, IT managers and the students from the selected HEIs for the qualitative data. The data obtained from the interviews were analysed based on the theoretical framework and the proposed framework was developed to guide HEIs in their adoption and continued use of SaaS. The proposed framework includes the organisational and social context variables and moderators as well as dynamic dependencies and feedback

loops. This research used the purposive sampling technique because the researcher selected the units that are representative of the research population based on the judgement of the researcher and the objective of the study (Singleton & Straits, 2005). The purposive sampling method was appropriate because the researcher had clear characteristics of the suitable participants and targeted the participants that are most likely to provide the information required (Kumar, 2005). One of such characteristics is that the participants must have knowledge and experience of using SaaS in an academic environment. The researcher used the characteristics to target a small sample that can provide some generalizability (Babbie & Mouton, 2001). The participating HEIs were selected based on their level of access to the ICT resources needed to support academic activities i.e. funds and software. To have a rich comparison of the HEIs, the researcher ensured that the degree of access of the selected HEIs to the needed ICT resources vary.

1.9 Prior Assumptions and Limitations

Based on the background studies, it is assumed that some of the HEIs are adopting SaaS for teaching and learning. There are several HEIs that do not have the basic requirements needed to use SaaS. For example, they do not have a good internet connection, they do not have computers or they do not have enough IT staff. Thus, it is also assumed that the HEIs already using SaaS have the basic financial, technology, organisation, management and human resources required to adopt SaaS although Oyeleye, Fagbola, and Daramola, (2014) noted that developing countries in general lacks the financial and human resources needed to ensure effective and successful implementation of ICT in education. Also, it is assumed that there is a gap between technology adoption and technology usage in HEIs. Furthermore, it is assumed that the adoption of SaaS is not likely to be a campus wide adoption in all the participanting HEIs (Mlitwa, 2010). This research focused on SaaS usage in the Nigerian and South African HEIs. PaaS and IaaS were not the focus of this research. Thus, there is a need to look at how the use of PaaS and IaaS can contribute towards the creation of a conducive academic environment in HEIs in future research. Another possible limitation of this study is the small sample size due to the limited time allowed for a doctoral study and the difficulty faced in gaining access to some participants.

1.10 Structure of the Thesis

The remainder of this thesis is structured as follows:

Chapter 2 provides a detailed literature review on CC, service providers, cloud service models, SaaS, higher education in Nigeria and South Africa, and the research on acceptance of SaaS. Chapter 3 describes the analytical frameworks investigated and provides a detailed explanation on the selected research model which the researcher used as a theoretical lens to understand the problem, identify the current solution and provide a better solution to improve on the current solution. The propositions were also introduced in chapter 3. The research design, methodology, research approach, research strategy, population sample, data collection, data analysis, research time frame and ethics and confidentiality issues are discussed in chapter 4. The data analysis is presented in chapter 5 while the research analysis and findings are presented in chapter 6. The discussion of findings and recommendations are presented in chapter 7. Chapter 8 presents the

proposed framework and chapter 9 presents the conclusion and evaluation of the study. Chapter 10 is a list of references and chapter 11 provides the appendix. A summary of the structure of this thesis is shown in Figure 1.

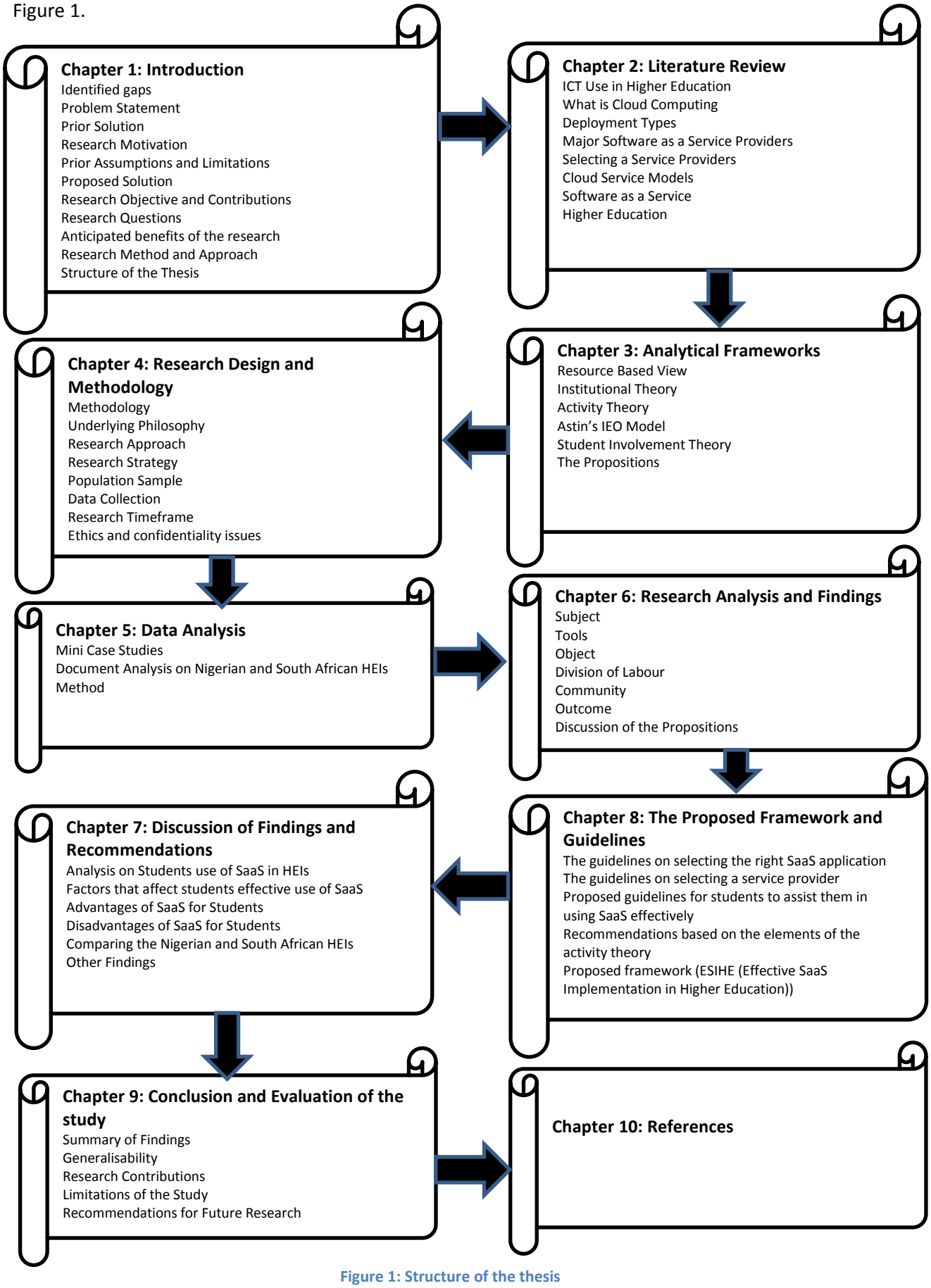

Figure 1: Structure of the thesis

2. LITERATURE REVIEW

An important part of any academic research is a systematic review of the existing literature as it helps the researcher to uncover what is already known in the body of knowledge before commencing the research study (Levy & Ellis, 2006). This chapter presents the literature review to provide an understanding of what is already known in the body of knowledge in this research area.

The researcher adopted the systematic guide to literature review by Okoli & Schabram, (2010). The eight-step guide to conducting a systematic literature review by Okoli & Schabram, (2010) was followed (Refer to Appendix P and Appendix Q for details). The researcher began by identifying the purpose and intended goals of the review (Okoli & Schabram, 2010). The researcher then developed a review protocol to assist in minimising bias on the part of the researcher and to ensure that the literature review is systematic (Manikas & Hansen, 2013). Hence, the literature review is focused on the research questions in section 1.7. The research organised the review protocol in a way that the research questions defined the main focus areas of this research.

After organising the research protocol, the researcher defined the literature body and started searching for relevant literature. The researcher then performed keyword search in a list of scientific databases and collected institutional documents from the participating HEIs. The databases searched include the ACM Digital Library, Google Scholar, IEEE Xplore and ScienceDirect.

The researcher started by investigating the top IS journals. The “A+”, “A” and “A-” lists of the top IS journals available on the website of the department of Information Systems of the University of Cape Town was investigated (Department of Information Systems, University of Cape Town, 2015).

To begin the search of the relevant data source, the researcher defined the topic in terms of the keywords to search for in the identified databases. The selection of resources was based on criteria’s such as the result should be scientific i.e. based on research or conceptual evidence and published article, monograph, PhD dissertation or research report (Bubnys & Zydziunaite, 2010), the literature should address SaaS or ICT use, be written in English and have a document body longer than one page (Manikas & Hansen, 2013). The keywords used include cloud computing, adoption, implementation of Software as a Service, ICT use, students, software, ICT, information and communication technology, ICT resources, Software as a Service, SaaS, learning, teaching, education, higher education, higher education institutions, Nigeria, South Africa, use of technology, institutions with a relative lack of resources, higher education institution with limited resources, resource constraint higher education institutions, ICT in higher education, the activity theory and Information Systems theories. A combination of the keywords was also used in some cases. For example, the keywords: SaaS in education, SaaS + usage, information technology + education, resource constraint + higher education institution, teaching and learning technologies, students + usage + SaaS etc. were also used to search for the relevant information from the selected databases.

To obtain recent and relevant information, the researcher set date limitations to the search. The researcher started with the articles with the most recent publication dates and worked back. The publications searched are peer-reviewed academic publications (scholarly articles, academic books, academic dissertations, academic thesis and other publications relevant to the research topic). The researcher employed a mixture of approaches in the search to ensure that no relevant data is omitted. The researcher employed a systematic approach by trying to find all the relevant data. The researcher employed a retrospective approach by finding the most recent publications and working backwards and the researcher employed a citation approach by following up references from useful publications (De Montfort University Library, 2013). This assisted the researcher in obtaining relevant and up to date peer-reviewed articles.

After collecting all the literature, the researcher applied inclusion/exclusion criteria which Okoli & Schabram, (2010) referred to as practical screen and quality appraisal respectively. This was useful in selecting the relevant literature and rejecting the non-relevant literature. The rejected literature was then searched for the terms SaaS, Software as a Service and education in the fields title, abstract, keywords and evaluated to determine whether they are related literature. This can assist in ensuring that papers with different combination of keyword are not rejected. After verifying whether the rejected literature is related or not, the researcher verified the included papers manually by reading through the abstract and conclusion to ensure that the included papers directly and indirectly related to SaaS or related technologies (Manikas & Hansen, 2013).

In collecting the literature body, the systematic literature review protocol was applied. The researcher continued searching for literature until he was satisfied that the data has reached saturation and no new information was being obtained. The literature extracted from the databases was 1878. All the institutional documents obtained were included. After the inclusion/exclusion criteria was applied, the articles that were irrelevant, superseded, non-academic and non-scientific were excluded. In total, the researcher rejected 1479 papers. The researcher then verified the rejected papers and included 28 papers from the rejected papers. Finally, when verifying the included papers, the researcher went through 427 papers (399 after applying the inclusion/exclusion criteria and 28 after verifying the rejected papers) and found 337 papers relevant. The high number of rejected papers was due to many papers just mentioning the keywords but not reporting the research on the that field. During the process of data extraction from the 337-relevant papers, the researcher read the papers that were found relevant and systematically extracted the applicable information that was interesting and capable of providing answers to the research questions from each study. After extracting the relevant information, the researcher analysed the literature and combined the facts extracted from the studies using qualitative techniques. Finally, the researcher wrote a review to ensure that the results of the review can be independently reproduced (Okoli & Schabram, 2010). The review is discussed in sections 2.1 to 2.9. The list of researches on adoption, acceptance or usage of SaaS in Table 5a and Table 5b was also compiled using the same methodology that was used to select the publications used in the systematic literature review.

2.1 Information and Communication Technology Use in Higher Education

ICT is a term used to describe any communication device such as radio, television, cellular phones, computer, network hardware and software, satellite system etc. including the various services and applications associated with them like video-conferencing and distance learning (Buttar, 2015).

Higher education institutions are increasingly accepting ICTs as important educational tool for supporting teaching and learning activities. Some of the reasons why HEIs are adopting ICTs include increased access to information, improved communication, synchronous and asynchronous learning, increased collaboration, cost-effectiveness and pedagogical improvement (Nawaz, Awan, & Ahmad, 2011). In education, ICTs can be used as an informative tool (providing data in different formats such as audio, video and documents), situating tool (creating real life experience situations for students), constructive tool (for data manipulation and analysis) and communicative tool (to eliminate communication barriers like space and time. The use of ICTs in education also allows students to be more active in their learning as opposed to being passive (Alam, 2016).

HEIs use ICTs to develop course materials, deliver and share content, communicate between learners, teachers, other HEIs, and industries, create and deliver presentation and lectures, academic research, administrative support and student enrolment (Buttar, 2015).

As HEIs continue to adopt ICTs, it is important that both lecturers and students are equipped with the right skills needed to use these technologies effectively. The lecturers are also required to possess not just the technology skills but the skills to integrate ICTs into the classroom successfully to avoid them from not only teaching the technology skills but also to solve educational problems. HEIs are using ICTs for activities such as email, document sharing and video-conferencing which has improved their communication and sharing (Nawaz, Awan, & Ahmad, 2011).

ICTs can provide a catalyst for rethinking teaching practice, improving education outcomes, improving students' performance, improving the quality of teaching and learning and developing the right graduates and citizens needed in an information age (Jaffer, Ng'ambi, & Czerniewicz, 2007).

ICTs assists HEIs to network among themselves, create virtual laboratories, create databases and access documents. It also improves teaching and learning by replacing conventional teaching with innovative methods such as power point presentations, animations, modelling and simulations, video clips and LCD projectors etc. which makes teaching and learning easier. The quality of research work in higher education is also improved through the use of ICTs because researchers are able to easily access large volumes of data and perform complex analysis (Alam, 2016).

Although ICTs offers HEIs several benefits, many HEIs especially in Africa and other developing countries are unable to enjoy the expected benefits because their information and communication technology

infrastructure these HEIs are poorly developed and unevenly distributed (Toro & Joshi, 2012). Many of these HEIs also fail to adopt ICTs successfully due to issues such as inappropriate technology, poor-implementation, lack of follow-up, inadequate support for the technology, difficulties in creating and sustaining a project within the changing social, cultural and political environment. The changes associated with the adoption of ICTs such as the need to acquire new skills, new investments of time, money, space and changes in the way people do things are also not well managed thereby leading to implantation failure. Despite the promises of ICTs, many HEIs have not fully integrated ICTs into their curriculum (Nawaz, Awan, & Ahmad, 2011). Many HEIs in Africa and other developing countries are unable to adopt ICTs successfully because of challenges like lack of awareness and mindset, lack of top-management support, lack of a systematic method of ICT implementation, cost of bandwidth and inefficient utilization of ICT (Toro & Joshi, 2012).

Other barriers to ICT implementation in HEIs in Africa and other developing countries include lack of proper vision and planning, lack of convergence of technology and education (Parvin, 2013), lack of institutional ICT policy for education (Tibebu, Bandyopadhyay, & Negash, 2009), lack of national ICT policy, political instability, computer illiteracy among staff and students, lack of incentives (Murgor, 2015), high cost of setting up ICT (Addy & Ofori-Boateng, 2015), lack of ICT supported infrastructure (hardware and software), lack of resources, insufficient funds, political factors, social factors, cultural factors, corruption, attitude and beliefs of lecturers and student toward ICT use, lack of knowledge and skill required to use ICTs and lack of time (Khan, Hasan, & Clement, 2012; Toro & Joshi, 2012; Parvin, 2013; Alam, 2016).

The barriers and complexities involved with the adoption of ICTs prevent HEIs from implementing ICTs successfully. The problem of lack of supporting infrastructure is a common problem among HEIs in Africa and other developing countries. SaaS has the potential to help eradicate this problem since majority of the infrastructure needed to support SaaS is provided by the service provider.

2.2 Cloud Computing

Although there is no common definition of CC, the definition by the national institute of standards and technology (NIST) is widely used in CC literature. NIST defined CC as a model for supporting convenient, on-demand network access to computing resources which can be shared among several users. Examples of resources include networks, servers, storage, applications, and services which can be quickly set up and made available with little management effort or service provider interaction (Canedo, de Sousa Junior, & de Oliveira, 2012; Zhang, Cheng, & Boutaba, 2010; Zissis & Lekkas, 2012). CC is also defined as a collection of applications, hardware and system software which are designed to deliver services to end users over the internet (Islam & Grégoire, 2012). Khorshed, Ali, & Wasimi, (2012) defined CC as a system, where the resources of a data centre is shared using virtualization technology. It provides elastic, on demand and instant services to customers and customer usage is charged as utility bill.

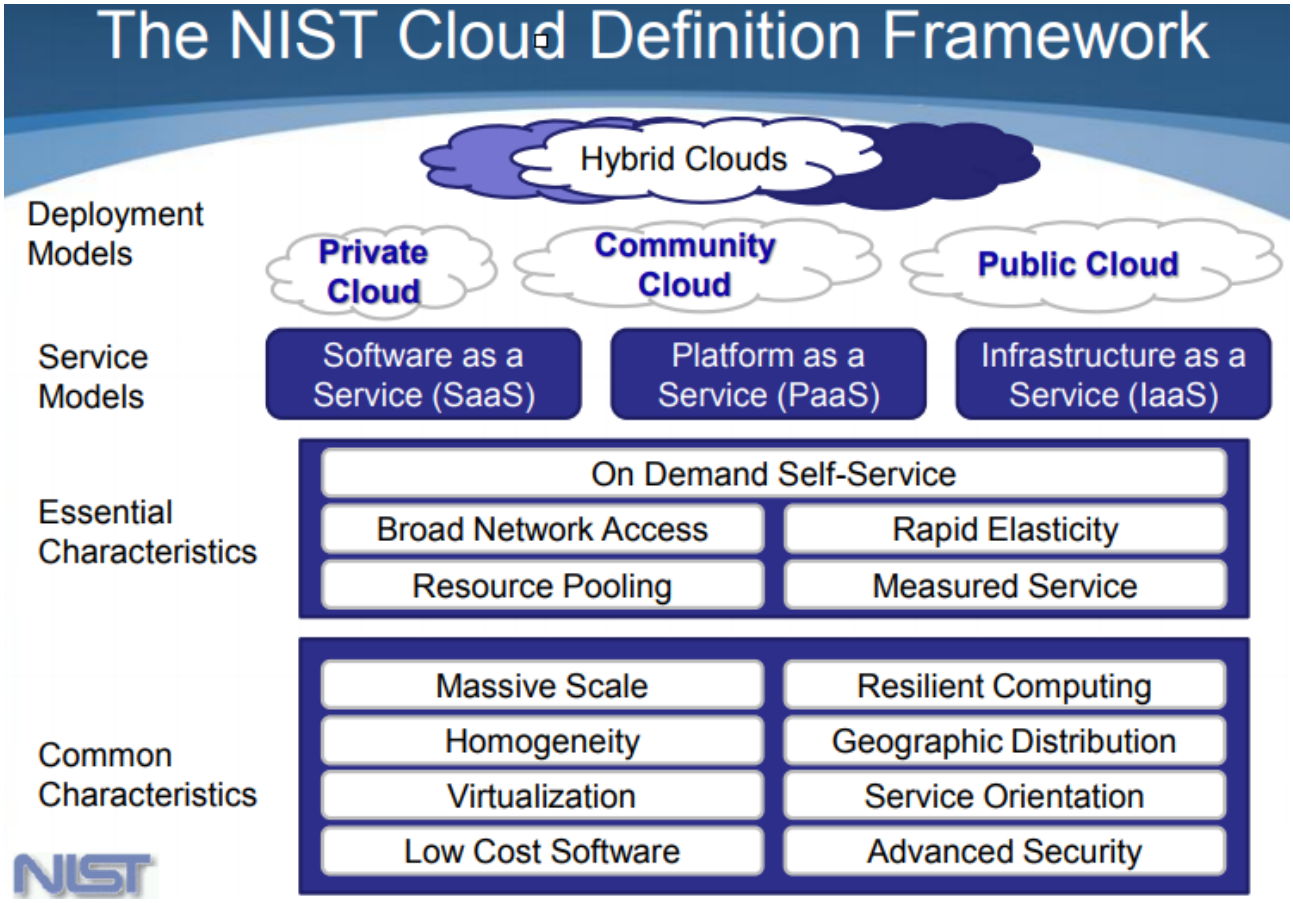

Figure 2: Cloud Computing Definition
Source: Mell and Grance (2009, Pg. 15)

Figure 2 is the framework of the NIST definition of CC. The framework shows the five essential characteristics, the three main service models (SaaS, PaaS and IaaS) and the four deployment models (Private, Public, Hybrid and Community clouds) of CC (Hadzhikoleva & Hadzhikolev, 2016). Among the different service models, the most common one used in HEIs is SaaS (Akande & Van Belle, 2016).

2.3 Cloud Computing Deployment Models

There are four deployment models based on the users. These are private, public, hybrid and community clouds (Santoso, 2014). They all have the capabilities to provide wider access to needed resources for students in HEIs (Olutola & Olatoye, 2015). The differences among them are in the type or group of users who can access them. The following section discusses them in further details.

2.3.1 Private cloud

In a private cloud, the resources are utilised by a single organisation and this gives them more control over their data. A HEI that wants to adopt a CC offering may set up the infrastructure either on premises or off premises. The HEI may also manage the infrastructure themselves or appoint a third-party service provider to help them manage it. A private cloud is dedicated to a single customer because they own the infrastructure

and this gives them a total control of the infrastructure thereby making it more secure. In terms of cost, private cloud is the most expensive because the user owns the infrastructure and needs to maintain it.

2.3.2 Public cloud

In a public cloud, resources are shared among several organisations and the service provider has more control on access and data (Bulla, Hunshal, & Mehta, 2016). The infrastructure is owned by a third-party service provider and HEIs or any other organisation may subscribe to use the infrastructure, application, platform or software and pay the service provider per use. This means that if the infrastructure, application, platform or software is not used, the user will not have to pay. This can be cheaper compared to the private cloud because the purchase and maintenance, installations and upgrades of the infrastructure, software and applications is carried out by the third-party service provider. The public cloud is located away from the user's premises and this serves as an extension to the user's infrastructure. The essential characteristics of a public cloud are that there is a common policy in place; the infrastructure is homogenous; resources are shared among multiple tenants; the infrastructure could either be leased or rented; and the cost model is operational (Ndukwe & Amadi, 2013) i.e. pay as you go. One of the main advantages of the public cloud is that it allows flexibility and scalability (Narkar & Shaharkar, 2014). For example, a HEI may add more student users at any time if there are more students that need access. They can also reduce the number of students at any time should there be a decrease in the number of students enrolled for the course. If it were a private cloud, the HEI would need to acquire additional infrastructure to cater for the increase in the number of students. Another advantage is that the vendor enjoys economies of scale and can share the same resources among multiple tenants. This makes public cloud cheaper when compared to other deployment models. In terms of security, a public cloud is less secure when compared to a private cloud because different organisations share the resources. The cost of bandwidth and internet connectivity reliability could also differ between private cloud and the public cloud due to the location of the resources.

2.3.3 Community cloud

In community cloud, a group of organisations with a common goal within a community share resources on the cloud. For example, HEIs in Nigeria or South Africa may agree to set up a cloud which they can all access. The cloud services would be dedicated to the HEIs alone and no other organisation will have access to the cloud. This can improve collaboration among HEIs and students will also have access to a wider range of resources as the same resources will be available to all the students in all the HEIs using the cloud. The HEIs may jointly manage the infrastructure, appoint a member to manage the infrastructure or appoint a third-party service provider to manage the infrastructure for them. In the context of this research, it could be two or more resource constrained HEIs (universities, technikons, polytechnics, colleges of education or any other HEI) coming together to set up a community cloud to achieve their common goals. This kind of cloud might be cheaper in the long run as all the HEIs will share the cost of setting up the cloud infrastructure. Other costs such as upgrades, installations, maintenance would also be shared among the HEIs in this community.

2.3.4 Hybrid cloud

A hybrid cloud is a combination of two or more clouds i.e. 'private and public' or 'private and community'. In a hybrid cloud, more sensitive data could be kept in a private cloud while less sensitive data could be kept in a public cloud (Zissis & Lekkas, 2012). HEIs may keep less sensitive data such as course outline, information about admission, campus activities and calendar etc. on the public cloud while sensitive data such as student's records can be kept in the private cloud. This will ensure that they have control of the sensitive data and access to such sensitive data is restricted.

2.4 Software as a Service Providers that offer Applications that are Applicable in the Higher Education Sector

The forerunner in this field is Salesforce.com with their online CRM offering (Kaur & Ghumman, 2017). Other providers in this field are Exoprise systems, Microsoft, Aplicor, Google (Chaudhary & Siddique, 2017), NetSuite, Apple and Antenna software CVM solutions (Sharma & Ganpati, 2013). A detailed discussion about the major educational SaaS providers can be found in section 2.8. This research notes that there are thousands of SaaS providers (Blue, 2018) but for the purpose of this study, the researcher has compiled the list as shown in Table 1 based on the SaaS applications that are relevant in the higher education sector. These providers have several applications that HEIs can utilise to create a conducive academic environment where students can perform optimally. Table 1 provides a list of the SaaS providers with applications relevant in the higher education sector, examples of their application and a brief description of the application.

Service provider	Example of software offered	A brief description of the software
Sales force.com	Salesforce for student's success	This application provides users with facilities to manage communication among HEI stakeholders. Facilities to manage students and alumni information are also provided. Users are also able to perform real time analytics using this application. It also has features that are used for mobile communication, recruitment of students, collaboration among teams, and developing application.
Microsoft	Office 365	Office 365 allows users to send and receive emails. It is also used to perform office documentation. It also an effective tool used to manage meetings and communication. It can be used by students, researchers, lecturers, faculty staff, administrative staff, developers and other institutional users.
Google	Google Big Query Google Docs Google Apps	Google Big Query makes it easy to perform analysis on large volumes of data. It can be used by students, lecturers and researchers. Google docs allow easy sharing of files and documents and supports collaboration.
Box	Box	Box allows users to collaborate of projects from anywhere at any time. The users can share large files and documents which are protected by usernames and passwords.
Zendesk	Zendesk	Zendesk assists in integrating communications across many channels and has features such as automatic response, real time chat services and built in phone support solution known as Zendesk
Docusign	Docusign	Docusign allows users to sign documents electronically and share electronic contracts and other business documents from anywhere at any time

Dropbox	Dropbox	Dropbox allows users to save, access and share files and documents from anywhere at any time. It also promotes collaboration amongst users.
Slack	Slack	Slack supports real time communication, archiving, file sharing and document sharing.
Antenna Software	Antenna mobility platform	It allows users to build, deploy and manage their own mobile application
Adobe	Adobe Creative Cloud	Supports video editing, graphic design, web development, and photography editing.
Cisco	WebEx	Offers video conferencing service and collaboration service for teams to work on a joint project
Xero	Xero	Xero is particularly useful for accounting students as it offers automatic bank and credit card account feeds, accounts payable, invoicing, expense claims, purchase orders, fixed asset depreciations as well as standard business and management reporting
Tableau	Tableau Online	It offers interactive data visualization and data analytics features for business intelligence. It is useful for students studying information technology, computer science, information systems and related courses.
Blackboard	Blackboard Learn	Provides a virtual learning environment for students and it also offers course management system for online learning
SurveyMonkey		Offers a cloud based online survey and questionnaire platform which is useful for students when gathering research data.
GageIn	GageIn	Supports content-driven networking and collaboration

Table 1: Software as a Service Providers that offer applications that are applicable in the higher education sector
Source: Own research; Chaudhary & Siddique, 2017; Kaur & Ghumman, 2017; Patrizio, 2017; Sharma & Ganpati, 2013

2.5 Selecting a Service Provider

The quality of service offered by a service provider is important to help HEIs achieve their goals and maximise the intended benefits of SaaS. HEIs need to investigate and find out whether the service provider has a good reputation with their existing clients or not. The size of the service provider organisation is another important issue that HEIs need to find out as the bigger the size of the organisation, the lesser the risk of the service provider going out of business due to issues like insufficient funding. The number of staff, market share and access to resources are the areas to look at when trying to determine the size of the service providers organisation to ensure their reputability (Heinle & Strebel, 2010). The selection of a reputable service provider is an important step towards a successful SaaS adoption and implementation. Thus, HEIs should be careful when selecting a service provider especially for the paid version of SaaS which require cash commitment.

They should investigate the cost of the software from a service provider and ensure that the cost is reasonable and market related as it may be difficult to change the service provider at a later stage due to data lock-in or integration issues. For example, a research at CSU revealed that the costs of software licensing, hardware and support staff to cater for fifty thousand (50,000) users on Microsoft Exchange e-mail is $9,774,000 per year. On the other hand, the cost of Google Apps for business for the same number of students is $2,500,000 per year at the rate of $50 per student per year. By doing this research, CSU saved $7,274,000 per year which they can now spend on other important resources (Kumar, Kommareddy, & Rani, 2013). It is important to note that there is also a free Google app for Education version which would have

been free i.e. $0 (Ajith & Hemalatha, 2012). From this, it is evident that both the business version and the educational version of Google app are not as costly as Microsoft Exchange e-mail. A Canadian university, Lakehead University was one of the early adopters of Gmail. Lakehead University saved $250,000 per year by moving their institutions emails to Gmail. The storage space allocated to each student was also significantly increased compared to their previous on premise email system. The Vanderbilt University and Arizona State University also recorded a saving of $750,000 and $500,000 respectively by migrating to Gmail (Jain & Pandey, 2013).

If HEIs carefully select a service provider, they will be able to save a lot on cost and at the same time enjoy quality service. Apart from the cost, it is important to compare the features of the service provider offering to ensure that it has all the needed features before selecting the service provider. The uptime, security and flexibility of the service provider SaaS environment are also important issues to consider before selecting a service provider.

2.6 Cloud Service Models

As discussed in chapter 1, there are three main cloud delivery models which are IaaS, PaaS and SaaS (Gital & Zambuk, 2011; Memeti, Selimi, & Çiço, 2014). SaaS enables users to access software and applications over the Internet on a pay per use basis (Misra & Mondal, 2011). This research focused on SaaS because it the most common delivery model among HEIs (Akande & Van Belle, 2014; Muriithi & Kotzé, 2012). Figure 3 shows the three main cloud service models and the relationship amongst them. The following section provides a detailed explanation of the three cloud delivery models. IaaS provides the infrastructure that supports PaaS and SaaS while PaaS is used to develop SaaS (Briscoe & Marinos, 2009).

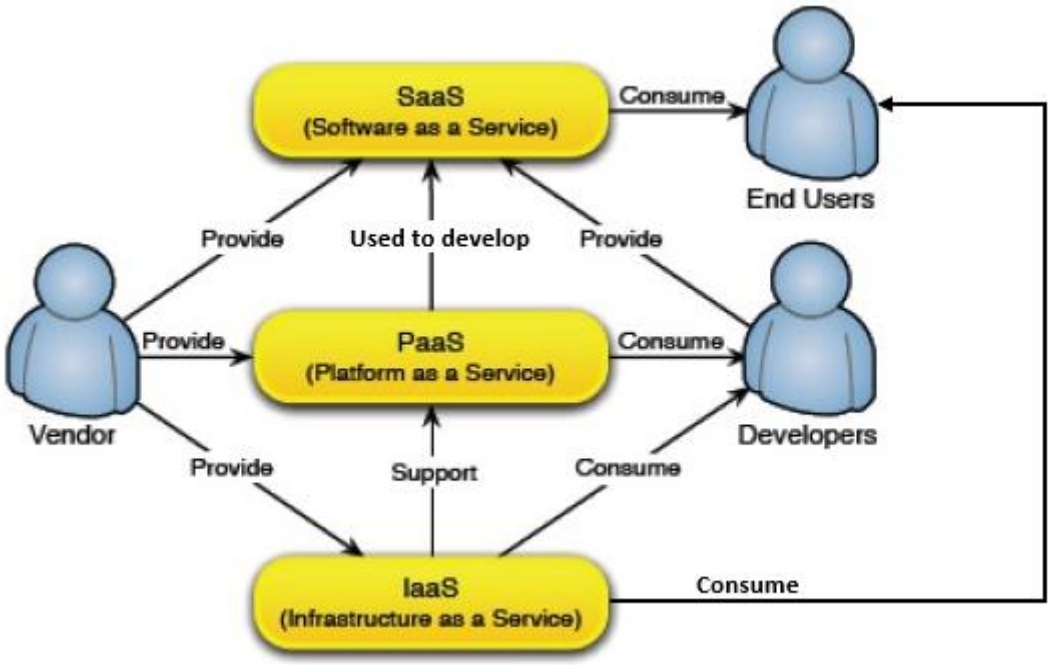

Figure 3: Cloud Computing service models adapted from Briscoe & Marinos, (2009, Pg. 104)

2.6.1 Software as a Service

Interest in the use of SaaS is growing among HEIs because of its ability to help reduce costs and improve access to needed resources. Communication among students, lecturers and researchers can also be improved using SaaS applications like Google apps (Weber, 2011) which has features such as calendar and meeting management etc. SaaS offerings such as learning management systems, statistical tools, productivity software, electronic libraries, electronic books (EBooks), referencing tools, plagiarism and writing tools etc. have the capability to support academic activities. The different SaaS offerings used by students in the participating HEIs was investigated. Because of the promises of SaaS, this research investigated whether HEIs are enjoying the intended benefits of SaaS.

SaaS enables users to use software and applications running on a cloud infrastructure. This relieves the users from the stress of managing or controlling cloud infrastructures like servers, network, operating systems (OS) and other supporting infrastructures (Zissis & Lekkas, 2012). SaaS relieves organisations of the need to install, upgrade and maintain software or applications thereby allowing them to use their time for other activities (Sultan, 2010; Zissis & Lekkas, 2012; Narkar & Shaharkar, 2014). The user has no control over the infrastructure as it is managed by the service provider. SaaS provides all users with the same version of software since the upgrade is done centrally by the service provider. SaaS also provides benefits such as automatic updates, patch management, improved collaboration and communication (Gupta, 2012). The user makes use of software and applications provided by the service provider via a thin client interphase like the web browser (Yataghene, Ait-Idir, Deba, & Eddoud, 2014). Common examples of SaaS are Gmail, Google Apps and Google docs (Jansen, Bollen, Baloian, & Hoppe, 2012) from Google and Hotmail and Business Productivity Online Standard Suite (BPOS) from Microsoft (Ahmed, Chowdhury, Ahmed, & Rafee, 2010). Other examples of SaaS are Dropbox, QuickBooks Online, Limelight Video Platform, Salesforce.com and Microsoft Office 365 (Boja , Pocatilu, & Toma, 2013). Figure 4 shows the typical users of SaaS in HEI setting with the students highlighted in red because they are the focus of this research.

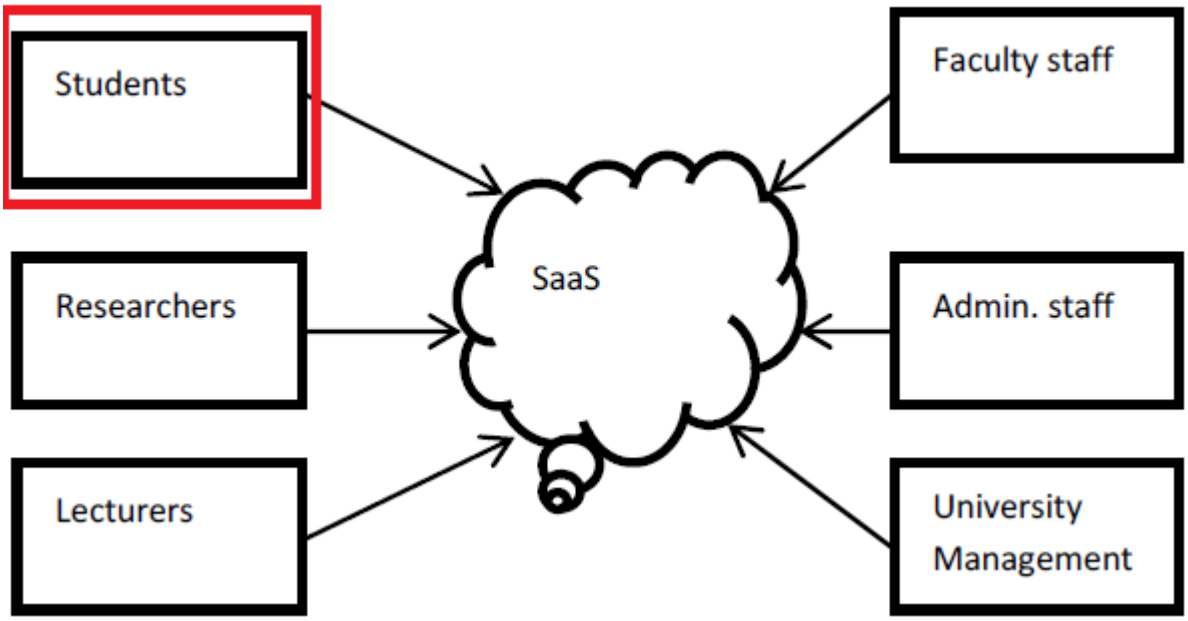

Figure 4: Typical Users of SaaS in Higher Educational Institutions adapted from Akande and Van Belle (2014, Pg. 3)

2.6.2 Platform as a Service

In platform as a service, the service provider makes development tools such as servers, operating system, libraries, programming languages available to users. Cloud users can develop and deploy their own software and applications using the computing platform and program execution environment provided by the service provider (Bala, 2010; Mathew, 2012). PaaS can be used by students to develop their own software. In PaaS, a set of preconfigured images is made available for different virtual machines (VMs) with different OS and the developer or user only needs to select an image to begin development in the cloud. The user has more control with PaaS than SaaS especially over the software and application being developed. Examples of PaaS are Google App Engine, Amazon Elastic MapReduce and Microsoft Azure. These could be used in course where programming and software or applications development are part of the curriculum such as Computer Science, Engineering or Information Systems (IS).

Figure 5 shows that PaaS is mainly used by software developers in HEIs. The researcher updated figure 5 by adding the arrow in blue to indicate that researchers also make use of PaaS in HEIs (Mathew, 2012).

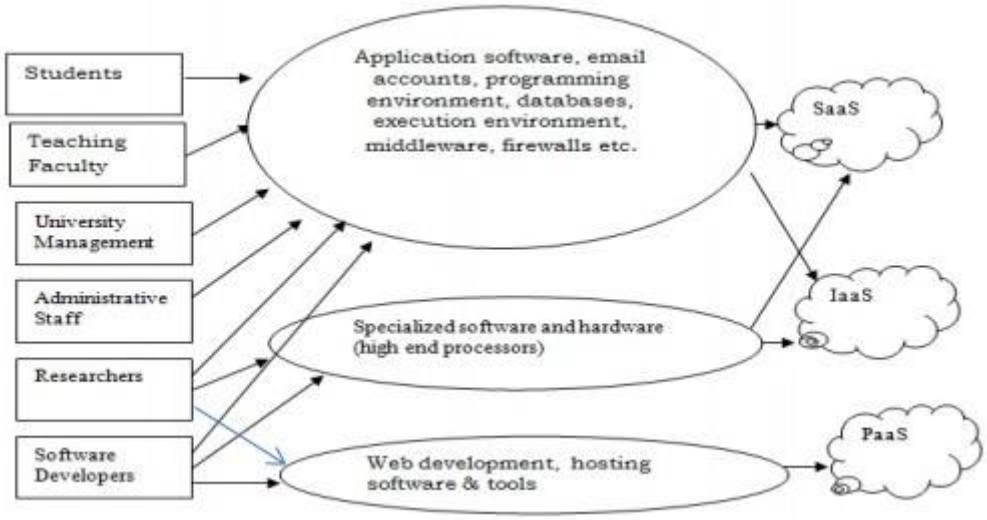

Figure 5: Three Tier Cloud Architecture for Higher Education Institution adapted from Sharma and Ganpati, (2013, pg. 204).

2.6.3 Infrastructure as a Service

In IaaS, the service provider makes necessary computing infrastructure such as server, central processing unit, storage, connections, routers, switches and other computing infrastructure available to users over a network on a pay as you go basis (Fakeeh, 2015). IaaS can be rapidly provisioned and it provides flexibility and scalability for the user because the user can scale up or down depending on the needs of the user. The users have control over running applications, operating systems and virtual machine (VM) configurations. Since it is easy to scale up or down, managing the energy consumption of data centres and utilisation of resources is improved with IaaS. Examples of IaaS are Amazon EC2 and S3. Figure 5 shows that the typical users of IaaS in HEI include students, teaching faculty, management, administrative staff, researchers and software developers. For example, they all make use of the SaaS server to store their data. The following section will discuss SaaS in further detail because SaaS is the focus of this research and one of the aims of this research is to create a better understanding of SaaS and its use in HEIs.

2.7 Software as a Service

2.7.1 The evolution of Software as a Service

SaaS is a total overhaul of the traditional model of offering software. In the traditional model also known as the on-premises model, software is installed locally on a computer and it can only be accessed on the computer in which it was installed (Zheng , Sun, Jiang, Cao, & Zhang, 2006). There was transformation in the early 1990's when Application Service Providers (ASPs) disrupted the traditional model by offering software and applications over the internet using a client server model (Tout, 2014). With the new method offered by ASPs, the applications were no longer installed on premise but they were installed and accessed on a central server owned by the ASPs who performs installations, upgrades and maintenance of the software. The ASPs also performs data backup and recovery as well as ensure security of the data. Over time, the demand for quality and reliable software and applications by customers could not be met by the ASPs (Seidmann & Ma, 2004) because the ASPs offered applications tailored for a contained audience and could not offer many

customers the needed applications on demand (Adebisi, Adekanmi, & Oluwatobi, 2014). The problem with the ASPs was that they had to set up a new application for every new client and they could not enjoy economies of scale. Thus, customers lost trust in ASPs because they could not access the applications on demand. The failure of the ASPs to provide reliable applications to customers lead to the invention of SaaS in early 21st century. The ability of SaaS to provide services to multiple tenants at the same time makes it a preferred option for customers and it provides the service providers with economies of scale in the deployment, management, support and maintenance of their offerings (Adebisi, Adekanmi, & Oluwatobi, 2014). To gain trust of customers such as HEIs, SaaS does not require customers to make huge investment commitment and customers are only required to pay for the software and applications based on their usage.

2.7.2 How is Software as a Service different from on-premise software?

There are several differences between SaaS and on-premise software offerings. Firstly, with SaaS, the internet is needed as access to the software would not be possible without an internet connection (Rao & Challa, 2013). On premise software on the other hand do not need internet access as the software is installed physically on the institutions server or local machine. Another difference is that installation, upgrades and maintenance of the software is performed by the service provider with SaaS while the user performs the installations, upgrades and maintenance with on premise software. The ownership of the license remains with the service provider with SaaS while the user owns the license with on premise. Furthermore, with SaaS, the user pays on a pay as you go basis. This means that the user does not pay if he or she does not make use of the software. With on premise software, the user must purchase the software. This has been a problem in cases where HEIs purchase software and licenses and students are not utilising them. It becomes a waste of resources in such cases. SaaS helps avoid such wastes because the HEI will only pay for the software that is used. In Figure 6, with on premise, users access the software directly without the need for internet connection while with SaaS, access is through the internet. A vendor who is the third-party service provider is also shown in Figure 6 for SaaS while the service provider is not needed with on premise software.

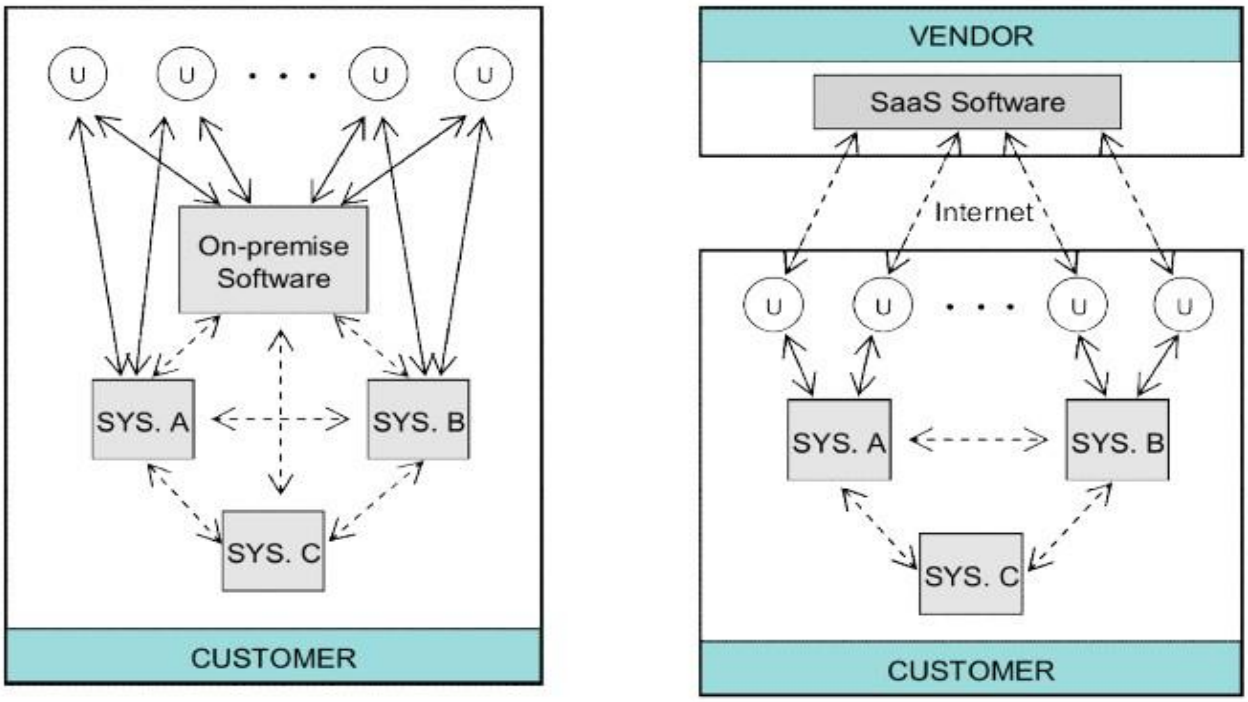

Figure 6: Difference between Software as a service and on-premise software
Source: Jiang, Chen, & Mukhopadhyay, (2007, p.g. 6)

2.7.3 Characteristics of Software as a Service

SaaS is changing the way students access resources and interact with fellow students, lecturers and other members of HEIs. The main feature of SaaS is that the user is not always the owner of the software. Other features of SaaS include reusability, availability, scalability, pay per use, customizability of service, service provider manages the data (Cheun, Lee, Lee, & Kim, 2009). The service provider installs the software or application in a data centre and the users access the software via a thin client like web browser (Velte, Velte , & Elsenpeter, 2009). The service provider install, upgrades and maintains the software thereby allowing the users to spend the time needed for installations, upgrades and maintenance on other important activities. Other terms used to describe SaaS are subscription software or pay as you go. SaaS allows customisation so the users can customise some feature of the software to suit their specific needs.

2.7.4 Components of Software as a Service

There are five components of SaaS (Anerousis & Mohindra , 2006). These are end users, SaaS providers, SaaS developers, SaaS hosts and hub provider. The end users are the people who use the SaaS software or applications to carry out their tasks. In HEIs, this includes students, lecturers and researchers. The SaaS provider is the organization that provides SaaS services to users and performs the installation, upgrades and maintenance of the software and applications. The SaaS developers are the programmers or software engineers who are employees of the service providers and developed the software and applications. The SaaS hosts are the companies that manage the infrastructure used to deliver SaaS applications over the internet. In some cases, the SaaS provider is not the SaaS host and they can either appoint another company to be the host and provide the infrastructure. The user can also act as the host in some instance. For example, an HEI with private cloud can host the software and applications in their private cloud while only subscribing

to the software from the SaaS provider. The hub provider helps to integrate SaaS with client's legacy systems. There two other groups of people involved with managing SaaS applications. These are platform administrators and SaaS administrators. The platform administrators manage the ICT infrastructure used to host SaaS applications while the SaaS administrators manage issues with different SaaS versions. With regards to multitenancy, SaaS and ASPs are different in that SaaS offers multitenancy while ASPs did not offer multitenancy.

2.7.5 SaaS service

SaaS can be grouped into two categories based on the intended users. The SaaS providers have applications intended for individual users such as Gmail, Facebook and Twitter (Gutiérrez-Carreón , Daradoumis, & Jorba, 2015). These are sometimes made available to users at no cost. On the other hand, some applications such as customer relationship management (CRM) system, supply chain management (SCM) system, enterprise resource planning (ERP) system, project management system, and finance management system are aimed at corporate users (Liao & Tao, 2008). The software aimed at groups of users are normally paid for by their organizations on a pay as you go basis.

2.7.6 Software as a Service platform

The SaaS platform can be divided into seven modules. These are access services, platform support service, security services, SaaS management services, SaaS instances, data services and integration services. The access services provide a connection between the SaaS providers and the users. It performs user validations on both the user and provider sides before granting system access to users and provider respectively. The platform support service aid communication between the users and service provider. It contains tools for managing SaaS applications. The security service works together with access services to control user roles and ensure that users can only access what was intended for users in their defined roles. The SaaS management service provides the service provider with the systems life cycle management to ensure successful development and maintenance of the system. SaaS instances are the actual software that the users use for their activities while the data services control the data used in various SaaS instances. Finally, the integration service provides a link between the service provider's data centre and the user's device and gives the user access to data stored on the service provider's server (Anerousis & Mohindra , 2006).

2.7.7 The advantages of Software as a Service for the institution

Although the students stand to benefits from the introduction of SaaS, the institutions also have huge benefits from the use of SaaS. HEIs with relative lack of resources don't have enough funds (money), IT staff and infrastructure. SaaS can assist them in eliminating some of these issues because with SaaS, HEIs need little or no initial ICT investment, fewer IT staff, less server room, less equipment, no need to set up, no need to maintain or upgrade the software, the licensing is simpler and instead of a capital outlay, they now have the operational outlay every year. The advantages of SaaS for the institution will now be discussed further.

2.7.6.1 Cost

The ability of SaaS to replace traditional software installed on campus computers with applications delivered can reduce the cost and complexity of ICT owned by universities (Sasikala & Prema, 2010). SaaS can also help to reduce cost because of its pay as you go capability. There is also no need for additional software licensing (Mathew, 2012; Pocatilu, Alecu, & Vetrici, 2010). The time spent on technical support is saved because the installation and maintenance of the software is performed by the service provider (Alotaibi, 2016). This allows HEIs to reduce the number of IT staff needed and lead to a significant cost saving. SaaS helps to avoid the costs of acquiring and maintaining software and applications which are usually very expensive. There are also no licensing fees required before an institution can implement SaaS. This makes it easy for HEIs to adopt SaaS and implement it on demand. A HEI in the United Kingdom (UK), University of Westminster saved one million pounds in purchase and maintenance cost by using Google docs and Google Apps (free) for productivity and collaboration (Gonzalez-Martínez, Bote-Lorenzo, Gomez-Sanchez, & Cano-Parra, 2015; Tashkandi & Al-Jabri, 2015; Akande & Van Belle, 2016). The funds saved through SaaS can be used for other important activities that can contribute to the development of a conducive academic environment.

2.7.6.2 Scalability

The economy of scale is an important benefit of SaaS (Katzan & Dowling, 2010). HEIs can increase or decrease the number of students using the software or application at any time depending on the number of students registered for the course. This helps to ensure that resources are well utilised and wastage is highly reduced.

2.7.6.3 Go green

Software as a Service has the capability to contribute to the reduction of carbon footprint (Singh, Singh, & Sodhi, 2012; Muli & Kimutai, 2015). The use of SaaS will help HEIs to save a lot of money on energy cost as the responsibility of the energy cost would shift to the service provider. There is also a significant cost saving during holidays. For example, with the traditional on-premise software, the downtime during holidays and off-peak periods lead to under-utilization and a significant waste of energy, cooling and other resources like maintenance staff (Tout, 2014). With SaaS, these wastes would be avoided as during holidays and off-peak periods, usage would be low and the cost would be reduced.

2.7.6.4 Reduction in the number of IT staff

There is no need for HEIs to employ many IT staff to install, upgrade and maintain the software and applications as these tasks are executed by the service provider (Gupta, 2012; Narkar & Shaharkar, 2014; Bulla , Hunshal , & Mehta, 2016). This also helps the institution to save on cost and will increase the availability of funds for other important resources.

2.7.6.5 Better governance

SaaS can provide better governance as there would be provisions for breach of agreement. HEIs will be able to access the risks posed by the service provider and it is the responsibility of the service provider to ensure security of data. This promotes better governance as IT staff of HEIs can use their time for other activities such as ensuring that the service provider meets the requirements of the service level agreement (SLA). The penalties for non-performance of the service provider should be clearly stated in the SLA and this can also be enforced by the IT staff. There would also be a difference in governance protocol as a third-party service provider is involved with management of data and provision of service.

2.7.6.6 Quicker to deploy

It is quicker to deploy as there is no need for installation and requires little or no effort from the IT department. This ensures that there is no delay in its use as it can be deployed on demand (Alotaibi, 2016). The service provider takes care of all the set up including installation and upgrades. This makes SaaS available on demand as it is ready for use as soon as a user decides to make use of it (Bulla, Hunshal, & Mehta, 2016). SaaS is therefore a quick solution to software provisioning.

2.7.6.7 Free or trial versions

SaaS could be implemented without committing the limited funds or ICT resources of the institution to it (Bulla, Hunshal, & Mehta, 2016). This ensures that for paid versions, HEIs only need to pay once they are sure that the SaaS offering meets their requirements and can provide the expected benefits.

2.7.6.8 Hardware compatibility

In most cases, SaaS offerings are compatible with older hardware so there might be no need for the institution to purchase new hardware (Bulla, Hunshal, & Mehta, 2016). This means that the HEI can make use of existing hardware to support the SaaS offering and would be able to use the funds that was supposed to be used to purchase new hardware for other important resources.

2.7.6.9 Improved relationship with business and industry

SaaS has the potential of improving communication between HEIs and business. With SaaS HEIs can open their ICT infrastructure to business and industry (Rai & Shakya, 2015). This will help to improve research and collaboration among HEIs, business and industries (Bala, 2010). This will ensure that students have an experience of how things are done in the business world and give them valuable knowledge and experience that will be used when they finally join the labour force (Bulla, Hunshal, & Mehta, 2016).

2.7.6.10 Availability of up to date software

HEIs are faced with continuous changes in software requirements and energy cost (Memeti, Selimi, & Çiço, 2014). SaaS provides solution to this problem because the upgrades of software is performed by the service provider thereby ensuring that up to date software is available to HEIs as soon as it is available. The cost of energy is also catered for by the service providers as the hardware and processing are with the service provider.

2.7.8 The advantages of Software as a Service for students

2.7.8.1 Any time anywhere access

Students can access SaaS at any time from any place without having to be physically present on campus. They can access files that were saved from any computer at any time in any place provided there is internet access. This means that they can even work from home or anywhere (Aljebreen , Dahanayake , & Syed, 2015) they are using their own equipment, mobile devices, institutions equipment, or combination of these options in anytime or any place convenient for them (Ashtari & Eydgahi , 2015). This improves productivity of students as they can work from anywhere at any time thereby allowing them to do more work when compared to the time they could only work from campus computer laboratories.

2.7.8.2 Access through any internet enabled device

Students can access SaaS applications through any internet enabled device (Meske, Stieglitz, Vogl, & Rudolph, 2014) like their cell phones, PDAs, laptops, desktops etc. This improves access as students no longer wait in long queues in the computer laboratory before being able to access the needed resources.

2.7.8.3 Improved communication and collaboration

In this research, collaboration means the possibility of students and/or lecturers from one or more HEIs to work together at the same time on the same project using SaaS applications (Barhate & Narale, 2015). Collaboration can be improved among students, businesses and industries for research advancements. Collaboration among students can be improved because students may work on their project or document simultaneously. SaaS provides facilities to create and store documents, access the stored documents, schedule a plan, and instant messages (Kalpeyeva & Mustafina, 2013). SaaS also encourages resource pooling as it allows students to easily share resources among themselves. It also allows students to communicate easily with one another. With SaaS, students are also able to work on projects together without having to be in the same physical space. SaaS also allows easy sharing of files (Akande & Van Belle, 2014; Mathew, 2012). In terms of communication, it allows branding of institutions by providing them with custom domain email ids with their institution's name as suffix e.g. student@myinstituition.ac.za. The quality of collaboration tools, email service as well as storage services can be better than any of the available on-premise services.

2.7.8.4 Availability of soft copies of study materials

A lot of study materials are available as soft copies in form of EBooks. This relieves students from the burdens of carrying heavy textbooks and study materials all over (Al-Shqeerat, Al-Shrouf, Hassan, & Fajraoui, 2017).

2.7.8.5 Reduction in the cost of study materials

The cost of purchasing soft copies of study materials like textbooks are cheaper than hard copies therefore, students can save a lot of money by using EBooks. This helps to resolve the problems of students using outdated materials because they cannot afford the latest version of the textbook (Al-Shqeerat, Al-Shrouf, Hassan, & Fajraoui, 2017).

2.7.8.6 No need for installation and upgrades

SaaS allows students and lecturers to use software and applications without having to install them on their computers. The service provider performs all the installations and upgrades of the software and applications (Akande & Van Belle, 2014). This helps the students to save time which they can use for valuable academic activities.

2.7.8.7 Improvement in course delivery

The use of SaaS makes access to course material easy for students as they can access course materials from anywhere at any time with any internet enabled device. The students are also able to submit their assignments and tests via the SaaS applications. After students submit their tests and assignments, lecturers can view and grade them. Students are then able to view their tests and assignments grades. This improves course delivery through improved communication among students and lecturers (Akande & Van Belle, 2016)

2.7.8.8 Improved access to ICT resources

SaaS can also make learning facilities available to a larger number of students and reduce time spent on several activities thereby making the students more productive (Erkoç & Kert, 2011).

2.7.8.9 Software is free or institution pay per use

The institution gets free subscription to most of the educational SaaS offerings and in instances where the software is not free, the institution pays on a pay per use agreement with the service provider. This makes SaaS a preferred option for students when compared to the traditional method because the students don't have to purchase their own copy of the software.

2.7.8.10 Backup and recovery

The service provider provides backup and recovery in case of data loss (Al-Shqeerat, Al-Shrouf, Hassan, & Fajraoui, 2017). The data is stored in secure location and in cases of data loss, the service providers have duplicate servers which house copies of data stored in the cloud.

2.7.8.11 Assist in learning management

SaaS offers learning management systems (Jansen, Bollen, Baloian, & Hoppe, 2012) for HEIs which helps create a conducive learning environment for students. The students can manage their tasks and activities well using SaaS as it provides them with tools to manage their time and activities. This ensures that students complete each task on time and can meet the requirements for successful completion of their courses.

2.7.8.12 Students can engage in advanced research

The ability of SaaS to provide students with large volume of resources improves their chances of engaging in advanced research (Akande & Van Belle, 2016). SaaS also provide students with access to specialised tools which can be used for different academic activities such as data analysis, referencing and performing complex calculations. This also improves the chances of success when conducting research because all the materials and resources needed to conduct research are made available by SaaS.

2.7.8.13 Exposure to new technologies

SaaS has the capability to improve students understanding of the values of new technologies by exposing them to new and latest technologies. This is a huge benefit for students as they understand the value of technology better in future when they join the working class (Erkoç & Kert, 2011; Barhate & Narale, 2015; Bulla , Hunshal , & Mehta, 2016).

2.7.8.14 Protection from virus attacks

In the past, students had to move up and down with storage devices such as a USB flash drive or external hard drive to save their files and documents and can access it at a later stage whether on the same machine or a different machine (Sharma & Ganpati, 2013). This posed a lot of risks to the computer and other devices which the storage devices are connected as they are often infected with virus and malware which cause damage to the computers and other devices and in some cases, causes loos of data. With SaaS, this problem can be eradicated because students no longer have to move up and down with different storage device as they are able to save their files and documents in the cloud and access them at anytime from anywhere using any internet enabled device.

2.7.8.15 Restricted working hours and limited resources

In the past, students are only able to do their work within school hours as the computer laboratories are closed after school hours. This was a problem because the school hours were always not enough for students to complete their given tasks and assignments especially when they have to wait in queues before it's their turn to make use of the limited computers in the laboratories (Sharma & Ganpati, 2013). The possibility of accessing SaaS from anywhere at any time helps overcome this problem because students are now able to work on their tasks and assignments even after school hours. Figure 7 provides a summary of the benefits of SaaS to students in higher education institutions.

It is important to note that although SaaS offers several benefits, there are some requirements which need to be met by all stakeholders (Students, staff, HEIs, government etc.) to ensure that the benefits are realized.

These include adequate and reliable bandwidth as SaaS relies on the internet. SaaS will also require ICT staff to learn some new skills such as negotiation, communication skills, management skills, data integration and analysis skill (McKendrick, 2012). SaaS will be of benefit to students from HEIs with relative lack of resources because students will be able to access their academic software via any internet enabled device which means that they no longer have to stand in long queues for a chance to use the institutions computers and other resources. SaaS will provide students and faculties with access to email, operating systems, specialised software and other applications which will aid effective teaching and learning (Mariya, 2011).

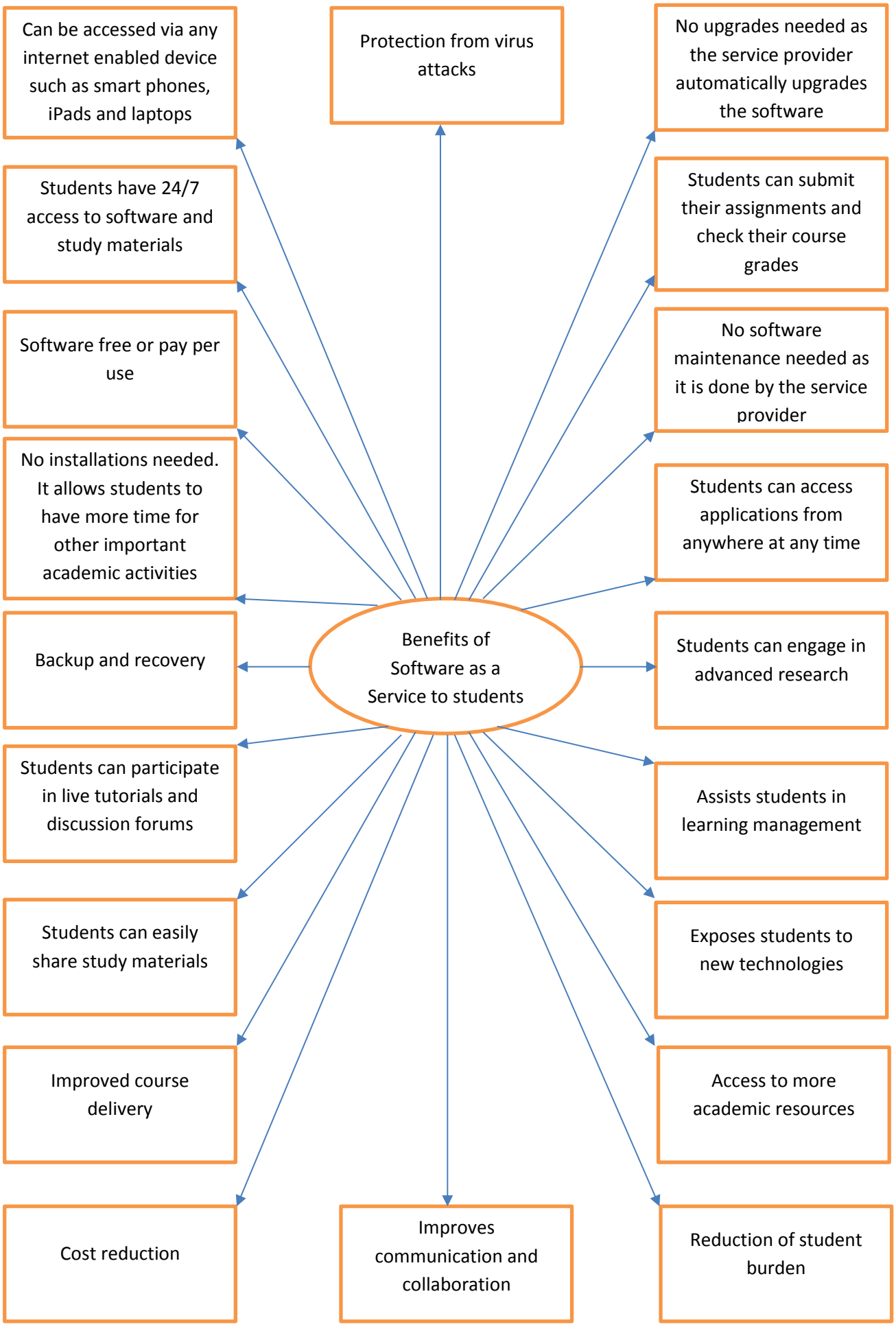

Figure 7: Benefits of SaaS to students in higher education adapted from Akande and Van Belle, (2016, Pg.3)

2.7.9 The disadvantages of Software as a Service for institutions

2.7.9.1 Some applications may not run in the cloud

One of the issues with SaaS is that it does not accommodate all applications. Some applications are not available through SaaS (Akande & Van Belle, 2016). The SaaS offering by a service provider may also not have all the features needed by users. In cases where the institution is making use of a service provider who does not offer all the applications needed, it may mean that they have to deal with more than one service providers. If there is no service provider that offers a software needed by the institution, it may mean that the institution would have to go back to the traditional system to acquire that software.

2.7.9.2 Vendor instability

Vendor instability could result in a poor service. For example, if there is a new management for the service provider due to sales of the company, the new management may not meet the expectations of the clients or standards of the previous management. Another issue is that some vendors may not have proper backup arrangements. In such cases, the students need to be informed to make proper arrangements for their own back up (Kourik & Wang, 2012). There is also a possibility of lack of funds and lack of maturity of the SaaS market. This may lead to the service provider going out of business or a possible reduction in the quality of service offered by the service provider (Kumar, Kommareddy, & Rani, 2013). This could pose a risk to the effective use of SaaS by students and faculties in HEIs.

2.7.9.3 Browser compatibility

Some SaaS software does not support all browser. The lecturers and students should be informed of the supported browser to avoid the issue of unsupported browser (Kourik & Wang, 2012).

2.7.9.4 Possible disruptions due to upgrade and maintenance by the service provider.

The service provider may perform upgrades at a time that is not convenient (Kourik & Wang, 2012). For example, there was a case when the service provider upgraded a software in the middle of a term and it affected the use of the software by the students. Navigation through the software became difficult for students' due to changes in features of the software during the upgrades.

2.7.9.5 Integration issues

It might be difficult to integrate some of the existing software and application with SaaS (Rao & Challa, 2013; Bulla , Hunshal , & Mehta, 2016). Buyya, Broberg, & Goscinski, (2011) found that integration is a major limitation with SaaS. This could pose a big problem because some of the existing applications might be needed to provide data to use the SaaS offering. It is therefore important for HEIs to properly investigate whether a SaaS application could be integrated with existing applications before adoption and implementation.

2.7.9.6 Lack of standardisation and the possibility of data/vendor lock-in

The lack of standardisation is another issue and it could lead to data/vendor lock in and HEIs may be unable to change service provider if the service of the current service provider is not satisfactory. There is also the possibility of some software not being able to work on some platforms. Thus, it may be difficult to change the service provider if the institution is not pleased with their services. There is also a lack of universal set of standards and interface which could also result in vendor lock-in (Rao & Challa, 2013).

2.7.9.7 Constant changes in technology

There are consistent changes in computer based technologies and HEIs are unable to meet up with these changes due to budget constraints (Gilakjani, Leong, & Ismail, 2013). The flexibility of SaaS can help HEIs cope with frequent changes in ICT resource requirements.

2.7.9.8 Lack of ICT infrastructure and lack of constant electricity supply

The lack of ICT infrastructure and lack of constant electricity supply are some of the biggest challenges that affect ICT adoption in Nigerian HEIs (Oyeleye, Fagbola , & Daramola , 2014). Constant electricity is needed to power the computers and other SaaS supporting technologies. Nigerian HEIs also lack infrastructure and access to computers is limited as the ratio of students to computers was about 50:1 in most Nigeria universities (Gital & Zambuk, 2011). In SA HEIs, access to ICT infrastructure and electricity is better when compared to Nigerian HEIs although there is unequal distribution of resources due to the legacy of apartheid (Jansen, 2003). This means that some HEIs in SA have better access to ICT infrastructure than others. The problem of electricity is not an issue with South African HEIs as electricity supply is adequate in South Africa.

2.7.10The disadvantages of Software as a Service for students

2.7.10.1 Security, privacy and loss of control over data

The protection of sensitive data is a major concern because the security of data lies with the service provider. There are privacy issues with SaaS because the service providers are in control of the data and in the process; they may have access to confidential and private data of the users. This is of high concern to all the stakeholders in HEIs (Deepa & Sathiyaseelan, 2012; Muli & Kimutai, 2015; Bulla , Hunshal , & Mehta, 2016). This is of high concern to students and other institutional users as they do not want their personal data to fall into the hands of an unwanted person. The security of data is therefore very important for the service provider to gain the confidence of the users.

2.7.10.2 Reliance on the internet and the high cost of internet access

The reliance of SaaS on the internet to function is an issue because if the internet is not good, access to SaaS will be affected (Briscoe & Marinos, 2009). The quality of SaaS is only as good as the quality of the internet service. For example, if the quality of internet service is poor, the quality of SaaS will be reduced. There could also be issues with dissemination politics and intellectual property (Akande & Van Belle, 2014; Mathew, 2012). The high cost of internet means that many students cannot afford internet services when off campus.

This affects the ability to use SaaS off campus because the internet is vital to gain access to SaaS. The students from areas with poor internet access would also not benefit from the anytime anywhere access advantage of SaaS and they may be forced to stay on campus to have internet access to access SaaS. The high cost of internet means that a lot of students cannot access SaaS off campus and are therefore unable to enjoy the benefit of anytime anywhere access. For students to be able to use SaaS effectively, they need to have access to internet from anywhere at any time and not just on campus. The concept of zero rated services which service providers offer free access to students when accessing SaaS and other educational resources may help solve this issue. Some HEIs have agreements with some service providers who now offer zero rated services to students when accessing SaaS applications or any other educational resources (Information and Communication Technology Services, University of Cape Town, 2017; Vodacom Foundation, 2017). In a bid to help address the cost challenges associated with access to education content and remote learning for institutions of higher learning, one of the service providers has already enabled 19 universities of the 23 South African universities for zero rated services (Nkwanyane, 2017). Although this can help students in accessing SaaS and other educational resources, only few HEIs have such agreement in place. It will be beneficial to students from other HEIs as well if their institutions can have an arrangement with service providers to also offer free access to their students to access SaaS and other educational resources online.

2.7.10.3 Unsolicited advertisements

There may be unsolicited advertisement from time to time while using SaaS especially when it is free (Odeh, Warwick, & Garcia-Perez, 2015). This may be a source of disturbance for students as some students may get carried away with the advert and click on links in the advert that will take them completely away from their work. This is a serious disadvantage especially if the student gets carried away all the time as valuable time would be lost looking at unsolicited advertisement.

2.7.10.4 The need to learn new skills

SaaS comes with the demand to learn new skills such as computer and management skills (Akande & Van Belle, 2016). This might discourage some students especially if they do not have prior experience with technology before gaining admission into HEI. The fear of technology might discourage them from wanting to learn the skills required to use SaaS effectively and this would have an adverse effect on their ability to use SaaS.

2.7.10.5 Possibility of students missing classes intentionally because of the availability of lecture materials such as lecture notes and class videos

The use of SaaS makes it possible to record lectures and make them available online to students so that they can access it later. Thus, there is a decrease in class attendance because of the availability of lecture materials via SaaS applications such as Office 365 and Moodle (Blin & Munro, 2008). The students believe that recorded lecturers are useful during a course and when preparing for a test or assessment as it is an effective tool that ensure their success in the course. Out of the 746 students that participated in a study conducted on the impact of recorded lectures, 80% of the students said that recorded lecturers make learning easy for them (Price & Almpanis, 2015). Availability of recorded lectures has been found to be an advantage by some researchers. Larkin, (2010) also found that students are not willing to replace classes with recorded lectures and attendance remained high even when recorded lectures are available. Nashash & Gunn, (2013) also found that students did not miss lectures because of the availability of recorded lectures. Although some researchers have found that availability of recorded lectures does not affect students class attendance, this research would like to emphasise that it could also be a form of disadvantage because the possibility of some students missing classes intentionally because they know that they can watch the videos at a later stage cannot be ruled out completely as another study by Traphagan, Kucsera, & Kishi, (2010) found that there was a reduction of about nine percent in class attendance as a result of the availability of webcast. Class attendance should be encouraged because it more interactive and students can actively participate in class discussions. Recorded lectures should only be encouraged in cases where the students have genuine reasons for not attending classes. For example, when the student is sick as this would allow the student to access the video of the missed classes to catch up with whatever was missed.

2.7.10.6 Poor bandwidth

The availability of bandwidth is important to effectively use SaaS. Poor bandwidth is a problem as if affects the quality of SaaS applications (Mlitwa, 2010). If there is poor bandwidth, the quality of SaaS will also be reduced. In cases where real time access is required such as during live group session, poor bandwidth will affect the session as messages would not be transmitted in real time.

2.7.10.7 Lack of awareness of Software as a Service

The lack of awareness of SaaS affect students' confidence in SaaS (Muli & Kimutai, 2015). The students need to develop confidence in SaaS by attending training on how to use SaaS effectively for academic purposes. The lack of confidence in SaaS may prevent students from using SaaS in the intended manner and this would affect their overall performance. Figure 8 shows the limitations of SaaS to students in HEIs.

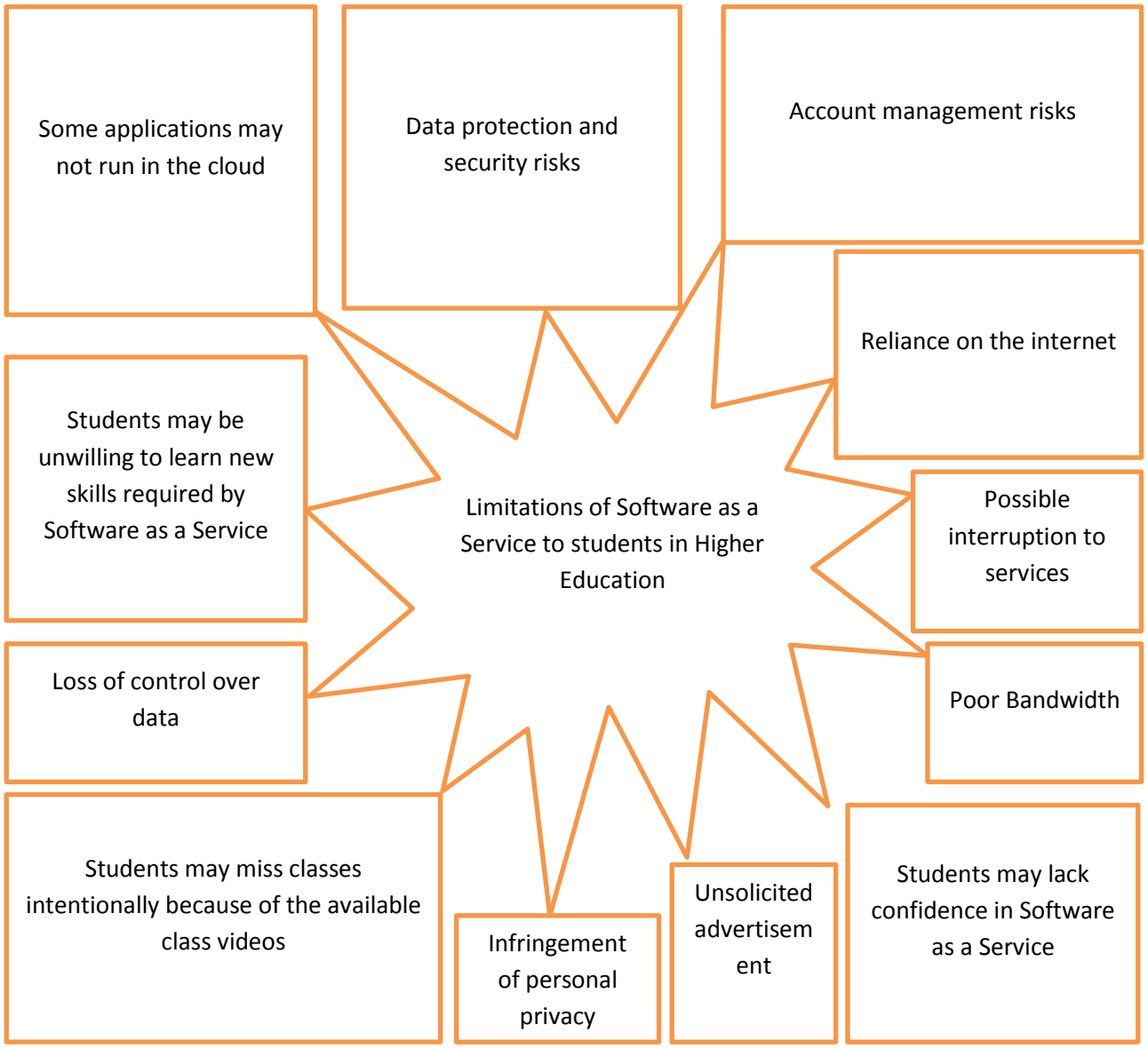

Figure 8: The limitations of SaaS to students in higher education adapted from Akande and Van Belle (2016, Pg. 3)

2.8 Higher Education in Nigeria and South Africa

Education involves acquiring functional skills, moral identity, and the desire to succeed in life to be able to contribute towards improving the society (Olutola & Olatoye, 2015). Higher education is an important aspect of social and economic development (Jain & Pandey, 2013; Bulla , Hunshal , & Mehta, 2016). Despite the importance of higher education in social and economic development, many HEIs continue to operate with limited resources which affects their ability to deliver their services effectively (Makoza, 2016). Higher education also referred to as tertiary education can be defined as the level of education after secondary school. This level of education is obtained from HEIs such as universities, polytechnics, technikons, monotechnics, liberal arts colleges, institutes of technology, college of education and other HEIs offering degree, certificates and diplomas (Famade, Omiyale, & Adebola, 2015; Omede , 2015). The HEI plays a leadership role in the nation and provides people with motivation, skills and qualifications which equip them to be creative, innovative and self-reliant (Olutola & Olatoye, 2015). Higher education also creates job opportunities for graduates and allows them to contribute towards building the nation (Omede , 2015).

2.8.1 Higher education in Nigeria

As at 1948, there was only one university in Nigeria. This number has significantly increased over time and Nigeria currently has 129 universities (Iruonagbe, Imhonopi, & Egharevba, 2015), 81 polytechnics, 27 monotechnics, over 60 colleges of educations, 36 colleges of Agriculture, 50 colleges of health technology, 132 technical colleges, 108 innovative enterprise institutions and vocational enterprise institutions (IEIs and VEIs) (Oye, Salleh, & Iahad, 2011; Famade, Omiyale, & Adebola, 2015).

Nigerian universities fall under three categories which are private, state or federal (Oseni, 2015). The federal universities are owned by the federal government, the state universities are owned by the state governments while the private universities are owned by private individuals. Nigerian universities can also be classified as first generation, second generation, third generation and new universities. The first-generation universities are those universities that was established before the mid 1970's. These are University of Ibadan (UI), University of Nigeria (Nsukka), Ahmadu Bello University, University of Lagos (Unilag), Obafemi Awolowo University (OAU) Ife and University of Benin (Uniben). The second-generation universities are those established in the mid 1970's while the third-generation universities are those established in the 1980's and 1990's including universities of agriculture and technology. The new generation universities are those established after Nigeria entered a democratic regime in 1999 (Oseni, 2015). This also affects the access and distribution of needed resources. This unequal distribution of resources makes it difficult for some universities to be able to provide their students with necessary resources. The quality of education offered is also affected and the required hardware and software are either unavailable or insufficient. Table 2 shows the number of HEIs in Nigeria.

Institutions	Federal	States	Private	Total
Colleges of education	21	38	4	63
Colleges of health technologies and allied institutions	9	40	1	50
Monotechnics/specialised institutions	23	2	2	27
Colleges of Agriculture	17	19	0	36
Polytechnics	21	38	22	81
Universities	40	39	50	129
Total	**131**	**176**	**79**	**386**

Table 2: Number of tertiary institutions in Nigeria

The quality of higher education offered by Nigerian universities also varies across the different universities in Nigeria. Many Nigerian universities are unable to provide their students with needed resources including equipment laboratories and workshops. Problems faced by Nigerian universities include inadequate funding, inadequate teaching staff, lack of resources, cultism, frequent labour disputes and closure of universities and lack of ICT facilities (Asiyai, 2013; Ahmed, 2015; Famade, Omiyale, & Adebola, 2015; Joshua, 2015). Another problem faced by Nigerian HEIs is inadequacy and decayed infrastructural facilities which results in poor and unfriendly learning environment (Ige , 2015). Other problems faced by HEIs in Nigeria are brain drain among teachers, unstable curriculum and subjects, unstable staff and politicization of education (Ahmed, 2015). Since the mid 1980's when there was a sudden increase in the number of HEIs and enrolment of students in Nigerian HEIs, government funding has reduced and the government even admitted openly that it could no longer afford to fund higher education alone (Famade, Omiyale, & Adebola, 2015). This is evident in the increasing number of student enrolment and reduction in government funding over the last ten years (Halidu, 2015). The Nigerian government has continuously paid little attention to the increasing demand for more government funding for HEIs and paid more attention to other social issues (Ahmed, 2015).

2.8.2 Higher education in South Africa

Prior to 2014/2015, there were 24 public universities and 50 further education and training (FET) colleges in SA. The universities are spread across the 9 provinces with each province having at least 1 university. The newest universities (Sol Plaatje University in Kimberley, Northern Cape Province and University of Mpumalanga in Mpumalanga Province) were established in 2014/2015 section to make the total number of public universities in SA 26 (Universities South Africa, 2016a). Only 2 universities have been established since the end of apartheid regime in 1994. Of the 26 universities in SA, 8 are universities of technology focusing on vocationally oriented education. Seven (7) are comprehensive universities that offer both academic and vocational diplomas and degrees. The remaining 11 South African universities are traditional universities offering university degrees that are theoretically oriented. Like the Nigerian HEIs, South African HEIs are also witnessing an increase in student enrolment and a reduction in government funding. The enrolment of students in South African universities has increased consistently over the years. In 2014, nine hundred and sixty-eight thousand, eight hundred and ninety (968,890) students were enrolled in South African HEIs. This

is expected to increase to 1,059,900 students in 2017 (Council on Higher Education, 2016). Although the number of student enrolment is increasing the increase in the number of staff is not proportional with the increase in the number of students. The increasing number of student's enrolment has not been met with adequate funding that can help achieve the national goals of HE (Webbstock, 2016). The increase student enrolment and reduction in government funding has left most of these HEIs with limited resources. Thus, they are unable to provide students with needed educational software (Akande & Van Belle, 2014). The quality of education offered by HEIs in SA is seen to vary across different HEIs. This is due to the previous system of apartheid in which more resources were given to some universities and others were provided with inadequate resources (Jansen, 2003). The unequal distribution of resources combined with tight budgets affects some HEIs ability to offer some courses because of the cost associated with providing students with necessary resources. This also affects the quality of education provided in some courses offered because they require resources such as software to teach effectively.

2.8.3 Higher education and Software as a Service

SaaS is changing the way in which students and faculty in HEIs access software and applications. The impact of SaaS on higher education is significant as it reduces cost thereby improving access to needed resources. Another impact of SaaS on higher education is the growth of contents. For example, if HEIs with a relative lack of resources come together and set up a community cloud, students and faculties from any of the HEIs can access resources from other HEIs and would no longer be restricted to the resources available on their institutions server or local machines. The impact of SaaS on how students collaborate with one another and faculty can also not be overlooked. The benefits and disadvantages of SaaS in HE will now be discussed.

2.8.4 Major providers of educational Software as a Service

2.8.4.1 Microsoft

The Microsoft cloud services for education is one of Microsoft's SaaS offerings. One of its features is Microsoft Live@Edu which provides users with email addresses and other communication and collaboration tools (Alshwaier, Youssef, & Emam, 2012). It is available for free to HEIs and it provides features which assists students, researchers, staff and faculties to carry out activities such as website creation, sharing of files and documents, word processing and documentation, desktop sharing, resource scheduling and Voice Over Internet Protocol (VOIP). This is illustrated in Table 3.

Microsoft Live@edu
Website Creation
File sharing
Word processing and presentation
Desktop sharing
Resource scheduling
VOIP
Communication and collaboration tools
Microsoft office
Skydrive

Table 3: Features of Microsoft Live@edu adapted from Alharthi, Alassaf, Alzahrani, Walters, & Wills, (2017, Pg. 820)

MicrosoftLive@Edu offers several benefits to students and faculties alike including improved communication and collaboration. Table 4 shows more benefits of MicrosoftLive@Edu in terms of electronic learning and blended learning.

Type of learning	Benefits of MS Live@Edu usage
e-Learning	• Remote students use course SkyDrive for storing their accomplished assignments • Real time chat is used by teachers for consulting remote students • Web office applications are used for consultations while both teacher and students edit the same document and the teacher can advise the students in real time
Blended learning	• Students enrolled in a course have access to courseware that is stored in a virtual disk • Discussions are actively used for communication between students and teachers • Real time chats are used for communications • Calendars and emails are actively used for time planning and scheduling • Profile customization features and social communication make education environment more user friendly and assists in learning • Teacher uses course virtual drive and integrated web office applications for delivering lectures. All related materials are stored in one place • Students and teachers access their files from personal virtual drives from the labs, home or any other place. No portable media is needed.

Table 4: Benefits of MS Live@Edu with respect to types of learning
Source: Miseviciene, Budnikas, & Ambraziene, (2011; Pg.267)

The Microsoft education cloud computing also offers identity management, ability to create applications that can be shared among students and faculties, creation of social networks or communities that can be used by student for group projects, migrating on premise educational software to the cloud, provide data mashups for assessment and accountability and testing of web services. Another feature of the Microsoft education cloud computing is that it can be used to test and deploy large volume of software and applications in different environment. It can also be used to evaluate educational software and make informed decision about the use of educational software (Alshwaier, Youssef, & Emam, 2012).

To expand and improve their services and to further establish themselves as one of the leading providers of SaaS applications that support educational activities, Microsoft came up with office 365. The new educational SaaS offering by Microsoft, office 365 is now the most common SaaS offering among HEIs (Akande & Van Belle, 2016). It provides services such as hosted emails, social networking, collaboration and office suite which include Microsoft (MS) word, MS Excel, MS PowerPoint, OneNote, Publisher, MS Access and MS Outlook. With Office 365, installation, upgrades and maintenance is performed by MS and the users get the updated versions without having to worry about installation, upgrades and maintenance. One of the functionalities of Office 365 is exchange online which provides hosted email. It allows students to synchronise contacts and calendar. It also aids the effective management of meetings and communication (Akande & Van Belle, 2014). Exchange online also provide outlook web access (OWA) which allows users to easily access contacts, calendars, emails and documents on SharePoint through a web browser. Another feature of Office 365 is the SharePoint. With SharePoint, students can share documents, files and other materials with other

students and lecturers. This improves communication and collaboration among students. OneDrive is another feature of Office 365. It provides students with storage space which they can use to upload and save files and documents. The students are then able to share the files and other documents with other students, lecturers, both from within and outside their institution. Office Online is another feature of Office 365. It allows students to be able to input or edit documents in MS word, MS Excel and MS PowerPoint through a web browser. It also allows students to simultaneously work on documents in real time for easy collaboration. Another feature of Office 365 is Lync Online which is Microsoft's instant messaging tool that students use for real time communication. Figure 9 is a screenshot of the home page of Microsoft's Office 365 showing the features.

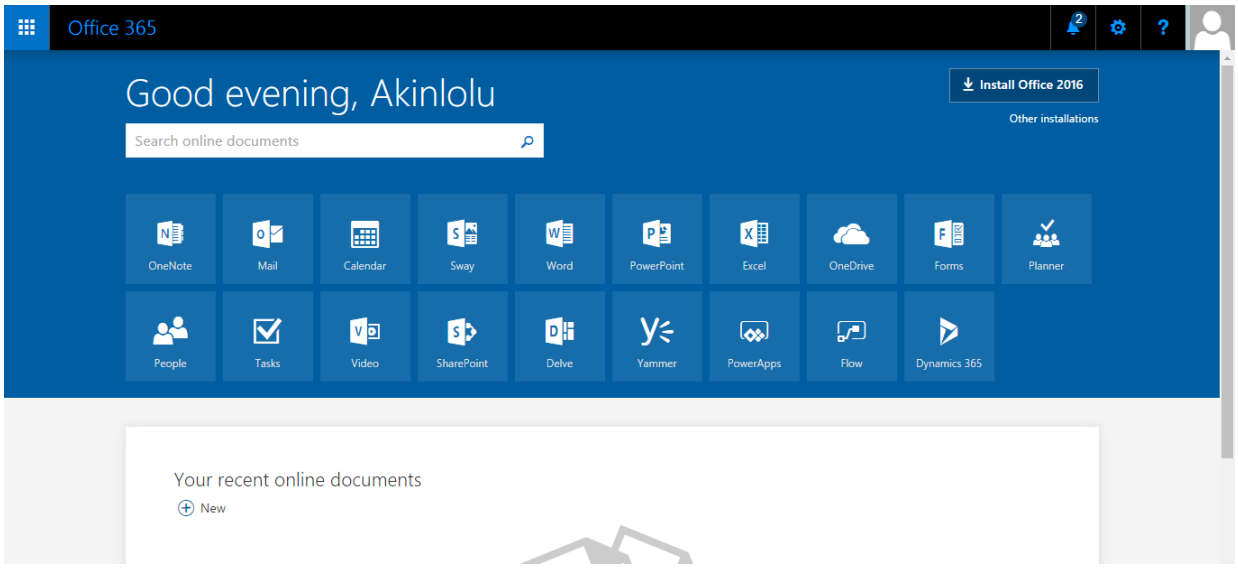

Figure 9: The home page Office 365 showing all the features

2.8.4.2 Google

Google Apps for business, Google Apps for education (GAFE) and a free Google Apps are different SaaS offerings available from google. GAFE is now known as G Suite for Education and it consists of a range of online applications which can increase productivity and collaboration (Information and communication Technology Services, 2017). This research will discuss GAFE in details because it is designed for education and it is the most relevant to this research. All the applications and features from GAFE are accessible through a web browser. The users need to have a Google account and once they are logged on, they will be able to access the different applications and features. GAFE is available at no cost to schools with 24/7 support, no advertisements and the users have control over their data. It allows students to create, share and edit documents and files in real time for easy collaboration. It can be accessed using any internet enabled device like cell phone, tablet, laptop or desktop at anytime from anywhere. The innovative tools provided by GAFE enables and promote new ways of learning. Google apps for education are used by over 30 million students, teachers, and administrators from schools across the world (Google, 2014). Google apps for education are:

a. Collaborative: They offer students with the capability to edit in real time, sharing controls and compatibility which supports teamwork and fast and easy collaboration;
b. Customizable: The institution can customise the apps to suit the needs of each student. For example, they can turn off some features that are not relevant for a specific course;
c. Free: There are no costs involved to use GAFE;
d. Secure: Google have dedicated engineers that ensure the security of data stored by users. The ownership of the data also lies with the user which makes is secure;
e. No advertisements: There are no unsolicited advertisements so distraction because of advertisements can be avoided with GAFE; and
f. Can be used on any device: Students can access the apps using any device such as tablets, iPads, phones, laptops etc. from anywhere at any time.

The features of Google apps for education are Gmail, calendar, drive, docs, sheets, slides, sites, forms, classroom, vault and talk/hangouts (Miseviciene, Budnikas, & Ambraziene, 2011; Landry-Hyde & Cantwell, 2013; Babin & Halilovic, 2017). GAFE allows staff and students to send and receive emails and instant messages, host video conferences, store data in a secure location, share access to class notes and assignments, collaborate on documents, create surveys and forms, and create documents, spreadsheets, drawings and presentations (Information and communication Technology Services, 2017).
Figure 10 is a screenshot of the home page of the Google Apps showing the features of Google Apps.

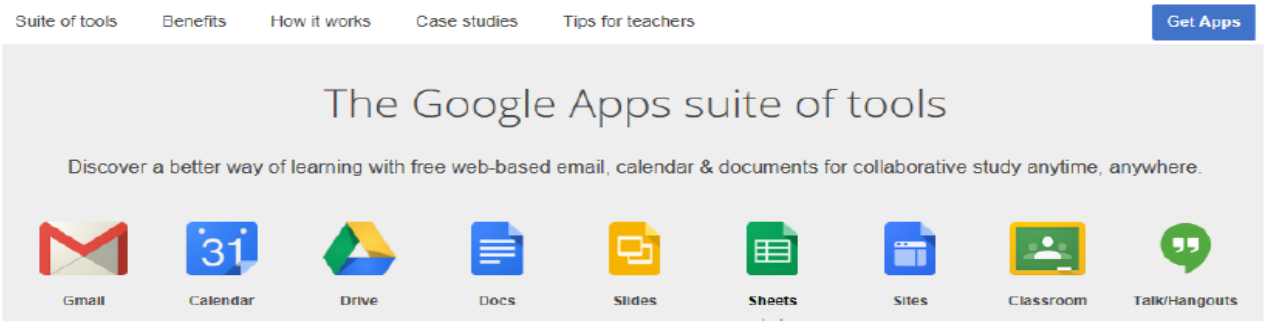

Figure 10: Google Apps Suite of Tools

2.8.4.3 Salesforce

Saleforce.com is another leading provider of SaaS. One of their SaaS offerings is Salesforce for student's success (Sales force, 2016). This application also provides easy customization which allows every student to be treated as an individual and solutions tailored to meet their individual needs. It allows faculty and staff to engage with each student and give them one on one attention that they need to be successful till graduation and even after graduation. It provides features which allow lecturers to provide quick response to students' questions. It is also accessible via any internet enabled device such as mobile phones, iPads, laptops, desktops etc. Its features include:

a. Student community: With this feature, students can check their current academic standing, grades, change their contact information, see tasks and activities that they need to complete, and reach out if they need additional help on any of their tasks;
b. Collaboration: Students can collaborate, share ideas and find answers together anytime from anywhere using any internet enabled device;
c. It also allows students to form their own private groups where they can also share ideas, collaborate and work together on the same project;
d. It also has features to invite alumni's to be able to interact with students for mentorship and networking purposes;
e. It provides students with all the needed resources in one place because students can access other materials through the application;
f. It provides a 360-degree view of every student to advisers, faculty and staff and provides them with valuable information to better meet the needs of the students;
g. It can also be integrated with other systems like the learning management systems, student information systems and customer relationship management you can create an early warning system that advice you of high risk students who are not performing well in their studies and needs special attention to be able to get them the resources they need to get back on track;
h. It allows the institution to stay in tune with student community by allowing them to see what is important to the students. I.e. the institution can identify students' needs by looking at student discussions in the groups and forums; and
i. It also allows information to be passed across to students easily by raising awareness of events, deadlines and issues on campus (Sales force, 2016).

2.8.4.4 IBM educational cloud services

The students, researchers and faculties at HEIs can access IBM educational cloud services with little or no ICT knowledge. They can share computer lab contents, programs and services with little ICT expertise (Aljebreen , Dahanayake , & Syed, 2015). With the IBM SmartCloud for education, HEIs would be able to get real time insights on educators as well as the performance of their institution using predictive analytics. The access to lab resources will also be improved and researcher's effectiveness enhanced. The IBM SmartCloud for education promises an improvement in student achievements and improved access to resources. The IBM SmartCloud for Education also offers IBM virtual computing lab (VCL) solutions which provides a technical infrastructure and support for free or open source Software. Some of the features of this software are communication and collaboration tools, support tools and provisioning manager which helps with the management of images (Kumar, Kommareddy, & Rani, 2013).

2.8.5 Classification of Software as a Service offerings in higher education

Many HEIs have already adopted SaaS and have recorded improvements in delivery of academic materials and other resources to students. Applications such as word processing, spreadsheets, PowerPoint and e-mail are some of the SaaS offerings used by HEIs. There are several SaaS offerings available for educational purposes. This research classified the available SaaS offerings into three categories. These are the general academic computing SaaS offerings, the research specific SaaS offerings and the subject specific SaaS offerings. The classification is based on their usage and a detailed analysis of each of the SaaS groupings was conducted. Typology of SaaS

2.8.5.1 General academic computing

The general academic computing SaaS offerings are those that are used across all the departments in HEIs. In this research, the general academic computing SaaS offerings used in the commerce faculties of the participating HEIs were identified. This includes plagiarism detection software, referencing tools, calendar, e-learning packages, library resources, e-books, communication tools including email, chat and video-conferencing. In this research, learning management systems (LMS) are also classified as general academic computing applications. LMSs are available as either server based or SaaS based. With the server based, the institution purchases the license and installs them on the institutions server. The institution also performs the upgrades and maintenance of the applications themselves. The SaaS based LMSs are different from the server based because the ownership of the license remains with the service provider. The service provider also performs the installation, upgrades and maintenance of the applications. Another difference could be the response time when accessing the application because the server based application could be faster than the SaaS based application due to latency issues. This is because the SaaS based application could be stored far away from the institution. For example, it could be in another country. From a student point of view, it might be difficult to ascertain whether a LMS is server based or SaaS based because they are only able to access the front end of the application and do not know where the application resides. The IT staff are in a better position to know whether a LMS is server based or SaaS based. Google docs, Gmail, Dropbox and Microsoft Office 365 are the most common examples of the general academic computing SaaS offerings used by HEIs. Refer to appendix K for further details.

2.8.5.2 Research specific

The research specific SaaS offerings are those that are used to carry out research activities such as data gathering and data analysis. This includes statistical software, qualitative analysis software and survey software. They make data gathering and analysis easy for researchers and provide graphs and information that gives a clear explanation of the data. Common examples of research specific SaaS offering used in HEIs are:

1. Atlas.ti,
2. Mendeley,

3. Wunderlist,
4. Evernote,
5. and Turnitin.

Further details can be found in appendix K.

2.8.5.3 Subject specific

The subject specific SaaS offerings are those used specifically for a subject or module. This includes ERP software, accounting software, tax software, programming and system development software, project management software, simulation software e.g. decision making, and operations research packages such as linear programming, scheduling and decision trees. For example, the Teradata University Network (TUN) provides software that allows students and faculty to conduct activities such as database management, decision support and data warehousing. It also has a feature which provides access to academic materials to students and faculty. It is useful for students majoring in information systems, management or computer science to finance, marketing or accounting (Teradata Corporation, 2018). The web based portal available in TUN also provides students and faculty with access to data from the industry for real-life experience. This can improve the performance of students when they finally join the labour force as they will already be used to the real-life data.

For activities like data mining, business intelligence and analytics, the SAS global academic program provides students and faculty with the SAS software. Various disciplines in higher education including economics, social sciences and operations research make use of SAS software. The Statistical Package for Social Sciences (SPSS) used for statistical analysis is also available as a SaaS offering but it is not free i.e. it is based on subscription (International Business Machines, 2018). The cost is reasonable when compared to traditional SPSS offering. Refer to appendix K for further details.

2.8.6 Gaps in Software as a Service acceptance, adoption or use research

There are a number of gaps identified in the literature on SaaS acceptance, adoption or use in higher education. The lack of resources is one of the major problems faced by education institutions (Adrees, Omer, & Sheta, 2016). There is frequent shortage of qualified staff and shortage of ICT resources (Jain & Pandey, 2013; Kumar, Kommareddy, & Rani, 2013). The reduction in government funding is another problem faced by HEIs (Mew, 2015). With the reliance of education on technologies these days, many HEI courses require the use of a software to train students and aid teaching and learning. The software needed to train students are often very expensive to license (Oh & Sim, 2014). As if that is not enough, maintaining and upgrading these software is also costly. This research tried to close this gap by zooming down on SaaS and identifying ways in which SaaS can help to eradicate the problems faced in using traditional software with the hope of creating awareness of SaaS among HEIs. The researcher hopes that this would improve the usage of SaaS in HEIs and also improve the access to needed software.

2.8.7 User experience with Software as a Service

For most users, SaaS is easy to use and requires just basic computer knowledge to be able to use it. In education, many of the students find it easy to understand and use SaaS applications. Some of the benefits of using SaaS identified by students in literature include improved communication, improved access to software, files and data (Santoso, 2014). Activities like accessing up to date software, viewing assignments and class notes, submission of assignments, organising assignments and tests, solving equations, viewing recorded videos and files, real time collaboration, data gathering, data analysis and presentation have become easier using SaaS (Deepa & Sathiyaseelan, 2012; Akande & Van Belle, 2014; Adeoye, 2015).

2.9 Research on Acceptance, Adoption or Use of Software as a Service in Higher Education Institutions

There are many researches on the acceptance, adoption or use of SaaS in HEIs. A list of some of these researches is provided in Table 5a and Table 5b and they are sorted based on the year of publication. This list was compiled based on the peer-reviewed academic publications identified using the selection criteria that was discussed at the beginning of this chapter (Chapter 2). The keywords used for searching includes cloud computing, adoption, implementation of Software as a Service, institutions, use of Software as a Service, students, software, ICT, information and communication technology, resources, higher education, higher education institutions, Nigeria, South Africa. Further details on the keywords is available at the beginning of this chapter (Chapter 2).

Table 5a is composed of the researches that focused on education while Table 5b is made up of researches that focused on other organisational sectors such as small and medium enterprises, large organisations and the government. From Table 5a and Table 5b, it is evident that majority of the research in this area focused on how to increase the adoption and acceptance of SaaS while only few focused on the usage of SaaS. The researcher did not limit the publications to SaaS only but included researches on cloud computing because SaaS is a major subset of cloud computing and therefore, a lot of the arguments on cloud computing are valid for SaaS. Out of the 43 papers listed in both Table 5a and Table 5b and published between 2008 and 2017, only 8 was conducted in African countries. This points to a need for more research to be conducted in this research area in African countries because the situation in countries from other continents where most of the research was conducted differs from the situation in Africa. The results from studies conducted in other continents might also not be applicable in the African context due to the different situations. This research hopes to cover this gap by exploring the use of SaaS by students in HEIs and developing a framework that will assist HEIs in minimising the risks and maximising the benefits associated with the use of SaaS. Most of the existing literature in this field agree that SaaS offers HEIs and their students many benefits. Some of the benefits identified in these researches are the ease of sharing contents and other academic materials, communication and collaboration, saving time because there is no need of installation, upgrades and maintenance, any time anywhere access and cost reduction (Kalpeyeva & Mustafina, 2013; Yadav, 2014). Out of the 43 publications listed (Table 5a and Table 5b combined), 22 was conducted on education (Table 5a).

This shows the importance of ICTs in education. Although it can be seen from the list that cloud computing and SaaS have gained considerable attention of researchers, more research needs to be conducted to further contributes to existing knowledge in this area.

Yadav, (2014) found that the lack of infrastructure is one of the biggest challenges the government faces in providing education. He also found that even in cases where the infrastructure is available, maintaining the infrastructure was another issue. Another issue found by Yadav, (2014) is that the cost of acquiring and maintaining software and hardware is high. Yadav, (2014) suggested that the use of CC can help eradicate these issues. Sharma and Ganpati, (2013) noted that the use of technologies such as SaaS has improved and increased the availability of data for analysis during research. They also noted that various ICT needs of HEIs can be met by migrating to the cloud environment from the traditional ICT environment and that ICT needs of students, management, faculty, and even administrative staff can be met by using SaaS applications. Some of the benefits of using such applications as noted by Sharma and Ganpati, (2013) include ease of access to books and articles, retrieval of previous research and similar studies, and the ability to interract with other researchers all over the world. Although SaaS has a lot of benefits for HEIs, students, faculty and staff, there are some limitations such as security and privacy issues, possibility of data lock in, unsolicited advertisements etc. which needs to be considered to ensure effective use of SaaS.

Research title, author and year	Study Type	Country	Theory/ framework used	The aim of the research/ findings
The influence of e-mail on students' learning in higher education: An extension to the technology acceptance model **(Macharia & Nyakwende, 2010)**	Acceptance of email by students in higher education institutions	Kenya	Technology acceptance model	This study investigates the factors that affects the adoption and diffusion of emails in higher education institutions. The study found that the diffusion and use of email is influenced by voluntariness and that the diffusion and use of email also influence student learning
IT-infrastructure of university based on cloud computing **(Kalpeyeva & Mustafina, 2013)**	Usage of cloud computing in educational institutions	Kazakhstan	N/A	This student describes the aspects of cloud computing that can benefit educational institutions. This study argues that the use of cloud services in universities will significantly reduce prices of purchasing and maintaining campus machinery.
Cloud Computing: An Economic Solution to Higher Education **(Sharma & Ganpati, 2013)**	Usage of cloud computing in Higher Education	India	N/A	This study discusses the challenges of cloud computing and higher education environment. This paper also discusses the cloud architecture for higher education environment and presents a cloud solution for higher education environment. This study argues that the use of cloud computing could be highly beneficial for educational institutions.
Factors hindering acceptance of using cloud services in	Usage of Cloud services in	China	Decision making trial and evaluation	The research proposes a novel evaluation framework to explore the factors hindering the acceptance of cloud services in a university.

Research title, author and year	Study Type	Country	Theory/ framework used	The aim of the research/ findings
university: a case study (Wu, Lan, & Lee, 2013)	higher education institutions		laboratory (DEMATEL) theory and Technology Acceptance Model	
A Study of Cloud Computing in the University Enterprise **(Adebisi, Adekanmi, & Oluwatobi, 2014)**	Adoption and usage of cloud computing	Nigeria	The Information Technology Infrastructure Library	This study explores the benefits of cloud computing and investigates the adoption and usage of cloud services in the higher education institutions. This study also discusses the benefits of cloud computing for higher education institutions and explored the adoption trend and usage of cloud services in higher education institutions.
Cloud Computing in Higher Education: A snapshot of Software as a Service (Akande & Van Belle, 2014)	Adoption and usage of Software as a Service in Higher Education Institutions	South Africa	N/A	This study explores the use of SaaS in South African higher educational institutions with the intention to determine whether SaaS is a viable option for higher educational institutions. The study also discussed the benefits and limitations of SaaS in higher education institutions.
Adoption of Cloud Computing by Tertiary Level Students – A Study **(Dhulla & Mathur, 2014)**	Adoption of cloud computing in higher education institutions	Mumbai	Unified Theory Acceptance and Use of Technology	The research attempts to identify the influencing factors contributing the adoption of cloud computing by students in higher education institutions
Exploring the potentials of Cloud Computing in Higher Education **(Tumbas , Matkovic , Sakal, & Tumbas, 2014)**	Adoption of Cloud Computing in Higher Education Institutions	N/A	N/A	This research discusses the concept of cloud computing, cloud standards, available services, and the possibilities of implementing them in in higher education to support business processes
Role of Cloud Computing in Education **(Yadav, 2014)**	Usage of cloud in educational institutions	India	N/A	This study argues that cloud computing allows educational institutions to focus on core activities. This study introduces a cloud education system and demonstrated how it can be beneficial to students, lecturers and faculties in providing quality education
Learning to Use, Useful for Learning: A Usability Study of Google Apps for Education **(Brown & Hocutt, 2015)**	Usage of GAFE by students	United States	N/A	This study examined student perceptions of the usefulness of Google Apps for Education (GAFE) in students' learning of core concepts in a first-year college composition course. It also investigated the ease of use and the level of difficulty of GAFE for students. This study found that students largely found GAFE usable, useful, and easy-to-learn. It concluded that majority of students will not have difficulty in using GAFE

Research title, author and year	Study Type	Country	Theory/ framework used	The aim of the research/ findings
Factors affecting cloud computing adoption among universities and colleges in the United States and Canada **(Klug & Bai, 2015)**	Adoption in universities and colleges	United States and Canada	Technology, Organisation and Environment Framework	The study found that three determinants of cloud computing adoption. These are technology readiness, institutional size, and complexity. Complexity was found to be related to the technology context in the framework while technology readiness and institutional size were found to be related to the organisational context. The study also found that relative advantage, compatibility, perceived barriers, regulatory policy, and service provider support were insignificant determinants.
The impacts of Cloud Computing adoption at Higher Education Institutions: A SWOT analysis **(Odeh, Warwick, & Garcia-Perez, 2015)**	Adoption of Cloud Computing in Higher Education Institutions	United Kingdom	Strengths, Weaknesses, Opportunities and Threats analysis	The research provided a SWOT analysis of the impact of cloud computing on higher education with the hope that it would assist higher education institutions in making decisions relating to migration of their learning management systems to the cloud based systems
Empirical Studies of Cloud Computing in Education: A Systematic Literature Review **(Ibrahim, Salleh, & Misra, 2015)**	Adoption of Cloud Computing	N/A	Unified Theory Acceptance and Use of Technology	The research found that there is a clear gap in the research on cloud computing. A lack of empirical studies focusing on utilizing cloud computing within educational institutions.
Exploring the Feasibility of Adopting Cloud Computing in Computer Center Taiz University **(Ibrahim & Ameen, 2015)**	Adoption of cloud computing in a university	Yemen	Theory of Planned Behavior	The research explores the different types of cloud based computing and identified the significant type of cloud computing that would benefit students and lecturers
Higher Education and the Adoption of Cloud Computing Technology in Africa **(Seke, 2015)**	Adoption of Cloud Computing in Higher Education Institutions	Several African Countries	Diffusion of Innovation	The research identified the challenges facing higher education in Africa and suggests that cloud computing could provide possible solutions to those challenges facing higher education in Africa
Cloud Computing Adoption in Zimbabwean State Universities: An Empathetic Examination **(Giyane & Buckley, 2015)**	Adoption of cloud Computing in Higher Education Institutions	Zimbabwe	Unified Theory of Acceptance and Use of Technology	The research aimed to examine the contextual situation of the adoption of cloud computing by end users in Zimbabwean state universities. Security and privacy issues as well as limited bandwidth were found to be the major barriers to cloud computing adoption in Zimbabwean state universities.
The Study on Awareness and Adoption of Cloud	Adoption of Cloud Computing	Sri Lanka	Diffusion of Innovation	The research aimed to understand the level of awareness and adoption of cloud computing by the academic staff in Sri Lankan universities. The research found that cost and time have positive

Research title, author and year	Study Type	Country	Theory/ framework used	The aim of the research/ findings
computing by Academics in Sri Lankan Universities **(Irshad, 2015)**				effect on adoption while security concerns was found to be the main reason for non- adoption of cloud computing
Student Perceptions of Cloud Computing Effectiveness in Higher Education **(Ashtari & Eydgahi , 2015)**	Usage of Cloud Computing in Higher Education Institutions	United States of America	Technology Acceptance model	The research focuses on the associations between variables identified in the literature that are influencing the use and perceptions of technology for undergraduate students of technology at a mid-sized university in Southeast Michigan.
The use of Software as a Service by Students in Higher Education Institutions (Akande & Van Belle, 2016)	Usage of Software as a Service in Higher Education Institutions	South Africa	Student Involvement Theory	This study conducted a systematic review of the literature on the use of SaaS by students in HEIs. This study identified the current state of student's use of SaaS in HEIs. This study also identified the benefits of SaaS as well as the perceived obstacles to student's use of SaaS in HEIs.
Using Software as a Service to Facilitate Quality Learning in Higher Education Institutions with a Relative Lack of Resources (Akande & Van Belle, 2017)	Usage of Software as a Service in Higher Education Institutions	South Africa	Activity theory	This research explores the current use of SaaS in HEIs and identified ways in which SaaS could contribute towards the creation of a conducive learning environment for students.
Critical Success Factors for Cloud Migration in Higher Education Institutions: A Conceptual Framework **(Alharthi, Alassaf, Alzahrani, Walters, & Wills, 2017)**	Adoption, usage and acceptance of cloud computing in Higher Education	Saudi Arabia	Critical Success Factors	This study argues that the migration of ICT services to cloud computing by higher education institutions in Saudi Arabia could deliver substantial benefits which can help to transform higher education in Saudi universities. This study also argues that it is essential to identify the enabling factors for a successful migration to the cloud environment in the higher education settings before migrating to the cloud.
Cloud Computing Security Challenges in Higher Educational Institutions -A Survey **(Al-Shqeerat, Al-Shrouf, Hassan, & Fajraoui, 2017)**	Adoption and Usage of Cloud Computing in Higher Education Institutions	Different countries	Technology Acceptance Model	The research identified benefits and limitations of cloud computing in higher education institutions. The also research provides recommendations to higher education institutions on how to avoid security risks efficiently when adopting cloud computing and identified benefits and limitations of cloud computing

Table 5a: Research on acceptance, adoption or usage of Software as a Service in Higher Education Institutions
Source: Author

Research title, author and year	Study Type	Country	Theory/ framework used	The aim of the research/ findings
Software as a service model: elaborating client-side adoption factors **(Xin & Levina, 2008)**	Adoption of Software as a Service	United States	Property Rights Theory, Resource Based theory, Institutional Theory	This study investigated the determinants of SaaS model adoption from the customers' side and developed a theoretical framework using economic, strategic management, and Information Systems theories.
Drivers of SaaS Adoption - An Empirical Study of Different Application Types **(Benlian, Hess, & Buxmann, 2009)**	Adoption	Germany	Transaction cost theory, The resource based view, Theory of planned behaviour	The decision to adopt SaaS depends on the type of application. The study also found that attitude toward SaaS-adoption, uncertainty about adoption, social influence and strategic value are the strongest and most consistent drivers across all the different types of application.
Analysing Enterprise Systems Delivery Modes for Small and Medium Enterprises **(Fuller & McLaren, 2010)**	Adoption by small and medium enterprises	Canada	N/A	This study compared integrated enterprise resource planning (ERP), best of breed (BoB) systems and Software as a Service (SaaS) and found that although, the implementation cost of BoB and SaaS are lower and they both can reduce risk to external vendors, ERP systems are better aligned with SMEs seeking an enterprise solutions.
Who is Out There? Exploring the Effects of Trust and Perceived Risk on SaaS Adoption Intentions **(Heart, 2010)**	Adoption of SaaS by organisations	Israel	Transaction Cost Economics	The study developed three risk related constructs which are perceived risk of SaaS, perceived risk of systems unavailability, and perceived risk of data insecurity. This study also developed three trust related constructs which are trust in the SaaS vendor community, perceived capabilities and perceived reputation of the SaaS vendor community. It was found that trust in the SaaS vendor community strongly affects all the three risk related constructs.
Challenges for adopting cloud-based software as a service (SAAS) in the public sector **(Janssen & Joha, 2011)**	Adoption and acceptance of SaaS in public sector	Netherlands	Transaction cost theory, Core competency theory, Resource based theory	This research explored the benefit, challenges and limitations for adopting SaaS in the public sector from a government perspective. This research found that SaaS could provide many benefits which are related to the outsourcing of the local control, installation and development of software which could result in potential cost-savings and better cost control. It was also found that the disadvantages and risks are related to the more difficult control of the ICT function.
Business application acquisition: On-premise or SaaS-based solutions? **(Bibi, Katsaros, & Bozanis, 2012)**	Adoption	Greece	SWOT analysis	The study provides the differences between SaaS and on-premise software and suggests that there are different aspects such as billing models and service level agreements that needs to be considered before adoption of SaaS.

Research title, author and year	Study Type	Country	Theory/ framework used	The aim of the research/ findings
Success factors for deploying cloud computing **(Garrison, Kim, & Wakefield, 2012)**	Acceptance by organisations	Asia North America Europe Australia Africa Other	Resource-based theory	The study found that trust between the customer and service provider is essential for implementation success. The study also found that successful cloud deployment allows organisations to enjoy competitive advantage by focusing on core competencies. The study also revealed that organisations that first invest in relational, technical, and managerial capabilities achieves greater ICT economies of scale with cloud computing
Understanding the formation of software as a service (SaaS) satisfaction from the perspective of service quality **(Chou & Chiang, 2013)**	Acceptance of SaaS by firms	Taiwan	Dedication-constraint mechanisms, Theory of outsourcing and service marketing, Social exchange theory, Social capital theory, Service marketing theory	The study found that that service quality affects trust positively and trust influences satisfaction. This study also found that customer satisfaction with service providers is influenced by both customers' emotion and rational cognition. The relationship between trust and satisfaction was also found to be theoretically and empirically sound and applicable to different settings such as outsourcing, and on-demand and on-line services like Software as a Service
The usage and adoption of cloud computing by small and medium businesses **(Gupta, Seetharaman, & Raj, 2013)**	Adoption, acceptance and usage of cloud computing by small and medium businesses	Singapore	Exploratory factor analysis, Confirmatory Factor Analysis	The study found that ease of use and convenience is the biggest factor that influence the adoption of cloud computing by small and medium businesses. Security and privacy was found to be the second biggest factor affecting the adoption of cloud computing by small and medium businesses while cost reduction is the third biggest factor. Small and medium businesses were found to be less concerned about the fourth and fifth factors which are reliability and sharing and collaboration.
Why do incumbents sometimes succeed? Investigating the role of interorganizational trust on the adoption of disruptive technology (Obal, 2013)	Adoption of disruptive technologies such as SaaS	United States	Technology acceptance model, Theory of interorganizational trust.	This study shows that pre-existing, interorganizational trust impacts the perceptions of prospective customers towards a disruptive technology like SaaS. It also shows how a prospective customers' intention to adopt SaaS is influenced by these perceptions. This study created a predictive model for intention to adopt using use perceived ease of use, perceived value, perceived usefulness and financial stability.
The usage and adoption of cloud computing by small and medium businesses **(Gupta, Seetharaman, & Raj, 2013)**	Adoption and usage of loud computing in small and medium enterprises	Developed countries and Asia pacific region	Confirmatory Factor Analysis	The paper focused on the perceived inclination of micro and small businesses toward cloud computing and the benefits obtained by them. Five factors influencing the usage of cloud computing by small and medium enterprises were identified in this paper.

Research title, author and year	Study Type	Country	Theory/ framework used	The aim of the research/ findings
Trust and Acceptance of Cloud Computing: A Revised UTAUT Model **(Alharbi, 2014)**	Acceptance of Cloud Computing	Saudi Arabia	Unified Theory of Acceptance and Use of Technology	The research presents a revised Unified Theory of Acceptance and Use of Technology that considers trust as the main construct beside its original constructs.
Exploring Users' attitudes and intentions toward the adoption of Cloud Computing in Saudi Arabia: An empirical investigation **(Alotaibi, 2014)**	Adoption of cloud computing	Saudi Arabia	Technology Acceptance Model	This research extended Technology Acceptance Model by integrating trust, anxiety and perceived risk and developed a proposed model to predict user intentions toward the use of cloud computing in Saudi Arabia
Adoption of Software as a Service (SaaS) Enterprise Resource Planning (ERP) Systems in Small and Medium Sized Enterprises (SMEs) **(Seethamraju, 2015)**	Adoption of Software as a Service by Small and Medium Enterprises	India	Technology, Organization and Environment framework	The research explained the determinants influencing the adoption of SaaS ERP systems and by highlighted the importance of the evaluation process, accounting shift of investment costs to operating expense and challenges such as change management and value co-creation. The research found that software vendor's reputation in the market, software fit to the business, the potential willingness of the vendor to support the customer throughout the product life cycle, the vendor's participation in co-creation of value for customers and the generic benefits of implementing an integrated ERP system are important factors that affects users' decision to adopt SaaS ERP.
Understanding SaaS adoption from the perspective of organizational users: A tripod readiness model **(Yang, Sun, Zhang, & Wang, 2015)**	Adoption of SaaS	China	Technology, Organization and Environment framework	The research found that technology, organization and environment factors are important in the adoption of Software as a Service. The research suggests that organisational users should be prepared for the technology, organization and environment factors of Software as a Service adoption for a successful adoption
The adoption of software as a service (SaaS): ranking the determinants **(Safari, Safari, & Hasanzadeh, 2015)**	Adoption of Software as a Service	Iran	Technology, Organization and Environment (TOE) framework and diffusion of innovation (DOI) theory	The research found that all attributes of technology, organisation and environment factors influence SaaS adoption. Relative advantage, competitive pressure, security and privacy, sharing and collaboration culture and social influence based on adopter's opinions were found to be the top five influential factors.
Cloud Computing Adoption in Nigeria: Challenges and Benefits	Adoption of Cloud Computing	Nigeria	N/A	The research highlighted the benefits and challenges of adopting cloud computing and provided recommendations on how to improve the adoption and usage of cloud computing in Nigeria.

Research title, author and year	Study Type	Country	Theory/ framework used	The aim of the research/ findings
(Muhammed, Zaharaddeen, Rumana, & Turaki, 2015)				
Understanding determinants of cloud computing adoption using an integrated Technology Acceptance Model and Technology, Organisation and Environment model **(Gangwar , Date , & Ramaswamy, 2015)**	Adoption of Cloud Computing	India	Technology Acceptance Model and Technology, Organisation and Environment model	The study extended Technology Acceptance Model using a set of Technology, Organisation and Environment variables relevant to cloud computing adoption as external variables of Technology Acceptance Model. The variables added include relative advantage, compatibility, complexity, organizational readiness, training and education, and top management commitment. The research found that cloud computing adoption is dependent on organisational infrastructure and cloud computing expertise.
Why do Companies Adopt or Reject SaaS? Looking at the Organizational Aspect **(Mangula, van de Weerd, & Brinkkemper, 2015)**	Adoption of Software as a Service	Indonesia	Technology, Organization and Environment framework	The research investigated the influence of three organisational factors which are top management support, organizational readiness, and organizational size on the adoption of SaaS. The research found that top management support has a positive influence on the adoption of SaaS. Organizational readiness and organizational size were found to have negative effects on the adoption of SaaS.
Task-Technology Fit (TTF) Model to Evaluate Adoption of cloud computing **(Tripathi & Jigeesh, 2015)**	Adoption of Cloud Computing	India	Task-Technology Fit (TTF) Model	The research attempts to evaluate the performance impacts of cloud computing technology in organisations. The research found that production timeliness, system reliability, ease of use, authorization to access data, automation and training positively influences the individual performance through cloud computing technology usage.
Predicting motivators of cloud computing adoption: A developing country perspective **(Sharma, Al-Badi, & Govindaluri, 2016)**	Adoption of cloud computing	Oman	Technology Acceptance Model	This research extended the Technology Acceptance Model with three new constructs namely computer self-efficacy, trust, and job opportunity. The research found that job opportunity, trust, perceived usefulness, self-efficacy, and perceived ease of use are the best predictors of cloud computing adoption.

Table 5b: Research on acceptance, adoption or usage of Software as a Service in other sectors
Source: Author

3. ANALYTICAL FRAMEWORKS

Applying theories effectively is of high importance in creating new knowledge in Information systems research (Lim, Saldanha, Malladi, & Melville, 2013). It is a common practice in the field of Information Systems to use theories as analytical devices or as objects of validation and development (Mlitwa, 2010). Information Systems researchers use theories from diverse disciplines including Psychology, Economics, Strategy, and Organization Science, Communication, Linguistics and Sociology. Theories provide guidance on analysis and they are used to predict a phenomenon. Theories are also used to provide or propose explanations of causes or influences, design research questions, guide the selection of relevant data and interpret data (Reeves, Albert, Kuper, & Hodges, 2008; Lim, Saldanha, Malladi, & Melville, 2013). Theories provide researchers with different views of complicated problems and social issues allowing them to view the data from different angles thereby giving them a framework to carry out their analysis and allowing them to generate hypothesis or propositions. It also allows researchers to be able to describe and explain what is happening (Reeves, Albert, Kuper, & Hodges, 2008).

Contrary to the findings from prior studies that there is no dominant theory in IS research, Lim, Saldanha, Malladi, & Melville, (2013) found that there are some dominant theories in IS research. Out of 174 theories identified by Lim, Saldanha, Malladi, & Melville, (2013) as theories used in IS research, 101 (58 percent of total) theories are only used once in research publication while the top 5 theories account for 21 percent of total theory usage in IS research. The top 20 percent acounts for 53 percent of the total theory usage in IS research. Lim, Saldanha, Malladi, & Melville, (2013) identified top 10 theories used in Information Systems by the two leading Information Systems Journals, MIS Quarterly (MISQ) and Information Systems Research (ISR). Soper & Turel, (2016) also identifeid 32 most commonly used theories in the field of Information Systems in North America. The researcher selected three theories from the lists of top 10 theories used in IS research by Lim, Saldanha, Malladi, & Melville, (2013) and investigated them for appropriateness for this research. The researcher found that the selected theories were also among the 32 most commonly used theories in the field of Information Systems in North America by Soper & Turel, (2016). This shows that the use of the selected theories in the field of Information Systems is persistent, consistent and relevant. These theories are: (1) Resource Based View Theory, (2) Institutional Theory and (3) Activity Theory. Two other theories used by researchers in prior studies to investigate students' use of technology in higher education institutions were also investigated for appropriateness for this research. These theories are: (1) Student Involvement Theory and (2) Astin's Input-Environment-Output (IEO) Model. Upon investigation of the suitability of the identified theories, this research used activity theory as the main theoretical lens to guide the researcher in his investigation of the phenomenon of interest. This assisted in eliciting answers to the research questions and developing the proposed framework. Activity theory provided a better understanding of how students (subjects) use the available SaaS offerings (tools) to improve their academic activities (objects). With a better understanding of how the tools are helping students to improve their academic activities, the researcher uncovered the issues and complexities associated with the use of SaaS in academic

settings. The use of activity theory assisted in answering the research questions and developing the proposed framework. Although, the student involvement theory and Astin's IEO model were not used as the main theoretical lens in this research, the researcher found them relevant for this research and their concepts and terminologies were used in this research to better understand how student's involvement in academic and social activities on campus affects their academic performance.

3.1 Resource Based View

The resource based view theory assumes that organisations possess resources which gives them competitive advantage and improved performance over a long period. An organisation with valuable and scarce resources not available to other organisations gains competitive advantage and performs better than the other organisations. RBV explains the difference in performance between firms (Gaya, Struwig, & Smith, 2013). RBV theory empowers IS researchers to think about how a firm's strategy and performance relates to Information Systems. ICT also provide researchers with a framework to evaluate the strategic value of information systems resources. It allows researchers to differentiate between various types of Information Systems and between IS and non-IS resources. The RBV assumes that e accumulation of valuable, rare, inimitable and non-substitutable (VRIN) resources give an organisation competitive advantage and economic rent which leads to improved performance (Lin & Wu, 2014).

One of the difficulties encountered by researchers in using the resource based view is that there is no unified definition of resource and different researchers have used different terms to define an organisations' resource. Some of the terms used by these researchers are competence, skills, strategic assets, assets and stocks (Wade & Hulland, 2004). Thus, it is important for every researcher using RBV theory to define what resource means in the context of their research. In this research, resources are ICT assets used to support academic activities and the skills possessed by students, lecturers and IT staff to use these resources effectively. Even though some researchers have found RBV to be a useful research tool, RBV has been criticized by researchers for weaknesses such as its lack of managerial implications, infinite regress, limited applicability, impossibility to achieve sustained competitive advantage (SCA), the value of a resource is too ambiguous, the resource based view is not a theory of the firm i.e. There is a disagreement amongst researchers on whether RBV qualifies as theory of a firm or not with some arguing that it insufficient as a theory of a firm and others arguing that it could be considered as a new theory of a firm, the definition of a resource is unworkable and the valuable, rareness, inimitable an non-substitutable plus having an organisation that can absorb and apply them in place (VRIN/O) criteria is not necessary and is inadequate for SCA (Kraaijenbrink , Spender, & Groen, 2010). Upon investigation, this research found that RBV is not suitable for this study because the focus of RBV is on the firm and this research's primary focus is the students and how they use SaaS for academic activities. Since the focus of this research is on the students and not the institution or the resources alone, the RBV theory was found to be unsuitable for this research. Other reasons why RBV is not suitable for this research are its limited applicability, the inability to generalise the results of studies based on RBV and the lack of clear definition of what resource means. For example, it could be argued

that the students themselves are resources of the institution. It is insignificant to this research because this research is looking at students as users of the resources and not as resources themselves. Furthermore, the RBV was less suitable for this research because competitive advantage is the focus of RBV and competitive advantage is not the main reason why HEIs are using SaaS. For most HEIs, there are limited resources so, it is more of a performance issue rather than competitive advantage. RBV is very much driven by competitive advantage like non-replicable resources, non-substitutable resources and unlimited scarce resources to attain competitive advantage. Since SaaS is easy to replicate and it is also easy to substitute, RBV is less applicable to the higher education environment in Nigeria and South Africa.

3.2 Institutional Theory

Institutional theory emerged from the work of John W. Meyer and his colleagues in 1977. Institutionalists seeks to illustrate the basic features of the entities being examined are a result of the cultural environments of the institution and not a norm outside the social system (Buchmann & Parrado, 2006). Institutional theory is based on history and tries to explain rather than evaluate and judge the possible future outcomes. Institutional theory has been used by previous studies in the adoption of innovations by institutionalized organisations. Institutionalisation is an avenue for instilling value which promotes stability and consistent organisational structure over time. Institutionalisation can be defined as the process by which actions are repeated over time and given similar meanings by the actor and other. Institutional theory is a social process in which a shared definition of social reality is accepted by individuals (Scott, 1987) and it is a popular and powerful tool used in explaining both individual and organisational actions (Dacin, Goodstein, & Scott, 2002; Cai, 2013). Institutional theory emphasises history as it is assumed that it is impossible to understand an institution without an understanding of the history of the process in which the institution was produced. There three phases in the process of internalisation. The first phase is the externalization in which the actors or members of the institution take actions. The second phase is objectivation in which the actors interpret their actions to have an external reality that is separate from themselves. The third phase is internalization in which the actors internalise the objectivated world (Scott, 1987). Once an action is internalized and agreed to be a norm in the institution, it becomes legitimate and it is used as a standard within the institution. Institutional theory could be useful in explaining why and how HEIs differ in the way their academic activities are organised. One of the criticism of researchers about institutional theory is that it is almost inherently static while the world it seeks to explain remain inherently dynamic. Another criticism of institutional theory is that it ignores the heterogeneity of organisations and treats all organisations as if they are the same (Meyer & Höllerer, 2014). After careful investigation of institutional theory for suitability as the framework for this research, the researcher found that institutional theory is not suitable for this research because of its focus on organisations and not on individuals. Another reason why Institutional theory was not used for this study is its failure to differentiate amongst different organisation. That could lead to a lack of robust comparison amongst the different HEIs selected for this research. After concluding that institutional theory was not suitable for this research, the researcher investigated activity theory and found it suitable for this research

because of its ability to focus on individuals, organisations, tools, environment and how work is shared among each actor in the activity system. A more detailed discussion of activity theory will now be provided.

3.3 Activity Theory

This research used activity theory to uncover the complexities and dynamics involved in the use of SaaS in higher education environment. Activity theory emerged as an approach in Russian psychology and later became popular amongst researchers in different countries across different disciplines (Clemmensen, Kaptelinin, & Nardi, 2016). Activity theory has been used by researchers in various fields including information systems, psychology, management, health care, culture and education (Hashim & Jones, 2007).

Activity theory assumes that activity is primary and that human thoughts lead to actions. It also states that images, intentions, goals, cognitive models and abstract notions such as definition and determinant are a result of people's actions (Morf & Weber, 2000). Activity theory breaks down an activity into three components which are subject, tool and object. The subject refers to the person or people being studied while the object refers to the activity that is being carried out (Daniels, 2004). The tool refers to the mediating device that is used to carry out the activity (Mlitwa, 2007). In this research, the subjects were students. The objects were the various activities such as assignments, meeting, communication, email and collaboration etc. that the students are undertake. The tools were the different SaaS offerings. Engeström, (2001) added two extra components which are rules and division of labour. The rules are a result of social conditioning and they help to determine how individuals may act and the reasons behind their actions. The division of labour allows responsibilities to be shared among members of a group to achieve an action. This is useful during group works at it will allow students to divide the tasks needed to complete the group work amongst themselves. Activity theory can assist in shifting the focus of analysis from the technological tool itself to the way that tool is used by people to achieve their goals (Elizabeth, 2010).

3.3.1 Origins of the activity theory

There are three theoretical generations of cultural historical activity theory (CHAT) (Engeström, 1999). The first generation or the foundational generation was inspired by Marxist philosopher and is based on the concept of tool mediation (Vygotsky, 1981). The second generation of activity theory which was also inspired by Marxist linked activity theory to the concept of division of labour (Leont'ev, 1981). The third generation of activity theory shifted focus from the individual to the collective (Engeström, 1987). To provide a better understanding of activity theory and how it fits in this research, the three generations of activity theory will be discussed and applied to HEI learning activities. The reason why the third generation was selected for this research will also be explained.

3.3.2 First generation activity theory by Vygotsky, (1981)

Human interact with their environment through the mediated use of social tools and sign such as symbol or language. The focus of Vygotsky's educational psychology was on how to assist learners to learn and teaching them how to make use of the most relevant knowledge available to them in any situation (Edwards, 2014). In an academic environment, a student interacts with other students and lecturers and learning is done through the interactions.

3.3.2.1 Mediation

One of the beliefs of Vygotsky, (1981) is that instructions are meant to assist learners in understanding how to use artefacts in an effective way. He also believed that mediation is progressive and he focused on how to achieve qualitative transformation using artefacts or tools. An important aspect of activity theory is the transformation of individuals and communities. In the context of this research, the transformation of individual students and the entire HEIs is the point of focus. How SaaS can transform individual students and improve the academic environment by making it conducive for learning is explored in this research. By mediation Vygotsky, (1981) refers to the use of tools to interact with the world indirectly. The mental processes of an individual as well as historical, cultural and social process are connected by mediation. Figure 11 is an illustration of Vygotsky's simple triangle. The main components of the Vygotsky's simple triangle are subject, object and mediating artefact.

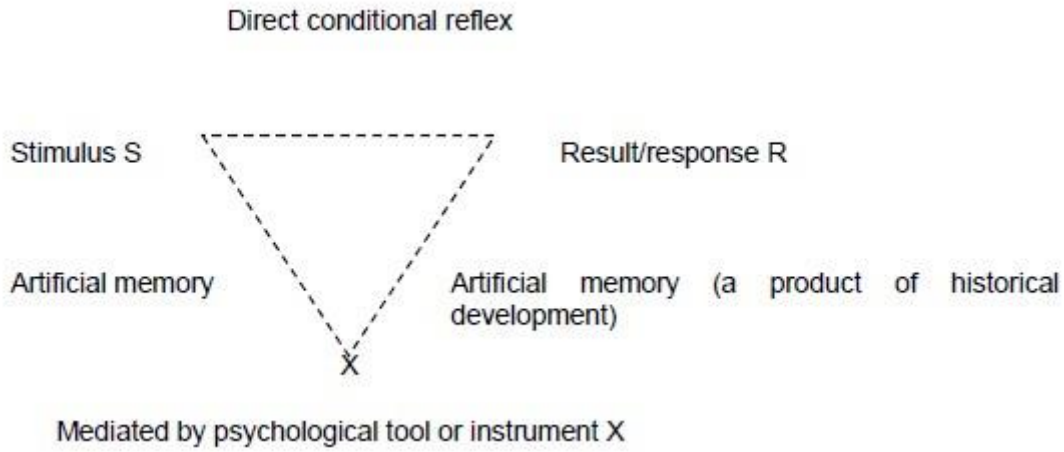

Figure 11: structure of a mediated act adapted from Vygotsky, (1981, Pg. 138)

3.3.2.2 Zone of proximal development (ZPD)

The main idea of this concept is that learning generally occurs when the learner interacts with someone who has more knowledge than the learner. This could be fellow students, tutors or lecturers (Vygotsky, 1981). Learning can occur in a theoretical situation i.e. in an academic environment, practical situation, i.e. in a work environment or through social interaction. This research focuses on learning in an academic environment and social situation because students mainly learn in academic and social environment. The zone refers to the difference between what the learner can do on his/her own and what the learner learns from the person who has more knowledge than the learner be it a fellow student, tutor or lecturer. To show that learning is

a progressive process, with time, the learner becomes more knowledgeable about the subject matter or situation and can apply such knowledge to similar situations. The focus of the first generation of activity theory is the individual. People from different cultural backgrounds develop different capabilities due the difference in activities (i.e. academic activities or social activities) and institutions (i.e. school, home or work). These differences may sometimes lead to conflicts between different institutional practices. In HEIs, some of the learning occurs using tools such as SaaS applications which aids the teaching and learning process between the person who is more knowledgeable about the subject matter and the learner. In 1981, the work of Vygotsky was extended by one of his students Leont'ev who developed the second generation of activity theory by adding the concept of division of labour and shifting the focus from an individual to the collective (Clemmensen, Kaptelinin, & Nardi, 2016).

3.3.3 Second generation activity theory by Leont'ev, (1981)

The concept of labour by Marx who believed that human activities begin with labour was used by Leont'ev to develop his idea about activity (Engeström & Miettinen, 1999). The collective nature of labour is a proof that we are humans and the making and using of tools is an important aspect of labour. Division of labour is an essential characteristic of the collective nature of activities. There is a difference between action and activity. An action in one activity in a particular-situation could be an action in a different activity. For example, a lecturer gives his students an assignment using a SaaS application. The students are required to log on to the SaaS application, view the questions of the assignment, answer the questions, and submit their answers to the questions for the lecturer to mark the assignments. Each of those actions can be an activity on its own but the goal of submitting an assignment cannot be completed if only one of the activities is carried out. All those activities need to be completed as a collective for the goal to be achieved. Logging on to the SaaS application was an action which was aimed at a particular-goal which was to submit an assignment which will serve as part of the continuous assessment of the students. The three-tiered scheme was proposed by Leont'ev's (1981). These schemes were (1) action i.e. motive, (2) activity i.e. goal and (3) operations i.e. instrumental conditions (Engeström & Miettinen, 1999). The motive is the reason why the activity is being carried out to achieve a goal. Action helps in realising the goal while the tools or artefacts used to achieve the goal are the instrumental conditions.

3.3.3.1 Differences between action and activity

An action is a part of an activity. Actions are directed towards a goal while activity is a combination of several actions. The conditions under which activities occur are referred to as operations. An action can either fail or be successful. It can lead to innovation or it may be disrupted. Activity on the other hand is a complete system made up of individual actions. During an activity, external processes are transformed into mental processes because individuals learn from their environment. This stage is referred to as internalization. For learning to occur, internalization (process of using information) and externalization (process of acquiring information) must take place. One of the limitations of the second generation of activity theory is that the societal and collaborative nature of individual actions is not explained. Actions were also not clearly identified as parts of

an activity. For a subject to complete an activity, the activity must include goals, means, the process of developing the object, and the outcome or result of the activity. The need to overcome the limitations of the second generation of activity theory motivated Engeström to develop the third generation of activity theory in 1987.

An activity is made up of actions. An action on the other hand consists of operations. An operation is the automatic steps needed to complete an action. For example, to conduct a class, the lecturer and the students need to be present in the class room at a particular-time. The action or goal of the lecturer is to teach the students and the action or goals of the students is to learn from the lecturer. To achieve these, the lecturers and students need to be present in the classroom and carry out their respective actions. There are different possible activities in the class room such as teaching which is performed by the lecturer and learning, writing or listening which is performed by students. The actions of teaching, listening, writing, and learning by the students and lecturer in the example is part an activity. Figure 12 shows the hierarchical levels of an activity.

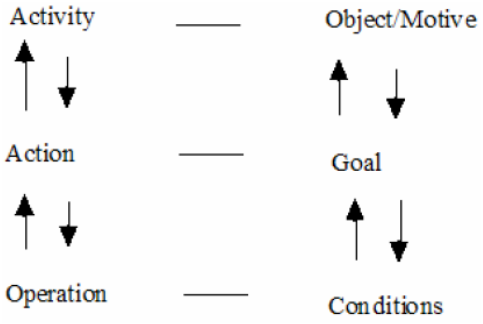

Figure 12: Hierarchical levels of an activity adapted from Leontev 1979

3.3.4 Third generation activity theory by Engeström, (1987)

The works of Vygotsky, (1981) and Leont'ev, (1981) were extended by Engeström, (1987) to develop the third generation of activity theory. The social and cultural aspects of human activities which are rules, community and division of labour by Leont'ev, (1981) were used together with Vygotsky, (1981)'s explanation of the mediated relationship between the subject and the object. Engeström, (1987) focused on the entire system instead of just the individual to understand all the different perspectives of the relations or voices of the participants in the entire system. These perspectives were referred to as multiplicity or multivoicedness.

The community is made up of one or more individuals with the same goals and objectives as the subject (Demiraslan & Usluel, 2008). The community defines the relationship between an individual and the environment while the relationship between subjects and the community is controlled by rules. The relationship between object and the community is facilitated through division of labour. Activity theory adds value by analysing individuals while carrying out their activities by examining their tools and how it facilitates activities based on rules, community as well as history. Activity theory is recognised by many researchers as helpful in understanding how people do things in a dynamic and changing environment. Activity theory helps to transform and improve practice in work organisations and even in education (Garraway, 2011). The third

generation of activity theory looks at activity from different perspectives and provide solutions to the limitations of previous generations of activity theory. Thus, the third generation of activity theory by Engeström was used as a conceptual framework of this research to be able to transform the way students access needed resources and to improve the academic environment for students. To situate this research in Engeström's activity theory, figure 13 illustrates the subject, object, tools, rules, community and division of labour in the context of this research.

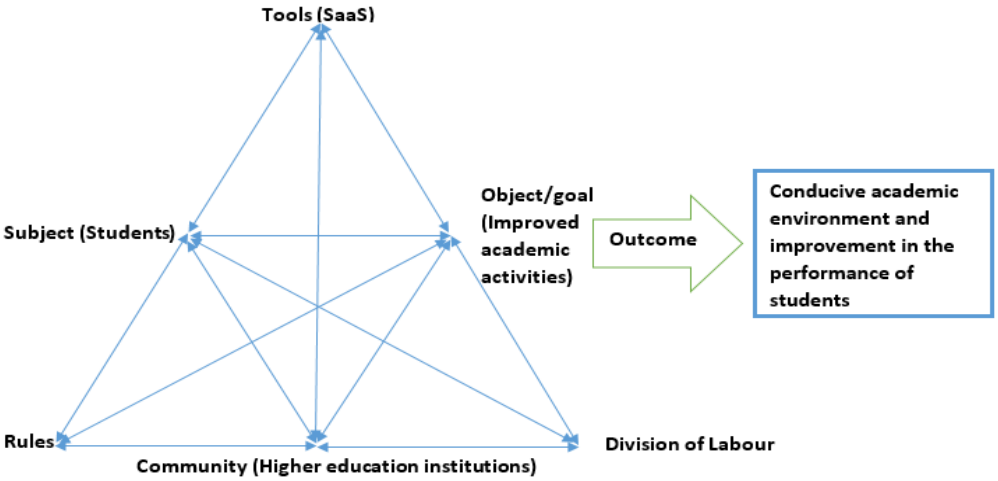

Figure 13: Engeström's expended activity theory model in a higher education institution setting adapted from Hashim & Jones, (2007)

Using this model to analyse the use of SaaS by students in HEIs, we can map the elements as shown in Table 6:

Elements of the activity system	The elements in the context of this research
Subject	Students (learning experience, learning approach, personal, administrational and educational use of SaaS, the place of SaaS in daily life, the necessity of knowledge and skills related to SaaS).
Object	The goals or motive behind the use of SaaS in the teaching and learning process for example, acquisition of knowledge and skills, problem solving, certificates, degrees.
Tools	SaaS and the tools other than SaaS. For example, computers, internet, smartphones etc.
Rules	The evaluation criteria, student's expectations, computer laboratory rules, class rules and rules of the institution.
Community	Students, teachers, school administration, ICT coordinator.
Division of Labour	The roles and responsibilities of students and teachers, cooperation among teachers, the support of administration.
Outcome	The results obtained from the use of SaaS in teaching and learning process.

Table 6: Mapping the elements of activity theory with this research adapted from Demiraslan & Usluel, (2008, Pg.459)

3.3.4.1 Transformation

Transformation of the object into an outcome is an important process in AT. Changing the object of the activity does not necessarily lead to transformation. For transformation to take place, the specific and unique features of the object should be changed. That explains the difference between change and transformation. In the context of this research, SaaS takes part in transforming the object into an outcome which can either be desired or unexpected (Plakitsi, 2013).

3.3.4.2 Contradictions and conflicts in the activity systems

Contradiction is the driving force of change and development within an activity system (Roth, 2009). Each action has the potential to transform people and conditions of life. A ZPD for individual learning and transformation can occur because of collective effort in an activity. It could also increase the possibility of an action. To understand the laws governing social change, it is important to understand the contradictions of the activity system. Contradictions show a disagreement within between two or more elements, between two or more activities or between different stages of development in a particular-activity. Contradictions can create problems if not handled constructively but they can also lead to development because of expansive learning (Demiraslan & Usluel, 2008). Contradiction is not a bad thing as it highlights the difference between two opposite activities. For example, the resolution of the contradictions often paves way for development. When there is a change in the situation of a person or the person himself, transformation is said to have taken place. Another reason for contradictions in activity systems is that there are different relationships between different activity systems. Since there are different participants in the system with different social

and cultural backgrounds, contradictions are bound to occur. If activity system is analysed as a collective, it makes it easy to identify the contradictions that may cause the system to fail. It also creates better ways of doing things. An example is the different social backgrounds of students at HEIs. Some students have prior knowledge of technology and are proficient in using SaaS technology while students without prior technology knowledge are uncomfortable using SaaS technology. Introducing SaaS into the activity systems in HEIs may possible lead to contradictions which hinders the effective integration of SaaS. To resolve these contradictions, it is important to reassess and redefine each component of the activity systems (Demiraslan & Usluel, 2008). Engeström's activity theory can be summarized with five principles.

1. There is more than one activity system and the different activity systems interact with each other. Thus, the focus is on collective systems and not individual systems.
2. The difference in views of the participants because of their different rules, tools, community, interest, traditions and division of labour is the main reason why there are changes in activity systems.
3. The dynamic nature of activity systems and the history of an activity system provides a better understanding of the problem.
4. The role of contradictions in transformation and development is that they are not problems because they often lead to innovation and positive change. They also lead to a better understanding of the system because of the different views of the different participants.
5. The system can be transformed because participants may move away from the established norms because of increased contradictions. This may lead to a complete overhaul of the system and a new belief system.

Development leads to improved systems and the old systems are replaced with new and improved systems.

3.3.4.3 Expansive learning

The contradictions of the old system and the need for a new system need to be understood. For development to take place, expansive learning needs to occur (Engeström, 2009). The theory of expansive learning states that knowledge is attained by bringing all the separate activities together to form a complete system. Engeström, (2009) suggests that questioning, analysing, modelling, examining, implementing, reflecting and consolidating should be done sequentially to be able to understand the reasons for current beliefs and existing behaviour. Understanding the reasons will allow participants to be able to question some aspects of the existing behaviour and accepted practise to come up with improved solution and a better way of doing things.

3.3.4.4 Vertical and horizontal development of the Subjects

Adapting to societal changes is what is referred to as horizontal development. Vertical development on the other hand is following a vertical path to the top of a hierarchy. People adapt to societal values and beliefs from one generation to another based on their educational background. From history, the differences in people's culture, society and background affect their level of understanding (Owen, 2008).

3.3.4.5 Polycontextuality and boundary- or border-crossing

It is important to be able to transfer one's knowledge from one situation to another to be able to adapt easily and cope with the changing environments. For example, when migrating from a traditional software system to SaaS, students who can transfer their knowledge of the traditional software systems to SaaS will find it easy to adapt to the new SaaS system. Students should therefore be trained to apply their knowledge of one system to another to find solutions to problems through existing knowledge. Boundary crossing in simple terms means applying our knowledge of one system to another system (Tuomi-Gröhn, Engeström, & Young, 2008). Boundary crossing will improve collaboration across the entire institution as it means that students can go out of their ways to solve problems from other departments or use solutions from other departments to solve problems in their own department.

3.3.5 Areas where activity theory has been used

In the field of information systems, Bodker, (1990) used activity theory to analyse levels of interaction between activities of information technology developers and that of their users. Hakkinen & Korpela, (2006) used activity theory to understand the practices of information management in health care environment and found that it provided a better understanding of activities of groups of users and provided different views of analysis of the information and users of the information as well as the dynamics between them. Crawford & Hasan, (2006) illustrated the value of activity theory in an information systems environment using various techniques of communication and collaboration. The study showed that the activity theory framework provided richness and insight into the environment being studied and was therefore the applicable framework.

In education, Mlitwa, (2010) applied activity theory in his doctoral study on the integration of e-learning systems into academic programmes in South African HEIs. He used activity theory to understand why and how educators use course and learning management systems (C/LMSs). Robertson, (2015) also applied activity theory in her doctoral study titled "Leadership development for technical and vocational education and training college leaders in South Africa: a post-graduate curriculum framework" and found activity theory relevant and useful in academic environments. Scanlon and Issroff, (2005) used activity theory to examine the current use of learning technologies in higher education. Their research was based on the students' and lecturers' experiences of technology use. Liaw, Huang, and Chen, (2007) also used activity theory to investigate the attitude of learners towards e-learning systems. They found that activity theory is a suitable

theory to use in understanding and solving problems associated with e-learning systems and the environment in which they are used.

Activity theory has also been used in studies for investigating the use of ICT in schools. For example, Lim and Hung, (2003) investigated the process of integrating ICT into schools in Singapore from a socio-cultural and pedagogical view. Demiraslan & Usluel, (2008) used activity theory to study the social, pedagogical and technological issues that affects ICT integration in schools in Turkey. They identified and analysed the contradictions within the activity systems and discussed the potential effects which Engeström referred to as 'expansive learning'. Since previous studies have successfully used AT to investigate the use of ICT in education, this study found AT to be appropriate in investigating the use of SaaS by students in HEIs with a relative lack of resources.

Activity theory is a qualitative approach that provides a different lens that can be used to analyse learning processes and outcomes. Researchers such as Barab, Barnett, Yamagata-Lynch, Squire, and Keating, (2004), Blin, (2004), Blin (2005), Brine and Franken, (2006) and Issroff and Scanlon, (2002) studied the design and implementation of learning supported by technology in different communities of practice using activity theory (Abdullah, 2014). They all found activity theory to be an appropriate theory for studies in learning communities. The consistent use of activity theory in information systems and education research makes it an appropriate theory for the current research which hopes to uncover the dynamics and complexities involved with the use of SaaS to improve academic environment for students in HEIs. The most significant limitation of activity theory is that its focus is on the individual. Thus, the extended activity theory called the human activity system by Engestrom, (2001) was used in this research and it allowed the researcher to focus on both individual and collective behaviour. Another limitation of activity theory is that the scope is wide as it covers areas such as cognition, psychology, policy studies, ethnomethodology, education, organisational studies etc. Thus, the scope can be ambiguous when compared to the scope of other theories. There is a need for a theory that will focus on the use of technology to support the academic environment in HEIs especially technologies that can help in the creation of a conducive academic environments for students. This is because proper implementation and use of such technology is important as it affects the overall experience and performance of students. This research hopes to develop a framework that will help eradicate the problems by focusing on technology use in education.

3.4 Astin's IEO Model

The Input-Environment-Output (IEO) model by Astin (1993) was also explored in this research. The IEO model allowed the researcher to understand the institutional impact of SaaS on students' development. It also allowed the researcher to understand the relationship between students' input, the academic environment and the output as illustrated in Figure 14.

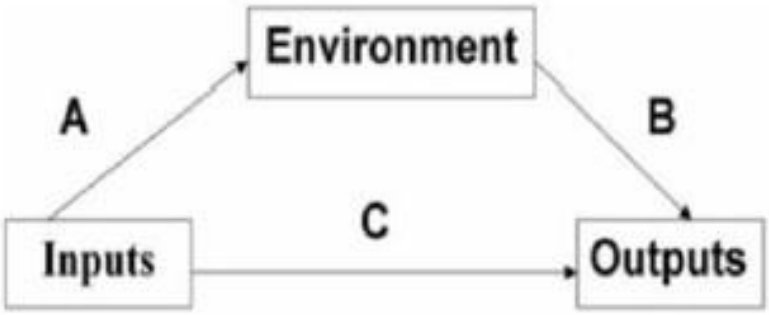

Figure 14: Astin's I-E-O Model
Source: Irlbeck, Adams, Akers, Burris, & Jones, (2013, Pg. 156)

The inputs are the resources available to the students before coming to the institution. The environment is the current experiences of the student while at the institution. The outputs are the student's learning outcomes, achievements and their circumstances after graduation (Irlbeck, Adams, Akers, Burris, & Jones, 2014). The input factors considered in this research includes the students prior experience with SaaS and related technologies, student's prior academic achievements and prior learning support available to students. The environmental factors considered in this research include staff experienced with SaaS, ICT based academic support tools available for students use, government support, support from industry and rich individuals, availability of internet services to support SaaS and the general academic and social conditions in the academic environment. The outputs are the change in academic achievement of students, development of competencies and the circumstances of the students after graduation.

3.5 Student Involvement Theory

The student involvement theory was developed by Astin, (1999). It emphasises active participation of students in the learning process. The student involvement theory states that the development of students depends on the quantity and quality of their involvement in various academic and social activities both at home and in the academic environment. Students who put a lot of effort and are actively involved in academic activities, extra-curricular activities and interact frequently with peers, lecturers, and other members of the academic community are expected to perform better and obtain optimum growth in learning and development than an uninvolved student who neglect studies, is not always on campus, does not partake in extracurricular activities and does not have frequent contact with other students, lecturers or faculty members (Astin, 1999). The student involvement theory explains the influences that the environment has on students' development and guides researchers' investigation of student development. It can also help college administrators and faculty to create a more effective learning environment (Astin, 1999). This involvement

and efforts of students in the use of SaaS is an important factor in this research. It will be difficult to achieve the goal of the research which is to create a conducive and more effective learning environment if students are not involved in the use of SaaS.

The level of student's involvement with friends, academicians and academic programs, learning support tools and academic environment determines their level of development. This research considered factors like interaction with lecturers and peers, extra-curricular activities and academic effort of students. The involvement of students in every activity on campus is very vital in their development and can lead to satisfaction among students thereby contributing towards making the academic environment more effective and conducive.

There are five basic postulates of the involvement theory:

1. Involvement refers to the investment of physical and psychological energy in various objects. The objects may be highly generalized (the student experience) or highly specific (preparing for a chemistry examination).
2. Regardless of its object, involvement occurs along a continuum; that is, different students manifest different degrees of involvement in each object, and the same student manifests different degrees of involvement in different objects at different times.
3. Involvement has both quantitative and qualitative features. The extent of a student's involvement in academic work, for instance, can be measured quantitatively (how many hours the student spends studying) and qualitatively (whether the student reviews and comprehends reading assignments or simply stares at the textbook and daydreams).
4. The amount of student learning and personal development associated with any educational program is directly proportional to the quality and quantity of student involvement in that program.
5. The effectiveness of any educational policy or practice is directly related to the capacity of that policy or practice to increase student involvement (Astin, 1999, Pg. 519).

These last two propositions provide clues for designing more effective educational programs for students and are the main educational postulates (Astin, 1999). Although, student involvement theory was not the main theory adopted in this research, it provided an understanding of the effect that students involvement in academic and social activities has on the academic performance of students.

3.6 The Propositions

This study used the deductive research strategy and used activity theory as a theoretical lens to guide the research. A set of propositions was derived from the relevant concepts identified from the activity theory. The research questions are related to the propositions. The research questions are the enquiries that the researcher should respond to while propositions are the predictions made about the answers to the research questions. In a quantitative study, the propositions are usually referred to as a hypothesis while in a qualitative study, they are called propositions (Radović-Marković & Alecchi, 2016). Being a qualitative study, this research generated some propositions and the propositions illustrate the relationships among the concepts. The propositions were discussed in relation to the empirical data that was obtained during the interviews. This research demonstrated the applicability of the activity theory during the discussion of the propositions by confirming whether the propositions are true or not for the participating HEIs.
The researcher ensured that the propositions are falsifiable and analysed the propositions against the empirical data (Sarker & Lee, 2000).

In an activity system, the term contradiction is used to indicate a tension or misalignment within or between elements of the activity systems or between the different activity systems (Demiraslan & Usleul, 2008; Behrend, 2014). The introduction of ICT into the activity systems could bring about some contradictions which can hinder the effective integration of ICT if not properly addressed. The contradictions can lead to conflicts which can be expressed as a misunderstanding, a disagreement, or diverging point of views and it may cause resistance, refusal or rejection (Bonneau, 2013). The contradictions could also create problems if they are not handled in a constructive way. If handled constructively, they could lead to development through expansive learning (Demiraslan & Usleul, 2008; Plakitsi, 2013). Thus, leading to an improvement in the overall learning experience of the students.

The terms impact and outcomes have become familiar to academic researchers over the years but the differences between the two terms are rarely discussed and sometimes poorly understood by some academic researchers (Harding, 2014). In this research, impact is the effect of an outcome over a long time. Outcome and impact differs in their reach, scope and nature. An outcome is a finite and often measurable change with a reach that is predefined and having a limited scope (Harding, 2014). For example, some of the outcomes derived from the use of SaaS are (1) the students' can submit an assignment, (2) the students' can view the marks for an assignment and (3) they can access the lecture materials. Other examples of an outcome are improved academic grades and improved communications.

In contrast, an impact can be viewed as a longer-term effect of an outcome. For example, the impact could be (1) the overall learning experience of the students, (2) an increase in confidence and (3) the fact that they can graduate.

Finding a solution to the contradictions in a constructive way could lead to innovation and a new way of doing things. It can further lead to an improved overall learning experience for the students. These empirical observations lead to the following propositions (P1, P2 and P3).

P1: If there are too many contradictions within or between the activity systems, it could reduce the impact of the tool.

P2: If there are too many contradictions within or between the activity systems, there are less chances of realising the desired learning outcomes.

P3: The contradictions in the activity systems can improve the overall learning experience of the students if handled in a constructive way.

There are rules or social norms (social, cultural and organisational factors) that regulate and influence the behaviour of people in a community (Anthony, 2012). The rules mediate the relationship between the Subject and the Community (Jonassen & Rohrer-Murphy, 1999). The rules can be either implicit or explicit and can support or constrain a behaviour (Liao & Luo, 2012). Some examples of rules in the higher education environment are the institutional policies, the rules regarding class attendance, and the rules about submitting an assignment on time (Hardman, 2005). The rules and other elements of the activity system are important resources for situated action and the activity cannot be completed successfully without them (Roth & Lee, 2007). The students engage in joint activities with the other stakeholders under some rules or social norms using the tools to transform an object/goal into an outcome. If a new system or technology is introduced (for example, the introduction of SaaS), it might lead to some contradictions if the old rule is not aligned with the new technology or the new rule. This could cause conflicts which may result in the expected outcomes not being realised (Engeström , 2001). For example, the students whose tools, rules and objects are misaligned usually experience contradictions and they fail to achieve the desired outcomes (Basharina, 2007). Thus, having a rule in place is one of the requirements to obtain a desired outcome (Engeström , 2001). The successful completion of any activity involves a Subject, the object of the activity, the tools and the actions and operations that affect an outcome (Jonassen & Rohrer-Murphy, 1999). The separation of duties (division of labour) leads to specialisation and an improvement in the desired outcome (Baran, 2010). An activity system is defined by the common outcomes that the Subjects, their organisation and their community is trying to achieve (Capper & Williams, 2004). The outcome is therefore the main reason behind an activity and it is the result of transforming an object (Kaptelinin, 2005). There are several positive outcomes mentioned in the literature regarding the use of SaaS but only a few negative outcomes were identified and mentioned in the literature. These empirical observations lead to the following propositions (P4, P5 and P6).

P4:

P4a: If the rules are not in place, there are less chances of realising the expected benefits.
P4b: If the rules are not aligned with SaaS, there are less chances of realising the expected benefits.

P5: The actual positive outcomes from the use of SaaS greatly exceeds the actual negative outcomes.

P6: The social, cultural and organisational factors within the academic environment mediate the way in which the Subjects conduct their activities.

The tools mediate the activities between the Subject and the object and they are used by the Subjects to transform an object into an outcome (Anthony, 2012). The tools are used by the Subjects to manipulate the environment in order to satisfy their needs (Capper & Williams, 2004). An activity cannot be understood without understanding the role of the artefacts (tools) in everyday life and their integration into social practice. (Jonassen & Rohrer-Murphy, 1999). Humans use the tools to change the world and in the process, they are transformed themselves (Hardman, 2005). "A fundamental assumption of the activity theory is that the tools mediate or alter the nature of human activities and, when internalized, influence human's mental development" (Jonassen & Rohrer-Murphy, 1999, Pg.67). This leads to the following proposition (P7).

P7: The use of SaaS mediates and shapes the way the students and the lecturers do their work.

Finally, in an activity system, an information is very important and the lack of an information may hinder the Subjects from achieving the desired outcomes (Capper & Williams, 2004). The information about human needs (i.e. identifying the needs and how to satisfy them) and the information about the environment (i.e. what resources are available to meet human needs and how to use the resources) are the two types of information needed to engage in an activity that is directed at achieving an outcome. The information is an unprocessed content that the Subjects need to transform into knowledge (Baran, 2010) and it can be obtained from the environment by using the tools (Capper & Williams, 2004). The availability of information in a timely manner can assist the students in making sense of the activities (Jonassen & Rohrer-Murphy, 1999). If an information is inadequate or if it is incorrectly interpreted through the culturally biased lenses of the people handling it, it may lead to deficiencies which may affect the Subject-Object-Outcome plane and prevent the Subject from realising the expected outcomes (Capper & Williams, 2004). These empirical observations lead to the following proposition (P8).

P8: *If there is insufficient or restricted flow of information within the activity system, the desired outcome will not be achieved.*

A detailed discussion of the propositions can be found in section 6.7.

4. RESEARCH DESIGN AND METHODOLOGY

I encountered several challenges at different stages of this research. The research design was challenging and it was a good way of testing my research capabilities. As I continued the journey, I realised that the theoretical stance I take was important in determining the credibility and validity of the research outcome which could be affected by any bias that I may have because of my theoretical stance. It thought me the importance of self-disclosing your bias as a researcher to allow the readers to know your stance and separate that from the actual research outcome.

Also, the researcher encountered difficulties in gaining access to the research participants. The requirements for gaining access to students and staff in the selected HEIs varied and they all had different requirements. For example, in South Africa, one of the HEIs has research ethic committee that provided permission for the researcher to access staff and students on the condition that permission was also obtained from director of human resources for staff access and the director of student affairs for student access. Obtaining the permission from the director of student affairs and the director of human resources was a lengthy process and took more time than expected. Another two of the participating HEIs from South Africa required that access to participants for interview purposes can only be granted by the registrar. This also made getting permission to access staff and students from these HEIs a daunting task. Approval was finally granted by the registrar from one of the HEIs while the third South African HEI was excluded from the sample because of the difficulty in getting approval from their registrar to gain access to their students and staff. Getting approval in Nigerian HEIs was also not an easy task but it was easier than that of the South African HEIs as both participating Nigerian HEIs had research committees that deals with such issues.

After the approvals to access staff and students were obtained from the selected HEIs from Nigerian and South Africa, getting hold of the individual participants was also a challenging process as some participants had to cancel and reschedule the interview at the last minute which made the data gathering process time consuming.

4.1 Research Methodology

This research adopted the qualitative approach to provide answers to the research questions. Face-to-face interviews were conducted to collect primary data. This research also collected secondary data from available literature, journals and books to allow triangulation. The study investigated the use of SaaS as a learning support tool in HEIs from the perspectives of learners, academic staff and IT managers in participating HEIs. The qualitative approach allowed the researcher to understand the phenomenon under investigation and describe it based on the perception, attitudes and interpretations of the participants (Bojuwoye, Moletsane, Stofile, Moolla, & Sylvester, 2014). This research used the positivist approach because it is assumed that reality is objective and its properties are measurable and independent of the instruments of the researcher (Myers, 2009). The aim of a positivist research is to validate theories to enhance the understanding surrounding a phenomenon. In this research, activity theory was used to understand the issues and

contradictions involved with the use of SaaS in HEIs, develop a framework and to answer the research questions. Astin's IEO model and student involvement theory was used to emphasise the importance of student's involvement in activities on campus. For example, if SaaS and other supporting tools are available on campus and students don't get involved in its use, they cannot enjoy benefits associated with its use. Their involvement is therefore an important aspect that could lead to their development. To minimise bias on the part of the researcher, this research adopted the objective ontological assumption in which the researcher had no predetermined dependency between social actors and entities (Saunders, Lewis, & Thornhill, 2007).

There is a tension among researchers on whether positivist research can be used for qualitative research or not. Some researchers like Orlikowski & Baroudi, (1991) believe that for IS research to be classified as a positivist research, it must be quantitative and it should have evidence of formal propositions, quantifiable measures of variables and hypothesis testing. They also believe that it should draw inferences about a phenomenon from the sample to a stated population. They however noted that descriptive studies are exempted from these assumptions. Similarly, researchers such as Klein & Meyers, (1999) believes that positivism cannot be used outside a predetermined theoretical framework to explore the contextual relationships between technology and the social phenomenon (Mlitwa, 2010). These beliefs that positivist research cannot be qualitative leads to the presumption that only phenomena that can be observed directly and recorded numerically are worthy of scientific study. This is a problem because it places serious limitations on the research that can be conducted (Griffin, 2004). Contrary to these believes, researchers such as Benbasat, Goldstein, & Mead, (1987) and Yin, (1994) have used the positivist research approach for qualitative studies and found it useful in understanding and explaining the phenomenon of interest. De Villiers, 2005 also demonstrated that a positivist research can use qualitative approach as illustrated in Figure 15. The section highlighted in red is the overlapping section illustrating that a positivist research can be qualitative and can be conducted using observations, questionnaires or interviews. This research used observation and interviews.

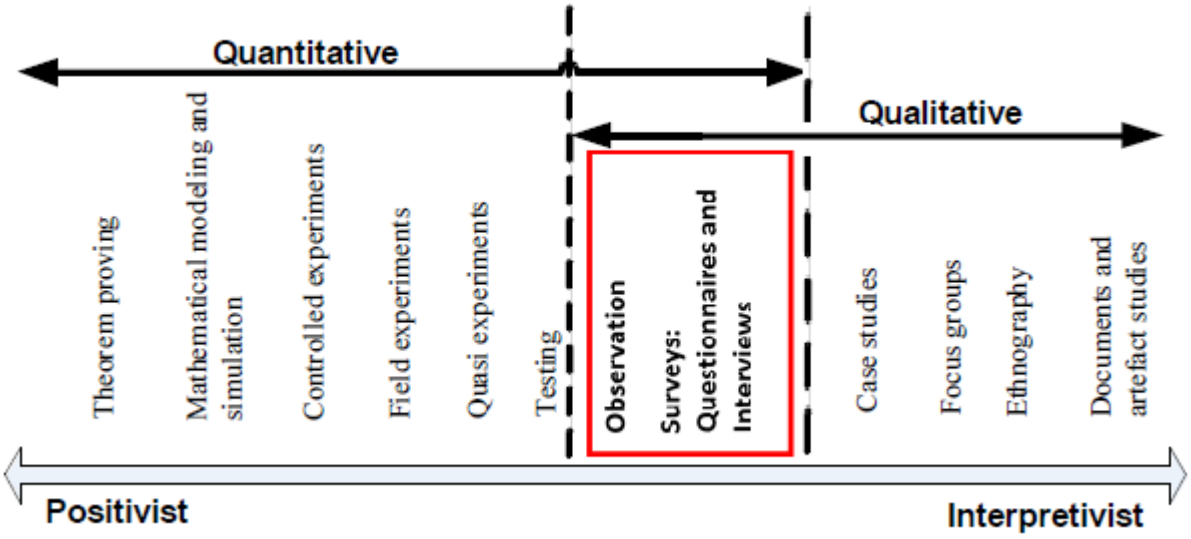

Figure 15: Research methods/strategies
Source: De Villiers, (2005, Pg. 112)

The tensions around the use of activity theory for qualitative research has also been dismissed by researchers such as Hashim & Jones, (2007) and Sam, (2012) who have successfully used activity theory for qualitative research studies. Sam, (2012) even went further to suggest that activity theory is an underused but powerful tool for qualitative researchers looking for new conceptual model to study issues about people, technology and community. With the introduction of new tools such as SaaS, activity theory emphasises that there should also be a new reality, or space of human experience in form of qualitative transformation of the action and not merely an increase in efficiency (Sam, 2012). Qualitative research can be employed to understand the new reality and activity theory is a suitable conceptual model. Activity theory is socio-constructivist and activities can only be understood in context. Several qualitative methods such as interviews, observations and historical document analysis have been employed by activity theory researchers to arrive at different views on the activity being investigated (Sam, 2012). Based on the success of prior researchers in using activity theory for qualitative research from a positivist stance, this research used activity theory as a theoretical lens and followed a qualitative-positivist approach.

4.2 Underlying Philosophy

The understanding of the underlying philosophy is essential at it provided a better understanding of the knowledge in the research area. It also provided a better knowledge of the research approach and helped to design the right methodology (Saunders, Lewis, & Thornhill, 2007). The understanding of the underlying philosophy assisted the researcher in choosing the appropriate data collection method.

4.2.1 Epistemology

Epistemology deals with the believe about the right way to investigate on the world. The process of creating knowledge and how the knowledge created is affected by the prior assumptions of the researchers are explained by the epistemology. The three main epistemology approaches are:

1. positivist approach;
2. interpretive approach; and
3. critical approach

Positivism assumes that the physical and social world exists independent of humans. It also assumes that the nature of the physical and social worlds can be understood and measured (Orlikowski & Baroudi, 1991). Another assumption of positivism is that the facts are objective and can be measured empirically. There should be a distinction between the subject and the object as well as the context (Burke, 2007). The positivist research tradition (1) gives priority to natural science research methods over other methods and (2) assumes that there are adequate similarities between natural science phenomena, social science phenomena and related research. This implies that (3) the logic of fixed relationships between different phenomena applies to all disciplines and that natural science research methods are applicable in all research (Mlitwa, 2010). Positivism is a common research approach in Information Systems (Orlikowski & Baroudi, 1991). Some critics of positivism argues that it is inadequate and inappropriate in explaining the human, organizational and societal matters relating to Information Systems (Lee & Liebenau, 1997). They also argue that positivist research focus on universal laws and it does not regard historical and contextual conditions as possible triggers of events or human action. Positivism is also associated with quantitative research and is often characterized by hypothesis formulation and the theory testing with the aim of making predictions or generalisations about a phenomenon (Myers, 1997). Although positivist research is generally assumed to inadequate for qualitative research, researchers such as Creswell, (2003) argues that positivist research can employ qualitative methods in understanding and explaining the phenomenon of interest. This research is based on the positivist assumptions that reality is objective and that reality has properties that can be measured independently of the researcher's instrument (Myers, 2009). The researcher obtained original knowledge from the students, lecturers and IT staff interviewed during the data gathering process based on their sense, experience and positive verification.

Interpretive research explores the meaning people assign to a phenomenon and the contexts in which the person acts and tries to provide an understanding of the phenomenon. The data obtained through an interpretive research is often transformed into information which is then transformed into knowledge based on peoples' interpretation and the meaning they assign to it (Byrne & Sahay, 2007). The interpretive research assumes that the world is subjective and that reality is relative and socially constructed (Guba & Lincoln, 1989).

Critical theory aims to achieve emancipation and assumes that social realities are unjust (Klein & Hyunh, 2004). It advocates for a change in the status quo and critiques repressive conditions that restrict individuals from developing to their full potential. It focuses on issues like domination, conflict, contradiction and power within organisations and societies (Howcroft & Trauth, 2005).

4.2.2 Ontology

The aim of ontology is to establish relationships between social entities and the assumptions of the world. It refers to the researcher's assumptions about how reality is constructed. The two assumptions of ontology are:

1. objectivism; and
2. subjectivism

The assumption of objectivity is that social entities are not dependent on social actors. Subjectivism on the other hand assumes that a social phenomenon is a result of the perceptions and actions of social actors (Saunders, Lewis, & Thornhill, 2007). The researcher's involvement with reality during a subjective research may cause bias. With objective research, the possibility of bias on the part of the researcher is slim because there are no predetermined dependencies between the social actors and social entities. The researcher holds the subjectivism view because he believes that truth is dependent on the subjects' experience.

4.2.3 Axiology

The judgement of the researchers based on value often affects the research conclusions. That explains why there is a possibility that when two researchers perform the same research under the same conditions, they may arrive at different results because of difference in their judgement with regards to value (Saunders, Lewis, & Thornhill, 2007). Although the researcher had preconceived knowledge of the perceived benefits of SaaS before the interview, the researcher was aware of the possibility of bias and therefore ensured that he did not in any way influence the judgement of the participants. The participants freely expressed themselves about all the questions asked without intervention from the researcher. Thus, the outcome of the research was not based on the judgement of the researcher.

The following section will discuss in detail the processes that were followed when conducting this research.

4.3 Research Approach

The process that was followed when conducting this research employed both deductive and inductive approaches. The deductive approach was employed by using the selected theories and the literature as a starting point. This research used an inductive approach by developing a framework which Nigerian and South African HEIs can use to uncover the dynamics and complexities involved with the use of SaaS in HEIs based on observations and findings during in-depth interviews (Saunders, Lewis, & Thornhill, 2007). The proposed framework will assist HEIs in their use of SaaS towards the creation of a conducive learning environment for students in HEIs. This research used interviews to obtain adequate data that would provide

a generalizable result. The interviews provided the researcher with rich data which reflects the opinions of the participants and provided the researcher with a detailed picture of how the participants go about their day to day activities using SaaS. The use of qualitative approach allowed the researcher to focus on events relating to the use of SaaS and assisted the researcher in obtaining real-life occurrences.

The qualitative research method has been criticized by researchers as biased, small scale, anecdotal, and/or lacking rigour (Anderson, 2010). The main limitation of qualitative research is that some researchers question the issues of representativeness and generalizability of the results of qualitative research because the findings from a qualitative research usually cannot be extended to a wider population with the same degree of certainty as the findings of a quantitative research (Atieno, 2009). Anderson, (2010) argues that the results of a qualitative research can be unbiased, in depth, valid, reliable, credible and rigorous provided the research is carried out properly. The ability of the researcher to approach the data analysis in a transparent and systematic way can help to demonstrate rigour in the research. The openness of the data analysis to surprises and new information can also demonstrate rigour (Skovdal & Cornish, 2015). There should be a way to investigate how convincing evidence supports the research claims. The question of validity and reliability is no longer restricted to quantitative research as they have become important concepts in qualitative research.

Other possible limitations of qualitative research include the dependence of findings on the researchers individual skills, the possibility of bias on the part of the researcher, difficulty to demonstrate rigour, the large amount of data makes the analysis and interpretation time consuming, the response of the participants may be influenced by the researcher, difficulty to visually characterize findings and present the findings due to issues of confidentiality and anonymity (Anderson, 2010).

Another limitation of qualitative data is the ambiguity in human language in which different participants might use the same word to mean different things during the interviews (Atieno, 2009). Although the researcher acknowledges these limitations of qualitative research, the researcher would like to emphasise that there are limitations with other approaches also but a good understanding of these limitations can assist the researcher in reducing the issues that may arise due to these limitations.

At this point, it is important to mention that although, there are limitations with the use of qualitative research, it also has advantages which makes it attractive as the research approach for the study. Some of the advantages of qualitative research are that it allows the researcher to conduct an in-depth examination of the research problem, the flexibility of the research framework and direction which can be adjusted based on new information, there are no restrictions on the interviews i.e. it allows the participants to freely express themselves on any questions asked, it allows the researcher to obtain information about real life experiences of the participant and although it could be difficult to generalise findings because of small sample size, the findings of a qualitative study are sometimes transferable to a larger sample (Anderson, 2010). Based on the

researchers' understanding of the limitations of qualitative research and its benefits, this research employed qualitative methods.

4.4 Research Strategy

Data analysis varies from one research strategy to another. The research strategy includes how data is collected, the tools used to collect the data, the limitations or challenges faced during the research and the outline of the research. Archival research, ethnography, survey, grounded theory, action research, and experiments are types of research strategy (Myers, 2009). Each of the research strategies could be classified as either a descriptive, exploratory or explanatory research and can be used in either inductive or deductive approach. During archival research, old documents that are organized and stored are used as sources of data. In ethnography, the researcher becomes a part of the community of participants and performs field observation to properly understand things from an insider's perspective. Questionnaires, structured interviews or observations are method employed in surveys to get data. In grounded theory, the data collected and analyzed are used for theory development. Action research makes a substantial contribution to solving academic knowledge and provides solutions to problems in the real world. Trial and error procedures are used during experiments to verify, falsify or establish if a hypothesis is valid or not.

Some of the techniques of qualitative method are interview, observation, diary methods or questionnaire. Out of these techniques, interview and questionnaire are the most commonly used techniques in qualitative research. Interviews can be unstructured, structured or semi structured. This research conducted semi-structured interviews with students, lecturers and IT staff from the participating HEIs. The interviews were all conducted face to face in a natural setting and the researcher collected rich and deep data based on the experiences of the participants. This research is multi method as it also used books, literature, institutional documents and interviews.

4.4.1 Semi-structured interview

The participants answered the questions posed by the researcher and were given freedom to discuss any other points or issue that they wish to discuss which was not mentioned by the researcher. This provided the researcher with rich and robust data which included things that the researcher had omitted. The freedom to speak freely allowed the participants to discuss issues from their own point of view. This played a big role in helping to avoid bias on the part of the researcher. The researcher recorded the interviews to remember everything that was discussed during the interview. After the interviews, the researcher listened to the recordings on several occasions and transcription was done. The researcher's role during the interview was that of a mediator and not to impose anything on the participant. The researcher was just asking questions, listening, encouraging, recording and guiding the interview process.

4.5 Population Sample

This research identified HEIs with different levels of access to resources in both Nigeria and SA using purposive sampling. Purposive sampling method was used because the researcher had knowledge of the selected HEIs and targeted the HEIs that match the classifications of resource constraint and resource rich HEIs respectively. This allowed the researcher to make comparisons between the resource constraint and resource rich HEIs and draw conclusions. The HEIs were selected based on their access to resources. One HEI was selected because it has more access to resources than the other selected HEIs. The second HEI was selected because it is a recently established institution and it would be interesting to find out how they compare with already established institutions in terms of access to needed resources. Another institution was selected because it is a privately-owned institution and comparing them with government owned HEI in terms of access to resources will provide a robust discussion for this research. The last HEI was selected because it was assumed that it has limited access to resources. Based on the criterions mentioned earlier, two HEIs were selected from SA while another two HEIs were selected from Nigeria. This research was conducted in Nigerian and South African HEIs because both countries have the basic infrastructure requirements for SaaS. Secondly, the researcher has studied in HEIs in both Nigeria and South Africa and is knowledgeable about the situations in HEIs in both countries. Kenya is another country in Africa that meets the basic infrastructure requirement for SaaS but was not covered in this research because of the scope, limited time and financial resources available for this research. Nigeria and SA are also the two largest economies in Africa (Berg & Fuchs, 2013; Stefan, et al., 2013; Buhari, 2015; Africa Ranking, 2017). Thus, other African countries are likely to be looking up to them as examples. After the HEIs were identified, participants were identified and contacted. Interviews were conducted with the academic staff (lecturers), IT managers and students from the selected HEIs for qualitative data. The interviews assisted the researcher in obtaining valid and reliable data that are relevant to the research questions and objectives from the participants. After the researcher obtained adequate data through interviews, the researcher transcribed the recordings and the transcripts were analysed using Atlas.ti. An in-depth discussion of the outcome of the analysis was then provided. After the data analysis, the results were sent to participants to verify whether the results reflected what they intended during the data collection process. The feedback from participants and new information obtained was then added to the analysis.

The researcher faced several challenges in gaining access to participants but after several attempts, access was granted in four out of the five HEIs initially selected for this research. The fifth HEI was dropped because of the difficulty in gaining access to participants from that institution.

4.6 Unit of analysis

The unit of analysis in this research was the students. This research identified the participating HEIs based on the criteria's set out in section 1.6. After necessary permission was obtained from the selected HEIs, this research identified students from each of the participating HEIs for data collection. Although, the unit of

analysis is the students, this research also collected data from lecturers and IT staff to validate and triangulate the data obtained from the students.

4.7 Summary of Research Strategy

Table 7 summarizes the research strategy adopted by this research.

Component	Approach & Short Description
Research Method	This research is qualitative in nature. The results of the qualitative research method clearly reflect the objectives of this study.
Philosophical and Epistemological Perspective	These methods applied in this study were based on the research questions the research was set to answer. A positivist approach was employed.
Key Analytical and Descriptive Frameworks	Activity theory, Astin's IEO model and Student Involvement Theory
Research Instrument	Open ended interviews were used in this research. Each interview lasted for an average of one to two hours.
Participants	In total, 20 participants were interviewed from four higher education institutions (Two higher education institutions from Nigeria and two higher education institutions from South Africa). Twelve participants were students, four participants were lecturers and four participants were IT staff.
Mode of Analysis	Thematic analysis
Type of Study	This study can be classified as an empirical and design study because it led to the development of a framework.
Unit of analysis	Students from selected Higher Education Institutions in Nigeria and South Africa.
Cross-sectional / Profile	Profile study. Interviews were carried out from July 2016 to April 2017

Table 7: Summary of research strategy employed in this research

4.8 Data Collection

Although the focus of this research is on the students and their usage of SaaS for educational activities, this research collected data from students, lecturers and IT staff for allow triangulation of the findings. Interviews were conducted and each interview lasted between 45 minutes and 1 hour. To capture the data in preparation for transcription and data analysis, the researcher recorded the interviews with permission from the participants (Skovdal & Cornish, 2015). Table 8 is the research instrument used in seeking answers to the research questions. The research instrument was formulated based on existing literature and the AT. The questions asked during the interviews and the reasons why they were asked are shown in Table 8 and categorized based on the corresponding AT element. Below each question, there are codes indicting which

group of participants the question was addressed to. S indicates that the question was addressed to students, L indicates that the question was addressed to lecturers and It indicates that the question was addressed to IT staff. In cases where more than one code appears below a question, it means that the question was addressed to all the groups whose code appears below the question. For example, S+L+IT indicates that the question was addressed to students, lecturers and IT staff.

Activity theory element	Interview Question (Student = S, Lecturers = L and IT staff = IT)	Motivation
Subject	1. What skills do you require to use Software as a Service? (S + L + IT)	This question was posed to IT staff, students and lecturers. The aim of this question was to find out whether the subjects have the necessary skills and knowledge to use SaaS effectively.
	2. Are your students equipped with the required skills? (L)	This question was posed to the lecturers to find out if the subjects possess the necessary skills to use SaaS effectively.
	3. What is the attitude of your students towards the use of the Software as a Service offering(s) you currently use? (L)	The aim of this question was to ascertain whether the subjects are interested and actively involved in the use of SaaS for academic purposes. This is because a positive attitude from the subject will bring about a positive outcome and a negative attitude will bring about a negative outcome. This question was posed to the lecturers.
	4. What is the level of acceptance of Software as a Service among students? (S)	This question was directed towards the subjects to determine the level of acceptance of the tool among them. A higher level of acceptance could improve the attitude of students towards the use of SaaS for academic activities.
	5. Does your background / prior experience before you were admitted into higher education institution have any effect on your ability to use Software as a Service effectively? (S)	This question was posed to the subjects to investigate their prior experience with technological tools such as computers, software, applications, smartphones etc. had any impact on the ability to use SaaS effectively.
	6. If you were to go back in time, what would you have done differently before you gained admission into higher education institution that would have improved your chances of using Software as a Service efficiently? (S)	This question was a build-up question on the previous question. It was also directed towards the students to find out if there was something they wish they had done before they got into HEI that would have assisted them in their use of SaaS.
	7. What are your views of Software as a Service usage in your institution? (S + L + IT)	This question was posed to IT staff, Lecturer and students to gain different views on the usage of SaaS in their institution.
Object	8. What is your understanding of Software as a Service? (S + L + IT)	This question was aimed at knowing if the participants understand SaaS and to investigate whether their understanding of SaaS has motivated them to have goals about their use of SaaS.
	9. In your opinion, how does SaaS benefit students? (IT)	This question was posed to IT staff about the object. The aim of this question was also to

Activity theory element	Interview Question (Student = S, Lecturers = L and IT staff = IT)	Motivation
		know the goals of students when using SaaS from the perspective of the IT staff.
	10. How do you feel about the cost of Software as a Service? (L + IT)	This question also helps to determine whether cost is one of the reasons why HEIs are adopting SaaS.
	11. What features influence you to use Software as a Service for your courses? (L)	The question was directed to the lecturers to identify the goals of the object from the lecturer's perspective.
	12. In your opinion, what are the advantages of Software as a Service? (S + L)	This question was directed to students who are the focus of this research to identify their goals when using SaaS.
	13. In your own words, how has the use of Software as a Service contributed to your academic performance? (S)	This question was directed to students to confirm whether some or all the goals of the object are being achieved by students in their use of SaaS.
Tools	14. What ICT based academic support tools are available at your institution? (S + L + IT)	This question was posed to the students, lecturers and IT staff to identify the ICT tools used in the participating HEIs.
	15. How easy is it accessing these tools? (S + L)	This question was aimed at investigating whether access to the tools used to mediate the Subject-Object relationship was easily accessible when needed. It was directed towards lecturers and students who are directly involved in use of SaaS for teaching and learning activities.
	16. What Software as a Service offering does your institution currently use or is planning to use? (IT)	This question was directed towards the IT staff because they are involved with the implementation of the ICT tools used to mediate Subject-Object relationships.
	17. What Software as a Service offering do you use? (L)	This question was posed to the lecturers to identify the tools they use in their course or modules for teach and learning activities.
	18. Which on premises software do you use at your institution? (S + L + IT)	This question was posed to IT staff, students and lecturers to triangulate their response and view it from three different perspectives. It was aimed at establishing whether there equivalent SaaS offerings for the on premises software and applications currently being used.
	19. Is your institution having adequate Software as a Service support tools like computers, bandwidth, etc.? (L)	The lecturers were asked this question to ascertain whether the SaaS support tools are adequately available.
	20. How will you identify the right Software as a Service offering for your course(s)? (L)	This question was asked to establish ways to identify the right tools for Subject-Object mediations.
	21. Have you used any Software as a Service offering? (S)	This question was directed at students to find out if they are using the SaaS software and applications as a tool for mediating the Subject-Object relationships in the academics.
	22. What other Software as a Service offering do you know? (S)	This question was directed to the students to determine if they are aware of any other

Activity theory element	Interview Question (Student = S, Lecturers = L and IT staff = IT)	Motivation
		SaaS tool that they could use to mediate their Subject-Object relationship.
	23. Which is the most common Software as a Service offering available at your institution? (S)	This question was posed to students to identify the most common SaaS offering used by students.
	24. What do you need to make the academic environment more conducive for students? (L)	This question was directed to the lecturers to find out what they consider necessary for effective use of SaaS towards the creation of a conducive academic environment.
Rules	25. What rules are applied to the use of SaaS and supporting tools at your institution? (S)	This question was posed to students to find out about the rules applied at their institution on the use of SaaS applications and supporting tools.
Community	26. Is your organisation already using Software as a Service? (L + IT)	The question was directed towards the IT staff and lecturers to determine the level of acceptance of SaaS.
	27. What security measures do you have for your Software as a Service environment? (S + IT)	This question was posed at IT staff and students to find out the community's steps or actions against the threats of security and privacy.
	28. How would you describe your ICT architectural capabilities for Software as a Service? (IT)	The question was directed to the IT staff to find out if they have necessary ICT architectures to support SaaS.
	29. How will you identify the right Software as a Service vendor for your institution? (IT)	This question was posed to the IT staff because they are involved with negotiations and acquisition of SaaS software and applications for their institution. They are an important party in the decision to select ICT tools for their institutions.
	30. What are indicators that a Software as a Service vendor is trustworthy? (IT)	This question is related to the previous question and was directed towards the IT staff as part of the process to select the right SaaS offering for the institution.
	31. How would you describe management capabilities of your Software as a Service environment? (S + L + IT)	The support of management is important to ensure the successful implementation of SaaS just like any other ICT implementation. This question was directed towards IT staff, lecturers and students to know if there is adequate support from management for their SaaS initiatives.
	32. Does your institution have employees with Software as a Service experience? (L + IT)	This question was directed to the IT staff and Lecturer to determine whether there are enough number of employees with knowledge of SaaS to promote the SaaS initiatives on campus.
	33. What skills assessment and training plans does your institution have for your Software as a Service initiative? (S + L + IT)	The aim of this question was to establish whether there are training and skills assessment programs available at the institution to train staff and students on how to use SaaS effectively.

Activity theory element	Interview Question (Student = S, Lecturers = L and IT staff = IT)	Motivation
	34. What steps have been taking around communicating the results of your Software as a Service initiative? (S + L + IT)	Another important step towards a success SaaS implementation is to let the community know about the benefits of SaaS and how it can help improve academic activities. This question was posed to IT staff, lecturers and students to find out whether the participating HEIs ware taking any step in these regards.
	35. Do you know the legislation and laws relating to Software as a Service? (L + IT)	The country where the institution is located is part of the community of the institution and is part of the activity system. The laws of the country that affects SaaS usage and any other ICT usage in important in the successful implementation of SaaS. This question was posed to IT staff and lecturers and the aim was to find out if there are any laws or regulations relating to SaaS and whether the higher education institution community is aware of such laws or regulations.
	36. Is there any government support for Software as a Service that can benefit your institution? (S + L + IT)	This question was directed towards the IT staff, lecturers and students because the HEI as an activity system is part of a bigger activity system which is the country and government support in form of finance, training and infrastructure is important to implement SaaS successfully.
	37. Apart from government support, which other form of support is available for your Software as a Service initiative? (S + L + IT)	Another important source of support for HEIs ICT initiatives is the industry and rich individuals in the society who are also part of the bigger activity system. This question was posed to IT staff, lecturers and students to find out if there is any support from the industry or individuals towards their SaaS initiatives.
	38. Are your lecturers using Software as a Service effectively to improve your academic environment? (S)	This question was posed to students to find out if there is a need for improvement in how their lecturers currently use SaaS for teaching and learning activities.
	39. Has Software as a Service in any way contributed towards the creation of a conducive academic environment? (S)	To know whether the institution is already reaping some dividends of SaaS implementation, this question was posed to the students.
Division of labour	40. Who is responsible in the case of data loss or breach of privacy? (IT)	This question was posed to the IT staff to identify the division of labour in terms of data loss or privacy because one of the main concerns about the use of SaaS software and applications in HEIs is the privacy and security of data.
	41. What is the attitude of your students towards the use of the Software as a Service offering(s) you currently use? (L)	This is about the involvement of students. The students are more active in courses where SaaS is used when compared to courses where SaaS is not used. The interactions among students also improved

Activity theory element	Interview Question (Student = S, Lecturers = L and IT staff = IT)	Motivation
		in courses where SaaS was used and the communicated more often and shared various academic materials using SaaS.
Outcome	42. Since the introduction of Software as a Service, did you notice any improvement in your students that you can attribute to the use of Software as a Service? (L)	This question was posed to the lecturers to find out if they have noticed any outcome or results in their students because of using SaaS.
	43. Is there any negative impact of Software as a Service on your students? (L)	Just as there two sides to a coin, there are positive outcomes and there are negative outcomes. This question was directed to lecturers to find out if they have noticed any negative outcome on their students' due to their use of SaaS.
	44. Is there any course/module that you think should introduce the use of Software as a Service to improve learning outcomes? (S)	This question was posed to students to find out if they can like the usage of SaaS to any outcome.
	45. If you have identified a course/module in question 12, why? (S)	This question is related to the previous question; its aim was to find out if they can like the usage of SaaS to any outcome.
	46. In your view, what are the disadvantages of Software as a Service? (S + L)	This question was posed to the students to find out the negative outcome they have identified in their use of SaaS.
	47. Is there any improvement in your performance that you can attribute to the use of Software as a Service? (S)	This question was posed to students to identify the direct outcomes of their use of SaaS in their academic activities.

Table 8: The Research Instrument

4.8.1 Design of the interview questions

A set of interview questions can be open ended or closed ended questions. The open-ended questions allow the interview participants to express themselves freely without any influence from the researcher. The closed ended questions limit the interview participants to a set of options leading to a possibility of bias (Foddy, 1994). The interview questions can be designed to either find out what people know, what people do, why they do certain things and what their beliefs are (Robson, 1993). The interview questions in the current study were designed to find out what students do using SaaS and what the students' belief about SaaS.

The current study deals with the usage of SaaS by students in HEIs questions. Hence, the current study used questions similar to those used in studies on usage of related technologies.

The interview questions were structured to conform to the selected research frameworks. This assisted the researcher in finding suitable answers to the research questions. The researcher designed the interview questions based on the surveyed literature and the AT. The interview questions from similar research was

compiled after the literature survey and they were modified using the AT. The questions were then validated using pilot interviews and the feedback from the pilot interviews were then used to refine the interview questions. Being a qualitative research, it was important for the researcher to ensure the credibility and transferability of the research. A credible research is a research whose findings are trustworthy and whose presented findings are accepted by other researchers and scholars. A research is transferable if the research strategy, research approach and findings of the research when applied to a similar study yields a similar result.

The pilot interviews conducted assisted the researcher in validating the questionnaire and ensuring that they would assist in obtaining relevant data needed to answer the research questions. The researcher conducted pilot interviews with 1 student, 1 lecturer and 1 IT staff from the selected HEIs. After the interviews, the researcher asked the participants for their feedback on the clarity of the questions to ascertain whether there were any questions they felt uneasy to answer and whether any important topic has been omitted. The participants were also asked if they have any other comments they wanted to add. The researcher obtained valuable feedback from the participants and the feedback was used to refine and improve the final interview questions.

The outcome of the pilot interviews helped the researcher to identify the problems and limitations of the interview design. The researcher was then able to make necessary changes to the interview questions to suitably provide answers to the research questions. The interview questions can be found in Table 8 and also in the interview guides (Appendix F, Appendix G and Appendix H). The questions in the interview guides were structured based on the participants (i.e. appendix F is for the Students, appendix G is for the lecturers and appendix H is for the IT staff). The interview guides (appendix F, appendix G and appendix H) consist of an introductory section, the rights of the participants, general questions and SaaS specific questions.

4.8.2 Interview duration

Some of the interviews were conducted face to face and others were conducted telephonically. A telephone interview allowed the researcher to obtain good information from the participants that it was difficult to access (Creswell, 2012). All the interviews were recorded with permission from the participants. Each interview lasted between 1 hour to 2 hours. For some questions, some participants provided long answers while other provides short answers. Hence the variation in interview times. The participants were given the opportunity to respond to the questions in their own words without any interference from the researcher. This helped to ensure that the researcher did not have any influence on the responses of the participants.

4.8.3 Profile of the participants

The participants are students, lecturers and IT staff from selected HEIs. The HEIs are referred to as HEI1, HEI2, HEI3 and HEI4 for confidentiality reasons. HEI 2 and HEI3 are among the leading HEIs in their respective countries. HEI3 is also one of the leading research HEIs in Africa. The students are referred to as S1, S2, S3, S4, S5, S6, S7, S8, S9, S10, S11 and S12 to ensure their anonymity. The students include both undergraduate

and post-graduate students. The lecturers interviewed are senior lecturers with experience of using SaaS ranging from 2 years to 7 years. The IT staff interviewed are managers and are directly involved in making ICT decisions for their respective institutions. Table 9 provides more information about the participants and their institutions.

Higher Education Institution	Position	Role in organisation/ Level of education	Years of experience using SaaS	Gender	Country	Budget of the Institution	Number of students	Number of lecturers	Number of permanent IT staff
HEI1	S1	3rd year student (Management Information Systems)	2	Female	Nigeria	3, 899, 999, 880 Nigerian naira (~+- 10,833,333 US dollars at an exchange rate of N360 to 1 US$)	15000	458	56
	S2	PhD student (Accounting)	1	Male					
	S3	3rd year student (Computer and Information Sciences)	5	Male					
	L1	Senior lecturer	3	Male					
	IT1	IT manager	6	Male					
HEI2	S4	PhD student (Computer and Information Systems)	1	Female		13, 999, 999, 680 Nigerian naira (~+- 38, 888, 888 US dollars at an exchange rate of N360 to 1 US$)	34000	2604	30
	S5	PhD student (Business Administration)	4	Female					
	S6	4th year student (Accounting)	3	Male					
	L2	Senior lecturer	5	Male					
	IT2	IT manager (Advisory and Implementation)	16	Male					
HEI3	S7	3rd year student (Accounting)	4	Female	South Africa	2, 994, 714, 450 South African rand (~+- 223,486,153 US dollars at an exchange rate of R13.4 to 1 US$)	29000	1629	33
	S8	Honours student (Information Systems)	7	Female					
	S9	3rd year student (Business Science)	4	Male					
	L3	Senior lecturer	7	Male					
	IT3	IT manager and Systems administrator	3	Male					
HEI4	S10	3rd year student (Application development)	3	Female		780, 601, 536 South African rand (~+- 58,253,846 US dollars at an exchange rate of R13.4 to 1 US$)	1200	40	8
	S11	3rd year student (Software Engineering)	6	Male					
	S12	3rd year student (Data Science)	4	Male					
	L4	Senior lecturer	2	Male					
	IT4	IT manager	8	Male					

Table 9: Profile of participants (The data on the budget of the institution, number of students, number of lecturers and the number of permanent IT staff is based on the 2017 academic year)
Source: Author

4.8.4 Sample design and sampling methods

To ensure that an extensive part of the HEIs in Nigeria and SA are covered to get a better understanding on the use of SaaS in these institutions, students, lecturers and IT staff from selected higher education institutions in both countries were interviewed. The students are the focus of this research but lecturers and IT staff were also interviewed to ensure triangulation of the data obtained from the students. This assisted in validating the data obtained from the students.

The higher education institutions were selected based on access to resources. The criteria used to identify the selected HEIs include the number of computers available per number of students; the number of IT staff; availability of personnel's capable of handling ICT equipment; government allocation of funds; level of expertise in purchasing the right resources; maintenance plan for available resources; internet access; and access to software.

There are noticeable differences between resource constraint and resource rich HEIs. Table 10 presents the ratio of computers to students, ratio of academic staff to students, ratio of IT staff to students, government allocation of funds, budget per students per year, percentage of students with internet access and the ratio of software to students in the participating HEIs and the average in United Kingdom and United States of America were included to provide a basis for comparison. On the ratio of computers to students, HEI1, HEI2 and HEI3 are resource constraint as there are more students having to share one computer. HEI4 has adequate number of computers because they provide each student with free laptop. This could be because HEI4 is a newly established HEI and they currently have less number of students. As the population of students in HEI4 grows, there is a possibility that the ratio of computers to students may change. On the ratio of academic staff to students, HEI1, HEI2, HEI3 and HEI4 have fewer academic staff compared to the United Kingdom and the United States of America averages and that signifies that they are all resources constraint in that area. The ratio of IT staff to students in HEI1, HEI2, HEI3 and HEI4 also show that they have limited number of IT staff and hence, they are resource constraint. In terms of the government funding, HEI2 and HEI4 are resources constraint as they have limited funding hence lower budget per students. On the percentage of students with internet access HEI1, HEI2, HEI3 and HEI4 are all resources constraint as there are occasional issues with internet. The ratio of software to students in HEI1, HEI2 and HEI3 are also very low and this show that there is inadequate access to software by students in these HEIs. From Table 10, HEI1 and HEI2 are the most resource constraint HEIs among the participating HEIs. HEI3 seems to have more resources than the other participating HEIs except for HEI4 that has provisioned adequate resources because they are a newly established HEI. Although, HEI3 and HEI4 have more access to resources than HEI1 and HEI2, they also appear to be resource constraint when compared with HEIs in the United Kingdom and United States of America.

Institution	Measure						
	The ratio of computers to students	The ratio of academic staff to student	The ratio of IT staff to student	Government allocation of funds	Budget per students per year	Percentage of student with Internet access	Ratio of software to students
HEI1	1:18	1:28	1:120	N/A	Approximately $3000	45 percent	1:18
HEI2	1:40	1:32	1:500	Approximately $38,888,888	Approximately $1000	40 percent	1:40
HEI3	1:10	1:20	1:150	Approximately $223,486,153	Approximately $5000	75 percent	1:10
HEI4	1:1	1:28	1:200	Approximately $58,253,846	Approximately $2000	60 percent	1:1
United Kingdom Average	1:4	1:18	1:38	Approximately $241,212,614	Approximately $8000	80 percent	1:4
United States of America Average	1:2	1:16	1:30	Approximately $342,629,482	Approximately $7000	80 percent	1:2

Table 10: The participating HEIs vs United Kingdom and United States of Americas HEIs based on selected measures
Source: Own research; Chin'anga & Nhundu, (2017); Heaney, (2017); Tanasychuk, (2017).

After identifying the HEIs, the researcher sent letters to each institution to request their permission to interview their students, lecturers and IT staff (See Appendix C and Appendix D). Getting the permission was a lengthy process as it took about 8 months to get all the necessary permissions. After the permissions were all granted, the researcher went to each of the participating HEIs to identify the interviewees and set up interview dates with each of them. It took about three months to get the required number of participants. The researcher then sent letters to each of the identified participants requesting their voluntary participation in the interview. Copies of these letters were also read to the participants by the researcher before the interviews and can be found in the interview guides (See Appendices F, G, and H). After the permission letters were received from the students, lecturers and IT Staff, the researcher arranged an interview date with each of them. Interview assists in gathering reliable and valid data which helps in answering the research questions and meeting the objectives of the research (Chisnall, 1997; Saunders, Lewis, & Thornhill, 2007). This research collected primary data through the interviews with the selected participants and secondary data was collected from existing literature. During the interview process, face to face interviews were conducted but a telephonic interview was conducted in some instances. In some cases, the participants were unable to meet up with the dates set for appointments and the researcher had to travel back to his base without being able to conduct the interviews as scheduled. In those cases where the interviews were cancelled, the researcher had to reschedule new dates for either a telephonic interview or skype interview based on the choice of the participant. This was to avoid the cost of travelling to the participants for the second time. After several attempts, the researcher managed to conduct all the necessary interviews and obtained institutional documents for analysis.

4.8.5 Data capturing and editing

During each of the interviews, the researcher had an electronic digital recorder which was used to record all the interviews with the permission of the participants. After the interviews, the recordings were each transcribed to a text format by the researcher (Skovdal & Cornish, 2015). The transcribed data was then analysed using thematic analysis.

4.8.6 Validity

To ensure the validity of a research, the research findings must reflect the intended objective of the research to ensure that the purpose of the research is achieved. The validity of qualitative research has been questioned by many researchers. Mason, (2002) believes that there is lack of credibility, validity, and generalizability in qualitative research. Bryman and Bell, (2011) also believes that validity, reliability and replication are more suitable for quantitative research and are not relevant in qualitative research. Although some researchers question the validity of qualitative research, other researchers believe that credibility, validity, and generalizability can be demonstrated in a qualitative research (Saunders, Lewis, & Thornhill, 2007). There are different types of validity. These are:

1. measurement validity;

2. internal validity;
3. external validity; and
4. ecological validity (Bryman & Bell, 2011).

Measurement validity indicates how well a researcher measured his/her constructs (Bryman & Bell, 2011). Internal validity is about how honest the interview participant was when answering the interview questions. For example, if the participant does not have knowledge of SaaS, this may affect the quality of data obtained from such participant. To avoid this problem, the researcher asked the participants whether they have knowledge of SaaS before setting up any appointments with them.

External validity deals with the possibility of applying the research findings to similar situations. Ecological validity is concerned with the extent to which one can generalise a behaviour observed in one context to another.

4.8.7 Reliability

Data is reliable if it can be verified by other researchers or interview participants (data sources). Reliability is the degree of influence the researcher has on the repeatability of the result (Runeson & Höst, 2009). Since the researcher is the main instrument of research in qualitative data, there is a possibility of bias on the part of the researcher. To eliminate bias, triangulation is useful as it helps to ensure reliability (Creswell & Miller, Determining Validity in Qualitative Inquiry, 2000). The researcher needs to identify, sought out, examine and account for contrary evidence during the analysis. This helps to ensure that the researchers bias does not influence his/her perception of the data and any possible insights from the data (Anderson, 2010). Reliability can be ensured if data obtained from a participant can be verified by other participants. Interviews are useful in gathering valid and reliable data that are relevant to the research objectives as well as the research questions. This research ensured reliability by obtaining multiple views from students, lecturers and IT staff and triangulating the results with literature and institutional documents.

4.8.8 Conference presentations and publications

To further validate the data obtained during the data gathering process and to verify the relevance of this research with researchers and scholars in similar areas of research, the researcher submitted and presented part of this research titled “Cloud Computing in Higher Education: A Snapshot of Software as a Service” at the 2014 6th IEEE International Conference on Adaptive Science and Technology (ICAST) conference held at Covenant University, Nigeria in September 2014. The researcher obtained valuable feedback from researchers and scholars from all over the world present at the conference. The feedback was later used to improve the output of this research.

After making necessary improvements to the research output based on the feedback from ICAST 2014, the researcher submitted another paper titled “The use of software as a service by students in higher education institutions: a systematic literature review” to the 18th Annual International Conference on Electronic

Commerce (ICEC): E-Commerce in Smart Connected World which was held in Suwon, South Korea in September 2016. The submitted paper was accepted and presented at the conference by the researcher. The researcher also received valuable feedback from researchers and scholars from academic and industry across the world that was present at the conference. The feedback was also considered and used to improve the quality of the output of this research.

After the initial data analysis, another paper titled "The use of Software as a Service to Facilitate Quality Learning Experience for Students in Higher Education Institutions" was submitted to the 4th International Conference on Next Generation Computing and Communication Technologies (ICNGCCT) held in Dubai, United Arab Emirates (UAE) in April 2017. The paper was accepted and presented at the conference. The feedback from the conference participants was useful in refining the final output of this research and it assisted in improving the quality of this research.

The conference papers that formed part of this research and were presented at conferences in Nigeria, South Korea and UAE gave the researcher a priceless opportunity to interact with world class researchers from various institutions and industries all over the world. This allowed the researcher to gain valuable feedback and suggestions which helped to improve this research. Based on the feedback from the conference participants, the researcher confirmed that this research is relevant and the problem that the research aims to resolve is also relevant and persistent. It therefore gave the assurance that the output of this research will make a valuable contribution to knowledge and the contributions would have valuable to academics and industry alike.

4.8.9 Feedback from the interview participants

A good way to triangulate the data is by validating the data with the participants. This was done by sending the transcripts, analysis, and proposed framework to participants to obtain their feedback. This assisted the researcher to confirm whether his interpretations of the participant's responses are accurate. It also assisted the researcher to check for inconsistencies and challenge the assumptions of the researcher thereby providing the researcher with an opportunity to fine tune the data (Anderson, 2010). After transcribing the recordings of the interviews, the researcher sent copies of the transcripts to the interview participants to ensure that the intended contributions of the participants are reflected in the transcripts. This helped to validate the accuracy of the data obtained during the interviews. After developing the proposed framework, the researcher also sent copies to the interview participants to validate the contents of the framework and to confirm that it contains what the participants said during the interviews.

4.8.10Data collection limitations

One of the challenges faced during the data collection process was getting hold of participants. It was difficult to get hold of some participants as some cancelled the appointments at the last minute after the researcher had already travelled to their institution for the scheduled appointment. This affected the researcher's ability to conduct face to face interviews with such participants. The #Feesmustfall protest which led to the closure

of South African HEIs (Suttner, 2015; Hauser, 2016; Greve, 2017) also contributed to the challenges faced in getting hold of the participants. Another limitation faced during the data gathering process was that the funds available for travelling to the different HEIs was limited and thus, the researcher could only go to each HEI once and any interview missed was done telephonically. This may influence the quality of data as the researcher was not able to make observations during the telephonic interviews. Travelling to the participant's institution only for the interview to be cancelled was also a waste of the limited financial resources available for this research project. Another limitation of the data collection was that there was no way to verify the level of participant's knowledge before the interview dates. The researcher had to rely on the answer provided by the participants when asked if they have knowledge of SaaS before the interview was scheduled. The level of expertise of each of the participants may therefore vary as there was no way to determine it prior to the interview.

4.9 Research Timeframe

The research activities were carried out in line with the deadlines set by the department of Information Systems, University of Cape Town. The research lasted from 2014 to 2017. The research time frame can be found in Appendix J. It shows the activities, their description, duration, and completion dates.

4.10 Ethics and Confidentiality

During the design of the interview questions, it is important to consider ethical factors such as informed consent, review board approval, confidentiality, feedback, inducement and handling of sensitive results as this may cause problems at a later stage in the research if not included from the beginning. The researcher submitted the interview questions for this research to the University of Cape Town's Ethics Committee for approval. The research design and instrument were also submitted to the University of Cape Town's Ethics Committee for approval. Furthermore, ethics clearance was obtained from the participating HEIs. The questionnaire contains a section that addressed the ethics and confidentiality issues related to this research. Before each interview, the researcher gave each of the participants an informed consent form (See Appendix E) to confirm to them that their participation was voluntary and to confirm that they were willing to participate in this research. The researcher explained all the issues and risks about this research to the respondents and ensured that they understood why this research was conducted. To motivate participants, a draw was organised and some of the participants won some incentives. The researcher convinced the respondents about the confidentiality of the information obtained from them. The respondents were also informed that their participation was voluntary and that information about them or their organisations will be kept confidential. To achieve this, raw data obtained from the interviews were not published. Only the final data was published and will be used in future publications. Respondents were permitted to use their personal email address and not their work or student email to further protect and keep their information and that of their respective organisations anonymous. The names of the institutions were also not published for confidentiality reasons.

5. DATA ANALYSIS

This research used qualitative data analysis (QDA) approaches to analyse the data obtained during the interviews with the participants. QDA assists researchers in analysing and editing data to extract the more meaningful data that are relevant to the research (Myers, 2009). There are different methods for analysing qualitative data. Some of the most commonly used ones are semiotics, narrative analysis, hermeneutics and thematic analysis. This research adopted thematic analysis because:

1. it is flexible and that makes it possible for researchers to modify it for several studies, providing rich and detailed and yet complex description of data (Javadi & Zarea, 2016; Nowell, Norris, White, & Moules, 2017).
2. it has been found useful in analyzing qualitative and textual data (Attride-Stirling, 2001).
3. it can help in reflecting and clarifying reality (Javadi & Zarea, 2016).
4. is easy to understand and easy to apply because there are few prescriptions and procedures (Nowell, Norris, White, & Moules, 2017). Thus, it assists in identifying, analyzing and reporting themes in data.
5. It is a useful method for examining the perspectives of different research participants, highlighting similarities and differences, and generating unanticipated insights (Nowell, Norris, White, & Moules, 2017). Hence, it is appropriate for this research because the researcher examined the perspectives of different research participants (students, lecturers and IT staff) and highlighted similarities and difference between the participating HEIs while also generating unanticipated insights.
6. it is useful for summarizing the key features of a large volume of data because it ensures that the researcher takes a well-structured approach to handling data therefore helping to produce a clear and organized report of the findings (Nowell, Norris, White, & Moules, 2017).

The processes of transcribing the data, familiarization with the data, searching for themes, generating codes, defining themes and naming themes was simplified using thematic analysis. Thematic analysis was used during the analysis stage in this research. Peng and Gala, (2014) noted that there are five stages in thematic analysis. These includes understanding the data, coding data, grouping codes into themes, reviewing themes and developing ontology and reporting findings. Table 11 illustrates the five stages of thematic analysis based on the work of Peng and Gala, (2014). A brief description of each stage is also provided.

Although, thematic analysis offers several advantages, it is not without its disadvantages when compared to other methods. One of the disadvantages of thematic analysis is that there are few literatures on thematic analysis compared to other methods like the grounded theory, ethnography, and phenomenology. This may create confusion for a novice researcher on how to conduct a rigorous thematic analysis (Nowell, Norris, White, & Moules, 2017). This disadvantage is not an issue for the current researcher because the researcher has experience in conducting qualitative research. Another disadvantage of the thematic analysis approach is that the flexibility can lead to inconsistencies and lack of coherence when developing themes obtained from the data. This research ensured consistency and cohesion because the researcher employed an

epistemological position that coherently underpins the empirical claims of the research (Nowell, Norris, White, & Moules, 2017).

Stage	Description of the process
1. Understanding the data	Understand the data by reading the data over and over until you are familiar with the data
2. Coding of data (open coding, axial coding and selective coding)	Identify codes in the data and systematically code the textual data across the whole data set
3. Group codes into themes	Combine and group the codes into themes, sub categories. Identify all relevant data in each theme and category.
4. Review themes and develop ontology	Verify the themes and categories correlate to the entire data set and the coded quote. Once the verification is complete, you can proceed with the generation of the ontology of the analysis.
5. Report the findings	Conduct a final analysis of the quotes that you selected, connect the results with the research question and literature. Finally, present the findings.

Table 11: The five stages in thematic analysis adapted from Peng and Gala (2014, Pg. 25)

Some of the steps identified by Peng and Gala, (2014) for analysing qualitative data are similar to the steps identified by Braun & Clarke, (2006). For example, the first stage identified by Braun & Clarke, (2006) was familiarization with data and the first stage identified by Peng and Gala, (2014) is understanding data. Both are similar and involve the researcher transcribing the data and going through the data several times to better understand the data and ensure that it is consistent with the research purpose. Both Peng and Gala, (2014) and Braun & Clarke, (2006)'s stages also involve code generation, theme generation, reviewing themes, and producing a report that correctly provide answers to the research questions.

The interview transcripts were systematically coded (thematic analysis) using the computer software Atlas.ti. The researcher started by first reading through the transcripts repeatedly as though it was a novel to familiarize himself with the data. After familiarization with the data, the researcher started with open coding by assigning initial codes to text fragments from the transcripts. Text based data is the most common form of data used in qualitative analysis (Skovdal & Cornish, 2015). Although the researcher had a selected framework for this study, the researcher did not use the framework during open coding and only used the text fragments from the interview transcripts to come up with the initial codes. The open coding allowed the researcher to come up with more codes that were later combined with the codes from the framework.

The researcher conducted open coding of the transcripts and grouped related texts under the same code. The researcher added new codes as he encountered texts that did not fit into any of the existing codes. After coding all the transcripts, the researcher went through all the open codes and identified the most common ones for further analysis. To ensure that nothing was omitted and all open codes were identified, the

researcher went through the process several times by reading through the texts repeatedly and identifying open codes.

After open coding, axial coding was conducted and codes were grouped into categories (themes) and subcategories (sub themes). Connections were made between the categories and some codes were combined whenever a link was found between them. For example, the codes access to prospective students, prior experience and early introduction to SaaS were combined into the category "students' background". The codes student attitude and student involvement were also combined to category "students' use of SaaS".

Once all the codes have been assigned into categories and subcategories, the researcher conducted selective coding by identifying the core categories that includes all the data. The researcher then read through the transcripts again to identify all the data relating to the core categories identified. The findings were then discussed based on the identified categories (thematic analysis).

Before starting the analysis, the next sections will discuss two mini case studies. The first one is on the reason why HEI3 migrated to Microsoft Office 365 from the previous onsite Microsoft exchange server. The second mini case study will be on why HEI2 opted for the SaaS version of Moodle, a learning management system instead of a server based learning management system

5.1 Mini Case Studies on Reasons for SaaS Adoption (The Case of HEI2 and HEI3)

5.1.1 Case 1: Why HEI3 migrated to Office 365 from their onsite Microsoft exchange server.

One of the reasons why HEI3 migrated its student and staff email from their onsite Microsoft Exchange server to Office 365 is because of the bigger storage space of 50Gb offered by Office 365. "*This is one of the benefits of moving the staff email and calendaring solution from the onsite Microsoft Exchange server to the Office 365 cloud based email system*" (Information and Communication Technology Services, 2016).

The infrastructure needed to ensure a high uptime (availability) with the Microsoft exchange server is costly. "*We were spending a lot of money to maintain the infrastructure and ensure high availability. With Office 365, since the infrastructure is owned and maintained by Microsoft, it makes sense for us to migrate to Office 365 because they have the resources needed and they guarantee us high availability*" (IT3).

In terms of security, Office 365 is more secured than Microsoft exchange server and there is no extra cost for the security features of Office 365. "*When it comes to security, Microsoft guarantees the security of data and they do not charge for it separately. With the Microsoft exchange server, we had to pay for any extra security feature that we needed*" (IT3).

From the students' perspective, the storage space available with the onsite Microsoft exchange server was inadequate and as a result, most students were not using their Microsoft exchange server account. Instead, they used their personal Gmail account. "*The storage space available with Office 365 is more than the one available with the Microsoft exchange server. I was not using my school email because of the limited space when we were still using the Microsoft exchange server. I was using my Gmail account which provided me with more space for free*" (S9).

Another reason why the HEI3 migrated to Office 365 from their onsite Microsoft exchange server is the frequent slow access especially for off-campus access. The students were unable to access their email due to downtime and frequent slow access when off-campus. "*There used to be difficulty in accessing emails due to the frequent slow access when off-campus. I think accessing Office 365 is better especially if your internet access is good*" (S7).

Another reason why HEI3 was convinced to migrate to Office 365 is the guarantee that the ownership of data remains with the institution. This was enforced using the SLA. Although the mailbox is now hosted by Microsoft, the ownership of the content remains with the institution and a confidentiality, privacy and ownership of data agreement was signed with Microsoft (Information and Communication Technology Services, 2016).

The assurance from Microsoft that the security measure has been improved and data would be secure is another reason why HEI3 migrated to Office 365. "*Security measures have also been jacked up, so you can rest assured that your data is secure*" (Information and Communication Technology Services, 2016, Pg.1).

The service provider (Microsoft) also guaranteed the continuity of work should anything go wrong and the systems go down. They have put a contingency plan in place for data backup. "*Should the system go down at any time, Microsoft has a contingency tool in place to automatically move the institution's data to a secondary data centre so that you can continue working without much interruption*" (Information and Communication Technology Services, 2016, Pg.1).

The ability to work from anywhere at any time is another reason why HEI3 migrated to Office 365. The reduced infrastructure cost is also a source of attraction for HEI3 when migrating to Office 365.

"*So, with top class security measures in place, reduced infrastructure costs and the ability to work anywhere in the world, Office 365 may just become your new best productivity tool*" (Information and Communication Technology Services, 2016, Pg.1).

5.1.2 Case 2: Why HEI2 opted for the SaaS version of Moodle (MoodleCloud) instead of a server based learning management system

HEI2 is a public HEI with a relative lack of resources. Hence, the main reason why they opted for a SaaS based LMS is cost savings. "*In our institution, we have limited funding and a server based LMS is too expensive for us. Moodle which is SaaS based was a viable option for us because of the cost savings from things like less IT staff needed, no need for installation, upgrades and maintenance, less hardware requirements etc.*" (IT2). HEI2 also lacks adequate number of IT staff, hence they do not have the capacity to perform the installation, upgrades and maintenance of the application in house. "*We have few IT staff and our work load is too much. It makes sense for us to outsource as much of our work as possible so that we can be able to work efficiently*" (IT2). This reflects in the ratio of IT staff to student (1:500) for HEI2 as shown in Table 10. Since they do not have enough ICT capacity, adopting a SaaS based LMS was a viable option for HEI2.

The availability of technical support 24/7 is another reason why HEI2 adopted Moodle. "*Moodle has 24/7 online support which means that our students can get help anytime anywhere. That to us is important and it is one of the reasons why we opted for Moodle. It also complements our staff shortage as we do not have to assign our staff members for support services*" (IT2).

The ability to customise Moodle to suit user needs attracted HEI2 to adopt Moodle. "*The customizability of Moodle is one thing we also considered when adopting Moodle. It gives us the flexibility to customize the application to suit our use needs*" (IT2). Finally, the anytime anywhere access of Moodle also attracted HEI2.

Another reason why HEI2 opted for the SaaS based Moodle is because of the automatic updates provided by the SaaS based version of Moodle. "*The cloud version of Moodle offers automatic updates so we don't have to worry about the update issues*" (IT2).

Furthermore, HEI2 opted for the SaaS based version of Moodle because it is mobile friendly and supports several operating systems including Microsoft windows, android, and Apple iOS. "*The SaaS based version of Moodle is available via any internet enabled device such as smartphones, laptop and PDAs from anywhere at any time. It also supports different operating systems including windows, iOS and android. So, it appeals to us as the right choice of learning management system which can meet the demand of our students and allow them to learn on the go*" (IT2).

The service provide also provides storage for the SaaS version of Moodle so it allows HEI2 to save on the cost of acquiring and maintaining the infrastructure. "*It saves our institution a lot of money as the cost of purchasing and maintaining our own server is eliminated*" (IT2).

Another benefit of the SaaS based version of Moodle is that security, back and recovery of data is guaranteed by the service provider. This means that the institution does not have to worry about the security, backup and recovery of data and they can redeploy their staff to focus on other important activities. "*Things like*

security, data backup and data recovery are done by the service provider so there is guarantee that our data is save" (IT2).

5.2 Document Analysis on Nigerian and South African HEIs

5.2.1 Nigerian higher education institutions

In Nigeria, the National Universities Commission (NUC) which is a division of the Federal Ministry of Education (FME) is concerned with ensuring that the quality of academic programme in Nigerian HEIs is maintained. They are also tasked with making necessary provisions to meet the financial needs of HEIs in Nigeria from grants received from the Federal Government of Nigeria. The funding from NUC has been used to provide learning resources for HEIs in Nigeria since it was introduced in 1992. The NUC has made several efforts to encourage Nigerian HEIs to increase their use of ICTs to improve access to education and to provide Nigerian students with access to world class knowledge. The NUC and FME have championed several ICT projects in Nigerian HEIs (Aduwa-Ogiegbaen & Uwameiye, 2008). NUC has also made several efforts to train lecturers on the use of ICTs. The deployment and use of ICT in Nigerian HEIs is very low (Adelana, 2016). To demonstrate the need to transform Nigerian higher education system by improving access to resources through ICT, the executive secretary of the NUC Professor Julius Okojie mentioned that the increasing number of students and the limited number of spaces at Nigerian HEIs makes it necessary for HEIs to explore the use of ICT to improve access. He said there are about 24 million students in Nigerian HEIs and an additional 1.8 million seeks entrance into the Nigerian HEIs on a yearly basis. He also mentioned that the Nigerian HEIs only have the capacity to admit about 500,000 students. He iterated that Nigerian HEIs need to find a way to expand access to tertiary institutions and that he believes that ICT has the capability to improve the quality of students and lecturers in Nigerian HEIs (Okeke, 2015). Although there have been efforts to improve ICT usage in Nigerian HEIs, Nigerian HEIs are not coping with the constant changes in ICT because of the poor ability of lecturers and administrators in HEIs in implementing ICT assisted learning (Okeke, 2015). Because of the problem of electricity in Nigeria, NUC is partnering with an ICT firm called OMATEK Ventures to provide solar power to universities in Nigeria (Nan, 2016).

A study conducted by the Nigerian Institute of Advanced and Legal Studies (NIALS) on gaps in data privacy and security in cloud services and how to promote the adoption of cloud services in Nigerian educational system recommended that the education ministries should encourage educational institutions to have an action plan for the adoption of cloud services and to guide Nigerian schools to upgrade their ICT curriculum and courses to include cloud computing services and technologies to build the capacities of administrators, teachers and lecturers (Aginam, 2015). If this is done, it will improve the usage of SaaS and other ICTs in Nigerian HEIs.

Although, FME and NUC are making efforts to improve the usage of ICTs in Nigerian HEIs, it remains the responsibility of HEIs to adopt and implement ICTs to improve the quality of education and create a conducive academic environment. As suggested by literature, the use of SaaS is low in Nigerian HEIs. Most software

used in Nigeria are still on premises and only a few SaaS applications are being used. The majority of the SaaS applications being used are also not subject specific but general academic computing and research specific. The majority of the students are also not using SaaS effectively for academic purposes but are using it mainly for social and administrative purposes such as viewing course grades, submission of assignments, communication and sharing and documents and files. They are not really utilising SaaS in conducting experiments or providing solutions and solving problems (Usluel, Mumcu, & Demiraslan, 2007). Thus, the usage of SaaS is still very low in Nigerian HEIs. The poor usage of SaaS can also be attributed to the lack of technical support, lack of ICT knowledge and lack of training and awareness of SaaS. These affects both students and lecturers alike as some lecturers also avoid using SaaS for their courses because they lack ICT knowledge, technical support and training. To improve the usage of SaaS in HEIs, the dynamics and relationships between the ICT tools, lecturers, students, HEI management, institutional culture, the educational programs and the should be considered (Sutherland, 2004; Demiraslan & Usluel, 2008) as they all impact on successful implementation of SaaS. This research found activity theory relevant in resolving the conflicts and complexities involved with these dynamics in both Nigerian and South African HEIs.

5.2.2 South African higher education institutions

In South Africa, Universities South Africa (USAf) is the organisation tasked with ensuring that quality teaching and learning takes place in South African HEIs (Universities South Africa, 2016c). USAf is also responsible for ensuring that HEIs in South Africa are provided with adequate resources. Other tasks allocated to USAf are ensuring that:

1. there is access to HE for all qualifying students irrespective of their social, cultural and economic background,
2. HEIs play a significant role in the socio-economic and cultural development of South Africa
3. South Africa's HE policy is informed by quality research and is based on evidence
4. the HE sectors in South Africa attracts talent from all over the world and
5. the value of HEIs is realised and understood by South Africa (Universities South Africa, 2016c).

Although there are efforts by USAf to ensure that HEIs in South Africa are provided with adequate resources, resource allocation in South African HEIs is inadequate because there has been a steady decline in government funding (Universities South Africa, 2016d). This leaves some South African HEIs struggling to provide adequate resources needed for teaching and learning.

The Higher Education South Africa (HESA) is another organisation that supports HEIs in South Africa towards the advancement of teaching, learning, research and community service. HESA is also tasked with designing and implementing initiatives aimed at assisting South African HEIs in building their capacities and using economies of scale to improve access to available resources for South African HEIs. HESA also aims to promote and improve collaboration and information sharing among South African HEIs and similar

organisations, advance the educational sectors interests by participating in national structures and provide updated and relevant information concerning HE in South Africa for effective decision making.

Several ICT projects have been initiated by USAf and HESA to improve access to resources in HEIs in South Africa especially in rural and previously disadvantaged HEIs. An example of such projects is the Rural Campus Connection Project (RCCP) (A 28 million Rands project) intended to provided ICT access networks to HEIs in rural areas (Universities South Africa , 2013). Like the situation in Nigerian HEIs, although efforts are being made to improve access to resources in HEIs in South Africa, the reduction in government funding and increasing number of students have continuously strained the resources available for teaching and learning in HEIs. This research suggests that SaaS can assist in improving access to needed ICT resources and assist in promoting and improving collaboration as well as information sharing among South African HEIs and similar organisations. This research found that usage of SaaS is low in South African HEIs although the usage is higher than that of Nigerian HEIs. South African HEIs are also using SaaS for general academic computing and communication. They are not using subject specific and research specific SaaS applications as expected.

5.2.3 Method

The participants were selected from two Nigerian HEIs and two South African HEIs. One of the selected HEIs from Nigeria is a public HEI while the other one is a privately owned HEI. In South Africa, one of the selected HEIs is assumed to have access to more resources than other selected HEIs while the other HEI is a newly established HEI. In all the selected HEIs, one lecturer, one IT staff and three students were interviewed making it a total of 10 interviews from the Nigerian HEIs and another 10 interviews from the South African HEIs. All the participants had knowledge of SaaS and could explain the meaning of SaaS in their own words. Further details about the participants and their institutions is provided in Table 9. The accessibility of resources in the participating HEIs compared to UK and USA averages is provided in Table 10. The researcher ensured that the selected IT staff were the head of ICT in their respective institutions to ensure that they have a wide background of the entire ICT of their institutions. Thus, the researcher found it sufficient to interview only the head of ICT from each HEI as they are involved with every decision regarding ICTs. Similarly, the lecturers interviewed were senior lecturers with good knowledge of their institutions ICT and SaaS. This was to ensure that they have broad knowledge of their institutions ICT and relevant experience with SaaS. Thus, selecting one lecturer from each of the participating HEIs was sufficient for this study.

6. RESEARCH ANALYSIS AND FINDINGS

This chapter discusses the research findings and it is structured using the elements of the activity theory. I understand that activity theory is more than just the six concepts as it includes the relationship among the concepts as well as the contradictions that exist between and within them in an activity system. I have discussed the contradictions in depth in section 6.6.

I will now discuss the themes that emerged during the thematic analysis based on the framework. At different stages of the analysis, new themes emerged and they were still reclassified under the framework.

6.1 Subjects

6.1.1 Students background

The computer and ICT background of the students played a big role on their ability to use SaaS effectively. The students who had prior experience with computers, internet, smartphones etc. found it easy to use SaaS when they got to campus compared to students with no prior experience with technologies. S1, S2, S3, S4, S5, S9, S10 and S12 are some of the students with prior experience with technologies before getting to HEI. For example, S3 and S9 both mentioned that they started using computer from their primary school days and that assisted them a lot because they were confident using SaaS. S10 also noted that she did computer science in high school from grade 10 to grade 12 and thus, it increased her confidence and ability to use SaaS effectively when she finally got to the HEI. "*I had computer science in my high school from grade 10 till matric so it really-increased my ability to use Software as a Service effectively. So, if someone is using computers for the first time in the university, I offer to help them with the basics and I tell them if it does this, do that or if it gives you this problem, just restart the computer*" (S10). S12 is another student with ICT background who noted that his prior experience gave him some advantages as he did not struggle to use SaaS when he got to the HEI.

The lack of prior experience with computers, internet, smartphones and other technologies affected students like S6, S7, S8 and S11 who mentioned that it was not easy for them when they initially started learning how to use SaaS because they did not have any prior experience with technologies. "*I think I struggled a bit when I got to the university. It was hard for me because there is no access to things like computers and internet where I come from*" (S7). Furthermore, S7 added that she is from a rural area in the Kwazulu Natal province in South Africa and did not have access to technologies because her family could not afford to buy computers, smartphones, internet, software etc. She also mentioned that even the public libraries close to her village did not have computers and internet. Thus, there was no way she could have access to SaaS. There is a clear evidence that students with no exposure to ICT find it difficult to use SaaS. There are cases of students with no prior experience from both Nigeria and South Africa hence, there is a need for government in both countries to provide ICT facilities in less privileged areas where people cannot afford their own technologies and ensure that ICT training is included in school curriculums from as early as primary school to provide students with the necessary ICT background.

S10 suggested that HEIs should provide limited access to prospective students especially those in their final year of high school to give them some knowledge of ICT and prepare them for campus life. For example, S10 suggested that prospective students should be given restricted access to Moodle without them having to register with student number as they do not have a student number yet. That will help them in getting the basic skills needed to use SaaS prior to admission and improve their confidence after admission. A lot of students are not exposed to ICT before admission into HEIs (S10). This is a problem as it affects their ability to use SaaS and other ICTs effectively when they get to HEI. This research suggests that ICT training should be introduced into schools from primary school level right through to higher education level to prepare a good foundation for the students. In HEIs the students should also be introduced to SaaS and other ICTs from the first year to build on the foundation from primary school and secondary school. For example, S10 noted that if they had been thought how to use SaaS in the first year of university, it would have been easier for them to handle all the SaaS applications they use in the third year.

6.1.2 Lecturers use of Software as a Service and perspective of Software as a Service usage in higher education institutions.

The way the lecturers use SaaS in their courses influence the students' usage. For example, if a lecturer enforces the use of SaaS in his/her course, the students have no choice than to use it. Most of the students interviewed noted that their lecturers are using SaaS applications effectively to communicate with the students and manage class activities.

S1, S3, S5, S7, S8, S9, S10, S11 and S12 all agreed that their lecturers are using SaaS effectively. "*They are doing all they can to make sure that we receive all the information and materials about our courses*" (S8). For example, S10 mentioned that their institutions email is SaaS and their lecturers email them the work done in class after every class. The lecturers also send extra support like previous tests or examinations to students for preparations for upcoming tests or examinations (S10). The lecturers also upload resources such as class notes, class videos etc. using SaaS applications like Moodle (S5). The students are also given feedback about their class performance, test or examination via SaaS applications such as Moodle (S7; S11; S12). "*The lecturers upload resources on those tools and they provide us with feedback as well*" (S11).

S2, S4 and S6 are of a different opinion. They believe that the lecturers are not using SaaS effectively. They suggest that the lecturers need to be trained on how to use SaaS effectively as some of the lecturers are not even using SaaS at all while others only use few of the functionalities of the SaaS applications. S4 added that many of the lecturers are '*sometimes very old school fashioned and used to their old ways of doing things*'. This signifies resistance to change as some lecturers are not willing to do things differently from their old ways of doing things. The findings on the perspective of lecturers with regards to SaaS usage in HEIs is presented in a summary format in Table 12.

Motivating factors	Lecturers expectations	Lecturers experience	Similarities and differences between Nigerian HEIs based on lecturers' perspectives	Similarities and differences between SA HEIs based on lecturers' perspectives	Nigerian HEIs Vs South African HEIs based on lecturers' perspectives	Lecturers suggestions and recommendations
Understanding of SaaS	The lecturers have a good understanding of SaaS and believes that it can improve the teaching and learning process. They also believe that it can help them save time	The lecturers interviewed noted that SaaS is helping them in their time management and it has improved communication with students.	All the lecturers from both HEIs in Nigeria are using SaaS for their courses. They also acknowledged that there are some lecturers who are not using SaaS for their courses.	The South African lecturers interviewed are also using SaaS in the respective courses. If was also noted that not all the lecturers in the South African HEIs are using SaaS in their courses	There is an understanding of SaaS amongst all the lecturers interviewed in both countries.	All the lecturers should introduce SaaS in their courses to ensure consistency. There should also be knowledge sharing sessions on SaaS among lecturers to encourage the ones that are not currently using it to join the band wagon
Background or prior experience with SaaS	The lecturers expect all students to have at least the basic knowledge of ICT which is believed to be enough to use SaaS effectively	Contrary to the lecturer's expectations, not all students have the basic ICT knowledge needed to use SaaS	In Nigerian HEIs, majority of the lecturers interviewed noted that their students have the ICT background required to use SaaS	The lecturers interviewed from the South African HEIs also confirmed that most of their students have the ICT background needed to use SaaS	Most students from HEIs in both Nigeria and South Africa have prior experience with ICTs. There are few students with no prior experience with ICTs in both countries	The students should be introduced to technologies from early stages as early as primary school because technology is no longer a luxury. It is now a necessity. HEIs should also set up standardized training and skills assessment programmes to identify students who does not have the basic ICT skills and provide such students with the needed training

Motivating factors	Lecturers expectations	Lecturers experience	Similarities and differences between Nigerian HEIs based on lecturers' perspectives	Similarities and differences between SA HEIs based on lecturers' perspectives	Nigerian HEIs Vs South African HEIs based on lecturers' perspectives	Lecturers suggestions and recommendations
Access to supporting tools	The lecturers assume that all the necessary tools are available for all students and expects all students to meet up with deadlines	The lecturers occasionally get reports from students who complain that they were unable to complete their tasks and assignments on time due to problems with internet access	Students from HEI2 had frequent issues with internet access. The students from HEI2 also had issues with access to the computer labs as they are sometimes occupied for tutorials, meetings, orientation and other activities which prevents other students from gaining access to the resources at that time. The students from HEI1 did not have problem with internet access as the interruptions with internet access is not regular and does not last for a long period.	The students from the South African HEIs also have problems with internet access at times but it was not reported to be a major issue like in the Nigerian HEIs.	To avoid the problem with access to computers in the computer labs, South African HEIs provides their students and staff with free devices to access SaaS and other applications. HEI3 encourages their students to access SaaS on their personal devices and provide tablets for students who cannot afford to buy their own personal device. HEI4 provides laptops for all their students regardless of their affordability. None of the Nigerian HEIs offer free devices for their students	There was no complaint about having access to computers from any South African student because they all have personal devices to access SaaS. The Nigerian HEIs can learn from this and find ways to provide their students with personal devices such as laptops and tablets to eradicate the issues of access to computers

Motivating factors	Lecturers expectations	Lecturers experience	Similarities and differences between Nigerian HEIs based on lecturers' perspectives	Similarities and differences between SA HEIs based on lecturers' perspectives	Nigerian HEIs Vs South African HEIs based on lecturers' perspectives	Lecturers suggestions and recommendations
Management Support	The lecturers expect that management should automatically support SaaS and related ICTs	The lecturers sometimes find it difficult to convince management on implementation of new technologies	In both Nigerian HEIs there is adequate support for SaaS initiatives from management. The lecturer from HEI1 did not have any issue about getting support from the management but the lecturer from HEI2 said it is sometimes difficult to convince the management about the benefits of SaaS to get them to support its implementation	In the South African HEIs, the lecturers also agreed that there is adequate support from management with the lecturer from HEI4 noted that the support from their management is because of their top management personnel's having strong ICT background	All the HEIs from both countries have the support of their management for their SaaS implementation	The management need to be aware of all the benefits and limitations of SaaS to encourage them to support its implementation. The management should also encourage all lecturers to incorporate the use of SaaS in their courses

Motivating factors	Lecturers expectations	Lecturers experience	Similarities and differences between Nigerian HEIs based on lecturers' perspectives	Similarities and differences between SA HEIs based on lecturers' perspectives	Nigerian HEIs Vs South African HEIs based on lecturers' perspectives	Lecturers suggestions and recommendations
Usage of SaaS	Like the students, the lecturers expect that all the features and functionalities of SaaS should be easy to use and understand. They expect the students to be able to navigate through the applications and understand most of the features and functionalities on their own	The lecturers are often encounter students who do not know how to use some of the features and functionalities of SaaS	The lecturers in both Nigerian HEIs mentioned that the usage of SaaS is high in their respective institutions	The lecturers from the South African HEIs also noted that the usage of SaaS is high in their corresponding institutions	Confirming what the students said, the lecturers from the Nigerian and South African HEIs also mentioned that the use of general academic computing SaaS applications is high in their institutions. As also mentioned by the students, the research specific SaaS applications are used in both South African HEIs and only one of the Nigerian HEIs use research specific SaaS applications. The lecturers also agreed with the students that the subject specific SaaS applications are not used in the Nigerian and South African HEIs that participated in this research.	The lecturers need more workshops and training on how to use SaaS. The lecturers should encourage each other to use SaaS in their courses and encourage their students to also use it

Motivating factors	Lecturers expectations	Lecturers experience	Similarities and differences between Nigerian HEIs based on lecturers' perspectives	Similarities and differences between SA HEIs based on lecturers' perspectives	Nigerian HEIs Vs South African HEIs based on lecturers' perspectives	Lecturers suggestions and recommendations
Students attitude (Acceptance of SaaS)	The lecturers expect that all students should have a good attitude towards using SaaS and should be happy and willing to use SaaS	The lecturers mentioned that students have a good attitude towards the use of SaaS and are generally happy to use SaaS	All the students from both participating HEIs in Nigeria are eager to use SaaS and have expectations that it will make their learning process easier. One of the students mentioned that SaaS will help them in getting access to original software as most of the traditional software they currently use are pirated copies	The students from the South African HEIs also have positive attitudes towards the use of SaaS.	Generally, students from both countries are willing to use SaaS and they all believe that SaaS can lead to the creation of a conducive academic environment	The positive attitude of students towards SaaS is good but that is not enough. The students also need to be independent work individually. They also need to be self-motivated and disciplined to avoid distractions due to the use of SaaS.
Benefits of SaaS	The lecturers also have expectations from their use of SaaS for academic activities. Like the students one of the lecturers interviewed never thought of the limitations of SaaS but had a lot of expectations in terms of the benefits	Lecturers also face some challenges with their use of SaaS. The problem of internet access also affects lecturers when the internet service is down	The lecturers in the Nigerian HEIs have noticed improvements in their students grades and general performance. The lecturers also confirmed that there is improved communications and collaboration, better time management	The lecturers in the South African HEIs also mentioned that there are noticeable improvements in the academic performance of their students because of SaaS usage. One of the lecturers	The lectures from both countries have noticed the benefits of using SaaS in their students. They also noted that they also noticed some benefits of SaaS as lecturers. One of the lecturers mentioned that time management is one of the most	To maximise the benefits of SaaS, institutions should provide more ICT training for their staff and students.

Motivating factors	Lecturers expectations	Lecturers experience	Similarities and differences between Nigerian HEIs based on lecturers' perspectives	Similarities and differences between SA HEIs based on lecturers' perspectives	Nigerian HEIs Vs South African HEIs based on lecturers' perspectives	Lecturers suggestions and recommendations
			and improved access to course materials among others	mentioned that even the shy students are now able to ask questions and participate effectively in group discussions via the SaaS applications	important benefits of SaaS and added that he now has more time to spend on other important academic activities	

Motivating factors	Lecturers expectations	Lecturers experience	Similarities and differences between Nigerian HEIs based on lecturers' perspectives	Similarities and differences between SA HEIs based on lecturers' perspectives	Nigerian HEIs Vs South African HEIs based on lecturers' perspectives	Lecturers suggestions and recommendations
Disadvantages	The lecturers expect that the disadvantages of SaaS should have little or no effect on their students. They expect their students to be self-motivated and independent and not get distracted when using SaaS applications	Although, many of the students meet the expectations of the lecturers and are not affected by the limitations of SaaS, some students still get distracted with unsolicited advertisement while others miss lectures intentionally because they know that the lecture materials will be available via the SaaS application	The lecturers from the Nigerian HEIs also confirmed that the internet access is sometimes not reliable hence, access to SaaS is impossible at such times.	The disruption of the internet service was also confirmed by the lecturers from the South African HEIs not to be a major issue.	The limitations of SaaS such as students intentionally missing lectures and getting distracted by unsolicited advertisement or the use of SaaS were also present in the South African HEIs. The main difference as mentioned by the students that internet connectivity is a major problem in Nigeria and not so serious in South Africa was echoed by the lecturers	Access to internet should be improved. The cost of bandwidth also need to be reduced to ensure that an average student can afford internet access when at home. One of the lecturers in HEI4 confirmed that he always instructs his students to switch of all their devices before commencing his lectures to avoid distractions and encourages all lecturers to do so as well.

Table 12: Lecturers Perspective of SaaS usage in HEIs

6.1.3 Students use of Software as a Service

6.1.3.1. Students attitude, involvement and acceptance of Software as a Service

The students are usually reluctant to use SaaS at the beginning but over time, they begin to see the benefits of it and their attitudes toward it changes (L4). "*In the beginning, they won't like it but as time goes on they would enjoy it and they will become comfortable with it*" (L4). Generally, students have good attitude towards the use of SaaS because of its perceived benefits and they are always eager to learn new technologies provided it has some perceived benefits for them (L1; L2). The students follow instructions, submit their assignments, download course materials and communicate with their lecturers using SaaS (L3). "*The students attitude is positive. They always follow instructions. They submit their assignments, download course materials and communicate with us lecturers effectively using Software as a Service*" (L3).

Acceptance of SaaS is high amongst students because of the perceived benefits of SaaS (S7; S8; S9; S10; S11; S12, IT4; L4) and the ease of use (L4). "*The usage is okay but I think it's not enough. We rely on SaaS for so many things so there need to be an increase in its use. For example, you need it in order to check your marks, to check your tutorials etc. That's how we communicate with our lectures. We also need it to send messages. So, there is no other choice, we have to use them. You can't be a student and not use them*" (S7). S1, S2, S3, S4, S5, S6, L1, L2, IT1 and IT2 are of the view that the usage of SaaS is low in their institutions. IT1 believes that usage is low because they are not yet fully incorporated into the curriculum. L1 believes some students use SaaS application because they feel it is required of them and not because they are convinced it would assist them in their learning process. L2 mentioned that they hope to see an improvement in the usage of SaaS in their institution in the next few years.

Though some students and lecturers are already using SaaS, many of the students and lecturers are not yet aware of SaaS. Some of those that are using it are not even aware that it is SaaS (S5). S6 suggested that the problem of low usage of SaaS is not about student's acceptance but because SaaS has not been fully introduced on campus (S6). The responses from the participants suggest that there is a direct link between the acceptance and usage of SaaS. Most of the participants agreed that acceptance is high but the usage is low. It can be observed that most participants in South African HEIs agreed that both acceptance and usage of SaaS are high in their institutions while their Nigerian counterparts believe that acceptance in their institutions is high but the usage is still low. "*The acceptance of SaaS is very high among students but usage is low. Students like technologies especially if it can help them in their school work*" (S8). This research suggests that Nigerian HEIs should fully implement the use of SaaS into their curriculums to improve usage.

The use of all these applications places more responsibility on students (S3) and requires them to be independent and use the applications with little or no supervision (S6). To use SaaS more effectively, the students need to be able to learn on their own (S5; S6). For example, they need to know how to use the help tools on the applications to find solutions to their problems. This will ensure that they do not waste time

looking for someone to help them. The students also need to be disciplined and use the software for things that will improve their academic performance and not just for social activities (S5).

6.1.3.2. Students need to be in control of the learning process

One of the responsibilities that SaaS places on students is that they need to be in control of their own learning process. They should be able to ask questions when they are having problems (IT1). "*With SaaS, students need to be in control of their own learning process and be able to ask questions when they are having problems. So, they need to develop the skills of knowing when to ask questions*" (IT1). The students also need to ensure that they use SaaS mainly for educational purposes (L1). The students need to be able to give priority to important tasks and avoid the features of the applications which are not needed for the academic activities. "*For me, using these software places more responsibilities on the students. It requires them to be independent and can complete their tasks and assignments with little or no supervision. Students also need to be able to give priority to important tasks because the software and applications have different features and functionalities which can let students get carried away if care is not taking thereby wasting their time and letting them waste time on less important activities*" (S3). They should also be able to decide on which features of the application are needed for their tasks to avoid being carried away with features that are not needed at that time (S6).

6.1.3.3. Not aware they were using Software as a Service

As initially envisaged by the researcher, some of the students are not able to distinguish between SaaS based applications and server based applications. Some of the students were not even aware that they were already using some SaaS applications because of their inability to distinguish between SaaS based applications and server based applications. For example, S4 has been using office 365 and Dropbox for some time but asked during the interview if office 365 and Dropbox were SaaS applications. "*I wonder if something like drop box is an example of SaaS*" (S4). Though some people are using SaaS already, many people on campus are not even aware of SaaS. Even some of those already using it are not aware that are using it (S5). "*Though some people are using it but majority of the people are not even aware of it. Even those that are using it, most of them are not even aware that it is software as a service that they have been using. They cannot really say that what they are using is software as a service*" (S5) A lot of work still needs to be done by the HEI management to improve awareness of software as a service on campus (S6).

6.1.3.4. Skills

To use SaaS effectively, users are required to have some set of new skills. This varies from one SaaS application to another. "*I think it depends on the package that you're using. I think it's important to have some database skills, some technical skills and an understanding of how the internet works*" (IT3). It is important that users have some database skills, technical skills and internet skills (IT4). Basic computer skills such as how to access the internet, how to insert a website uniform resource locator (url) and other end user computing skills are essential especially for non-ICT students (S10; S12; L4). "*Basic internet skills like*

connecting to the internet and browsing skills is needed. Another thing is that students should be able to manage documents and files. For example, they should be able to save documents, name documents, delete documents, update documents, move documents, share documents, copy documents and backup documents" (IT1).

In HEI4, the institution organises training for the lecturers to equip them with the necessary skills. The lecturers then train the students. Although, S11 and S12 agrees that most students in their institution have basic computer skills necessary to use SaaS, they noted that there is no SaaS specific training in their institution which contradicts the statements of S10 and L4. This shows that there is a misunderstanding as to what constitutes SaaS training.

Training should be given to the students to provide them with the basic computer skills like how to start up a computer, move the mouse, use the internet, type, underline word, bold, italics, copying and pasting, deleting, spell-checking, saving, uploading and downloading files and so on (S1; S2; S3; S7; S8; S9; IT1; IT3; L1; L2; L3). For example, IT3 noted that he had assisted lecturers in courses on introduction to computers and has seen students who could not do basic things like moving a computer mouse. Basic internet skills like network troubleshooting and surfing is also vital for students to be able to use SaaS (L3). Since SaaS relies on the internet, students need to be able to do some troubleshooting to resolve minor internet issues on their own and get back to work as soon as possible (S6). The problem is that it is usually assumed that majority of the students know how to use a computer but it is not true. This emphasises the need to equip students with basic computer skills. The students that need to use more specialised software that require special skills are trained by the lecturers (IT3).

"Using any software is like a project on its own so it is important for students to have project management skills to use SaaS effectively" (IT1). Time management skills is another important set of skills that the students need to possess because most of the tasks and assignments performed by students using SaaS are done by students on their own. If they are not able to manage their time efficiently, they will be unable to meet up with deadlines for submission of tasks and assignments (IT1). Students need to be independent and be able to learn on their own with little or no supervision. For example, they need to know how to use the help tools on the applications to find solutions to their problems. This will ensure that they do not waste time looking for someone to help them. Online communication skill is also important for students to use SaaS effectively (S5; S6). "*I believe that anyone who can use the internet and do things on the internet should be able to use software as a service well. So basically surfing, online and web skills are important*" (IT2). With regards to skills, the students from the participating HEIs all noted that training is inadequate, hence many students don't have the required skills to use SaaS effectively. This research suggests that HEIs should provide more training to students to equip them with necessary skills that will assist them in using SaaS and other educational technologies effectively. To make the academic environment more conducive, more ICT

resources are needed. There is a need for more computer laboratories, improved internet services, more WiFi access as well as training and assessment (L2).

6.1.3.5. Maturity of the students

The maturity of students plays a big role in their ability to use SaaS effectively. For example, older and more matured students are usually more careful when performing a task. They think twice before clicking on something unlike the younger students who just click on anything they see without thinking twice. "*I mean the older you are, the more careful you are. You think twice before you click on something. But I think nowadays with the smartphones available, the tablets available, people are not so scared to use the PCs like before*" (IT3). The matured students are also more focused and do not get easily distracted by unsolicited advertisement, social media or some features of the application. They remain focused on the tasks they intend to perform with the application unlike the younger students who may end up getting distracted by unsolicited advertisements. Self-discipline is an essential skill that can help students to avoid such distractions.

6.1.3.6. Understanding of Software as a Service

All the participants have knowledge of SaaS and could define or explain what SaaS means based on their own understanding. "*Software as a Service is the delivery of a software to multiple use by a service provider over the internet. The service provider is responsible for things like installation of the software, upgrades and maintenance. Software as a Service model allows the users to pay based on usage just like paying for utility services such as water or electricity bills. It is one of the three main types of cloud computing. The other two are Infrastructure as a Service and Platform as a Service*" (L3).

L4 defined SaaS as a software that can be accessed from anywhere and can be used to communicate and send academic materials to students. The software also allows the students to respond to communications, interact with one another and share ideas. S10 explained that SaaS allows lecturers and administrators to upload academic materials which students can access. S11 and S12 defined SaaS as a software that can be accessed over the internet with no need for installation. SaaS is the provision of software to multiple users by a service provider over the internet (S4; S5; S6; L3; IT3). SaaS is also referred to as on demand software because users can access it on demand (S3). The users can access the software using any internet enabled device and only pay for what they use. The service provider caters for things like upgrades, installations and maintenance so, the users can focus on their core activities (S6; S7; S8). S1, S9 and IT1 defined SaaS as a software that is developed and hosted by a third-party service provider who allows the users to use the software over the internet by accessing it through a thin client. The ownership of the software remains with the service provider and the users only pay per usage. For example, IT1 noted that his institution saves a lot of money during holidays when usage of SaaS is low. So, it's like they are renting the software from the service provider. "*Our institution saves a lot of money during holidays as many of our students are away and*

do not use any applications during those periods" (IT1). Examples of SaaS are Office 365, Dropbox and Google Apps for Education (S2; S3; S6).

IT2 defined SaaS as a model of software licensing on subscription basis. L2 mentioned that Turnitin is an example of SaaS application that they use in their institution for detecting plagiarism. He added that Turnitin has helped to improve the overall output and performance of both students and lecturers. The findings on the perspective of students with regards to SaaS usage in HEIs is presented in a summary format in Table 13.

Motivating factors	Students expectations	Students experience	Similarities and differences between Nigerian HEIs based on Students perspectives	Similarities and differences between SA HEIs based on Students perspectives	Nigerian HEIs Vs South African HEIs based on Students perspectives	Students suggestions and recommendations
Understanding of SaaS	Most of the students interviewed have a good understanding of SaaS and have expectations that SaaS can improve their academic performance and lead to the creation of a conducive academic environment	All the students interviewed have experienced an improvement in the academic performance and they all noted that SaaS has also made the academic environment more conducive for learning	In the Nigerian HEIs, there is a general understanding among student on the meaning of SaaS. Students from both Nigerian HEIs could explain SaaS based on their experience of using SaaS	The students from the South African HEIs also have a good understanding of the meaning of SaaS. Students from both South African HEIs also explained SaaS based on their experience of using SaaS	Students from both Nigerian and South African HEIs understands SaaS and are already using one form of SaaS or the other.	The lecturers need to use SaaS in all their courses to ensure consistency. The students should also have self-control and can avoid distractions due to the use of SaaS
Background/Prior experience with SaaS	The students expect to receive extensive training on how to use SaaS effectively before they are required to use it in their course	Although many of the students have experience with technologies, there are some students with no knowledge of technologies who only see computers for the first time in HEI. Students generally complained that the training provided is inadequate and most of the students learnt how	Most of the students interviewed from the Nigerian HEIs have prior experience with technologies.	There are some of the students in the South African HEIs who are from the previously disadvantaged communities and never saw a computer until they got to HEI.	Although, all the students interviewed in the Nigerian HEIs has prior experience with technologies, the researcher does not rule out the possibility of finding students with no ICT background in the Nigerian HEIs.	The assumption that that all students have prior knowledge of ICT before getting to HEI is not true. There are some students from poor background with no knowledge of ICT before getting to HEI. The education departments in Nigeria and South Africa should consider introducing ICT into their curriculum and make it compulsory for all learners as ICT is fast becoming a necessary tool for all disciplines.

Motivating factors	Students expectations	Students experience	Similarities and differences between Nigerian HEIs based on Students perspectives	Similarities and differences between SA HEIs based on Students perspectives	Nigerian HEIs Vs South African HEIs based on Students perspectives	Students suggestions and recommendations
		to use SaaS on their own				
Access to supporting tools	Students expects their institutions to be provide them with all the supporting tools like computers, internet, software etc. need for their academic activities	Contrary to the student's expectations, not all the supporting tools are provided and even when they are provided, they are sometimes not enough for all the students. The faulty systems are also often neglected as there is no proper maintenance plans in place which further puts a strain on the already constrained resources	Both Nigerian HEIs provide needed supporting tools like computers and internet for their students. The internet connectivity in one of the Nigerian HEIs is sometimes unreliable and it is always a problem for students to use SaaS when there is an issue with the internet connectivity.	The South African HEIs also provide their students with the needed supporting tools like computers and internet. One of the South African HEIs provides their students with free laptops and ensure there is internet connectivity all through the campus and in the hostels. The other South African HEI provides students who are deemed to be 'needy' with free tablets, free data bundles and free flash drives in cases where there is no internet access for the student at home.	Both Nigerian and South African HEIs have computer labs and internet facilities for their students to access SaaS. The main difference between the Nigerian and South African HEIs is that the South African HEIs provide free laptops, tablets, data bundles and flash drives to their students and staff. The South African HEIs also have agreements with some telecommunications companies in South Africa to provide free internet access to students when using SaaS and any other application from the institution.	The institutions should provide more mobile devices for students to encourage anytime anywhere access. The occasional problems with internet access should also be resolved and the internet service provider should be held accountable to ensure their services are not interrupted.

Motivating factors	Students expectations	Students experience	Similarities and differences between Nigerian HEIs based on Students perspectives	Similarities and differences between SA HEIs based on Students perspectives	Nigerian HEIs Vs South African HEIs based on Students perspectives	Students suggestions and recommendations
Training and Skills	Students always expect that training will be provided on any tool they need to use.	It is generally assumed that students have the basic computer skills needed to use SaaS. The reality is that students are expected to learn how to use these tools on their own. This affects some students who are not technology savvy.	Both Nigerian HEIs have no SaaS specific training for their students. They only provide students with a general overview of the software and expect students to approach the ICT department should they encounter any problem.	The South African HEIs like their Nigerian Counterparts does not have any SaaS specific training for the students. One of the South African HEIs provides online training if a training need is identified while the other South African HEI provides their students with a short presentation on the software.	Both Nigerian and South African HEIs don't have any SaaS specific training or skills assessment programme for their students.	Skills assessment and training programmes should be put in place by all the HEIs on how to use SaaS effectively for academic purposes. This will assist students that struggle with it and are often discouraged or scared because of their lack of training
Lecturers support and willingness to use SaaS	Students want the lecturers to use SaaS in all their courses and they expect consistency in its use. They also expect it to be use from their first year to the last year.	Some lecturers are not using SaaS in their courses. The lecturers that use SaaS are sometimes inconsistence with its use.	In the Nigerian HEIs, there are some lecturers who don't use SaaS in their courses because they are used to the traditional method.	In one of the South African HEIs, the students mentioned that the use of Moodle for example was only enforced in their first year and it was ignored from the second year onwards. Students from the second South African HEI noted that they are	There is support for SaaS from lecturers in both Nigerian and South African HEIs. The difference is with one of the South African HEIs where the use of a specific SaaS application was only in the first year.	There should be consistency in the use of SaaS applications and it should be used throughout the degree from the first year to the last year.

Motivating factors	Students expectations	Students experience	Similarities and differences between Nigerian HEIs based on Students perspectives	Similarities and differences between SA HEIs based on Students perspectives	Nigerian HEIs Vs South African HEIs based on Students perspectives	Students suggestions and recommendations
				satisfied with the use of SaaS by their lecturer and one of the students mentioned that SaaS is used by the lecturers in all her courses		
Usage of SaaS	Students expect that all the features and functionalities should be easy to use and understand. They also expect the lecturers to understand all the functionalities of SaaS and can explain to the students when required	The expectations of the students are sometimes not met because the lecturers sometimes don't know how to use all the features and functionalities of some SaaS applications and would sometimes refer the students to the IT staff who themselves don't know how to use all the features and functionalities of the SaaS applications in some instances	In the Nigerian HEIs, the usage of SaaS is high but only the general academic computing SaaS applications are being used. The lecturers don't know all the functionalities of some of the applications and require students to learn how to use them on their own. Some students also find it difficult to use some of the features and functionalities of some SaaS applications	The students in the South African HEIs have not used many of the features and functionalities of the SaaS applications they are currently using. For example, Microsoft office 365 is only used for communications while features like calendar and PowerApps, OneDrive, Sway, Forms etc. are never used	The usage of general academic computing SaaS applications is high in both Nigerian and South African HEIs. The research specific SaaS applications such as Turnitin are used in both South African HEIs while only one of the Nigerian HEIs use it. The other Nigerian HEI not currently using a research specific SaaS application however said that they are in the process of adopting Turnitin. The subject specific SaaS application are	The lecturers should be trained on how to use all the functionalities of the applications that we use so that they can assist students when required. The research specific and subject specific SaaS applications should be adopted and implemented by HEIs as they are currently using too much of traditional software which are very expensive

Motivating factors	Students expectations	Students experience	Similarities and differences between Nigerian HEIs based on Students perspectives	Similarities and differences between SA HEIs based on Students perspectives	Nigerian HEIs Vs South African HEIs based on Students perspectives	Students suggestions and recommendations
					not used in both Nigerian and South African HEIs.	
Acceptance of SaaS	The level of acceptance of SaaS amongst students is high because students expect that it is a tool that can help them to achieve their academic goals	The students are forced to use SaaS in courses where the lecturers make use of SaaS as all their course materials and communications are available via the SaaS applications	The acceptance of SaaS is high amongst Nigerian students	Like the level of acceptance of SaaS by the Nigerian students, the level of acceptance of SaaS is also high amongst the South African Students.	Students from both countries are eager to use SaaS and believes that it can help them to improve their academic experience	The institutions need to do more to encourage students to use SaaS effectively. The students are willing to use SaaS but needs training and skills assessment. The issues such as occasional interruptions in the internet services should also be resolved as that discourages students and makes them reluctant to use SaaS
Benefits of SaaS	Most of the students have high expectations from SaaS and have not considered the fact that there are possible limitations of SaaS	Students experience some limitations such as distraction from important academic activities and reduction in class attendance due to their use of SaaS	The students have noticed significant improvements in their academic activities in both Nigerian HEIs. They are also experiencing benefits such as improved access to course materials, improved communications and collaborations etc.	The South African students are also enjoying the benefits of SaaS. They have also noticed improvements in their academic activities, communications, collaborations and access to academic resources	The students from HEIs in both countries have experienced different benefits from their use of SaaS.	The current challenges with SaaS should be identified and HEIs should find ways to reduce or eradicate the identified challenges. The introduction of SaaS across the entire institution could improve access to resources among students.

Motivating factors	Students expectations	Students experience	Similarities and differences between Nigerian HEIs based on Students perspectives	Similarities and differences between SA HEIs based on Students perspectives	Nigerian HEIs Vs South African HEIs based on Students perspectives	Students suggestions and recommendations
Disadvantages of SaaS	The students expect that SaaS does not have a disadvantage. Many of them have never thought of the possibility if SaaS having a disadvantage	The reality is that SaaS has its disadvantages and students experience these disadvantages from time to time	The poor internet access and the reliance of SaaS on the internet is one of the main disadvantages in one of the Nigerian HEIs. The second Nigerian HEIs also have occasional disruptions with their internet services but enjoys a better internet service more than the other Nigerian HEI. Other disadvantages in the Nigerian HEIs are the possibility of students intentionally missing classes and the possibility of SaaS becoming a form of distraction for some students	Disruption of the internet service is not a major issue with the South African HEIs as they both enjoy more uptime. Like their Nigerian counterparts, there are some students who miss classes intentionally because of the availability of class video and other course materials via SaaS. Some students also get distracted by unsolicited advertisement or some features of the applications are unable to concentrate in class during lectures. To avoid this problem, the lecturers in one of the South African HEIs instruct all the students to switch	The main difference in this regard is that the internet connection in Nigeria is not as reliable as that in South Africa. Students from both countries face similar disadvantages due to their use of SaaS	Since internet is a necessity for SaaS. The institutions should ensure that the internet service provider meets the availability requirements of the institution as agreed in the SLA. To avoid students being distracted during lectures, the lecturers should ensure that the students switch off their devices during lectures.

Motivating factors	Students expectations	Students experience	Similarities and differences between Nigerian HEIs based on Students perspectives	Similarities and differences between SA HEIs based on Students perspectives	Nigerian HEIs Vs South African HEIs based on Students perspectives	Students suggestions and recommendations
				off their phones, laptops and other tools that may distract them during lectures		

Table 13: Students Perspective of SaaS usage in HEIs

6.1.4 Perspectives of the IT Staff with regards to the use of Software as a Service in higher education institutions

The IT staff also have their own view of the usage of SaaS in HEIs. In some cases, this research found that they have similar views with the students and the lecturers but they also share a different view on some other cases. The findings on the perspective of the IT staff with regards to SaaS usage in HEIs is presented in a summary format in Table 14.

Motivating factors	IT Staff's expectations	IT Staff's experience	Similarities and differences between Nigerian HEIs based on IT Staff's perspectives	Similarities and differences between SA HEIs based on IT Staff's perspectives	Nigerian HEIs Vs South African HEIs based on IT Staff's perspectives	IT Staff's suggestions and recommendations
Understanding of SaaS	The IT staff have a good understanding of SaaS in general and are aware of the benefits and limitations of SaaS. It was surprising however that one of the IT staff in South African HEIs did not know SaaS although he understands the concept of SaaS and has worked with different SaaS applications. The expectation is that all the IT staff should understand all the features and functionalities of SaaS and to assist lecturers and students when required	The IT staff are very helpful with technical issues with SaaS such as deployment or troubleshooting but are sometimes unable to use the actual-applications because they are not aware of the features and functionalities of the SaaS applications	The IT staff in both HEIs in Nigeria understand SaaS and could explain what it means and how it is being used in their institutions	The IT staff from the South African HEIs also understands SaaS but one of them was unable to explain SaaS until the research explained the concept of SaaS to him. Only after that was he able to explain SaaS based on his experience and understanding of SaaS	Generally, the IT staff all understand the concept of SaaS and have experience working with SaaS.	It is incorrect to assume that every IT staff can use any application. The IT staff should be trained by the service provider on how to use their applications. All the features and functionalities of the applications should be explained to the IT staff by the service provider
Access to supporting tools	The IT staff expects that available supporting tools should be enough for the students.	The IT staff often receive complaints from students about computers in the labs that are not working and needs attention. Since the students need the computers to access SaaS, it is a challenge for students to access SaaS if the computers	The IT staff from HEI2 received more complaints from students regarding poor internet access and faulty computers	The IT staff from the South African HEIs also receive complaints occasionally about poor internet access and faulty computers but responds faster to such complaints than their Nigerian counterparts	IT staff from HEIs in both Nigeria and South Africa are faced with resolving the issues with the computer and the internet on a regular basis but are sometimes unable to resolve the issues on time due to lack of resources or poor response from the service providers	The IT staff should be provided with the resources needed to repair faulty computers on time. The service providers should also be held accountable for down time and should be made to pay penalties should the service be down for longer than stipulated in the service level agreement

Motivating factors	IT Staff's expectations	IT Staff's experience	Similarities and differences between Nigerian HEIs based on IT Staff's perspectives	Similarities and differences between SA HEIs based on IT Staff's perspectives	Nigerian HEIs Vs South African HEIs based on IT Staff's perspectives	IT Staff's suggestions and recommendations
		are not in a working condition				
Training and Skills	IT staff expects to be trained on how to use the features and functionalities of the SaaS applications	Training on how to use the features and functionalities of the SaaS applications are often not provided for the IT staff. It is always assumed that they should be able to understand the features and functionalities of the applications on their own because they are IT specialists	There is no training in place for IT staff in both Nigerian HEIs that participated in this research on the features and functionalities of the applications in use	The South African HEIs like their Nigerian Counterparts also do not provide training for their IT staff on the features and functionalities of the SaaS applications	Both Nigerian and South African HEIs don't have any training programme for their IT staff on the features and functionalities. IT2 however noted that at the beginning when they first implemented Office 365, they were trained on how to use Office 365 but added that the training was not intensive and it did not cover all the features and functionalities of Office 365	It should not be assumed that IT staff would automatically be able to use every SaaS applications. Training and skills assessment should be provided for the IT staff on all the features and functionalities of the SaaS applications so that they can assist students and lecturers when approached for help
Management Support	The IT staff expect the management to make all the needed resources for the successful adoption and implementation of SaaS available	The IT staff sometimes need to convince management about the return on investment before the needed resources are made available. This can sometimes	In both Nigerian HEIs, the IT staff agreed with the students and lecturers that there is adequate support from	In the South African HEIs, the IT staff also agreed that there is adequate support from management with regards to SaaS and other ICT initiatives	There is adequate support for SaaS and other ICT initiatives in all the participating HEIs from Nigeria and South Africa	The IT staff should make efforts to further enlighten the management about the benefits and limitations of SaaS to gain further support from them

Motivating factors	IT Staff's expectations	IT Staff's experience	Similarities and differences between Nigerian HEIs based on IT Staff's perspectives	Similarities and differences between SA HEIs based on IT Staff's perspectives	Nigerian HEIs Vs South African HEIs based on IT Staff's perspectives	IT Staff's suggestions and recommendations
		be a daunting task for the IT staff	management for their SaaS initiatives			
Lecturers support and willingness to use SaaS	The IT staff expects the lecturers to be willing to use any SaaS application relevant for their course(s) and be supportive in terms of its implementation	The lecturers are supportive of SaaS implementation and they work with the IT staff to implement the applications.	In the Nigerian HEIs, the view of the IT staff on the support of lecturers and their willingness to use SaaS echoes that of the students. The IT staff also noted that there are few lecturers who are yet to incorporate the use of SaaS in their courses	The IT staff in the South African HEIs believes that the lecturers are very supportive of their SaaS initiatives and are using it effectively in their courses. They however noted that there are some lecturers that have not started using SaaS in their courses	The lecturers in all the participating HEIs are supportive of SaaS and are willing to use it in their courses.	The lecturers should show more interest and use SaaS more in their courses because it can improve course delivery. All the lecturers that are not using it yet should also introduce it in their courses to encourage acceptance and use across the entire institution
Usage of SaaS	The IT staff expects to see a high usage of SaaS amongst students	The usage of SaaS is high amongst students so the expectations of the IT staff are met	The usage of SaaS is high in both Nigerian HEIs	The usage of SaaS is high in both South African HEIs	HEIs in both countries experience high usage of SaaS amongst students	Although usage of SaaS is high, the usage of traditional software is even higher. HEIs should therefore introduce other types of SaaS application that are research specific and subject specific

Motivating factors	IT Staff's expectations	IT Staff's experience	Similarities and differences between Nigerian HEIs based on IT Staff's perspectives	Similarities and differences between SA HEIs based on IT Staff's perspectives	Nigerian HEIs Vs South African HEIs based on IT Staff's perspectives	IT Staff's suggestions and recommendations
Resistance to change	The IT staff believes that their jobs might be at risk if SaaS is implemented fully across the institution	The IT staff experience a reduction in their workload and takes on new roles of dealing with the service providers	The IT staff from both Nigerian HEIs did not express the fear of losing their jobs due to full implementation of SaaS	The IT staff from HEI3 noted his fear about the possibility of getting fired or his colleagues getting fired due to the use of SaaS	Resistance to change is present in both Nigerian and South African HEIs although it was specifically mentioned by IT3	The institutions should find a way to guarantee the IT staff that the implementation of SaaS will not lead to job loss. The management need to actively engage the IT department on ways to convince the IT staff that their job is safe

Table 14: Perspective of the IT Staff with regards to the usage of SaaS in HEIs

6.2 Tools

6.2.1 Resources

Availability of resources to students is important to ensure that students carry out the necessary tasks as expected. "*The lack of resources often prevents students from doing their tasks*" (L4). IT4 noted that their students have access to adequate resources because they provisioned more resources than needed being a new HEI. Having resources available does not translate into usage. The students need to show interest in using the resources to achieve their academic goal (L3). The institution does not need to purchase the SaaS application because they are available on demand and the institution only need to subscribe and pay for usage (L1). The accessibility of SaaS is a good advantage because you can access it from anywhere using any device with internet facilities (IT2). That also makes it easy for students to share documents and collaborate on projects (S1; S3). "*The high availability and the fact that you can access SaaS from anywhere at any time makes it important and improves access. The confidence that it gives you that wherever you are you can access it is a very good advantage*" (S2).

Internet access is inadequate in Nigerian HEIs when compared with South African HEIs. "*We have to buy our own data when we are off campus. Even most of our hostels don't have internet facilities. So, that makes it expensive for students because data in Nigeria is very expensive*" (S1). Maintenance of resources needed to access SaaS such as computers is also inadequate in Nigerian HEIs as S4 noted that most of the computers in their computer laboratories are faulty and only about 20 out of 100 computers are in working condition. The ability to access study materials from anywhere at any time is an important advantage of SaaS (S5; S6).

6.2.2 Accessibility

The fact that you can access SaaS from any internet enabled device such as your phone and from any place at any time is an advantage (S1; S2; S9; S10; L1; L2; IT1; IT2). "*The ability to access the SaaS applications needed and all the supporting tools like Computers and internet access from any place at any time is also important. It will aid students in using SaaS effectively and assist in making the academic environment more conducive for students*" (L1). SaaS can be accessed via any internet enabled device such as a tablet, smartphone, notebook or laptop. The availability SaaS anytime anywhere is of high importance. It allows students to be able to work at their own pace. For example, there was a day when S3 had to do an assignment but he was very busy and could not do the assignment during the day. He only realised about 11:00pm that he needed some documents for the assignment which was due the next morning. He then used the hotspot at his hostel to access that document on Dropbox. That was how he could complete the assignment that night.

"*One of the biggest problems on campus is that students don't want to stay on campus till 1 or 2am to do a project because the software is only available in the laboratories*" (IT3). SaaS helps to provide solution to that problem because the students can go home and access the software from home to complete their tasks. So, SaaS is available to students 24 hours a day, seven days a week. So, whether a student decides to do an

assignment on a Sunday afternoon at 3 o'clock or on a Monday morning at 10 o'clock, the student can access the software (IT3). The accessibility of SaaS from any place at any time makes it interesting. S5 noted that the ease of access of SaaS has helped her with time management and has improved the quality of her work. She also noted that getting all the materials needed for her academic work through SaaS has helped her to improve her academic performance.

6.2.3 Software as a Service applications in higher education institutions

The participants mentioned several SaaS tools used in their institutions. Blackboard is one of the SaaS applications used in the participating HEIs (S4; L4). The other SaaS applications used in some of the participating HEIs is Dropbox (S4; S5; S6; S12), Office 365 (S3; S8; S9; S10; S11; S12; IT4) and Google Apps for Education (S1; S2; S3; S6; S8; L1; L2; IT1; IT2), Facebook (S8; S11), WhatsApp (S8; S11), Instagram (S8; S11), twitter (L3) and Youtube (S6). Office 365 is the most common SaaS application in HEIs (S1; S2; S3; S4; S5; S8; S11; S12; L1; L2; L3; L4; IT1, IT2; IT3; IT4) and email is the most common feature of Office 365 used in HEIs (IT3). "*Office 365 is the most common Software as a Service offering. It's user friendly also and it has a lot of features in one package*" (S12). S4 added that her use of Dropbox has improved her academic performance by insuring her against the loss of documents. For example, if she is working and her computer crashes, she does not have to worry. All she must do is get another computer, connect to the internet and download what she was doing. She added that that helped her when she was working on her dissertation. Moodle is another common SaaS application used in HEIs (S1; S10; S11; S12; IT2). Moodle is a learning management system (S1) and its available as either SaaS based or server based. The SaaS based version of Moodle is used by three out of the four participating HEIs in this research. The lecturers from the three participating HEIs that use SaaS based version of Moodle performs activities such as uploading lecture notes and the students are able to access the lecture notes from their mobile phones, tablets or any other internet enabled device (L1).

As envisaged by the researcher, students struggle to determine when a software is traditional or SaaS. This is evident because S7, S8 and S9 all mentioned that VULA was an example of SaaS where in fact, VULA is a server based traditional software and not available as SaaS. "*VULA is also popular but I think Office 365 is the most popular because we use Office 365 every time and only use VULA when we have to. For example, when the lecturer uploads a material for us*" (S8). The surprising thing is that even a lecturer (L3) was confused and said that VULA is a SaaS application. For data analysis, HEIs use applications such as Atlas.ti, NVivo and SPSS (L3) which are available as either server based or SaaS. Turnitin is a common SaaS application used by HEIs for plagiarism detection (S7; S9; L2). Turnitin has helped to improve the quality of research output of both students and lecturers (S4; S5; S9; L2).

Apart from the SaaS applications, all the participating HEIs have supporting tools like computers, internet access. Most of the students also have personal devices with which they access SaaS. For example, HEI3 provides some students with personal devices like laptops and iPads provided such students are believed not

to be able to afford such devices and are identified and recommended by their lecturers to be given the device to assist them in gaining access to course materials (L3).

It is interesting to note that HEI4 uses SaaS ERP which is hosted in the cloud on a subscription basis. IT4 also noted that their institutions financial management system is also a cloud based SaaS application. The job application system in HEI4 known as 'erecruit' is also SaaS based. Furthermore, HEI4 has an online registration system which is SaaS based. A similar online registration system is also being used in HEI2.

6.2.4 Supporting infrastructure

All the participating HEIs have necessary ICT architectural capabilities in place. The supporting infrastructures are also available although, participants noted that they are inadequate. The accessibility and availability of the supporting infrastructure varies from one institution to another. For example, in HEI3, the computer laboratories are available to students 24 hours, 7 days a week while in HEI3, students are not allowed in the labs except there is a lecturer in the laboratory. For example, when S10 wanted to do an assignment in the laboratory, she was not allowed into the laboratory because there was no lecturer available at that time to supervise her in the laboratory. "*We have internet access when we are connected to the domain of the university. We have access to all the computers. We need permission to use all the tools that are there because the lecturers must be there with us when we are using it*" (S10).

All the participating HEIs are faced with inadequate access to resources except HEI4 which is still a new HEI and was reported to have provisioned much more resources than needed (IT4). This may change as the institution expands and admits more students.

6.2.5 Other supporting tools

There are SaaS supporting tools in all the participating HEIs although there are reports from some participants that they are inadequate. The internet on campus is also a challenge at times as there are occasional interruptions in the internet service (S3; S4; S5). For example, S2 noted that there was a time when he was working on a project and the internet service was down. He added that it affected him and he could not submit the project on time due to the poor internet service.

The inadequate number of computers in the computer laboratories sometimes means that some students cannot access a computer whenever that laboratories are full. This is sometimes a problem especially when a student need to use a computer urgently (S3; S6).

The students in all the participating HEIs have personal devices such as laptops, desktops, smartphones, iPads, PDAs etc. which they use to access SaaS (S2; S3; S6; S9; L2). One of the participating HEIs provides their students with free laptops and data. For example, HEI4 issued all their students and staff with free laptops and internet access (S10; S11; S12; L4; IT4). "*Our institution provided all the students and staff with free laptops and internet access*" (S11). This improves the confidence of some students in using the laptop because they can practice for as long as they wish since the laptop belongs to them (S11).

6.2.6 Traditional software

The use of traditional software is still very high in the participating HEIs due to reasons such as resistance to change from the staff. Most of the IT staff are afraid of losing their job if SaaS were to be fully adopted across the entire institution. That explains the unwavering support of traditional software from IT staff (IT3). Traditional software used in the participating HEIs include those used for managing network security access, enterprise resource planning, operation management, CCTV systems (IT4), Notepad ++ (S11), Google Chrome (L3), Firefox (S12; L3), Microsoft Office (S1; S2; S4; L2; IT1; IT3), Math lab (S5), Mathematica, Strata, Pastel, Statistical, SPSS (S9; L3), Scratch (S9), Scientific Workplace, SAP (L3), Microfit, Time series explorer, IBM Cognos (L3), iNet bridge, Gem Stat, EViews, Aris, NVivo (S9), Atlas.ti, Turnitin Autocad and AMOS (S3; L1; IT3). "*There are different on premises software that we use in our institution. Some of them are Microsoft office suite, SPSS, various programming software, various data mining software and analysis software*" (IT1).

6.2.7 Complaints and recommendations by students with regards to tools

6.2.7.1. Software piracy

The software used in HEIs ranges from programming software to analysis software to referencing software to productivity software (IT1). The high cost of these software has led to an increase in software piracy in Nigeria. For example, the cost of Microsoft Office is not affordable for an average Nigerian student. This means that such students would only be able to acquire pirated copies which are often cheap. This continues to encourage software piracy (S4). "*Well, I think I would like them to use more of software as a service because it is much cheaper than on premises software. It can also give us access to original software because some of us end up installing cracked and pirated copies on our laptops since we cannot afford the original ones*" (S3). SaaS could provide solution to this problem because it can provide students with needed software at a very cheap cost when compared with the traditional method. SaaS can give students access to original software especially those who cannot afford the original traditional software. Such students end up installing cracked and pirated copies of the software on their laptops since they cannot afford the original ones (S3). If the institution can subscribe to SaaS, the entire HEI community can have access to original software at cheaper cost. This will help reduce piracy (S4).

6.2.7.2. Lack of internet access off campus

Although HEIs are trying their best to ensure that internet access is available to all students both on campus and off campus, the lack of internet infrastructure in some areas still denies students living in such areas access to SaaS. To avoid this, HEI3 provides students with flash drive to save their work and upload it on their local computer at home (IT3). The lack of internet access for some students at home makes it difficult for them to benefit from SaaS while off campus. The use of flash drives to download the software and install it on their local machines at home seems to be the only viable option for such students hence, SaaS may not be beneficial to such students. "*The lack of internet access off campus is a disadvantage to the students that don't have internet access at home. The only way that they can receive anything is with a flash drive. It is a disadvantage to them because, they won't be able to finish their assignments or study for exams because of*

the lack of internet access that is required for the lecturers to provide everything" (S10). The lack of internet access off campus is a common problem faced by students from both Nigerian and South African HEIs. The students staying at home all reported that internet access from home is poor and unaffordable and in some cases, it is completely unavailable. Some students in HEI residences also noted that internet access in the hostels is also poor and expensive as the residences charge for internet access.

There are also complaints about the internet service on some HEI residencies. For example, S7 noted that she has a friend in her former HEI residence who could not access the internet in her room and always had to go to the bathroom and sit on the bathroom floor to do her work because that's where the internet access was better. In such cases where there is poor internet access or lack of internet access, accessing SaaS is a problem and the use of a flash drive may be a viable option.

6.2.7.3. Cost and internet

There is a general belief that SaaS is always cheaper than traditional software (S11; L1; IT1; IT2). That might only be in the short term and therefore, intending users should therefore do a proper cost analysis to estimate the cost of SaaS over a long term before adopting SaaS. That will assure them that there would be no hidden costs as some vendors may have hidden costs which they will not tell the client ahead (L2). "*I think people always make the mistake of thinking that it's cheaper overall but that might only be in the short term. But I think it's a lot cheaper because it's a subscription service and you don't have to buy the software. So, the cost of maintaining it and upgrading is also avoided. It also reduces the number of It personnel that you need. So, I think that even if the actual-service initially seems a little bit more expensive, over time it becomes a lot cheaper*" (IT4). IT4 further mentioned that SaaS might work out cheaper because it's a subscription service there is no need to buy the software. The user also pays per usage (L4). The cost of licensing, maintenance, installation and upgrading the software is also shifted from the user to the service provider. Furthermore, the number of IT staff needed would also be reduced (L3, IT3). For example, IT4 noted that the SaaS based job application system they currently use does the job of about 3 administration staff for the cost of 1 administration staff. So, even if the SaaS application initially seems a little bit more expensive than equivalent traditional software, over time it may become cheaper.

If HEIs move to CC, there could be additional infrastructure requirements and the cost profile could shift dramatically because in-house servers are more expensive upfront but once they are running, they cost nothing to run. Whereas CC does not cost anything upfront but once its running, you pay every time it runs. Therefore, over the life time in terms of cost, CC may be more expensive depending on how often you use it.

With regards to the energy, data centres of cloud service providers are usually located in low cost energy areas. In Nigeria and South Africa, the energy cost is high therefore cloud providers maximise the energy cost by locating their data centres in low cost energy locations but not necessarily broadband. The cost of broadband might also be reduced in the future because some cloud providers are already working on having data centres in South Africa.

Traditional software is often expensive because of the high cost of purchasing hardware, licensing, installation, upgrades and maintenance. For example, HEI3 currently pays about R795 per operating system in their commerce faculty alone, they pay for about 400 computers per annum (IT3) which means that they pay about R318,000 for only operating system on computers in the commerce faculty per year regardless of whether the operating system was used or not. Since SaaS allows the users to pay per usage, it means that the institution can maximise the usage of SaaS and save whenever it is not used. This leads to the assumption that SaaS is cheaper than traditional software. SaaS also eliminates the need to purchase expensive and sophisticated hardware because the processing is done on the server and even a basic computer is enough to access the most powerful SaaS applications.

Since traditional software is often expensive for students, SaaS may be a viable option but the high cost of data may lead to SaaS becoming expensive. For example, S1 noted that students buy their own data when off-campus. That makes SaaS expensive for students because data cost is reported to be high in Nigeria. The cost of data in South Africa is significantly high and is reported to be one of the highest in the world. A detailed evaluation and comparison of the mobile data cost in Nigeria, South Africa, Ghana, Kenya, Rwanda, United Kingdom and the United States of America can be found in Appendix L. This may not be the case in South Africa because the participating HEIs in South Africa have entered an agreement with some service providers to provide students with free data or zero-rated services when accessing SaaS, the institutions' websites or any third-party site with links originating from the institutions' websites. This research suggests that Nigerian HEIs should enter similar agreements with service providers in Nigeria to provide students with free access to SaaS applications and other institutions websites and applications.

Internet facility which is a vital supporting tool for SaaS is available in all the participating HEIs although occasional interruptions are reported in all the participating HEIs. "*The only problem is that there are times when there is a problem with the internet and it could be when you urgently need to work on something that the deadline is approaching. But apart from that, I think there is enough resources to access software as a service*" (S3). For students staying in HEI residences, internet access is better than students staying at home. Internet access in some HEI residences are however reported to be as expensive as when staying at home as some students noted that internet access at some HEI residences are not free and are sometimes very expensive (S4; S5; S6; S7; S8; S10). For example, S7 noted that she has stayed off campus and on campus and has experienced both situations. She added that residences with uncapped internet access are often expensive and cost as much as R4500 per month. Off campus access to the internet is a major challenge for students staying in areas with poor internet access (IT2).

The high cost of internet access at home is a disadvantage to the students that don't have internet access at home as it prevents them from enjoying the anytime anywhere access provided by SaaS (S10). IT3 mentioned that people always assume that about 99 percent of students have internet at home. He added that it is not

true and although he is not aware of any survey in that regard, he would not be surprised if the percentage of students with internet access at home is less than 50 percent. HEI3 provides students that stay in areas with no internet facilities with flash drives and mobile data bundles to access academic materials online (S8; IT3). The cost of SaaS should be an important factor when selecting a service provider or a SaaS application (IT4).

6.2.7.4. Needs to be implemented campus wide

The implementation of SaaS should be campus wide and not just in some departments as it would improve communication across campus and encourage collaboration (IT3). "*I believe that there would be an increase in the usage of SaaS if it is implemented campus wide*" (IT3).

6.2.7.5. Students do not have access to more powerful machines

There are some applications that requires computers with high specifications. Such computers are often too expensive and students cannot afford to buy them. This makes running such applications impossible for such students. The use of SaaS can help resolve this problem because the processing will be done on the service providers server therefore students do not need powerful computers to access and use software with high requirements specification. For example, students would be able to access the software via the service provider's systems and use the power from the service provider's machines. In other words, "*the students would be able to access powerful software with weaker machines"* (IT3). Examples of applications that require computers with high specifications are business intelligence and big data applications.

6.3 Objects

In using SaaS, the participants have some goals and objectives they hope to achieve. Some of the goals of the participants are 1) to access course materials, 2) to improve academic performance, 3) to improve communication and collaboration, 4) to ensure continuity, 5) to promote team work and 6) to create a conducive academic environment. "*The most important thing is the access to our course materials and the improved communication and collaboration that it offers*" (S7) The Subjects are unable to transform the objects into expected outcomes in some instances due to contradictions in the activity systems in their institution. The AT helps to provide an understanding of how these contradictions prevents the Subjects from realising the desired outcomes.

6.4 Division of Labour

There is division of labour between the lecturers and the students and between the IT staff and the service providers. For example, to complete a class test, the lecturer must set the questions and present the questions to the students. The students then need to answer the questions and submit the answers to the lecturer who will mark and provide students with their results. The IT staff and service provider also share responsibilities. For example, "*If the data loss is caused by users on our side, we will be responsible and if the data loss is caused by the provider then they will be responsible*" (IT4). The division of labour also plays a vital role in the Subject-Object-Outcome relationship because all the stakeholders are expected to play their role

to ensure that the desired outcome is reached. It may not be possible to achieve the desired outcome if one or more stakeholder fails to do their part.

6.5 Community

6.5.1. Change

The use of SaaS in HEIs brings about a change in how students, lecturers, management and IT staff carry out their daily activities. Accepting a change is a problem for most people because they are normally used to a way of doing things and they become reluctant to accept a new way of doing things (L2). For example, before new software is introduced on campus, the lecturers first need to convince the management by explaining how it can benefit the institution for them to see the effectiveness of the software. "*Convincing the management is a major issue. Even if you must implement any software, you have to convince them that that software will help them to do things better than the way they have been doing it before. So, change is a factor*" (L2). Another example is that some IT staff are uncomfortable with SaaS because they feel it might lead to job loss since most of the maintenance is done by the service provider (IT3). Thus, accepting the change becomes difficult for IT staff. Some students also resist the change for reasons such as fear that they might be required to learn new skills and lack of internet access off campus.

6.5.2. Improved academic environment

The participants noted that the use of SaaS applications like Microsoft Office 365 and Moodle has improved communication among students and lecturers (S1; S2; S8; S10; S12). For example, S10 mentioned that it allows them to interact with one another and provides them with a medium to ask a specific question from other students and receive a straight response. She added that the use of SaaS applications has made them friendlier with each other than they were in their first year when they were scared to ask questions from anyone. They now send the questions via email to fellow students or post it in the group discussion forum where they get answers from other students. "*We interact with each other and we can ask a specific question from someone and they will give us a straight answer. We are friendlier with each other than we were in our first year when we were scared to ask anybody anything. Now we can send the questions via email to our colleagues or post it in the group discussion forum and we get answers from our colleagues*" (S10)

The ability to access information from the lecturers and other students through SaaS applications such as Office 365 and Gmail has made the academic environment more conducive for learning (S11). For example, S11 and S12 noted that they can email their lecturer without fear whenever they have questions and get a response timeously. The use of SaaS also assists with time management and provides the opportunity to have more time for academic activities (S12). "*The possibility to access the application at anytime from anywhere enables students to work at their own pace. A student can learn out of school, out of class and from anywhere in different places*" (S4). This also makes the academic environment more conducive for students (S1; S3; S4; S5). To make the academic environment more conducive, more ICT resources are need. There is a need for more computer laboratories, improved internet services, more WiFi access as well as training and assessment

(L2). As initially assumed by the researcher, the adoption of SaaS in the participating HEIs is not campus wide as there are some departments that are not using SaaS for their academic activities (S1; S5; S8; S11). "*The use of SaaS should also be rolled out across the entire institution so that the benefits can be realised campus wide*" (S6).

6.5.3. Corruption

Corruption is a big problem affecting the implementation of SaaS and other ICT initiatives in Nigeria and it is really affecting the educational system (IT2). "*Corruption is too much in this country and it's really affecting our educational system*" (IT2). The funds meant for ICT projects are sometimes diverted for personal gains by the people who are supposed to execute the projects (S6). The issue of corruption needs urgent attention to ensure that the funds aimed at executing ICT projects in Nigerian HEIs are used as intended. The availability of funds to provide ICT tools will improve access to supporting infrastructures thereby contributing to improved access to ICT resources.

6.5.4. Cybercrimes

The issue of cybercrimes is a major issue in Nigeria. Some of the students engage in cybercrimes instead of using the internet for academic activities such as accessing SaaS applications. "*We have the issue of cybercrimes. That one has been covered because cybercrime is a major issue in Nigeria now but I don't know if software as a service has been covered*" (L2). The availability of internet access and other supporting infrastructures does not guarantee that the students will use it for intended academic activities. This is a problem because the resources meant to access SaaS applications are being used for malicious activities by some students. Since cybercrime is a major problem in Nigeria. There are laws relating to cybercrime in the country but there is no law specifically for SaaS (L2).

6.5.5. Security

HEIs are aware of the security issues associated with the use of SaaS. Thus, they have taken measures to overcome the threats posed by security issues. The most common measure used by all the participating HEIs is the provision of username and password for every user to prevent unauthorised access (S1; S4; S7; S11; L1; L2; L3; IT1; IT4). "*We use username* and passwords. So, there is no other security measure that I'm aware of apart from the username and password". The username and passwords are also updated frequently for security reasons (S10; S11). "*For example, when you want to access Moodle, you need your username and password. Your password will only be valid for two weeks. After two weeks, you will be required to change your password. So, if someone try to access your Moodle, you will be alerted. They admin. people will call you and tell you someone is trying to access your account*" (S11). The use of course codes for authentication is another security measure used in HEI3 and only the students registered for a course can access the application (IT3). "*Data encryption is another measure used to protect data in our institution*" (IT2). Although, most of the students agree that the use of the username and password is an adequate security measure, S2 noted that there is a need for a two-factor authentication method similar to that used by the banks so that

even if an unauthorised person gains access to a user's detail (username and password), it will not be sufficient to gain access to the user's account.

With SaaS applications, the service providers also have their own security measures on their side which protects their clients (IT1). The service provider provides the institution with a guarantee in terms of data security, uptime and data authentication. Another thing is that the ownership of data remains with the institution (IT4).

Another security measure used by HEI4 is that their applications are only accessible on the institutions' IP address. So, even though it's in the cloud, it cannot be accessed from any other web connection (IT4).

6.5.6. Government support for infrastructure provision

The support of government is necessary for HEIs to be able to execute ICT projects such as SaaS implementation successfully. Most of the participants are not aware of any support from the government that can benefit their institutions SaaS initiatives (S1; S2; S3; S8; S9; S10; S11; S12; IT1; IT3; IT4; L1; L4) but in South Africa, L3 noted that the government has made considerable efforts to ensure that there is adequate bandwidth and internet connectivity. The Nigerian government need to put more effort in ensuring that there is improved bandwidth and internet connectivity. The funds allocated to HEIs by the government should also be increased and more funds should be allocated to ICT initiatives such as SaaS (S7).

"In Nigeria, efforts are being made by organisations such as NITDA (National Information Technology Development Agency) and National Universities Commission (NUC) to assist HEIs with ICT projects like SaaS implementation and internet facilities. They also provide HEIs in Nigeria with funds for infrastructure" (L2). The Nigerian government also have the tertiary education fund which is for the development of HEIs (S4). Like the Nigerian government, the South African government also provide funding for South African HEIs but this research found that government funding for ICT projects in higher education is inadequate in both countries. Hence, there is a lack of ICT resources in HEIs in both countries. This research suggests that funding for ICT projects in HEIs should be increased to ensure that necessary ICTs are available to contribute towards the creation of a conducive academic environment for students.

6.5.7. Support from the industry and individuals

Apart from government support, the support from industry and wealthy individuals is essential in securing funding for ICT projects in HEIs. Companies such as Microsoft provide access to information and give technical advice on their products like Office 365. They also give discounts to the institution on some of their products and offer free storage for students and staff. "*I would say probably with Microsoft, there is a lot of access to quite a lot of resources in terms of information, in terms of technical advice, in terms of discounts on services and so on. They offer free storage for people as well. So, yes, there are some benefits from the industry*" (IT4). Another form of support from the industry is the provision of zero rated services by some of the telecommunications companies for students to access SaaS and other applications of their institution (S10;

L3; IT3). "*I know there are some companies that provide some services and answers to questions and things like that but anything specifically, I don't know. The other thing I know of is that there is an arrangement with some telecommunications service providers like MTN not to charge students when they access Software as a Service or any other university applications on the devices using the cellular numbers*" (S10). Some companies also provide support by sponsoring laboratories and providing computers and internet. For example, the smile laboratory and the economics laboratory in HEI3 are some of the laboratories sponsored by such companies (S8; L3; IT3).

Although there is support from some companies and individuals occasionally, the industry and individual support for ICT initiatives in HEIs is limited (S11) and more support is needed from the industries and rich individuals in the society (S5; L4).

L2 noted that the problem of industry-academic collaboration is high in Nigeria and getting funding from the industry is difficult but added that some companies especially the telecommunications companies are putting some infrastructures in place to assist the HEIs.

6.5.8. Management support

The lack of support from management may be detrimental to the success of SaaS initiatives. Thus, it is imperative to gain the support of the management before the adoption and implementation of SaaS. Some of the participants mentioned that there is support from management for SaaS initiatives in their respective institutions (IT1; L3; L4; IT4). "*The management is very supportive of our software as a service environment and they provide anything needed to keep it running*" (IT1). However, L2 and IT2 are of a different view. L2 noted that management lacks exposure and should be made aware of the advantages of SaaS to encourage them and garner their support. "*I think there is still lack of exposure. They need to know more about the advantages of software as a service. I think that will encourage everyone more*" (S2). IT2 suggests that more support is needed from management for SaaS initiatives. For example, he mentioned that when Moodle was introduced, it was not widely accepted by students and the management made no efforts to encourage students to use it. He suggested that if there was adequate support from the management, they would have made some efforts to encourage the students to use it. For S6, there is support from management but the support is limited due to relative lack of resources because of inadequate funding. To get support from management, there should be adequate funding and it is necessary for top management to have a good understanding of the ICT environment and the benefits that SaaS offers (IT4). For example, the top management in HEI4 have a very good knowledge of the ICT environment and understands the possible benefits that could be derived from the use of SaaS. The vice chancellor (VC) at HEI4 was also the deputy vice chancellor (DVC) in another HEI responsible for ICT. This explains the reason why there is a lot of support in HEI4 for SaaS (L4; IT4). "*I think with us, we've got great support because our top management has a good understanding of the ICT environment and are also quite aware of the benefits of the service as well. I think that's why we've been able to start moving that way already. Despite the university in the current*

environment, we are looking to contain cost as much as possible especially software cost. So, if we can for example, the HR system, the job application systems that we have invested in probably does the work of 2 to 3 admin people for a cost of 1. So, to start looking at such an investment and the saving on the cost as well makes a lot of sense" (IT4).

6.5.9. Legislation and laws

Although there are laws guiding the use of SaaS internationally (IT2), there are no legislation or laws specifically for SaaS in both Nigeria and South Africa (L1; IT1; IT3; L4). However, the protection of personal information (POPI) act in South Africa is relevant and is applicable to SaaS (L3; IT4). "*Well, not really. Apart from the POPI act, I don't know if there is anything else*" (IT4). This research suggests that both Nigerian and South African government should consider passing legislations that will regulate the adoption, implementation and use of SaaS to improve user confidence in SaaS and encourage widespread usage.

6.5.10. More investment in Software as a Service is needed

The lack of funding for ICT infrastructure makes access to resources more difficult for HEIs. To ensure that students benefit from SaaS, more investment is needed to acquire adequate ICT infrastructure and other SaaS supporting resources and to ensure that more students have access to these resources. Access to SaaS will help bring an end to the problem of piracy because the entire institution will have access to original software with all the functionalities through SaaS (S4). "*Invest more in software as a service. And off course, you know when you do that, it also helps the students to stop piracy because that's what we are used to. We buy pirated software and install because we can't even afford the original software. For example, the Microsoft office, there is almost nobody as a normal student that can afford it. So, piracy keeps going even in the university. We keep promoting piracy. But if you can subscribe to software as a service, then the whole university community can have access to something proper. I think we should just invest more in it*" (S4).

6.5.11. Service level agreement

The institution needs to ensure that there is a service level agreement (SLA) between the institution and the service provider. The SLA should contain all the actions expected from each party and the remedy in cases where either party is in breach of the SLA. For example, technically with SaaS, the data is owned by the service provider but HEI4 negotiated with their service provider and they agreed that the ownership of data remains with HEI4. This was then included in the SLA. "*Technically, with the Software as a Service model, the information belongs to the service provider but you can agree on the ownership of the information in the service level agreement to clarify that upfront*" (IT4).

Another example is that the service provider guarantees the uptime and data security. In cases where the service provider does not meet up with the agreed uptime or there is a breach of security from the service provider, the penalty or remedial actions of the service provider should be stipulated in the SLA (IT4). "*The ICT department work hand in hand with the service provider to ensure there is no breach of privacy from our*

side and to make sure that the service provider keeps to the agreement in the service level agreement including taking responsibility for any breach of privacy or data loss" (IT1).

6.5.12. Staff experience with Software as a Service usage

To successfully incorporate SaaS into the courses and to ensure that necessary support is available for students in their use of SaaS, it is essential that the institutions have adequate number of lecturers and IT staff with SaaS experience. This will ensure that there is support for students whenever they encounter any issue with the application. It is a common assumption that all IT staff have experience of SaaS. That is not true because most of the IT staff are only able to perform operations such as installation, upgrades and maintenance of software and in the case of SaaS, they can negotiate with the service provider in terms of their institutions requirements. They might not have experience of using the features and functionalities of the software. For example, the IT staff in HEI3 do not know how to use applications like Mathlab and Strata but can resolve technical issues with the software (IT3). "*We install those software, if there is any problem or error with it, we fix the problem but we don't know how to use that Mathlab for example. We also don't know how to use the strata so that kind of stuff has to be taught to students by their lecturers*" (IT3).

In HEI1, HEI2 and HEI4, the number of lecturers with SaaS experience is inadequate (L4; IT4). Only HEI3 has sufficient number of lecturers with SaaS experience. This research suggests that HEI1, HEI2, HEI4 and similar institutions should organise training for lecturers to equip them with the experience needed for them to incorporate SaaS successfully in their courses.

6.5.13. Training

Three of the four participating HEIs do not have training programmes in place to provide their students with the skills needed for SaaS (S12). Only HEI3 offers training for lecturers on SaaS (L3; IT3) to equip them with necessary skills to teach SaaS effectively. "*The lecturers then provide training to their students as needed"* (IT3). For example, S10 mentioned that nobody explained the Office 365 to her and other students in their first year. The students learnt how to use it on their own and this takes a lot of effort and time from the students. "*We learn most of them on our own. Like Office 365, I had to learn everything about it on my own*" (S8). In cases where training is provided, some features of the SaaS application are neglected and students are only though how to use selected features of the application. For example, in Office 365, the students in HEI4 were only thought how to use the email features (S10).

The problem is that it is assumed that close to 90 percent of the students know how to use computers but that is not true. "*I would probably say that at least 90 percent of them knows their way around a PC. And that's the reason why we've got about 21 – 22 tutors every year to assist the students. The tutors are available from 8 in the morning to 8 at night, Mondays to Fridays for that purpose say if you got an issue with Pastel or Strata. The tutors are available to assist you*" (IT3). Because of this, HEI3 employs senior students as tutors to assist junior students on how to use the applications. The tutors are available from 8am to 8am on weekdays. Apart from that, there is no specific SaaS training programme in place at HEI3 (S8; S9; L3; IT3). This

research suggests that HEIs should organise SaaS training for both students and lecturers on a regular basis and not assume that around 90 percent of students can use the computer and therefore, they can use SaaS.

6.5.14. Location

It is important to consider the location of a service provider when deciding on a choice of SaaS application. For example, if the service provider is in South Africa, the local bandwidth will be faster compared with the international bandwidth. A service provider in South Africa will therefore be a preferred choice for HEIs in South Africa while a service provider in Nigeria will be a preferred choice for Nigerian HEIs. "*We also need to consider the technical location of the service provider. If they are in South Africa, it's an advantage because we have much faster local bandwidth than the international bandwidth. So, it's much better if they have a local bandwidth system*" (IT4). For example, some of the students from HEI3 noted that their emails are slower than it was before they moved to office 365. This could be due to the latency issue because the data no longer seats on the institutions server but on the service providers (Microsoft) server which is situated of campus.

6.6 Outcomes

6.6.1. Benefits of Software as a Service for the students

As HEIs continue to adopt SaaS, there is a need to explore the actual benefits that HEI users derive from SaaS so that it can be compared with the expected benefits to ascertain whether the users are enjoying the expected benefits of SaaS. The participants identified several benefits of SaaS based on their personal experience. There are several benefits of SaaS for both students and institutions. One of the benefits of SaaS for students identified by the participants is the ability to access it from any internet enabled device such as smartphones and laptops (S10; L3). The hardware requirement is also minimal because the processing is done on the service providers hardware (S12). Thus, students are not forced to buy sophisticated and expensive devices as they can access SaaS with any basic device. "*I think it is cheaper for the students because they can access it using any device and they are not forced to by sophisticated and expensive device*" (IT1). Since the price of traditional software is often expensive and most students cannot afford it, SaaS makes the software available to students including those who would normally not afford it (S4). The high availability, ease of use and accessibility of SaaS are some other benefit identified by the participants (S2; S4; S6; S7; S9; IT2). "*I am attracted to software as a service because it is available at any time of the day or night. There was a day for example that I had to do an assignment. I was very busy throughout that day with other activities and only realised about 11:00pm that I needed some documents for my assignment which was due the next morning. I had to use the hotspot at my hostel to access that document on Dropbox and that was how I could finish my assignment that night. Otherwise, I wouldn't have been able to finish the assignment. Also, the fact that I don't have to think about installation and upgrades of the software gives me some extra time to do my school work. It's a really amazing innovation*" (S3). For students, the high availability is very important because they get more confidence knowing that they can access it from anywhere at any time (S2). Another

benefit identified by the participants is the anytime, anywhere access provided by SaaS (S1; S6; S9; S10; S11; L3; IT1; IT4). "*I think the accessibility of software as a service is a good advantage because you can access it from anywhere. It also makes it easy for students to share documents and collaborate on projects*" (S1). Some of the participants also mentioned that the use of SaaS helps with time management (S6; S9). "SaaS also improves productivity because it allows users to complete more tasks by assisting them with time management" (S11). For example, some SaaS applications such as Office 365 have features like calendar and allows users to schedule meetings and plan their time effectively.

The performance of SaaS is also reported to be good if the internet connection is good (S11). The participants also noticed an improvement in user confidence which subsequently leads to improved communication and collaboration as students can share documents and files and work on the same project simultaneously (S1; S3; S8; S11; IT1; IT4). For example, lecturers and students send emails to one another using SaaS applications. The lecturers also upload academic materials such as class notes, assignments and provide feedback for students using SaaS applications such as Moodle and Office 365 (L1; L2; L3; L4). The students can also chat with the lecturers and other students.

The continuity that SaaS offers is another benefit identified by the participants. "One advantage is the continuity it offers that allows *you to continue from where you stopped from another device from a different location. The second is the accessibility being able to see your work at a goal and the possibility to access it from anywhere at any time makes it interesting*" (S5). For example, a student can stop working on a project on campus and continue from where he/she stopped from home using another device. With group work, students working on the same projects can all see the up to date version of the project and they won't have to do what somebody else has done. This helps to eliminate repetition of work and can improve the quality of academic work (S5).

6.6.2. Benefits of Software as a Service for the institutions

The HEIs also benefit from the minimum hardware requirement of SaaS as the processing is done on the service providers hardware (S1; S12). Thus, the HEIs can purchase computers with low processing power which are often less expensive (IT3). The HEIs also benefit from SaaS because it provides them with adequate resources to meet their needs and allows them to scale up or down when necessary (L2). "*The institution can increase or decrease the number of devices with access to SaaS depending on the number of students enrolled in a class*" (L3). The cost of acquiring and using the software becomes cheaper for the institution with SaaS. The HEIs also save on licensing fees, installation fees, maintenance fees or upgrade fees as they are not applicable to SaaS (S4; S3; S9; S12; IT1). "*SaaS offers automatic updates which helps the institution to save both time and money needed for upgrades*" (IT1).

The capability of SaaS to allow students to manage their own activities means that less personnel time is needed, hence it could lead to cost savings for HEIs. "*Higher education institutions save on cost because there*

is less personnel time needed since the students are able to manage their own activities using SaaS applications" (L4).

The pay as you go model of SaaS is another benefit of SaaS noted by the participants as it assists HEIs to save on cost especially during holidays when usage is low (S3; S8; L3). "*We save a lot of money during school holidays because most of our students are away and the usage is very low at that period*" (IT2). SaaS also provides students with access to more resources as resources of several institutions can be pooled (IT1). For the institution, there is no cost of ownership as the institution does not need to purchase the software but simply needs to subscribe and pay per usage (L1). SaaS is available on demand and intending users can be up and running in no time (S3; L1, L2; IT2). SaaS also helps to reduce paper work because assignments, tests and examinations can now be done online (S6; L1; L2).

Some SaaS solutions makes the management of student and staff information easier for HEIs. Another important advantage of SaaS for HEIs is that it allows them to reach more students. The institutions can now provide software for as many students on demand. "*SaaS applications allow higher education institutions to communicate important information to students through any devices the student chooses and it keeps students updated about academic activities such as registration, class time table, course grades, and class notes*" (L2).

Also, SaaS reduces the human resource need of the institution as less number of IT staff is needed because most of the responsibilities has shifted to the service provider (L4). "*Since the installation, upgrades and maintenance are performed by the service providers, there is reduction in the number of IT staff needed*" (L4).

The quality of research output by HEIs can also be improved through SaaS applications such as Turnitin (for plagiarism detection) and Atlas.Ti (for data analysis and referencing) because there would be increase in the number of original research due to decrease plagiarism and quality data analysis (L1).

6.6.3. The limitations of Software as a Service for the students

SaaS like any other ICT have limitations and users should be aware of such limitations to find out ways to minimise their effects. The participants have experienced some of these limitations. One of the limitations mentioned by the participants is reliance of SaaS on the internet as the occasional interruptions in the internet service disrupts access to SaaS. This is a serious limitation and the problem does not lie with the students or SaaS but with the internet service (L1). The students are unable to access SaaS whenever there is not internet access or if the internet service is poor.

Also, SaaS could be expensive for students that stay off campus due to the high cost of data. Since most students cannot afford data off campus, it becomes a limitation as they would not be able to access the software without data. "*When we are not on campus, it is difficult to access SaaS because internet is expensive off-campus. Most students cannot afford the internet of campus so accessing SaaS from home is difficult*" (S1).

Furthermore, SaaS could be a source of distraction for some students as they could get carried away by unsolicited advertisement or other features of the application. "*The students mainly use SaaS applications for networking and socialising and they spend a lot of time using it for non-academic activities. These distractions can impact the performance of such students negatively*" (L1). Some students are even on the social networks such as WhatsApp, Facebook and Instagram during lectures. This poses a serious limitation and needs to be addressed urgently. This also shows a need for students to be disciplined and know when to use SaaS and what activities to use it for at different times to avoid being distracted. The students need to balance their use of SaaS between educational and non-educational activities. It is important to note that although social networking was not primarily designed for formal academic activities, they are designed to ensure open flow of information, easy networking and ease of use of technology in various circumstances (Mason & Rennie, 2008). Hence, this research does not argue that the use of SaaS applications for social networking is bad but argues that using SaaS applications for social networking during lectures or when there is an important academic activity is bad. Therefore, the use of SaaS applications for social networking by students during lectures should be avoided. The active participation and involvement of students is very important. "*The students need to show interest in using SaaS for educational activities*" (L1). This research suggests that students should understand and realise that the use of SaaS places more responsibilities on them. It requires them to be independent so that they would be able to complete their tasks and assignments with little or no supervision. The students also need to give priority to important tasks because SaaS applications have different features and functionalities which can distract students.

6.6.4. The limitations of Software as a Service for the institutions

The issues of access and security is a major problem identified by participants. Since the data is stored on the service provider's data centre, the data of the HEI, students, staff, and all other sensitive data are stored with the service provider. If there is any security threat, that could constitute a major problem and the institution could face problems such as lawsuits because of the security threats (S2, L2). "*So, security is a major problem that needs to be considered by the HEIs when adopting and implementing SaaS because a breach in security could lead to loss of data or sensitive information*" (L2). S2 suggests that more should be done in terms of access and security especially when a user loses his/her password to unauthorised person.

The question about the ownership of data is another problem for institutions. "*It is difficult to decide on the ownership of data since the institution may not even know where the data is stored by the service provider*" (S3). This might not be an issue if the institution and the service provider agrees on who owns the data and stipulate that in the SLA. The lack of such clauses in the SLA could lead to the institution losing valuable data to the service provider should there be a disagreement between the institution and the service provider.

6.6.5. Contradictions within the activity systems in the participating higher education institutions

6.6.5.1. Contradictions in HEI1

In HEI1, there is a contradiction between the subject and division of labour (a) as shown in Figure 16 that the students are interested in using SaaS but the lecturers are not really-giving the students the opportunity to use SaaS. "*They are not really giving us the opportunity to use it effectively*" (S2). The relative lack of resources and the insufficiency of resources creates a contradiction between subject and tools (b) as shown in Figure 16 that the students sometimes want to use the resources in the laboratory but the laboratory is full or unavailable due to some other classes taking place or a tutorial taking place. "*There are some labs that get full or are being used for tutorials and students from other classes cannot access it during such times. This is sometimes a problem especially when you need to use the tools urgently*" (S3). The occasional interruptions in internet service also lead to a contradiction between the subject and tools (b) as shown in Figure 16. Although, it was reported that HEI1 has several computer laboratories, it is evident that it is not enough and more needs to be put in place. The problem with internet access also needs to be considered as a matter of urgency to ensure that the tools are available to students on demand as this would lead to the effective use of SaaS.

Another contradiction arises between the community and tools because of the relative lack of resources (c) as shown in Figure 16. The insufficiency of resources leads to the expectations of the lecturers not being fulfilled because it prevents students from actively participating in class. "*Internet connectivity is available but sometime there might be issues like the servers might be down. So sometimes it's not dependable*" (S2). "*The only problem is that there are times when there is a problem with the internet and it could be when you urgently need to work on something that the deadline is approaching*" (S3). This also lead to a contradiction between the rules and the tools (d) as shown in Figure 16 because the students will be unable to submit assignments on time whenever there is interruption in internet service. Although the participants believe that ICT based support tools for SaaS is sufficient in their institutions, the ICT departments each need to find a way to ensure that there are no interruptions in the internet service especially during class periods.

There are also contradictions between the tools and the object (e) as shown in Figure 16. The problem of classroom management faced by lecturers and students causes a contradiction between the use of SaaS (for teaching and learning process) and the objective of improving student's involvement in academic activities and creating a conducive learning environment for students. The fact that many lecturers are not using SaaS in their courses shows a lack of communication and collaboration among the lecturers. This shows a contradiction between the object and division of labour (f) as shown in Figure 16. The use of SaaS should be encouraged across the entire institution to promote and ensure that the goal of creating a conducive learning environment is achieved across the entire institution.

L1 mentioned that lecturers don't have time because they play different roles in the institution. "*It will save you time which is very important to an academic most especially because we have three roles that we play. First is lecturing, second is research and third, community development. If you can save the time that you spend on marking manually because that system helps you with marking. It saves us time and we will be able to do more productive work. That's part of the reasons why I would want to use it in my classes*" (L1). This could lead to a contraction between rules and object (g) as shown in Figure 16 if the time saved is not reinvested into that course. For example, there are rules that a certain class should hold for a certain number of minutes or hours. There is a possibility that the time spent per each class is reduced because of the use of SaaS. The management and lecturers should find a way to structure the classes in way that time saved because of the use of SaaS is spent on other activities that are part of that particular-course or module and not spent on activities related to other roles as that will lead to an improvement in the course.

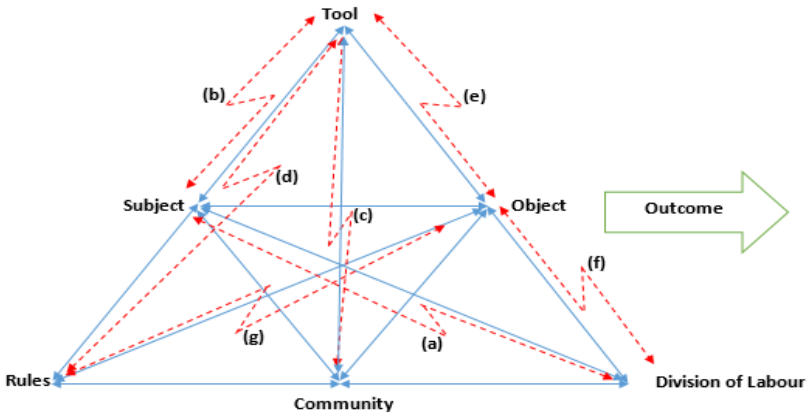

Figure 16: Contradictions within the Activity Systems in HEI1

6.6.5.2. Contradictions in HEI2

Just like the activity systems in HEI1, the activity systems in HEI2 have their own contradictions between the different elements of the activity systems. There is a contradiction between the subject and division of labour (a) as shown in Figure 17 the students are willing to use SaaS but the HEI has not fully adopted it. "*Our students are always eager to learn new technologies and thus, they are willing to use SaaS as soon as it is being fully implemented*" (L2). Another contradiction in the activity systems of HEI2 is between the community and division of labour (b) as shown in Figure 17 because the lecturers are willing to use SaaS but it is sometimes difficult to convince management about the benefits of SaaS. "*It is very difficult to convince management to use new technologies and I think that is one of the reasons why adoption of software as a service has been very slow at our institution*" (IT2). "*Management support is another one problem. Change is another one problem. You have to convince the management*" (L2).

The occasional problem with internet access creates a contradiction between the subject and tools (c) as shown in Figure 17 that the students sometimes want to access a SaaS application but are unable to access it due to interruptions in internet service. "*The problem is that it has not been fully introduced on campus.*

For example, Office 365 is only used in some departments and not across the entire institution. If it were to be fully introduced, I am sure that the students will willing accept it especially when they know that it will benefit them in several ways" (S6). Just like HEI1, participants from HEI2 said there are adequate resources to support SaaS with S5 saying that there are some laboratories that can accommodate very large number of students at the same time, they all noted that there is problem with internet access in some instances. There is also contradiction between the community and tools due to insufficient resources (d) as shown in Figure 17. The insufficiency of resources leads to expectation of the students that the HEI would offer quality education not being met because the tools needed are insufficient. "*There is inadequate funding in Nigerian public institutions like if you hear the gist in town, even some of the staff have not been paid and some of them were only paid half of their salaries so plenty things are happening. How would they provide funds for things like software as a service when they've not even paid the staff? So, I think resources may just be hindering some things that they genuinely want to do*" (S4). The lack of resources therefore prevents the subjects from reaching the desired outcomes.

HEI2 also exhibit a contradiction between object and division of labour. There are other courses that SaaS is needed but the lecturers are not using SaaS because there is poor communication and collaboration among the lecturers (e) as shown in Figure 17. "*It will be nice if they can introduce software as a service as part of the software engineering curriculum because a lot of the students are not aware of software as a service*" (S5). Communication and collaboration among lecturers should be encouraged.

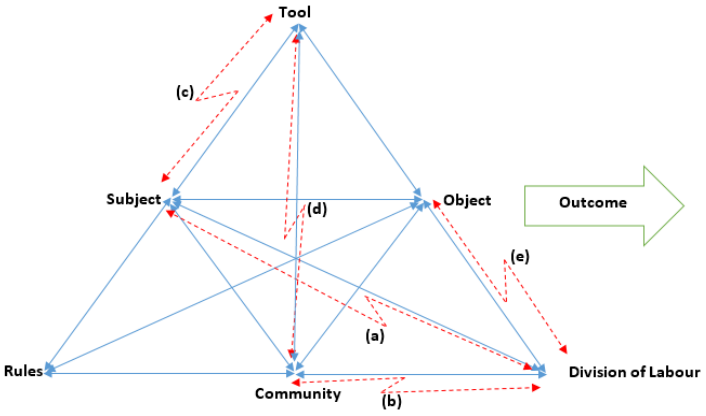

Figure 17: Contradictions within the Activity Systems in HEI2

6.6.5.3. Contradictions in HEI3

In HEI3, there is a contradiction between the Subjects and the Tools (a) as shown in Figure 18 in that it is generally assumed that the students have basic computer skills and in some cases, there are students with no computer knowledge. "*The problem is that it is assumed that close to 90 percent of people know how to use the PCs but it's not true*" (IT3). "*The institution wants to adopt SaaS and migrate fully to the cloud but there is still a lot of specialised software that are traditional software*. *All the specialised software are still based on a HEI3 server where you can go and download it and install it*" (IT3). This creates another contradiction between the Subject and Tools.

The reliance on the internet also creates contradiction between the Subject and the Tools because some students don't have internet access at home. Thus, they are unable to access SaaS from home. "*I have to say if you're not in school, then access to the internet is extremely costly*" (S7). HEI3 tries to resolve this contradiction by supplying students with data but the information about the data is only available to a few students leaving many students in need of data for home access unaware. This is because the ICT department did not create awareness about the provision of data for home access because of the fear that it will attract many students including those who can afford to buy their own data. "*I must tell you that we are not advertising to students about the free data bundles because we are afraid that they will abuse it. Even the ones that can afford it will come*" (IT3)

There is a contradiction between the Subject and the Community (b) as shown in Figure 18 because some of the undergraduate students complain that the bandwidth allocated to them is always insufficient but the institution believes that it is sufficient. "*The undergraduate students get capped internet access which is expected to be enough for their academic work. Although some of the undergraduate students often complain that the bandwidth allocated to them is not enough, the institution beliefs that it is enough if they utilise it for the intended purpose only which is doing their academic work*" (L3). "*There are sometimes when the bandwidth allocated to us is finished and we are not able to access the internet at that time. It will be nice if they also give us uncapped internet access like they give the postgraduate students. It will allow us uninterrupted access to our course materials*" (S9). This means that the students will be unable to access SaaS when their allocated that is used up. There is another contradiction between the Subject and Community in that the IT staff thinks that implementing SaaS on a large scale might lead to job loss.

The assumption that all students have the basic knowledge of computers and the internet creates another contradiction between the Subject and the Community because some students don't have any computer or internet knowledge before getting to the HEI. "*I did not have any experience of using computer and internet before I got to the university so I learnt everything I know about computers and the internet when I got to the university. I think it affected me a bit. I would have done better if I had some experience before getting to the university*" (S8). This also leads to a contradiction between the Rules and Object (c) as shown in Figure 18 because the IT staff disregard the need to implement SaaS due to the fear of getting fired. "*You want to get me to get fired. If SaaS is implemented across the institution, it means that most of the work will shift to the service provider leaving us the IT staff with little or no work. That is a threat to our jobs*" (IT3).

There are some students who get distracted and use SaaS for social activities during lectures. "*It is a form of distraction for students at times. They can even log on to Office 365 while they are in a lecture and look at their emails*" (S7). This results in a contradiction between the Tools and Object (d) as shown in Figure 18 because of the contradictions between the objective to use SaaS for teaching and learning and to create conducive academic environment for students.

There is a contradiction between the Community and Tools (e) as shown in Figure 18 because the there is no step taken to create awareness about the benefits and limitations of using SaaS in the community. "*There is nothing*" (IT3). There is another contradiction between the Community and Tools because some students would have gained experience about computers, software, internet and other technologies prior to getting to HEI if such facilities were available in communities where they grew up. "*I think I struggled a bit when I got to the university. It was hard for me because there is no access to things like computers and internet where I come from*" (S7). Figure 18 shows the contradictions within the activity systems in HEI3. The contradictions found within the activity systems of HEI4 will now be discussed.

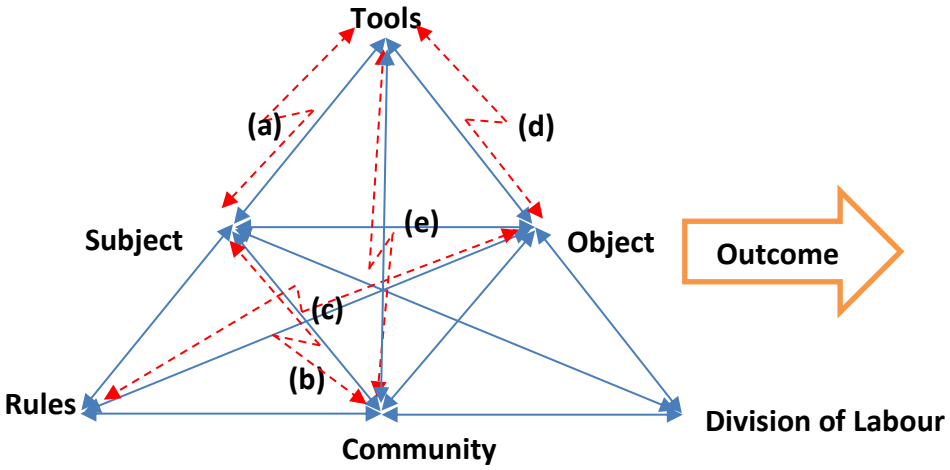

Figure 18: Contradictions within the Activity Systems in HEI3

6.6.5.4. Contradictions in HEI4

There is a contradiction between the Community and Division of Labour (a) as shown in Figure 19 because there could be problems in determining the responsible person in case of data loss as the institution and the service provider could be looking for ways to absolve themselves of the responsibility. "*If the data loss is caused by users on our side, we will be responsible and if the data loss is caused by the provider then they will be responsible*" (IT4).

There is a contradiction between the Subject and the Division of Labour (b) as shown in Figure 19 because the lecturers expect the students to be able to use SaaS on their own without any assistance while the students expect the lecturers to provide them with some training on how to use the applications for their academic work. The assumption by the lecturers that all the students have the required skills to use SaaS also create a contradiction between Subject and Tools (c) as shown in Figure 19 when students with no prior ICT or computer experience are involved because they are unable to use the tools effectively due to their lack of prior ICT knowledge. "*All our students have the required skills*" (L4). The lecturers should organise training for students on how to use SaaS and not just assume that they all have the required skills.

The rules that a lecturer must be present before a student can use the computer laboratory may lead to a contradiction between the Rules and Tools (d) as shown in Figure 19 because students should be allowed to have personal time with the tools to familiarise themselves more with the features and functionalities. "*It is not so easy to access the computer laboratories because in our university, you cannot use the laboratories if*

there is no lecturer there with you. Hence, students with no personal device cannot access SaaS because they need the computers in the laboratory to access SaaS" (S11).

Like HEI3, there is a contradiction between the Tools and the Object (e) as shown in Figure 19 in HEI4 because the students are not attending lectures because of the availability of lecture notes through SaaS applications. "*There is a negative impact because the students don't come to class regularly because they know they can access the materials online via Moodle. So, the problem is that they reduce their class attendance which is not a good idea because these tools are just there to support and not to replace classes*" (L4). The lecturers in other HEIs should follow the actions of L3 from HEI3 and ensure that attendance in lecture is compulsory and is a requirement to qualify to write examination.

The lack of communication and awareness about the benefits and limitations of SaaS leads to a contradiction between the Object and Division of Labour (f) as shown in Figure 19. From the interviews, it can be noted that HEI4, like HEI3 does not have any plan in place for communicating the results of their SaaS initiatives.

There is a contradiction between Community and Tools (g) as shown in Figure 19 due to the background of the subjects. Some students are not ICT savvy because of the lack of access to computers, internet software and other ICTs in the communities where they grew up. "*Obviously, you have some students that are ICT savvy but there are some students with no knowledge of ICT especially the students from poor backgrounds. They don't understand the internet or web browsers or software. I think it takes longer for them to be able to use these kind of software products*" (IT4). Figure 19 shows the contradictions within the activity systems in HEI4

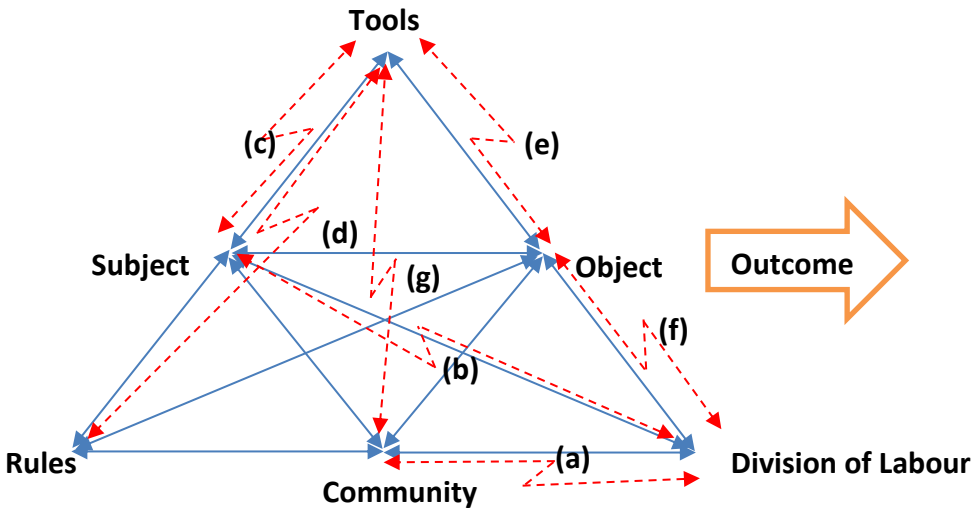

Figure 19: Contradictions within the Activity Systems in HEI4

6.6.6. Similarities and difference in the contradictions that exist within the activity systems in the participating higher education institutions

There are similarities and differences in the misalignments, tensions and contradictions that occur within the activity systems of the participating HEIs. Some of the similarities are:

1. There is an evidence of insufficient access to resources in HEI1, HEI2 and HEI3 with only HEI4 having sufficient ICT resources because of the small number of student population.
2. SaaS has not been implemented campus-wide in all the participating HEIs i.e. partial adoption
3. There is an assumption that students have basic ICT skills needed to use SaaS effectively but it is not true for all students
4. Some of the students get distracted by other features of the application or unsolicited advertisement when using SaaS
5. There are no steps taken to create more awareness of SaaS among the students and staff
6. In HEI3 and HEI4, some of the students intentionally misses lectures because of the availability of class notes via SaaS applications like Moodle
7. In all the participating HEIs, there are some students with no ICT background causing a contradiction between the Community and Tools.
8. There are reported cases of the occasional interruptions in the internet service in all the participating HEIs
9. The students are unable to meet deadlines for assignment submission due to the interruptions of the internet service

The differences include:

1. Only in HEI4, there is a contradiction between rules and tools because a student cannot use the computers in the laboratory unless there is a lecturer present. The other HEIs permit the students to use the computers in the laboratory even when there is no lecturer present
2. There is a difference between HEI2 and the other HEIs in that the students from HEI2 engage in software piracy and cybercrime using the resources meant for SaaS thereby leading to a contradiction between the Subject and the Tool.
3. The contradiction between the Subject and the Tools in which the students are not able to access SaaS based applications off-campus due to the high cost of data is a serious problem in HEI1 and HEI2 but HEI3 and HEI4 both provide students with free data for off-campus access.
4. In HEI3, there is a contradiction between the Subject and the Community because some students come from communities with no ICT facilities and as a result, they do not have the necessary ICT background needed to use SaaS. Although, the participants from HEI1, HEI2 and HEI3 have ICT background, this research does not rule out the possibility that there are some students in these HEIs who also don't have the necessary ICT background.

5. There is a contradiction between the Subject and Tool in HEI3 in which the IT staff was not in support of the full adoption of SaaS because of the fear that it may lead to job loss for him and his colleagues. Although the IT staff in other participating HEIs did not mention this concern, this research does not rule out the possibility that there could be such concern among the IT staff in other participating HEIs.

Although, there are similarities and differences with regards to the contradictions that exist in the activity systems of the participating HEIs, it is important to note that there are more similarities than differences. Thus, the solution to resolving a contradiction in one HEI may be applicable in other HEIs.

6.7 Summary of the findings and analysis

Table 15 provides a summary of the findings and analysis by showing the themes that emerged and the related subthemes.

Themes	Sub Themes
Subjects	❖ Students Background ❖ Lecturers use of Software as a Service and perspective of Software as a Service usage in higher education institutions. ❖ Students Use of Software as a Service o Students attitude, involvement and acceptance of Software as a Service o Students need to be in control of the learning process o Not aware they were using Software as a Service o Skills o Maturity of the students o Understanding of Software as a Service ❖ Perspectives of the IT Staff with regards to the use of Software as a Service in higher education institutions
Tools	❖ Resources ❖ Accessibility ❖ SaaS applications in HEIs ❖ Supporting Infrastructure ❖ Other Supporting Tools ❖ Traditional Software ❖ Complaints and Recommendations by Students with Regards to the Tools o Software Piracy o Lack of Internet Access off Campus o Cost and Internet o Needs to be Implemented Campus Wide o Students do not have access to more powerful machines
Objects	❖ Access course materials ❖ Improve academic performance ❖ Improve communication and collaboration ❖ Ensure continuity ❖ Promote team work ❖ Create a conducive academic environment
Division of Labour	❖ Between students and Lecturers ❖ Between lecturers and IT Staff
Community	❖ Change ❖ Improved academic environment ❖ Corruption ❖ Cybercrimes ❖ Security ❖ Government support for infrastructure provision ❖ Support from the industry and individuals ❖ Management support ❖ Legislation and laws ❖ More investment in Software as a Service is needed ❖ Service level agreement ❖ Staff experience with Software as a Service usage ❖ Training ❖ Location
Outcome	❖ Benefits of Software as a Service for the students ❖ Benefits of Software as a Service for the institutions ❖ The limitations of Software as a Service for the students ❖ The limitations of Software as a Service for the institutions ❖ Contradictions within the activity systems in the participating higher education institutions ❖ Similarities and difference in the contradictions that exist within the activity systems in the participating higher education institutions

Table 15: Summary of the findings and analysis

6.8 Discussion of the Propositions

This section tests the propositions by checking for evidence in the empirical data to confirm whether the proposition is true or not.

6.8.1. Proposition 1

P1: If there are too many contradictions within or between the activity systems, it could reduce the impact of the tool.

The number of contradictions in the activity systems within an organisation affects the impact of a tool. If there are too many contradictions, there would be less impact and the chances of achieving the desired outcome would also be reduced. This proposition is strongly supported in HEI1 and HEI4 with more contradictions as they have not fully realised the benefits of using SaaS. In HEI1, S1 and S2 noted that the use of SaaS applications has not been effective. "*I don't think the impact is as expected. There is less impact because of so many issues. For example, many people don't know much about SaaS and the awareness is low*" (S1). Similarly, in HEI4, S11 mentioned that SaaS is not being used effectively because there is no training in place and the students are forced to learn on their own. "*One of the reasons why the use of SaaS applications has not made much impact is that a lot of students don't have the basic skills needed to use SaaS and our university is also not helping much. They don't even have any training programs in place to improve the situation*" (S11). The impact of SaaS is minimised by the contradictions as they hinder the effective use of SaaS. However, the contradiction should not be seen as a problem but as an opportunity to create change and innovation. The issue with HEI1 and HEI4 is with the way they handle the contradictions. For example, in HEI1, there are cases where they could not identify the contradictions and thus, they could not identify a solution and the impact of the tool (SaaS) was less. "*I'm not sure they are aware of the contradictions*" (S3). In HEI4 also, they tend to view the contradictions as a problem rather than as an opportunity for change and innovation, hence the impact of the tool (SaaS) was also less. "*I think they are too afraid of the contradictions and they pay too much attention to finding the contradictions and looking for solution rather than focusing on other important aspects of the application*" (S10). In HEI2 and HEI3, the proposition is supported but not as strong as it was in HEI1 and HEI4. There are less contradictions in HEI2 and HEI3 compared to HEI1 and HEI4 and the impact of the tool is more in HEI2 and HEI3. For example, many students from HEI2 and HEI3 experienced an improvement in overall learning experience. In HEI2, there is a considerable improvement in the course grades of the students and quality of academic work. "*And in fact, there won't be any repetition of work and there will be continuity. You won't have to do what somebody else has done in the past and it will improve the quality of academic work. You can actually see what has been done and continue from where somebody else has stopped*" (S5).

The students from HEI3 also noted that they have noticed an improvement in their course grades. "*I would say that Software as a Service is making a very big impact. For example, it has increased the confidence of*

many students and we are not able to ask questions freely and get answers from our peers and lecturers. I have also noticed an improvement in my course grades" (S8).

Based on the evidence from the HEI1 and HEI4, it can be concluded that if there are too many contradictions within or between the activity systems, the impact of the tool is likely to be less. Conversely, the evidence from HEI2 and HEI3 shows that the impact of the tool is higher when there are fewer contradictions.

6.8.2. Proposition 2

P2: If there are too many contradictions within or between the activity systems, there are less chances of realising the desired learning outcomes.

The number of contradictions also affects the possibility of realising the desired outcome. Just as the number of contradictions reduces the impact of the tools, it reduces the chances of realising the desired outcome because the tool would not be used effectively.

This proposition (P2) is strongly supported by data from HEI1 and HEI4. For example, in HEI1 many of the benefits of SaaS are not being realised by the students because there are several unresolved contradictions. "T*he students are unable to enjoy the anytime anywhere benefit of SaaS because of the high cost of data and issues with internet access"* (S3).

Similarly, the students from HEI4 noted that the expected benefits of SaaS are not being fully realised because of the contradictions and misalignment within the activity system in their institution. "*There are so many issues that need attention before we can start enjoying the expected learning outcomes. For example, they need to create awareness of SaaS, they need to improve the access and availability of the internet and so on*" (S12). The contradictions affect the Subject-Object-Outcome plane by preventing the transformation of the Object into an Outcome.

Also, in HEI4 the contradiction between the Object and the Division of labour which there is no communication about the benefits and limitations of using SaaS applications prevented the Subjects from having a clear goal regarding their use of SaaS. "*I would say the outcomes are not being realised in full yet because many people are still confused about SaaS and there is no clarity on the reasons why they are required to use SaaS*" (L4). The lack of clear and specific goals prevents the Subjects from acting decisively on the Object to transform it into an outcome. Hence, they are unable to realise the desired outcome.

Conversely, this proposition is also supported in HEI2 and HEI3 with less contradictions although support is not as strong as that from HEI1 and HEI4. There are more cases of students realising the desired learning outcomes due to the fewer contradictions. For example, in HEI2, the students mentioned several benefits they have experienced due to their use of SaaS for academic purposes. "T*here are so many good outcomes that we are enjoying from the use of Software as a Service. For example, we can submit assignments, view our course marks, download the course materials, and communicate with out class mates and lecturers*" (S4).

The students from HEI3 also noted several benefits such as the ability to learn from any place at any time, improved communication and collaboration, ability to submit assignments and view their course marks. "*There is a significant improvement in my course marks and my communication and collaboration skills has greatly improved. I am more organised and I can submit my assignments on time. I am also able to access my study materials from anywhere at any time"* (S8).

The higher the number of unresolved contradictions, the less likely the chances of realising the desired outcome because the contradictions could discourage the Subjects and prevent them from having further interest in using the Tools (SaaS) to transform the Object into the desired Outcome. The evidence from HEI1 and HEI4 strongly supports this proposition (P2) because there are more contradictions in HEI1 and HEI4 than in HEI2 and HEI3 and as a result, the chances of realising the desired learning outcomes in HEI1 and HEI4 were less than in HEI2 and HEI3.

6.8.3. Proposition 3

P3: The contradictions in the activity systems can improve the overall learning experience of the students if handled in a constructive way.

The presence of contradictions within the activity systems of an organisation does not always mean a bad thing as it can lead to the creation of new knowledge which can improve the way activities are being carried out and lead to an improved overall learning outcome. The new understanding about a contradiction can lead to further contradictions which may even go beyond the activity system to other activity systems thereby increasing the possible boundary of learning. The understanding of the history of how the current activities became what they are now, understanding the weaknesses in the relationships between the elements of the activity systems, understanding the effects that possible changes could have on the activity system and identifying the potential for growth in the system can lead to an improvement in the overall learning experience of the students.

The concept of organisations as a social complex adaptive system explains this issue because organisations are not static but dynamic. For example, they undergo constant changes (i.e. change in educational sector policies, change in students, change in lecturers and change in ICT tools etc.) and they adapt to those changes (Keshavarz, Nutbeam, Rowling, & Khavarpour, 2010). That is also part of organisational culture because some organisations learn and adapt better than others. The complex adaptive systems are "highly context dependent in terms of time, history, and space including location and proximity" (Keshavarz, Nutbeam, Rowling, & Khavarpour, 2010; Pg. 1468).

The changes in the context requires organisations to adapt. Hence, organisations are constantly evolving and responding to the changes in the environment therefore there is a possibility of an improvement in the overall learning experience of the members of the organisation.

The changes in the activity systems of an organisation requires an organisation to be able to adapt, change, learn continuously and constantly improve in order to transform itself. The concept of an organisation as a learning organisation also explains this issue because a learning organisation facilitates the learning of all its members and constantly transforms itself to meet its strategic goals (Ghaffari, Burgoyne, Shah, & Nazri, 2017). Thus, the learning organisation has characteristics that allows it to meet the ever-changing needs of the environment (Hussein, Mohamad, Noordin, & Ishak, 2013).

Finally, the concept of innovation, including grassroot innovation also explains this issue. The contradictions within the activity systems in a higher education institution can lead to grassroot innovation which can facilitate the institutional adoption of alternative practices from grassroot to the mainstream. Thus, it will cause changes in the adopting institution (Boye, 2015).

This proposition is supported by the empirical data from HEI3 and HEI4. For example, in HEI3, the contradiction between the Subjects and the Tool in which some of the subjects (students) did not have access to the internet off-campus because they could not afford it prompted the students to form study groups and stay on campus to complete their assignments so that they can access the internet on campus. "*Some of us don't have internet access at home so we have formed study groups to encourage ourselves to stay on campus after lectures to complete our assignments before leaving the campus. That way, we are able to use the internet on-campus to complete our assignments"* (S9).

Similarly, the contradiction between the Subjects and the Tool in which some of the students did not have access to the internet off-campus prompted the institution to come up with a new way of distributing free data bundles to students for off-campus access. "*It is difficult to get internet access from home because the internet is very expensive and most of us students cannot afford it*" (S7). This lead the institution to provide the students in that category with free data bundles which they can use to access their study materials, submit assignments or view their course marks. The new way of providing internet access for students that stay off-campus contributed to the improved overall learning experience of the students as they are now able to also enjoy the anywhere anytime benefits of SaaS.

In HEI4, the contradiction between the Subject and the Division of Labour (b) as shown in Figure 19 in which the lecturers expect the students to be able to use SaaS on their own without any assistance and the students expect the lecturers to provide them with some training on how to use the applications was handled in a constructive way by some of the students. Instead of just waiting for the lecturers to provide training, some of the students sourced training and study materials on how to use the SaaS applications and studied on their own. Hence, they were able to use the applications effectively and enjoy an improved overall learning experience. "*As students, we expect to be trained on how to use these applications but unfortunately, there is no training plan in place at our institution. So, in my case, what I do is to look for the training materials for any application that we are using and I train myself on how to use it. That is how I have been able to cope and use the applications effectively to realise the benefits*" (S12).

This proposition (P3) is also supported in HEI1 because the contradiction between the Subject and Tool in which the students sometimes wish to use the computer laboratory but it is unavailable due to tutorials or other classes taking place in the laboratories prompted the students to find new ways of doing their assignments. For example, the students now do their assignments from Wi-Fi hot spots on campus using their personal devices to access the applications and thus, they are able to reap the benefits of the SaaS applications and experience an improved overall learning experience. "*If I go to the laboratory and it is unavailable, I usually just go to anywhere there is hot spot on campus and I do my work from there"* (S3).

Conversely, the contradiction between the community and tools in HEI1 because of the relative lack of resources (c) as shown in Figure 16 in which there is no internet access is poor is not being handled in a constructive way by some students who ignore their assignments and blame it on the lack of internet access at home. As a result, they fail their assignments and they are not able to realise an improved overall learning outcome. To handle the situation in a constructive way, they could have stayed on campus where there is internet access to complete their assignments. "*I have failed in some assignments in the past because I did not have internet access at home and I was not able to my assignment. So, I got a zero in that assignment" (S2).*

However, in HEI2, there is insufficient evidence to support this proposition (P3). The empirical evidence from HEI1, HEI3 and HEI4 shows that the overall learning experience of the students can be improved if the contradictions are identified and handled in a constructive way.

6.8.4. Proposition 4

P4:

P4a: If the rules are not in place, there are less chances of realising the expected benefits.

P4b: If the rules are not aligned with SaaS, there are less chances of realising the expected benefits.

The rules relating to the use of SaaS and supporting tools should be put in place and aligned to SaaS to ensure that they are directed towards the realisation of the desired outcome. If the rules are not aligned, the desired outcome may not be realised.

This proposition is strongly supported in HEI4 where the rule that the students are not allowed in the computer laboratories unless there is a lecturer present with them is not aligned with SaaS because the students will not be able to enjoy the expected benefit of anytime anywhere access when there is no lecturer available in the laboratory. "*In our university, the students are not allowed in the computer laboratories alone. A lecture must be there with them. I know they gave us free laptops and we don't really need the laboratory computers but what if there is a problem with our laptops and we need to do an assignment urgently?*" (S11). If there is no lecturer present in the laboratory, it means the students cannot use the resources in the laboratory. Thus, their chances of realising the expected benefits are reduced because they will not be able

to use the SaaS applications to achieve the expected benefits such as completing an assignment or viewing their course grades.

For example, although HEI4 provides all their students with free laptops and free internet access, there was an instance when the laptop of one of the students (S12) was faulty and the only place the student could access a computer was in the laboratory but because there was no lecturer around, S12 could not complete the assignment on time. Hence, the desired outcome was not realised. "*There was a time I had problems with my laptop and could not use the computers in the laboratory because there was no lecturer available at that time. That was the reason why I could not submit that assignment on time and I ended up getting a low mark in it*" (S12).

The empirical evidence from HEI1, HEI2 and HEI3 is insufficient to support or oppose this proposition. However, the empirical evidence from HEI4 strongly supports the proposition and show that the students get low grades because they are not able to complete their assignments due to the lack of access to the computer laboratory without the presence of a lecturer.

6.8.5. Proposition 5

P5: The actual positive outcomes from the use of SaaS greatly exceeds the actual negative outcomes.

The expected outcome is the motive or reason why the students engage in the activities and it explains what is happening more than the action itself because the same action might have different motives. For example, a student working hard on an assignment might be motivated to finish the assignment before the deadline or to get good grades in the assignment. Also, different actions could be taken to derive the same motive. For example, a student might read his books to gain more knowledge in preparation for test or examination and another student might have a group discussion with other students to share knowledge in preparation for the test or examination.

All the participating students have a motive or need for using SaaS applications (expected outcome) and their actual positive outcomes greatly exceeds their actual negative outcomes. "*I think the accessibility of software as a service is a good advantage because you can access it from anywhere. It also makes it easy for the students to share documents and collaborate on projects. I have enjoyed several benefits of Software as a Service but I have never really thought of the negative outcomes*" (S1). The researcher expected that there would be much closer gap between the actual positive outcomes and the actual negative outcomes but from the students' perspective, there are mostly positive outcomes. The data shows a wide gap between the actual positive outcomes and the actual negative outcomes as there are so many actual positive outcomes and very few actual negative outcomes.

Some of the actual positive outcomes include:

1. anytime anywhere access. "*I am attracted to software as a service because it is available at any time of the day or night*" (S3).
2. passing assignments, tests, or examinations. "*It has improved my course grades because I have been getting good marks in my assignments and tests. My examination results have also been improved*" (S4).
3. improved communication with peers and lecturers. "*there is significant improvement in my performance due to my use of software as a service. I now have access to all my course materials on time and from anywhere. This helps me to prepare in advance for my tests and exams" (S6).*
4. improved time management. *"I have also improved with my time management because of my use of software as a service*" (S6).
5. improved collaboration. "*It has improved our ability to collaborate and work together in group projects. For example, when we are doing a group assignment, we can work from our own computer and access what other group members are doing. It also allows each member of the group to update or edit the project*" (S11).
6. improved access to resources and getting up to date information about activities on campus. "*I use it to upload course materials so it makes it easy for the students to access the course materials*" (L3).
7. anytime anywhere access. "*I like it because it is accessible over any device with internet capability from any place at any time*" (S8).
8. no need for installation, upgrades or maintenance by the user. "*The fact that I don't have to worry about installation is another feature of Software as a Service that makes me like it*" (L3).
9. effective utilisation of resources. "*It also saves the university resources as the university only pays when the students use it*" (L3)

The actual negative outcomes include:

1. it may constitute a form of distraction for students. "S*ome students get distracted with SaaS because they do other things that are not related to the school work using these applications*" (S4).
2. some students may not be able to access it off campus due to high cost of data off campus. "*Data is very expensive off campus and most of us cannot afford it*" (S7).

From the students' perspective, there is a big difference between the actual positive outcomes and the actual negative outcomes. A detailed discussion on the positive and negative outcomes on the use of SaaS can be found in section 6.6. This proposition is strongly supported in all the participating HEIs. All the participants mentioned several expected positive outcomes and only a few expected negative outcomes. Some participants did not even mention any expected negative outcome as it has never occurred to them that there could be negative outcomes from the use of SaaS. "*I can't think of any negative outcome now because I have never given it a thought*" (S6).

This proposition (P5) is strongly supported in all the participating HEIs because the participants from these institutions all mentioned several actual benefits of their use of SaaS application with only a few actual negative outcomes mentioned. Some participants including (S6) could not even think of any negative outcome but were able to mention several positive outcomes.

6.8.6. Proposition 6

P6: The social, cultural and organisational factors within the academic environment mediate the way in which the Subjects conduct their activities.

The participating HEIs differ in the social, cultural and organisational factors that mediate the way in which the Subjects within them conduct their academic activities. All the participating HEIs have social conditions or rules that guides and shape the way the Subjects behave and do things. They also have cultural and organisational factors that help shape the way activities are carried out.

At this point, I would like to note that some of the social factors are cultural factors as well just like some of the cultural factors are organisational factors. Therefore, there is an overlap between the social, cultural and organisational factors. I have discussed them separately for convenience and the I am not trying to make a strict delimitation of what a social factor is, what a cultural factor is, or what an organisational factors is. They are normally grouped under socio-cultural factors because they are so interwoven. Hence, I have just made a rough classification for convenience.

6.8.6.1. The social factors

Humans engage in social activities which influence the way they conduct activities to meet their needs. The organisational structure, culture and history is transferred from one generation to another and this affects or shapes the way the next generation conduct their activities. For example, there are implicit rules which are unspoken and unwritten but are as a result of the organisational culture in HEIs. Such rules include: (1) the students are expected to behave appropriately in class and the lecturer is expected to be in charge and coordinate the class and (2) the students have to raise their hands if they have a question they would like to ask the lecturer. There are also explicit rules which are written and spoken for example, a student is not allowed to eat in the computer laboratory. "*There are basic rules like no noise in the laboratories, no eating or drinking in the laboratory etc. Because of the limited number of computers, we have to book a computer before the time we need it. There is a booking system to do that*" (S5). These rules are a result of the social, cultural and organisational factors in HEIs.

The Subjects engage in social activities within their organisation and the social factors mediate how they carry out these activities. The social factors include the students, lecturers, rules, social norms, the history of how things are done in the past, the history of how teaching is conducted, the history of how classroom is organised, the relationship between the classroom curriculum and the classroom surroundings, the

relationship between the classroom and the institution and the community, the resources available at the institution. A tool (computers or SaaS applications) is part of the larger social system in a typical educational environment and it affects the social patterns in the organisation. It is therefore important to understand the tools and their function in a complex and social environment (Accuosti, 2014). A good understanding of the tool and other social factors will assist the subjects in using the tools effectively.

In Nigeria, the students are expected to obey and listen to their lecturers and they rarely question whatever instruction the lecturer gives them. "*The social norm in Nigeria is that you cannot question your lecturers especially if they are much older than you. If you question them, it might cause trouble for you. They can even make sure you fail their course if they feel offended*" (S4). The social condition in South Africa is bit different from that in Nigeria because even though the students are also expected to obey their lecturers, they can easily question any instruction they disagree with. "*In South Africa, we are allowed to ask questions freely and we can question our lecturers on issues that we disagree with them. I think that gives us the opportunity to learn in a free environment*" (S7).

Looking at the two scenarios from Nigeria and South Africa, the social norm mediates how the students engage in activities because the students from the Nigerian HEIs may be unable to question their lecturers because of the fear of being seen as disrespectful. This can affect their ability to innovate as they will be conditioned to only follow the teachings and methods of their lecturers.

Conversely, the students from the South African HEIs might be able to innovate and come up with new ways of doing things. The difference in social factors between Nigerian and South African HEIs may affect the generalisability of the research outcome because the generalisability is contextual i.e. if the context is different, the outcomes will be different. It means that different factors affect the activity systems. The difference in the factor means that it is generalisable depending on the context. This research has shown that by applying this proposition (P6) in different contexts i.e. in Nigeria and South Africa. That supports proposition (P6). It is likely that if the results are applied in a different context, it would yield a different result.

Also, the rampant corruption in Nigeria which has become a social norm affects how the Subjects from HEI2 (a public HEI) carry out their academic activities because there is inadequate access to resources and as a result, adoption of SaaS has been very low in HEI2 and most students are not able to carry out their academic activities. "*There is a lot of corruption in Nigeria and in most cases, the money meant for It resources in the universities are diverted for personal gains of the individuals concerned. This affects the way we do things because we don't have the latest academic technologies like our peers in other less corrupt countries*" (S5). The social condition is in this regard is different in South Africa because the two South African HEIs performed better than HEI2 in terms of access to needed ICT resources. This demonstrates how the difference in social factors mediate how the Subjects conduct their activities.

6.8.6.2. The cultural factors

The cultural factors include the national culture in the environment which the organisation is located such as the language, religious beliefs, and the local culture of the people from that environment (Kanwal, Rehman, Bashir, & Qureshi, 2017). Cultural factors affect how people learn and conduct their daily activities and it can determine whether a tool would be accepted or rejected by the community. Cultural factors can influence a lecturers' decision on whether or not to use a technology for teaching and learning activities (Mirriahi, Dawson, & Hoven, 2012). If the cultural factors are not aligned with the tool, it may cause problems during the implementation of the technology (Al-adwan & Smedley, 2012).

The cultural factors in Nigeria differs in some aspect from that in South Africa. For example, the languages spoken in Nigeria vastly differs from the languages spoken in South Africa. Even within these countries there are cultural differences between the regions and that affects the way the people conduct activities. The differences in religious beliefs also shapes the way people engage in activities. Further details about difference between the Nigerian and the South African HEIs due to the different social factors in these countries can be found in section 7.3.

6.8.6.3. The organisational factors

The organisational factors also play a vital role in shaping the way activities are carried out by the Subjects. The organisational factors include the external environment in which the organization operates, the resources available within the organization, as well as its culture and management practices (Sokola, Gozdek, Figurska, & Blaskova, 2015).

The culture of the organisation is a reflection of the values of the organisation and it is essential in the creation of systems for change and provision or resources to effect those changes (Marshall, 2010). It involves a set of shared values, beliefs, patterns of behaviour, practices, comprehension, assumptions, norms, perceptions, emotions and feelings that form and governs the behaviour and attitudes of people in an organization" (Alrasheedi, Capretz, & Raza, 2015; Sokola, Gozdek, Figurska, & Blaskova, 2015).

Organisational culture has the potential to support or oppose activities and it affects the way activities are carried out by members of an organisation. The shared values have a strong influence on people and it dictates how they dress, act, or perform their daily activities (Areekkuzhiyil, 2016).

For example, the organisational culture in in HEI3 being an old institution differs from that of HEI4 which is a new and emerging institution. "*There are established and acceptable ways of doing things in our institution. So, if you want to do something, you just need to ask questions and find out how other have been doing it in the past*" (S8). The situation in HEI4 is different because it is a new and emerging institution and many of the activities are new to the students. "*We had to learn a lot of things on our own because we were the pioneering students and there were no senior students that we could learn from*" (S11). Refer to section 7.5 for additional

information regarding the difference between the old and newly established HEIs due to the difference in organisational culture.

Similarly, the organisational culture in HEI1 being a private HEI and HEI2 being a public institution affects the way activities are carried out. For example, the needed academic ICT resources are more available in HEI1 than in HEI2 because of the difference in organisational structures in which funds to acquire the resources mainly comes from the proprietor of HEI1 while in the case of HEI2, the fund comes from the government. Hence, the students from HEI1 have better access to needed ICT resources than the students from HEI2. "*We have enough ICT resources because our institution is private and we don't rely on the government for funding*" (S2). Refer to section 7.4 for further details regarding the difference between the private HEIs and the public HEIs as a result of the difference in organisational culture.

Also, in HEI3 because they were used to traditional software and it has become a part of their organizational culture, they were reluctant to migrate fully to SaaS based software because of uncertainties such as the change it might bring, the need to acquire new skills and the possibility of losing their job on the part of the IT staff. "*The problem is that we as the IT staff don't want to lose our jobs. The full adoption of SaaS might lead to job loss for me or some of my colleagues and we don't want that. So, we are not moving towards adopting SaaS in full but if the directive comes from the top management then we don't have a choice*" (IT3). Based on this comment from IT3, it will be difficult for HEI3 to fully adopt SaaS because the IT staff are supposed to provide the management with information and advice on the application so that they can make an informed decision. Since the IT staff are not willing to fully implement SaaS, they may withhold such information from the management and the management may not be able to initiate such implementation due to lack of adequate information.

The differences in the social, cultural and organisational factors of the participating HEIs speaks about the contextuality of the activity theory and my findings. It also talks about the generalisability issues because the differences may mean that the results are not generalisable or that they are only generalisable under certain social, cultural and organisational conditions. This proposition (P6) is strongly supported in all the participating HEIs because all the participating HEIs have social conditions or rules, cultural factors as well as organisational factors that guides and shape the way members of their organisations behave and do things.

6.8.7. Proposition 7

P7: The use of SaaS mediates and shapes the way the students and the lecturers do their work.

The students and lecturers use tools such as SaaS applications to manipulate the environment to achieve the desired outcome. The nature of the tools shapes the way activities are carried out when using them. For example, if one student uses a hard copy of a study material and another student uses a SaaS based version of the same material, there would be a difference in the way they do their work as the student with the hard copy can study the material without depending on other resources like the internet of an internet enabled

device while the student with soft copy will not be able to work if there is no internet access. "*If you are staying at the university residence, then there is internet access but if you stay at home, you would have to* get your own internet. That is the problem because internet is very expensive from home and we are not able to do our work from home because the internet is too expensive" (S10).

The applications are embedded in them the ideas and assumptions of the people who developed them and as such, they tend to force the users to do things the way the developers intended. "The lack of customisation in some cases is a disadvantage *with SaaS*" (S9). The lack of skills needed to use the tools by the Subjects also affect their ability to realise the desired outcome. If some Subjects are less privileged than others, it also affects their ability to achieve the desired outcome. "I think I struggled a bit when I got to the university because of my lack of needed ICT skills. It was hard for me because there is no access to things like computers and internet where I come from" (S7).

This proposition is strongly supported in all the participating HEIs. For example, the students are able to perform activities such as viewing an assignment, submitting an assignment, communicating with their peers and lecturers using SaaS applications as opposed to the lecturer writing the assignment on the board or reading it out for the students in class. "*It saves time and it allows us to view, complete and submit our* assignment electronically. It also improves accessibility because it is available from anywhere using any device that has internet capabilities. It is also easy to use because anyone with basic computer skills should be able to use it." (S6).

Also, in HEI3 there are some students like S7 who come from poor background and from rural areas with no ICT facilities. These students find it difficult to use SaaS due to their lack of the basic ICT skills needed to use SaaS. The other students from rich backgrounds have more privileges than the students from poor background and are able to use SaaS more effectively to achieve the desired outcomes. "*I had my own laptop since high school. I also did computer science in my high school from grade 10 till matric so it increased my ability to use Software as a Service effectively. So, if someone is using computers for the first time in the university, I offer to help them with the basics and I tell them if it does this, do that or if it gives you this problem, just restart the computer. Then, I help with basic things like if we use excel or word or PowerPoint, they will come to me and ask me how to do something. So, it helps a lot if you have at least the basic view of what happens in computers*" (S10). When there is a situation which some students have more privilege than others or some students have the basic skills needed while some students don't have it, or when the tools are not well suited for the intended goals, they affect the way the lecturers and students carry on their work.

This proposition is also true in HEI1. For example, because SaaS requires the internet to function, the students sometimes have to work at night because they mentioned that the internet service is usually better during the night when there is no overload. "*In our hostel, I have noticed that the internet service is better at night. Maybe it's because many people are sleeping at night and the usage is low*" (S1). This has changed the way

the students work as most students prefer to work during the day but they are forced to work at night on days when the internet service is congested or not accessible.

6.8.8. Proposition 8

P8: If there is insufficient or restricted flow of information within the activity system, the desired outcome will not be achieved.

The information about the environment, the resources available, and the possible outcomes are important in the realisation of the desired outcome. The availability of relevant information will assist the Subjects in getting a clear picture of the Object and the expected Outcome. It is important to know what information is available to the Subjects and what information is not available. The reason why such information is not available should also be identified in situations when they are not available. Also, ensuring the accuracy of the information is important as information may change as it passes from one person to another. If the information is inaccurate or distorted, it will prevent the Subjects from realising the desired Outcome. Also, people may act on inaccurate, inadequate or distorted information and this would create a contradiction and prevent them from realising the desired outcome.

Sometimes the information may not be clear or people may disagree with it. Sometimes the information is sent out by the institution but it gets interpreted differently by people. An example is when the institution says we are going to use SaaS because it can help us to save cost and then the IT staff say it can make us loose our jobs. "*The problem is that we as the IT staff don't want to lose our jobs. The full adoption of SaaS might lead to job loss for me or some of my colleagues and we don't want that" (IT3).*

This also relates to the culture of the institution. For example, if such a message is sent out to the IT staff in HEI4, it may not be an issue because it is still a new and growing HEI. So, the IT staff may not be bothered but in the case of an older institution like HEI3, the IT staff are worried about the possibility of losing their jobs

It is vital to note that it is not always a case of restricted flow of information in terms of the volume of information but in some cases, it could be because of the quality of information i.e. the information is not clear or it is misinterpreted. "*I think the problem is that people are not sure what will happen to their job if SaaS is fully implemented. There is no clear information about the effects of the full implementation on our job for example*" (IT3). In the case of HEI3 where the IT staff were afraid of losing their jobs, the information seems to have been misinterpreted by the IT staff and that is preventing the institution from realising the desired outcome of cost saving. The misinterpretation of the information prevents the Subjects from realising the desired outcomes because the IT staff did not support the full implementation of SaaS and some of the students were not able to reap the expected benefits. Furthermore, the desired outcome is not being realised in full because of the lack of awareness about the benefits and limitations of SaaS. The IT staff might have misinterpreted the information or they may have gotten a negative information about SaaS and they may not be aware of the positive sides like the opportunity to learn new skills. As a result, the IT staff may

withdraw important information about a SaaS application because of the fear that it might lead to job loss. This contradiction prevents the Subjects from acting on the Object in an effective way to transform the Object into the desired Outcome. This represents a tension in the activity system of HEI3.

Also, this proposition (P8) is strongly supported in HEI1 where there is lack of communication among the lecturers which prevents the campus wide implementation of SaaS. Thus, the students are not able to reap some of the expected benefits of SaaS because it has not been fully implemented due to the restricted flow of information among the lecturers. "Some lecturers are not using any SaaS application in their courses. I think this is due to the lack of awareness about the benefits and limitations of SaaS. Also, there is no communication among the lecturers on this topic" (L1). This proposition (P8) is also supported in HEI2 because there is no communication about the results of SaaS initiatives and as a result, the usage of SaaS is very low. Thus, the benefits are not being fully realised.

This proposition (P8) is ambiguous in HEI3 and HEI4 because there is empirical evidence from both HEI3 and HEI4 that supports and opposes this proposition. For example, there is empirical evidence from both HEI3 and HEI4 that shows a lack of communication among the students, lecturers, IT staff, management and the entire community but regardless of that, some of the students could still realise the expected outcomes. It not supported because the lack of communication did not prevent some of the students from achieving the desired outcomes because they were able to realise the expected outcomes regardless of the lack of communication (restricted flow of information). "*Although there is inadequate communication regarding the benefits and limitations of Software as a Service, some of us are still able to realise the desired outcomes. For example,* we are able to submit our assignments, view our marks and communicate with one another using Software as a Service application" (S10).

Also, there is no communication in all the participating HEIs about the results of their SaaS initiatives but regardless of that, the majority of students from HEI3 and HEI4 noted that they are enjoying the expected benefits of SaaS. "*There is no communication about the result of our SaaS initiative but it has not affected me in any way because I am enjoying the benefits of SaaS. For example, my communication and collaboration skills* has improved tremendously. My grades have also improved consistently" (S7). This shows a lack of support for this proposition.

Contrary to that, there are also cases in both HEI3 and HEI4 where this proposition is supported. For example, in HEI4, the vice chancellor gave a clear information on the implementation of Moodle. The IT staff got the message and did not misinterpret it because they knew that the vice chancellor knows what he wanted and explained himself clearly because of his ICT background. As a result, the IT staff supported the implementation of Moodle and both the institution and the students were able to realise the expected benefits. "Our vice chancellor has a very good ICT background so we get all the necessary support from him. The information we receive regarding the implementation of our SaaS applications is also clear. That allows us to implement the applications successfully" (IT4).

In summary, the propositions (P1 to P8) are supported by the empirical data except for cases where there is ambiguity (i.e. there is data that supports and opposes the proposition simultaneously) or the available data is insufficient to support or oppose the proposition. The proposition (P8) is supported in HEI1 and HEI2. In some instances, in both HEI3 and HEI4, this proposition is supported but in other instances, it is opposed. Hence the reason for the ambiguity. A summary of the propositions is presented in Table 16.

Identification of the contradictions between and within the activity systems in HEIs and resolving them will increase the impact of the tool (i.e. SaaS applications). It will also increase the chances of successfully transforming the Object and realising the desired Outcome.

Furthermore, if the contradictions are handled in a constructive way, it could lead to an improved overall learning experience for the students. To achieve this, the rules also need to be put in place and aligned towards SaaS.

In addition, the way in which the Subjects conduct their activities is shaped by the social, cultural and organisational factors in their community. Moreover, the use of SaaS mediates the way the students and the lecturers conduct their work.

Finally, the continuous flow of adequate, accurate and undistorted information is essential to ensure the effective use of SaaS and the realisation of the desired outcome.

Propositions	Higher Education Institutions			
	HEI1	HEI2	HEI3	HEI4
P1 (*If there are too many contradictions within or between the activity systems, the impact of the tool is likely to be less*)	✓✓	✓	✓	✓✓
P2 (*If there are too many contradictions within or between the activity systems, there are less chances of realising the desired learning outcomes)*	✓✓	✓	✓	✓✓
P3 *(The contradictions in the activity systems can improve the overall learning experience of the students if handled in a constructive way)*	✓	?	✓✓	✓✓
P4 *(If the rules are not aligned with SaaS or they are not in place, there are less chances of realising the expected benefits)*	0	0	0	✓✓
P5 *(The actual positive outcomes from the use of SaaS greatly exceeds the actual negative outcomes)*	✓✓	✓✓	✓✓	✓✓
P6 (*The social, cultural and organisational factors within the academic environment mediate the way in which the Subjects conduct activities)*	✓✓	✓✓	✓✓	✓✓
P7 (*The use of SaaS mediates and shapes the way the students and the lecturers do their work)*	✓✓	✓✓	✓✓	✓✓
P8 (*If there is insufficient or restricted flow of information within the activity system, the desired outcome will not be achieved)*	✓✓	✓	?	?

Table 16: Summary of the Propositions

✓✓	Strongly Supported
✓	Supported
?	Ambiguous
X	Opposed
XX	Strongly Opposed
0	Insufficient Evidence

7. DISCUSSION OF FINDINGS AND RECOMMENDATIONS

7.1 Findings on Student's Use of Software as a Service in Higher Education Institutions

Although there is a confusion amongst students on how to differentiate between the server/web based applications and SaaS based applications, most of the students interviewed have a good understanding of SaaS and are using SaaS for various academic activities including referencing, plagiarism check, programming, mathematics, statistics, data analysis and learning management. They all noted that there is an improvement in their academic activities based on their use of SaaS. In terms of student's use of SaaS, students from South African HEIs use more SaaS applications for their academic activities than students from Nigerian HEIs. While both South African HEIs have already adopted general computing SaaS applications and their students are already using these applications, the students from one of the two Nigerian HEIs are only using the general academic computing SaaS applications for activities like plagiarism check (e.g. Turnitin) and communication (e.g. Microsoft Office 365) and the other Nigerian HEI is yet to introduce these general academic computing SaaS applications but are in the process of introducing them.

7.2 Factors that Affect Students Effective use of Software as a Service

There are several factors that prevents students from using SaaS effectively. Some of the common factors identified in both Nigerian and SA HEIs include prior exposure to technologies as students with prior knowledge or experience with technology tend to use SaaS applications more effectively. The availability of training programmes is another factor as students from HEIs with training programmes in place were found to use SaaS applications more effectively than students from HEIs where there is no training programmes for students on how to use specific SaaS applications effectively.

The lack of ICT background prevents many students from using SaaS effectively. The dependence of SaaS on the internet and the high cost of the internet also affects the students' ability to use SaaS effectively because most of the students do not have internet access at home and are unable to benefit from the anytime anywhere access of SaaS. In the Nigerian HEIs, the affordability of needed supporting devices such as laptop or iPads is an issue as some of the students cannot afford their own devices and their institutions do not have provisions for free devices like their South African counterparts.

Another factor that prevents some students from using SaaS effectively is the distraction from other features of the application or unsolicited advertisement. The students get carried away and valuable time meant for academic activities is used for unimportant activities.

7.3 Comparing the Nigerian and South African Higher Education Institutions

The usage of SaaS among Nigerian HEIs is still very low and only the general academic computing SaaS applications are being used. In terms of management support, there is a disagreement between the two HEIs from Nigeria as participants from one of the HEIs in Nigeria mentioned that management support for SaaS is inadequate as they are reluctant to change from traditional software to SaaS. It is a different case with the other Nigerian HEI because the participants from that institution mention that there is adequate management support for SaaS application at their institution and that is why their usage of SaaS is better than that of the other Nigerian HEI. The South African HEIs on the other hand are all in agreement that they have adequate management support for their SaaS initiatives.

One of the main differences between Nigeria and SA HEIs is with access to power supply. In Nigeria, electricity is a major issue as there are times when there is no electricity to power the devices with which to access SaaS. However, electricity is not an issue with SA HEIs because the electricity supply in SA is more stable than in Nigeria.

Another difference is that Moodle is the most common learning management system in Nigerian HEIs while the LMS used by South African HEIs varies from one HEI to another. One of the South African HEIs uses Moodle while the other South African HEIs uses VULA which is a server based application and not a SaaS application. As discussed earlier, there is a confusion among students and lecturers on distinguishing whether an application is server based or SaaS.

In terms of access to SaaS, students from both the Nigerian and South African HEIs all mentioned that it is easy to access SaaS applications on campus. The Nigerian students however mentioned that the only issue they face is the occasional interruptions to their internet service. For off campus access, students from Nigerian HEIs noted that off campus access is very expensive and unreliable because of poor connectivity in some areas off campus. The South African students however have a divided opinion as some feel that off campus access is affordable and reliable while some feel that it is expensive. This means that students who cannot afford internet services off campus are forced to work from campus and are unable to benefit from the mobility advantage of SaaS. To improve students' access to internet when off campus, one of the South African HEIs have gone into an agreement with MTN to provide free internet access to students on their network for access to SaaS applications and any other academic applications used by the students. This means that their students can access their academic materials for free via the cellular phones numbers. It could be beneficial for students if such arrangements were to be made with other network providers. Other HEIs can also follow suits and enter such arrangements with service providers to ensure easy access to academic materials for their students.

7.3.1 Lessons Learnt from the Nigerian Higher Education Institutions

There is no accountability in one of the participating Nigerian HEIs due to claims of corruption which was said to be one of the biggest issues affecting successful implementation of ICT initiatives. An important lesson from this is that both the government and management of HEIs in Nigeria need to develop strategies to hold all stakeholders accountable for all the funds allocated to a project. This can ensure that funds are used for intended projects and not diverted for personal use of corrupt stakeholders. Another lesson learnt from Nigeria is that there is a need for government support for SaaS application to be used effectively in HEIs. Government support in terms of provision of electricity, proper regulation of the ICT and telecommunication industry to ensure that the cost of data needed to access SaaS and other internet enabled applications is minimal.

Furthermore, the orientation and training of students in Nigerian HEIs is inadequate and it impacts negatively on the ability of students to use SaaS effectively. One lesson that can be learnt from this is that the Nigerian HEIs can provide an in-depth orientation and training for their students as part of general ICT or academic competency training as this could provide them with the needed skills to use SaaS applications effectively.

One of the participating HEIs from SA ensured that the SLA contained clauses stating that the ownership of data remains with the institution. Other HEIs from Nigeria, South Africa and other African countries can learn from this as it could reduce the risks of possible data loss.

7.3.2 Lessons Learnt from the South African Higher Education Institutions

An important lesson learnt from South Africa is that there is a need to monitor students use of SaaS applications to ensure that they are used for academic purposes. Some of the lecturers in the South African HEIs ensure that students switch off their devices during lectures. The students are only allowed to switch on their devices if they are required for academic activities and they are strictly monitored by the lecturers. The lecturers from the Nigerian HEIs can also instruct students to switch off any device that is not needed for the class to prevent students from being distracted and losing concentration in class activities.

The Nigerian government could implement data related bills similar to the one implemented by the South African government as this could help in shaping and regulating the ICT industry which have a large contribution to the economy of a country.

While there are free internet facilities across the campuses in both participating HEIs from SA, the students from the private Nigerian HEI also enjoy free internet access across their campus but the students from the public Nigerian HEI mostly have to pay for internet access. There are also privately-owned internet cafes at the public Nigerian HEI where students could go to use the internet facilities but they also have to pay for it. One lesson that can be learnt from this is that the provision of free internet facilities promotes the use of SaaS among students as it frees them from the burden of the high cost of internet services. The onus is

therefore on Nigerian public HEIs to provide more internet access to their students as this could promote the use of SaaS among their students.

The South African HEIs are among the early adopters of SaaS applications and many of them have reaped the benefits of early adoption. A good lesson for the HEIs from Nigeria and other African countries is to investigate and adopt SaaS applications that are relevant and could be beneficial for their courses to ensure that their students gain access to the latest applications. This has the capacity to empower their students and make them more competitive against fellow students either from their institution, other institutions or other countries.

There is a need for HEIs to introduce SaaS across the entire institution. Most of the participants from Nigerian HEIs noted that SaaS has not been implemented campus wide in their respective institutions. This was among the reasons why adoption of SaaS is low in the Nigerian HEIs. There is a need for campus wide implementation as evident in the South African HEIs to encourage usage of SaaS among students and the entire institution.

The Nigerian HEIs can also enter into agreement with telecommunications and internet service providers just like their South African counterparts so that they can provide free internet access to students when accessing educational applications. This could improve off campus access and provide students with access to SaaS and other resources while off campus.

Although, it might be costly, providing students and staff with free laptops, internet and data by the South African HEIs has improved access to SaaS in their institutions. Nigerian students could also benefit from improved access to SaaS and other ICT resources if the Nigerian HEIs can also provide their students with free laptops, internet and data. For example, one of the participating South African HEIs (HEI4) provide all their students and staff with free laptops, internet and data. The other participating South African HEI (HEI3) also provide free laptops, internet and data to students but only when the student is deemed to be unable to afford to buy it on his or her own. Another effort made by HEI3 is that they agreed with some laptop manufacturers to provide laptops to students at prices lower than the retail prices. This makes it more affordable for the students. The Nigerian HEIs could also enter similar agreement with laptop manufacturers to provide students with laptops at prices below the retail price to improve access among students.

HEI3 ensures that service provider has 24 hours' support services to assist students whenever they encounter problems using the application. The Nigerian HEIs could also ensure that the service provider offers 24 hours, 7 days a week support to ensure that the students receive assistance with issues they encounter at anytime from anywhere when using SaaS applications.

7.4 Resource Rich vs Resource Constraint Higher Education Institutions

The resource constrained HEIs (HEI 2) and the resource rich HEIs (HEI1, HEI3 and HEI4) share similar problems such as increasing number of students and the high cost of ICTs. While the resource rich HEIs are able to meet the demand for resources due to increasing number of students, the resource constrained HEIs struggle to provide their students with adequate ICT resources. Also, many of the students from the resource constrained HEIs are from poor backgrounds and cannot afford basic ICT resources like laptops and internet. The resource rich HEIs on the other hand have access to more ICT infrastructure than resources constrained HEIs. Moreover, many of the students in the resource rich HEIs are from rich background and can afford basic ICT resources like laptops and internet. Ironically, the resource rich HEIs provide their students with these ICT resources for free even though most of their students can afford these resources.

Another major difference between the resource rich and the resourced constrained HEIs is that the use of traditional software is more prevalent in the resource rich HEIs. However, the resource constrained HEIs are more eager to adopt and implement SaaS because of the need to find cheap alternative ways to provide access to educational software for their students.

After careful investigation, this research classified the private HEI from Nigeria (HEI1) as a resource rich HEI because there is adequate provision of needed ICT resources for their students. Two of the public HEIs (HEI3 and HEI4) can also be classified as resource rich while one of the HEIs (HEI2) can be classified as an HEI with a relative lack of resources because they are not able to provide needed ICTs for the majority of their students. Being a newly established HEI, it was surprising to find out that HEI4 has adequate resources available for their students' contrary to the initial assumption by the researcher that HEI4 will be resource constrained. However, this research would like to emphasise that the HEIs classified as resource rich HEIs also lack some resources and the availability of resources varies from one HEI to another. These three HEIs (HEI1, HEI3 and HEI4) have been classified as resource rich HEIs in comparison to HEI2 based on the criteria's used by this research. Refer to Table 10 for further details on the criteria's. This is due to constant increase in the population of students and reduction in government funding which limits the funding available to them. This research found that reduction in government funding and limited funding are not the only reasons why public HEIs cannot afford to provide adequate ICT resources for their students. In Nigeria, some of the reasons why public HEIs are unable to provide adequate resources for their students include lack of accountability, mismanagement and claims of corruption because the money meant for these resources are usually diverted for other purposes or embezzled. Although this research does not rule out the possibility of lack of accountability, mismanagement and claims of corruption in private HEIs, it argues that there is more accountability in private HEIs because the owners are involved in the management of the institution.

Most of the students in the private HEIs are also from rich backgrounds and can afford personal devices such as laptops, smartphones and internet access unlike most of their colleagues in the public HEIs who come from poor backgrounds and cannot afford such personal devices.

This research does not argue that all private HEIs are resource rich HEIs as access to resources may vary from one private HEI to another. Similarly, it could be argued that not all public HEIs are resource constrained as some public HEIs have access to funding more than others. Also, not all students in public HEIs are from poor background. Hence, there are some students from the public HEIs who are from rich backgrounds and can acquire the needed ICT resources for themselves.

This research suggests that the government could consider increasing funding for public HEIs as the main source of funding for the public HEIs is the government. Additionally, government and management of public HEIs can develop strategies to ensure accountability and to reduce corruption. This can ensure that there is little or no cases of mismanagement and the funds meant for the purchase of ICT resources are used for the intended purpose.

7.5 Newly Established Higher Education Institutions vs Already Established Higher Education Institutions

The newly established HEI has fewer number of students compared to the already established HEIs. It was surprising to find out that the newly established HEI has adequate ICT infrastructure in place and the students and staff were all provided with free laptops and internet access regardless of their affordability. This contradicts the prior assumption of the researcher that the newly established HEIs would not have adequate ICT resources because they are expected to spend most of their budgets on other infrastructures such as building of lecture halls and offices. It was surprising to find that although the newly established HEI had other infrastructure commitments, they were still able to provide their students and staff with needed ICT resources. In terms of software usage, the newly established HEI is like the already established HEIs because they also use both traditional software and SaaS. It was also a surprise to find out that the newly established HEI ensured that the SLA with the SaaS service provider contained a clause stating that the ownership of data remains with the institution. None of the participants from the already established HEIs mentioned the inclusion of data ownership in the SLA. This could be a problem because there are jurisdictional issues relating to SaaS and in a case where the data is stored in a different country by the service provider, the laws relating to data ownership may differ from the law in the country of the institution whose data was stored in another country. This research suggests that the already established HEIs could learn from the newly established HEIs and include the clause stating that the ownership of data remains with the institution to ensure that they would be able to access their data even if they decide to move to another service provider.

7.6 Additional Findings and Recommendations

Successful SaaS adoption is critically dependent on the quality of the internet service. Hence, the quality of the internet services available determines the quality of SaaS service available to the students. All the participating HEIs experience poor quality or interruption of internet access occasionally although the quality is better in some HEIs than in the others. This necessitates the need for HEIs to ensure that the quality of internet access is improved to improve the quality of SaaS. One way they could do this is to ensure that the

uptime is specified in the SLA with the internet service providers (ISPs) and penalties are also agreed upon in the SLA in case of a breach in the SLA to ensure that the ISPs meet up with the agreed service level. The students need continuous and uninterrupted access to the internet to access and make use of SaaS applications. The HEIs should therefore see this as an important issue that requires urgent attention and find ways to provide the students with high quality internet service to aid the students in accessing academic resources.

This research agrees with the postulation of the student involvement theory that students who are actively involved in academic and social activities on campus perform better than the students who are less active. "I am actively involved in both academic and social activities and I relate well with most of the students and lecturers. I think that is why I perform well in my academics" (S10).

This research found that students are generally willing to use SaaS and any other ICTs that has the potential to transform learning and make things easier for them. This is good for the implementation of SaaS or any other ICTs because it means that once the HEIs fully implement SaaS, there will be little or no resistance from the students. Even though the students are willing to use SaaS, this research found that there is a lack of agreement among students with regards to the level of acceptance of SaaS because some of the students believe that acceptance of SaaS among students is high while others believe that acceptance is low among students because of the lack of awareness of the benefits and limitations of SaaS. There was a student (S9) who argues that the problem is not about acceptance but with adoption and implementation because their institution has not fully adopted SaaS.

Another finding from this research is that prior experience with computers, internet, software, applications and all other ICTs plays a vital role in student's ability to use SaaS effectively. The students with prior knowledge of ICTs all mentioned that they did not have any problem using SaaS and their prior knowledge of ICTs like computers gave them great confidence to use SaaS effectively. The students with no prior knowledge of ICTs tend to struggle with SaaS especially at the beginning and they waste a lot of time trying to catch up. This affects their performance and makes them lag behind their peers who are ICT savvy before getting to HEI. This research suggests that the government should introduce ICTs into curriculums from primary school level and provide more access to ICTs in schools especially those in the rural areas and schools with relative lack of resources. This will ensure that the students, especially those in the same situation as S7 who came from a rural area in Kwazulu Natal where there is no access to ICTs have experience with ICTs before getting to HEI. This will help in boosting their confidence and ability to use SaaS and other ICTs when they get to HE level. Government should also ensure that such facilities where children could have access to ICTs are available within close range to every community to ensure easy access for all. Availability of ICTs is not all that is needed to prepare students for higher education life, students should also ensure they take initiatives to go to places where these technologies are available be it at school or public libraries to learn how to use these technologies to prepare them for higher education life.

This research found that although the students and IT staff understand SaaS, some of the students were using some SaaS applications without knowing that they were SaaS applications while some IT staff do not know how to use some of the SaaS applications and can only assist students with technical issues. This contradicts the assumption that the IT staff can assist students with any issue they encounter with the applications.

This research found that HEIs are still using more of on premises software and applications and do not have strategies in place on how to adopt SaaS especially the subject specific and research specific applications. There are few SaaS applications currently used in the participating HEIs and they are mostly the productivity applications classified as general academic computing applications in this research. The research specific and the subject specific applications used in the participating HEIs are mostly traditional applications. A list of some of the on-premise software that are currently being used in the participating HEIs can be found in Appendix I and a list of the SaaS applications that are currently being used in the participating HEIs can be found in Appendix K. Appendix K confirms that Microsoft Office 365 is the most common SaaS application among HEIs. The HEIs are mainly using the productivity tools and learning management systems. There are basic SaaS supporting technologies in all the HEIs that participated in this research although they all have issues of occasional interruptions to their internet service. SaaS support tools and applications like computers, internet, own devices, GAFE, Microsoft Office 365 and Moodle are available but they are not fully utilised or implemented across the entire institution. Some of the HEIs are even still using the traditional Microsoft office although Microsoft Office 365 already available on campus. This shows that the use of SaaS among HEIs is still in its infancy because subject specific and research specific SaaS applications are not currently being used by HEIs. Even the general academic computing (productivity and learning management) SaaS applications that are already being used has not been fully implemented across the entire institution.

This research suggests that HEIs should seriously begin to consider fully implementing the general academic computing SaaS applications like Microsoft Office 365 and Turnitin across campus. They should also start to develop plans and strategy to identify the right subject specific and research specific SaaS applications and suitable service providers to adopt the subject specific and research specific SaaS applications and implement them across the entire campus. This research found that GAFE is the most common SaaS application used in HEIs and Microsoft Office 365 seems to be becoming popular as most HEIs have either recently adopted it or are in the process of adopting it.

Also, there is a lack of discipline on the part of some students. This research suggests that students should have self-discipline and know when to use SaaS and when not to use it to avoid distraction. This research also suggests that lecturers should ensure that the students are not allowed to make use of unwanted applications during lecturers. Only the approved SaaS applications for the course should be allowed in class to stop it from becoming a source of distraction for students. For example, in HEI1 the lecturer ensure that all students switch off their smart phones before the lecture begins. The lecturer also takes control of the class and instructs the students to log on to the application as necessary. Also, the lecturers walk around when the

students have been instructed to log on to the applications to ensure that all the students are following the instructions. This is a potential recommendation and not an absolute recommendation and this may depend on the social, cultural and organisational factors and it may not be applicable in some other social, cultural or organisational settings. Refer to the discussion on proposition 6 in section 7 for more details.

Some SaaS applications especially the social applications like Facebook, Twitter and Instagram are sources of distraction for a lot of students as some students are reported to be chatting or browsing on these applications even during lectures. Some students think that they can multitask and they only realised during the interviews that these applications have been a source of distraction to them.

Some students also cultivate the habit of not attending lectures and watching class videos or downloading class notes through SaaS applications such as Moodle and Office 365. This confirms the findings of Ifijeh, Osinulu, Esse, Adewole-Odeshi, & Fagbohun, (2015) in which 61.8 percent of the 7000 students interviewed mentioned that they mainly use Moodle for downloading class notes. "*Software as a Service be a form of distraction. Although they can be used for educational purposes. Things like WhatsApp, it can distract students and make them to concentrate on other things and it can impact negatively on their performance. I think what will help students now is discipline on the part of the students. They would need to balance it. That can actually be seen as one of the downsides*" (L1). It is important to reiterate that SaaS should not be a replacement for lectures but as a supporting tool. One way to ensure that the students attend classes is to make class attendance compulsory for students except if they have valid reasons to miss the class. That will force the students to attend lectures and use SaaS as a support tool and not as a replacement for lectures.

In terms of security, the students in the participating HEIs are provided with usernames and passwords. Contrary to findings of most literature about security concern, it is surprising to find that majority of the students believe that the use of usernames and passwords is an adequate security measure. "We use usernames and passwords to protect our data and I believe that is enough" (S8). Although most students believe that the use of username and password is adequate, this research suggests that HEIs should consider implementing other forms of security like the use of fingerprint access to ensure that when unwanted persons gain access to the username and password of a student, access to the students' information will not be granted if the fingerprint does not match with the username and password.

This research found that managements are supportive of SaaS initiatives in all the participating HEIs. This research also found that although the research participants all agreed that management is trying in their effort to support these initiatives, there is a consensus that more support is needed from management as a lot still needs to be done to improve the adoption and implementation of SaaS. This research suggests that management should engage more with the IT staff, lecturers and students to elicit their software requirements to identify suitable SaaS applications to meet their needs.

A surprising finding of this research negates the general belief by students that if they encounter problems using an application, they can always go to any IT staff to get help. “We always go to the IT staff for any issues we have and they assist us” (S9). This research found that there are times when the IT staff knows nothing about the features and functionalities of the applications and are only able to assist with technical issues (IT3). This research suggests that HEIs should enter agreements with SaaS providers to provide training and skills assessment for IT staff to ensure that they are able to assist the students whenever they are approached for assistance.

Communicating the results of SaaS initiatives with the entire campus community has the potential to increase acceptance level of SaaS across the entire institution. This research found that there is little or no communication about the results of SaaS initiatives on campus because SaaS has not been fully adopted and implemented. Another reason for this could be the resistance to change from the IT staff because of the fear that they could lose their jobs. This research suggests that the management of HEIs should regularly communicate the results of SaaS initiatives and other ICTs initiatives with the members of the institution to create awareness about SaaS and encourage widespread usage. The management should also assure the IT staff that they will not be fired or retrenched due to the adoption of SaaS but will be provided with alternative duties to further improve access to ICTs on campus.

Although there are laws and legislation in South Africa with regards to the protection of data and other ICT related issues, there is no SaaS specific law in South Africa. Similar to South Africa, there is no SaaS specific law in Nigeria but Nigeria has two data protection related bills which have not yet been passed into law (Akinsuyi, 2015). There are however some ICT related legislations in Nigeria. There are no SaaS specific law or legislation in both countries. The availability of data protection related laws and legislations will ensure that the location of data is always known by the users, the person in charge of processing the data will be clearly identified to ensure the data is save and secured (Widmer, 2009). This research suggests that the governments in both countries should develop laws and legislation that will help regulate the SaaS industries in their respective countries as that would ensure stability in the SaaS industries and encourage widespread adoption of SaaS in all spheres of the economy in both countries. The government is also important in overcoming some of the contradictions between the object and the community such as lack of adequate infrastructure and bandwidth and lack of relevant policies. The role of government in overcoming the high cost of services and ensuring the standard of services is also important (Makoza, 2016). In relation to government support, apart from providing laws and legislation to regulate the SaaS industry, governments could assist by ensuring that there is adequate national infrastructure to provide bandwidth and the other SaaS supporting infrastructure. More funds could also be allocated for ICTs initiatives of HEIs to ensure that they adopt and implement ICTs effectively.

An important point made by some of the participants from Nigerian HEIs is the claims that corruption affects ICT initiatives of Nigerian HEIs because most of the fund available are usually diverted to personal accounts

for individual gains. To overcome this problem, this research suggests that government and managements of HEIs could set up committees to oversee such projects and ensure that the funds allocated are used for the intended projects. The committees could also be mandated to provide detailed reports of the project and how the funds were utilised to the government and managements of the HEIs to ensure accountability.

The support from industry and well to do individuals in the society is also important to support SaaS initiatives. This research found that support from industry and individuals is limited in both countries although there seems to be more support in SA from the industry for example, a mobile network service provider in South Africa has entered an agreement with one of the HEIs in South Africa (HEI3) to provide zero rated internet services for their students when accessing any SaaS application that is used at the HEI for academic purpose.

Many of the computer laboratories and other ICT facilities in the participating South African HEIs are also sponsored by industry and rich individuals. This is research suggests that other South African HEIs and Nigerian HEIs should follow the footsteps of HEI3 and enter similar agreements with the service providers to provide their students with free off campus access to internet services which is a major requirement for accessing SaaS. This research found that there is no clear division of labour as to the person responsible for breach of privacy or data loss. This research suggests that the HEIs and their service providers should specify the roles and responsibilities of the service providers and HEIs in the SLA to make the division of labour clear to all parties.

It was also discovered in this research that only few of the courses offered by the participating HEIs make use of SaaS for teaching and learning. This research suggests that management and lecturers should work together to identify courses where the use of SaaS may be needed. Once the courses are identified, the suggested guidelines should be followed to identify the right SaaS applications for the courses and the right service providers. This will ensure that the benefits of SaaS are enjoyed by students in all the courses provided by the HEIs.

Although this research agrees with the findings of Dickinson, Pollock, & Troy, (1995) that education is unique and that students cannot access the quality of learning while studying because most students only understand the usefulness of what they learnt in school years after they had graduated. This research would like to establish that there are some students who can access the quality of learning they experience while studying. This is evident when students noted that they have noticed tremendous improvements in their academic performance due to their use of SaaS. "*For example, Microsoft office really helped me with a presentation I had to do. I did not have a flash drive to copy my presentation to the computer in the seminar room but I was able to access my presentation from the computer in the seminar room because I was using office 365. It really helped me a lot*" (S2). "*There is significant improvement in my performance due to my use of software as a service. I now have access to all my course materials on time and from anywhere. This helps me to prepare in advance for my tests and exams. I have also improved with my time management because*

of my use of software as a service. My communication skills have also been greatly improved. It has really improved my performance" (S6).

Higher education has witnessed substantial changes in the last few years. There has been a significant increase in the number of students and HEIs are faced with constantly snowballing funding concerns. This has placed further pressure on the budgets of HEIs and have left the HEIs with no option but to regularly increase school fees for students. Thus, many students are unable to afford their schools fees, ICT resources or other SaaS supporting technology for off campus access. These has led to several protests by disgruntled students who can no longer bear the burden of expensive school fees. The most recent of such protests is the #Feesmustfall movement by South African students (Council on Higher Education, 2016). In situations like this, it becomes a matter of urgency for government and HEIs to find ways to reduce the cost of providing education without reducing the quality of education. This research suggests the SaaS has the potential to contribute towards reducing cost without compromising the quality of education.

Furthermore, this research found that SaaS is helping students by improving communication and collaboration with fellow students and lecturers. Several activities including email, viewing of course marks and submission of assignments are performed by students using SaaS applications. This is consistent with the findings of Bulla, Hunshal, & Mehta, (2016). Other activities performed by students using SaaS applications includes chatting, data analysis, group discussion, posting and viewing of notices, sharing of academic materials and group work. "*We share different course materials using SaaS applications and there is improved collaboration especially when we do group assignments*" (S7). Most of the students were excited about their use of SaaS and some students mentioned that they have noticed regular improvement in their course grades because of the improved access to materials as well as the improved communication and collaboration derived from using SaaS applications. They also noticed an increase in their confidence when having discussions with fellow students and lecturers. "*We are not scared anymore to ask our lecturers any question that we have. We just email them the question and they reply*" (S7). Most of the students also noted the confidence they gained through their use of SaaS makes them feel more comfortable in the academic environment and it has made the academic environment more conducive for learning. Among other things, the students noted that they are inspired to learn because of "*the ease of access of SaaS applications that aids their learning process*" (S4). It is important to note that SaaS provides continuity in the sense that you can continue with your work from any place at any time using any device from where you previously stopped without the fear of losing any part of your work. S2 mentioned that continuity is one of the main attractions of SaaS for her as she can continue her work from wherever she previously stopped regardless of her location and time.

Most of the students are not worried about the security issues as they believe that their username and passwords is a sufficient security measure. Only S4 and S5 noted their concerns about the security and privacy issues of SaaS. "*I am also concerned that someone might have access to my information and use it for*

whatever reasons. For example, if I submit an assignment using SaaS, the service provider may have an employee with a family member in my class and may decide to get my assignment and give it to the family. This could cause a problem and our lecturer might think that we plagiarized not knowing exactly what happened" (S5). This is consistent with one of the findings of Akande & Van Belle, (2013) and Troshani, Rampersad, & Wickramasinghe, (2013) where they referred to this type of case as 'issue of malicious insider' in which case an unauthorized third party may gain access to confidential customer data through an employee of the service provider.

A surprising finding is that SaaS has the capability to reduce software piracy which is common amongst students in the Nigerian HEIs. "I think I would like them to use more of software as a service because it is much better than on premises software. It can also give us access to original software because some of us end up installing cracked and pirated copies on our laptops since we cannot afford the original ones" (S3). Although students from the South African HEIs did not mention piracy issues, they also noted that software and applications are expensive and a lot of students cannot afford them. The Nigerian students noted that software and other applications that they use for academic activities are often very expensive and an average student cannot afford such applications. The only alternative is to buy pirated copies of the software which is readily available to students at an affordable cost. The availability of SaaS versions of the software has the potential to reduce or even eradicate software piracy.

The gap in access to resources varies across the participating HEIs. HEI3 appears to have more traditional software and applications available to their students. They spend a lot of money on licensing, installation, maintenance and upgrades of these traditional applications. They even go as far as providing the students who cannot afford a personal device with tablets so that they can use it for off campus access. The students with own devices are provided with data bundles for internet access to be able to access their SaaS applications off campus. Another group of students who stay in areas with no internet coverage are provided with flash drives and compact disks (CDs) to download the required applications and go and install it locally on their machines off campus. This research acknowledges the efforts of HEI3 to provide their students with different resources to enable them access study materials via their SaaS application but emphasises that not all the HEIs have access to resources to provide their students with such resources. This research therefore reiterates the previous suggestion that governments should provide bandwidth for internet access in all areas including the rural areas as this can assist the students in accessing study material and other academic resources via SaaS.

This study found that the background of students played an important role in their ability to use SaaS. The students with rich family background who had access to ICTs like computer, smart phones, tablets and internet access at home have more confidence in using SaaS applications than their colleagues from poor background with no prior exposure to ICTs before getting to higher education level. "*I have been using computers since my primary school days and I am very proficient with computers. I have also used different*

software and applications in the past. I think that increased my confidence in using SaaS" (S4). As suggested earlier, government can provide computers and other educational technologies to the students from primary schools through to higher education level to provide the students with a good background. It is also recommended that the government should introduce computer training and other technologies to students from early school days as early as from primary school as that will provide them with necessary foundation that would increase their confidence in the use of technology as the proceed from primary level to secondary level and later higher education level. This can also provide equal opportunities for all the students and promote effective competition among them.

Many of the students find the flexible nature of SaaS as an attractive value of SaaS because it allows anytime anywhere access to resources. "I like the fact that I am able to work from anywhere using SaaS. I now go home early immediately after lectures knowing that I can do my assignments from home. I used to stay late on campus in the past to *be able to do my assignments*" (S6). However, some students are not attracted by the flexibility of SaaS because they do not have internet access at home and are only able to use SaaS while on campus. "*For me it does not really make a difference because I do not have internet access at home. So, the only place I can use SaaS is here at the school*" (S3). One of the differences between server based applications and SaaS based applications is that accessing a SaaS application can be slower than accessing a server based application depending on the distance between the institution and the location of the service providers data centre. In general, the participants (students, lecturers and IT staff) believe that SaaS is a good technology that is changing the way teaching and learning is carried out. The participants also believe that more effort is needed from HEIs to encourage more students to use SaaS applications to improve quality learning. "*I think Software as a Service is a good thing and it can really change the way we learn and help to improve our academic environment. I really wish our university would organize training for us on how to utilize Software as a Service to improve our academic environment*" (S8). This research found that there is no strategy in place at any of the participating HEIs on how to identify and select the right SaaS offering and service provider for the courses they offer. This could be one of the reasons why the adoption and implementation of SaaS has been slow in HEIs. To assist HEIs with this issue, this research developed a set of guidelines for selecting a service provider and for selecting the right applications. These guidelines and the proposed framework are discussed in the next chapter.

7.7 Generalisability

This section aims to draw attention to the generalisable aspects of the findings of this research in relation to other HEIs, other technologies, other stakeholders, other organisations and other African countries.

The usefulness of a theoretical construct beyond its limited domain of known observations is referred to as generalisability (Baskerville, 1996). There are misconceptions about generalisation in Information Systems research (Tsang & Williams, 2012a).

Lee and Baskerville (2003) identified four types of generalisability (Tsang & Williams, 2012a; Baskerville & Pries-Heje, 2014). These are:

1. Type EE generalisability (i.e. the researcher generalises from empirical statement to empirical statement)
2. Type ET generalisability (the researcher generalises from empirical statement to theory)
3. Type TE generalisability (the researcher generalises from theory to empirical statement)
4. Type TT generalisability (the researcher generalises from theory to theory)

This research has three of the four types of generalisability identified by Lee and Baskerville, (2003). The findings fall under the EE generalisability because they are empirical statements from empirical statements. The propositions fall under the TE generalisability as they are empirical statements derived from theory. The proposed framework falls under the ET generalisability i.e. empirical statement to theory generalisability. The type TT generalisability is not applicable in this research.

Although the four types of generalisability has been widely used by researchers in the field of Information Systems, there are some contradictions in Lee and Baskerville (2003)'s treatment of generalisability. For example, they claim that a larger sample size increases the generalizability of findings. This is misleading because it is the generalizability of a sample to other samples and not to the population (Tsang & Williams, 2012a). "*This is because any statistical generalization, however large the sample, is still as much an inductive inference as the case in which the sample consists of just one member of the population, and so is equally unjustified*" (Tsang & Williams, 2012a; Pg. 730). Furthermore, there are three problems with Lee and Baskerville (2003)'s definition of generalisation. These problems are: "

1. Their definition of it is not the sense used by researchers in natural or social sciences.
2. Their definition of induction is too narrow.
3. Their characterization of generalization contradicts their own definition of it" (Tsang & Williams, 2012a; Pg. 733).

These problems and the contradictions have caused misconceptions and confusion among IS researchers leading to some researchers misinterpreting and misusing the treatment of generalisation in their research. Refer to appendix M for some examples of confusion caused by Lee and Baskerville (2003).

Tsang & Williams, (2012a) further noted that out of the four types of generalisations by Lee and Baskerville (2003), only the Type ET qualifies as a type of generalisation and it is similar to one of the five (theoretical generalisation) types of generalisation by Tsang & Williams, (2012a). The theoretical generalisation involve generalising from research findings to theories.

This prompted Tsang & Williams, (2012a) to critisize the work of Lee and Baskerville (2003) and to try and provide a solution and a better understanding of the confusion caused by the work of Lee and Baskerville (2003). A summary of the proposed solutions to the major problems in Lee and Baskerville (2003) by Tsang & Williams, (2012a) can be found in appendix N.

As an alternative to Lee and Baskerville (2003)'s four types of generalisability, Tsang & Williams, (2012a) proposed five types of generalisabilty which are based on theoritical and empirical levels. "On the empirical level*, researchers collect data through observation; on the theoretical level, researchers develop theories based on data collected on the empirical level, pure conjectures, or a combination of both*" (Tsang & Williams, 2012a; Pg. 737).

These are:

1. theoretical i.e. the researcher tries to generalise the findings to some broader theory,
2. within-population (similar to internal validity) i.e. the sample is located inside the population in which generalisation is targeted,
3. cross-population (similar to external validity) i.e. the sample is located outside the population in which generalisation is targeted,
4. contextual ("*in contextual generalisation, researchers generalise from a sample in one population to members of another population, with both populations existing in significantly different contexts but within a similar period of time"* (Tsang & Williams, 2012a; Pg. 742)) i.e. generalisation across setting in relation to space–time constraint of social phenomena,
5. and temporal i.e. generalisation is dependent on time as what is generalisable today may not be generalisable in 5 years' time.

The theoretical generalization cuts across the empirical and theoretical levels while the other four generalisations falls under the empirical level. The five types of generalisability by (Tsang & Williams, 2012a; Pg. 742) is not restricted to a particular research paradigm and it accommodates both qualitative and

quantitative research i.e. it is compatible with interpretive, design research, statistical and positivist research (Tsang & Williams, 2012b). Hence, it is suitable for this research.

This research agrees with Tsang & Williams, (2012a) that the treatment of generalisability by Lee and Baskerville (2003) is causing some confusion among researchers and requires a revision. Because of the criticisms about by Lee and Baskerville, (2003)'s four types of generalisability and the confusion they cause among researchers, this research employed the five types of generalisability from Tsang and Williams, (2012a).

In this study, the findings are further classified into three categories based on the possibility to generalise and apply them to other institutions, other organisations or other countries that are not part of this research. These are:

1. Findings that can be generalised without any conditions required to be met
2. Findings that cannot be generalised unless certain conditions are met
3. Findings that cannot be generalised

Over time, there has been a misconception about the meaning of the term generalisability among researchers. Thus, "different researchers and philosophers have used the term generalisability to mean different things" (Lee & Baskerville, 2003; Pg. 228).

The possibility of achieving generalisability in qualitative research has also been questioned by several researchers who believe that "generalizability in qualitative research is neither important, attainable nor relevant in relation to the objectives of research" (Delmar, 2010; Pg. 117).

While some researchers argue that generalisability is not achievable in a qualitative research, others argue that it is possible to achieve generalisability in a qualitative research but cautions that the researcher needs to know what establishes a situation. They also caution that the similarities and differences between an already studied setting and the other settings that the researcher is intending to apply the findings of the already studied setting should be identified before generalisability can be applied (Delmar, 2010). This research agrees with the later view that it is possible to achieve generalisability in qualitative research provided that what caused a situation as well as the similarities and differences between the already studied setting and the other settings that the findings would applied to are identified.

Because the data was obtained from HEIs with different situations i.e. resource rich vs resource constraint HEIs, private vs public HEIs, rural vs urban HEIs and so on, the results may be generalisable to other HEIs with similar situation and to some extent, to other organisations. The students from the participating HEIs also come from diverse backgrounds i.e. there are students from both rich (those who can afford needed resources on their own) and poor (those who cannot afford the needed resources) background in all the participating HEIs. This provides a sample that is representative of all students irrespective of their

background, thereby making it possible to generalise the findings irrespective of the background of the students.

The results may also be generalisable to similar technologies like PaaS or IaaS because they have similar requirements as SaaS. However, it may not be generalisable to some other technologies with different requirements. It may also not be generalisable to other stakeholders. For example, since the focus was on the students, the results may not be applicable to the academic staff because the requirements and the situation of the students may be different from that of the academic staff.

Generalisability was conducted using member checking (external validity) with participants from other institutions not included in the study at different conferences. The feedback obtained from them shows that the guidelines and the framework are applicable in their institutions as they cover issues that are ongoing face in their respective institutions. See section 4.7 and page vi for further details on the conferences. The proposed guidelines and the proposed framework (ESIHE) can be generalised because they are not dependent on certain conditions. For example, they are not influenced by the social, cultural or organisational factors.

The most pertinent findings in terms of the generalisability of the research results will now be illustrated. One of the findings of this study is that the students with no prior ICT knowledge find it difficult to use SaaS applications from the beginning. This falls under category 1 of the three classifications because this finding can be applied to other HEIs in Nigeria, South African and other African countries without requiring any condition to be met for it to be applicable. In all HEIs, the background of the students will always be different regardless of their institution.

The students' attitude affects their ability to use SaaS applications effectively. This also does not depend on any suspensive conditions. Therefore, it falls under category 1 of the three classifications because there would always be a difference in the attitude of students as all students cannot behave in the same way. This can be generalised both within a population (within population generalisability) and across population (cross population generalisability).

The level of claims of corruption in Nigeria is high and the claims of corruption is prevalent among the public HEIs in Nigeria. In fact, Nigeria is rated as one of the most corrupt countries in the world (Dugguh, 2013). The claims of corruption by the participants is also reflected in the Transparency International corruption perception index 2016. Refer to appendix O for more details on the Transparency International corruption perception index 2016. Although the claims of corruption in the participating Nigerian public HEI may be generalisable to the other public HEIs in Nigeria, it may not be generalisable to the private HEIs i.e. it may not be applicable in the private HEIs that seem to have better strategies for accountability in comparison to the public HEIs. It may also not be possible to generalise it to HEIs in other African countries. This is because the level of corruption and accountability varies from one country to another (Dugguh, 2013) and is dependent

on the social, organisation and cultural factors. This falls within the contextual generalisability as the ability to generalise depends on the context or setting.

The finding that the newly established HEI has more than enough ICT resources and even provided free laptops for their student is not generalisable because the it cannot be said that every new HEI will have more than needed resources as it will depend of the size of the institution i.e. HEI4 only had about 200 students when they commenced operation and the small number of students could be the reason why they had more than enough ICT resources. This may change in future as their students' population expands. It will also depend of the funds available to the institution at commencement because if the funds are inadequate, they may not be able to afford all the needed resources.

The recommendation that the students should only be allowed to access only the approved SaaS applications during lecture hours as practiced in one of the Nigerian HEIs is generalisable to other Nigerian HEIs but it is not generalisable to the HEIs in South Africa because it is dependent on the social, organisational and cultural factors. For example, it is a social norm in the Nigerian communities that older people must be respected by younger people and that a younger person is not expected to question whatever the older person does or says. On the contrary, the culture in South Africa allows younger people to question whatever an older person says if they are not in agreement with it. Based on this, the recommendation that the lecturer should instruct the students to switch off their phones and only access their laptops or other internet enabled device on the instruction of the lecturer may be questioned in a South African environment. This is because some of the students may have the opinion that they can multitask (i.e. they can concentrate in class and still use other applications not related to what is being taught in class) without being distracted. Additional details on this issue is available in section 7.6.

The finding that SaaS could constitute a form of distraction for students is a contextual generalisability because it is only applicable to any student that is accessing SaaS applications that are not used in the course during lectures. If a student uses these applications outside of lecture, they may not lead to distraction and instead, they may be of benefit to the student. It is only when they are used in the context of a classroom environment when a lecture is taking place that this generalisation can be applied.

The finding that SaaS has the capability to reduce software piracy is a generalisable finding. It can be applied within population i.e. it can be generalised to other HEIs and other organisations in Nigeria where piracy was found to be high. This is because the people will have no reason to pirate the software if they have free or cheaper access to the same software via SaaS. On the contrary, this may not be generalisable to other countries (i.e. cross population may not be possible) with stringent laws against software piracy as the level of piracy in such countries is generally low compared to countries like Nigeria with a very high level of software piracy.

In addition to the empirical statements discussed above in relation to generalisability, the generalisability of the propositions (P1 to P8) will now be discussed.

The proposition P1 that '*if there are too many contradictions within or between the activity systems, the impact of the tool is likely to be less*' is generalisable because it is supported by emprical data from all the participating HEIs even though they exist in different social, cultural and organisational contexts. P1 can be generalised to other HEIs in Nigeria, South Africa and other countries not included in this study. It can also be generalised to other organisations as it is not influenced by organisational culture. Hence, P1 falls under both within population generalisability and cross population generalisabilty.

The proposition P2 that '*if there are too many contradictions within or between the activity systems, there are less chances of realising the desired learning outcomes*' is also generalisable to other HEIs in Nigeria, South Africa, other organisations and other countries because it is also not contextual and both the within population generalisability and the cross population generalisabilty are applicable.

The proposition P3 that *'the contradictions in the activity systems can improve the overall learning experience of the students if handled in a constructive way*' can be generalised contextually because in each setting, the meaning of constructive way will have to be defined and made explicit to establish whether the same results can be obtained if it is applied in the same or similar situations (setting) i.e. in a constructive way.

The proposition P4 that '*if the rules are not aligned with SaaS or they are not in place, there are less chances of realising the expected benefits*' is not generalisable because some of the institutions in this study did not have any rule that is specifically aligned to SaaS but regardless of that, some of their students still realised the expected benefits.

The proposition P5 that '*the actual positive outcomes from the use of SaaS greatly exceeds the actual negative outcomes*' is generalisable because the particpants from all the participating HEIs all mentioned several actual positive outcomes and very few actual negative outcomes. This shows that there is a wide gap between the actual positive outcomes and the actual negative outcomes and the actual positive outcomes greatly exceeds the actual negative outcomes. This can be contextual because it can depend of the attitudes of the students. For example, it the students in a certain HEI or a certain country do not use SaaS effectively for the intended activities, such student may not reap all the intended benefits. Thus, the gap between the actual positive outcomes and actual negative outcomes may be narrow.

The proposition P6 that '*the social, cultural and organisational factors within the academic environment mediate the way in which the Subjects conduct activities*' is generalisable because every academic environment consists of people with different and conflicting belief systems, different social status and different cultures. The organisational culture also differs from one organisation to another. All this fators play a big role in influencing how people behave, act and carry out their day to day activities. It therefore means that the social, cultural and organisational factors that exist where an institution is located can influence the

way in which the Subjects conduct their activities. This falls under contextual generalisability because if the results are applied under different social, cultural or organisational context, the results in the new setting will be different from that of the original setting where the research was initially conducted.

The proposition P7 that '*the use of SaaS mediates and shapes the way the students and the lecturers do their work*' is also generalisable. The majority of the SaaS applications have been developed to carry out certain activities in certain ways. There are predefined steps by the developers of the applications and any user of the applications is obliged to follow those steps in order to carry out the intended task. As a result, the SaaS application mediates and shapes the way the users (i.e. the students and the lecturers) do their work. This falls under both within population generalisability and cross population generalisability because it can be applied to the rest of the population (i.e. the other students from the participating HEIs that were not included in this research) and to samples from a different population (i.e. to other institutions in Nigeria, South Africa or other African countries).

Finally, the proposition P8 that '*if there is insufficient or restricted flow of information within the activity system, the desired outcome will not be achieved*' is contextual and depends on certain settings before it can be generalised to other instituions, other organisations or other countries. For example, the suggestion that the acceptance level of SaaS could be increased across an entire institution if the institution communicates the result of their SaaS initiatives with members of the institution is also contextual and may not always be generalisable to other institutions. It may also not be applicable to other samples within the same institution because it depends on the accuracy, completeness and the interpretation of the recipient of the information. If the information is restricted, insufficient, inaccurate, incomplete or misinterpreted, it may lead to a decrease in the level of SaaS acceptance instead of increasing it. Thus, it may only be generalised to other institutions, across the institution, other organisations and other countries if the information passed during the communication process is accurate, unrestricted, and complete.

The activity theory works well as a lens to analyse this type of phenomenon as the data suggests because almost all the propositions were supported and are generalisable. A summary of the generalisability of the propositions is provided in table 17.

Proposition	Generalisability
P1 (*If there are too many contradictions within or between the activity systems, the impact of the tool is likely to be less*)	**Generalisable** (Falls under both within population generalisability and cross population generalisability because it can be applied across the population and to other external population)
P2 (*If there are too many contradictions within or between the activity systems, there are less chances of realising the desired learning outcomes)*	**Generalisable** (Falls under both within population generalisability and cross population generalisability because it can be applied across the population and to other external population)
P3 *(The contradictions in the activity systems can improve the overall learning experience of the students if handled in a constructive way)*	**Generalisable** (Falls under contextual generalisability)
P4 *(If the rules are not aligned with SaaS or they are not in place, there are less chances of realising the expected benefits)*	**Not generalisable**
P5 *(The actual positive outcomes from the use of SaaS greatly exceeds the actual negative outcomes)*	**Generalisable** (Falls under contextual generalisability)
P6 (*The social, cultural and organisational factors within the academic environment mediate the way in which the Subjects conduct activities)*	**Generalisable** (Falls under contextual generalisability)
P7 (*The use of SaaS mediates and shapes the way the students and the lecturers do their work)*	**Generalisable** (Falls under both within population generalisability and cross population generalisability because it can be applied across the population and to other external population)
P8 (*If there is insufficient or restricted flow of information within the activity system, the desired outcome will not be achieved)*	**Not generalisable**

Table 17: A summary of the generalisability of the propositions

8. THE PROPOSED FRAMEWORK AND GUIDELINES

This research recommends that HEIs should come up with strategies and plans to identify courses that could be enhanced using SaaS. Once these courses have been identified, they should identify the criteria's (feature and functionalities) needed in the identified courses from the SaaS application. Once this is done, they should develop plans and strategies on selecting the right SaaS application as well as the right service provider. To select the right SaaS offering, this research suggests that HEIs should conduct some reviews of all the suitable SaaS offerings that provides the criteria's (features and functionalities) identified. After identifying all the SaaS offerings with needed features and functionalities, they now need to do a thorough comparison of those features and rank each offering based on how they compare with other offerings. Because the aim is to get a SaaS application that can provide HEIs with needed applications at an affordable price, the cost of the identified applications should be considered as one of the criteria's. Once the comparison is completed, the highest-ranking application should then be selected.

In designing the guidelines and framework, this research used the literature, institutional documents and AT. The process followed includes the design, testing and redesign in several iterations. During the testing phase, the researcher sent the guidelines and the framework to the participants to ascertain whether the guidelines and the framework represents what the participants intended during the interviews (Van Aken, Chandrasekaran, & Halman, 2016). The researcher then obtained valuable feedback from the participants and incorporated them during the redesign phase. The guidelines on selecting the right SaaS application will now be discussed.

8.1 The Guidelines for Selecting the Right Software as a Service Applications

After selecting the right service provider and choosing the right SaaS applications to adopt and implement, the next step before actual adoption is to plan for the adoption and implementation process because just having a service provider and selecting the right software is not enough to guarantee implementation success.

This research found that the adoption of SaaS among HEIs is still in its early stages because most of the HEIs are not fully using SaaS at present. The early adopters therefore need to be careful not to make mistakes when adopting and implementing SaaS. This research found it necessary to provide them with some guidelines that would assist them in that process. A proper preparation is necessary to avoid mistakes during adoption and implementation. This research presents a set of guidelines to assist with this process. These guidelines are referred to as steps to take towards adoption and implementation of SaaS. After each step, the source is indicated as I, D, L or a combination of either of them in cases where the step emanated from more than one source (I = Interviews, D = Documents and L = Literature).

The steps are:

1. Develop a strategy for your SaaS initiative: The institution should come up with plans on how identify the objectives i.e. reasons why the SaaS application is needed and how to effect changes to reach the objectives (I), (L).
2. Develop a change management plan (L).
3. Develop training and skills assessment plans (I), (D), (L).
4. Identify the tasks and activities to be carried out using SaaS (I).
5. Identify and ensure that the necessary infrastructure to support SaaS is available (L).
6. Ensure that the software is customizable and that integration with your existing software and applications will be possible (L).
7. Ensure that all the required features to carry out your academic activities are available on the SaaS offering before opting for it (I).
8. Ensure that it supports efficient communication and collaboration across the institution and beyond (I).
9. Ensure that there is a service level agreement that can easily be enforced (L).
10. Plan your exit strategy in advance to ensure that you can easily switch service provider or even revert-back to On-premises should you encounter unforeseen problems with SaaS (I) (L).
11. Ensure that there is a disaster recovery plan by the provider (L).

If the HEIs adhere to these guidelines, this research believes that it can help them to avoid mistakes usually made during adoption and implementation of SaaS and they could be able to minimise the risks involved with SaaS adoption and implementation while at the same time maximising the benefits.

8.2 The Guidelines for Selecting a Service Provider

To assist HEIs in selecting the right service provider, this research suggests a list of 13 steps that HEIs should take with the hope that it will guide the in selecting the right service provider. After each step, the source is indicated as I, D, L or a combination of either of them in cases where the step emanated from more than one source (I = Interviews, D = Documents and L = Literature).

These steps are:

1. The HEI should ensure that the service provider company is financially stable and well established in the industry (D) (L).
2. The HEIs should ensure that the service provider have a backup strategy in case of data loss due to a disaster (L).
3. The HEIs should investigate and find out what other customers are saying about the service provider before signing up with the service provider. If possible, HEIs should ask potential service providers for names and contacts of existing clients for verification of their service (I), (L), (D).
4. The HEIs should consider the size and market share of the service provider as a lower market share and a small company size may indicate that the service provider may soon go out of market leaving the customers stranded (L).
5. If there is a ranking of service providers by reputable industry analysts, this could be a good indication that the service provider is reliable and trustworthy because the analysts would have done research to find out how reliable and trustworthy the service provider is before publishing the ranking. HEIs should therefore look at the rankings by industry analyst when looking for a suitable and reputable service provider (I), (L).
6. The HEIs should check whether the service provider have relevant industry certifications with regards to ICT. This is to ensure that their data will be secure when they finally sign up with the service provider (I), (D), (L).
7. The HEIs should confirm and compare the level of support, response time and up time of the potential service providers. They could also try and communicate with the potential service providers before signing up to test their response time (I), (D), (L).
8. Since system requirements may vary from one service provider application to another, HEIs should ensure that they check system requirements and ensure that they have resources that meets those requirements before signing up with a service provider (I). "*Also, the compatibility with different browsers on campus is important because we have different systems from browsers from internet explorer to google chrome*" (IT3).
9. The HEIs should ensure that the service provider have support plans in place during and after the migration process (I).
10. The HEIs should also ensure that the service provider have training programs to assist staff and students in acquiring the skills needed to use the application effectively (I), (L).

11. Some service providers may have some hidden costs that they will not mention upfront. It therefore makes it necessary for HEIs to ensure that there are no hidden costs before they sign up with a service provider (I).
12. HEIs should specify in the SLA that the ownership of data remain with the institution and not the service provider to ensure that they do not lose control over their data (I), (D), (L).
13. The location of the service provider should also be considered before signing up with the service provider because the farther the service provider, the slower the access to the SaaS application due to latency issues (I), (L).
14. After clearly considering points 1 to 13, the HEIs should ensure that all the agreements are clearly stated in the SLA. The remedies and penalties for the service provider in case there is a breach should also be clearly outlined in the SLA. If the service provider can meet all the agreements in the SLA including providing remedies and paying the penalties whenever there is a breach from them, that is a clear indicator that the service provider is reliable and trustworthy (L).

This research suggests that if the HEIs follow these guidelines, they can be able to make the right choice of a service provider that is capable of meeting their institutional needs.

8.3 Proposed Guidelines for the Students to Assist them in using Software as a Service Effectively

For students to use SaaS effectively, this research proposes the following set of guidelines. After each step, the source is indicated as I, D, L or a combination of either of them in cases where the step emanated from more than one source (I = Interviews, D = Documents and L = Literature).

a. Familiarise yourself with the features of the application. For example, most students only use office 365 for email while the other features like PowerApp for creating your own applications are never used (I).
b. Attend training programmes to further familiarise yourself with the features of the application (I).
c. Limit your use of SaaS for social activities to avoid distractions (I), (L).
d. Self-control is important to avoid distractions due to SaaS (I).
e. Do not see SaaS as a replacement for lectures but rather a support tool (I).

This research suggests that these guidelines can assist the students in using SaaS effectively provided that the students adhere to them.

8.4 Recommendations Based on the Elements of the Activity Theory

This research provides some suggestions which are mapped to their corresponding relevant elements in the AT for improving the SaaS adoption and implementation process. This can serve as a guide for HEIs in their use of SaaS by enabling them to relate and identify the mappings of each activity they engage in while using SaaS. The subjects (students) are the crucial element in the activity systems of HEIs; their willingness to use SaaS and their active involvement in the activities where SaaS is used is essential in ensuring that SaaS is used effectively. For the subjects to achieve the objects (goals), training and skills assessment has been identified in this research as important action towards realisation of the objects. The rules to regulate and control the activities to ensure that each member of the HEI (community) carry out their tasks efficiently (division of labour) should be clear and unambiguous to avoid unnecessary mistakes. The tools (SaaS) should be used for intended activities and the students should avoid being distracted when using the tools for academic activities. Figure 20 shows the mapping of each elements of the AT with some suggestions for improvement. This research suggests that the right mapping of the elements with improvement suggestions will provide HEIs with a better understanding of the situation and to apply the suggestions effectively to achieve the desired outcomes as illustrated in Figure 20.

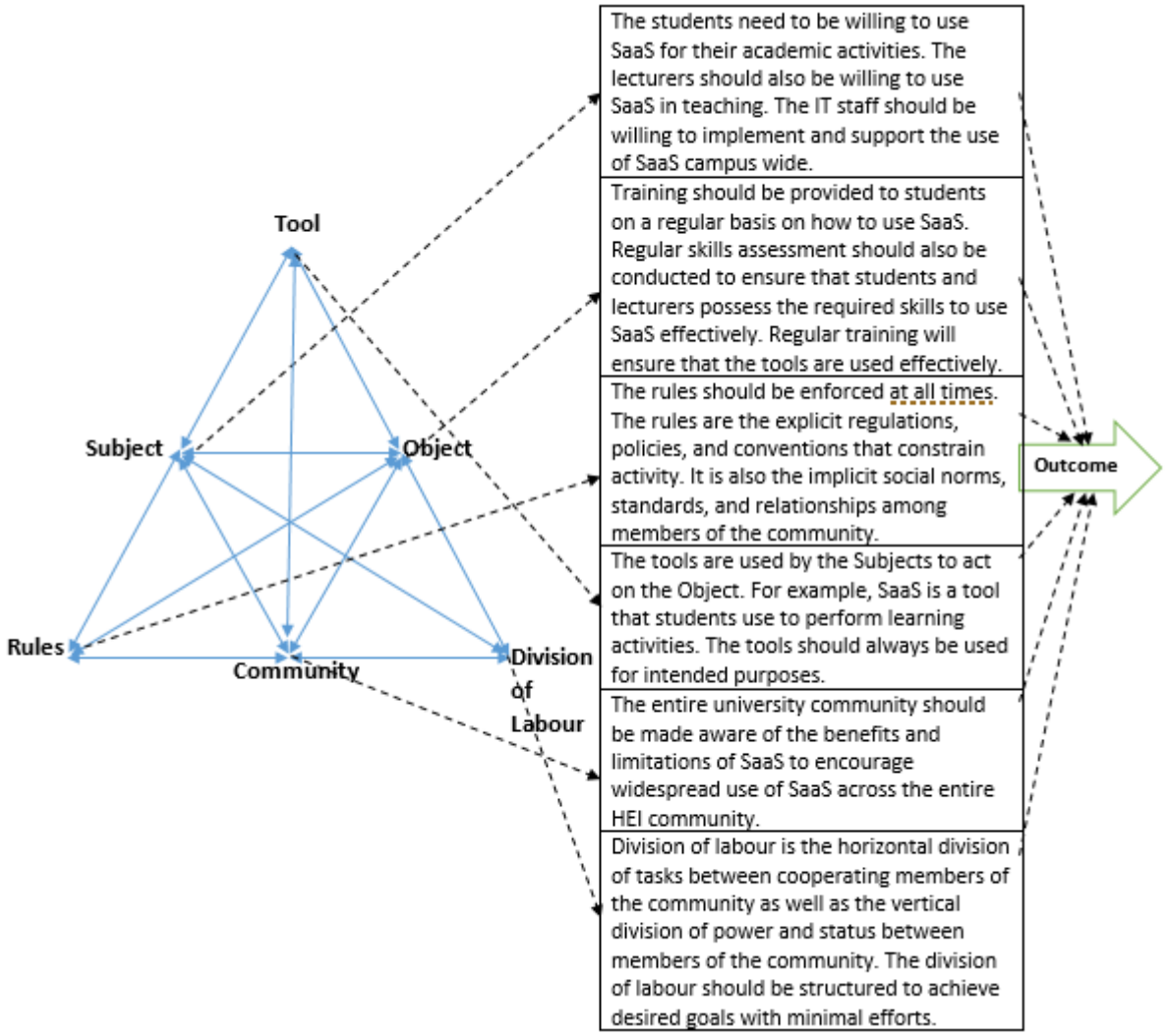

Figure 20: Mapping of the elements of Activity Theory to some suggestions for improvement

8.5 The Proposed Framework based on the Literature, Data Findings and Selected Theories

To ensure that SaaS is implemented successfully HEIs, this research proposes an integrated framework called "Effective SaaS adoption and implementation for HEIs". This framework provides guidelines for HEIs on the critical success factors (CSFs) needed to prepare them for SaaS adoption, implementation and continued use. It also provides HEIs with guidelines during the implementation and post implementation stages to ensure a successful use of SaaS in HEIs. The guidelines and recommendations for each phase will be discussed in detail. Figure 21 shows the proposed framework and the transition from one phase to the other.

To design the proposed framework, the researcher began by identifying the problem that the framework hope to resolve. The motivation for the framework was also identified. The HEIs encounter problems before implementation, during implementation and even after implementation. For example, before implementation (Pre-implementation), HEIs encounter problems in Some of the problems identified include selecting the right SaaS applications and the right service provider. During implementation, they face issues

such as the lack of skills needed to use SaaS, lack of management support, resistance from IT staff because of the fear of losing their jobs etc. During the post implementation, they face problems such as the lack of maintenance plans for the tools and lack of adequate change management plan. These problems affect the activity systems in the HEIs and prevents the Subjects from realising the desired outcomes.

The majority of the HEIs fail to identify some of these problems, hence, there are no viable solutions to the problems. Identifying the problems is therefore the first step towards creating a viable solution to the problems faced by HEIs in the adoption, implementation and continued use of SaaS.

The next step was to define the objectives for the solution which was to come up with a framework capable of assisting HEIs to adopt and use SaaS effectively. After defining the objectives, the researcher proceeded to the design and development phase. During the design and development phase, the researcher used the activity theory, interview data, literature, books and institutional documents from participating HEIs to develop the framework.

After developing the framework, the next step was the demonstration of the framework to confirm its applicability and relevance to the problems identified. The researcher sent the framework to the interview participants (students, lecturers and IT staff) for valuable feedback. The research researcher then performed an evaluation of the framework based on the feedback from the interview participants. After the evaluation, the framework was refined to improve its quality.

The research outputs relating to the final framework was published in conference proceedings. The publication was discussed with conference participants for further evaluation.
The proposed framework will now be discussed in detail.

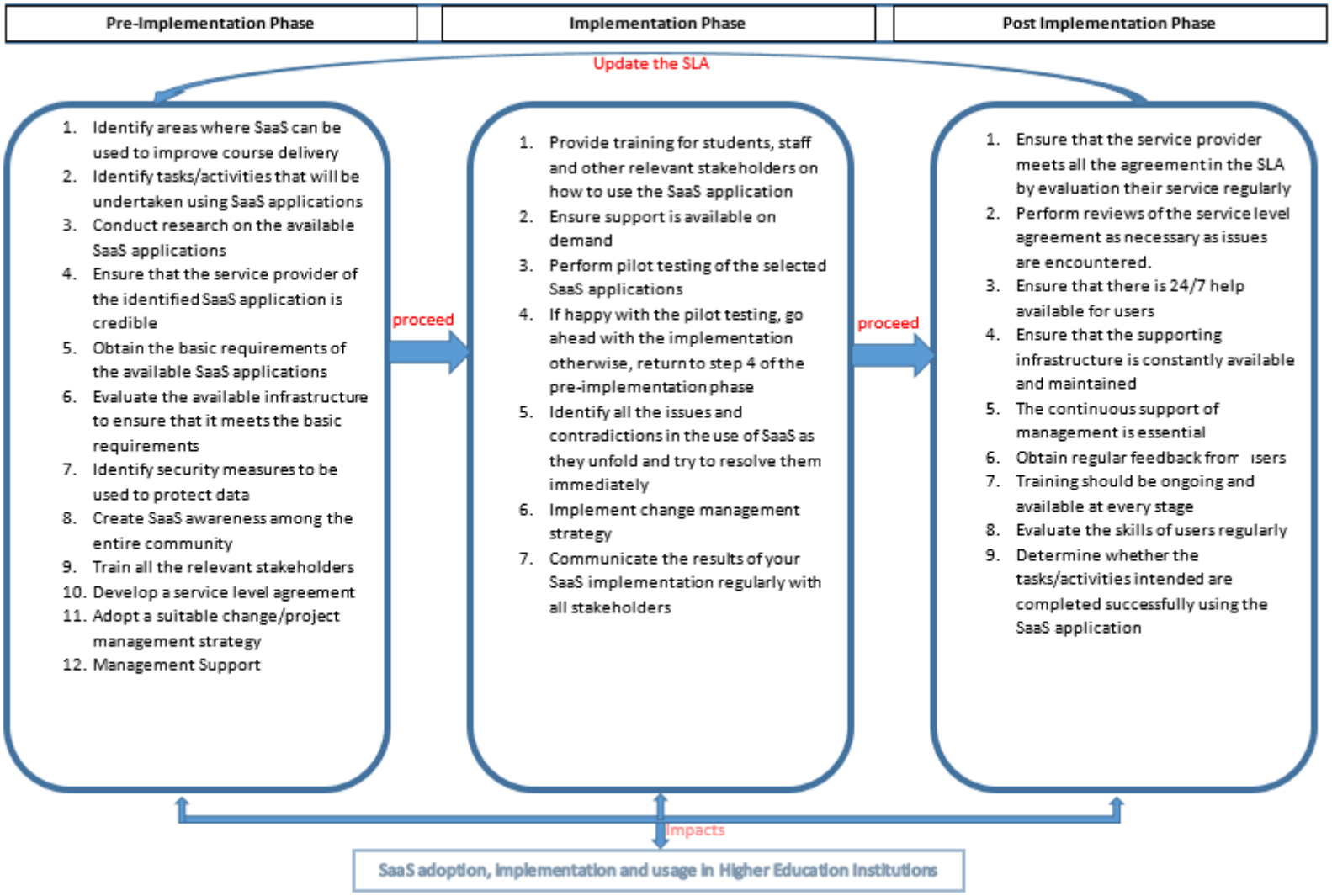

Figure 21: Framework for Effective Software as a Service Adoption, Implementation and Usage in Higher Education Institutions

8.5.1 Pre-Implementation Phase

This research found that the use of SaaS among HEIs is still in its infancy. This can be attributed to issues like lack of awareness of available SaaS offerings, lack of management support, lack of training and lack of infrastructure. Although all the participating HEIs in this research are already using one form of SaaS or the other especially the general academic computing SaaS applications, the use of SaaS is still very low in these HEIs. This research found that the reason for this is that there is no framework or guidelines to assist HEIs towards SaaS readiness and all the activities that are supposed to be carried out prior to implementation are either not undertaken at all or not done properly. To overcome this problem and increase the readiness of HEIs towards adoption and implementation of SaaS, this framework suggests some activities that HEIs can engage in before adopting and implementing SaaS. The activities make up the pre-implementation phase of this framework and they will now be discussed in more details. After each activity, the source is indicated as I, D, L or a combination of either of them in cases where the step emanated from more than one source (I = Interviews, D = Documents and L = Literature).

During the pre-implementation phase, HEIs need to:

8.5.1.1. Identify areas where Software as a Service can be used to improve course delivery (I).

One of the main reasons for failure of implementation of ICTs is that the reason for implementing ICT is not properly understood by users and other stakeholders. Another reason is that some organisations often implement a technology because other organisations are implementing it without finding out if it aligns with their business process. This framework suggests that lecturers should identify areas where SaaS could be utilised in their courses to improve delivery. Once the areas have been identified, impact and suitability analysis should be conducted to determine the level of suitability and the impact of SaaS on the delivery of that course. There are four possibilities in the impact and suitability analysis. They are high impact and low suitability, high impact and high suitability, low impact and high suitability and low impact and low suitability. If the SaaS application offers high impact and low suitability, it is not necessary to introduce the SaaS application. Other ICTs with a higher level of suitability may be appropriate in this instance. If the SaaS application offers high impact and high suitability, it should be implemented but the level of impact should be further analysed to determine if the impact is negative or positive. For example, in cases where it may lead to students missing lectures intentionally, that could be a form of negative impact. It is therefore important that HEIs develop strategies to eradicate or minimise such impacts before adopting SaaS. If the SaaS application offers low impact and low suitability, it should not be adopted as it will not bring any improvement in the course delivery. If the SaaS application offers low impact and high suitability. It should be implemented as it is highly suitable and will help improve course delivery.

8.5.1.2. Identify tasks/activities that will be undertaken using Software as a Service applications (I).

After the impact and suitability assessment, all the tasks or activities that will be carried out using the application should be identified as this will assist during the vendor and product selections and it will ensure that all the needed features are available in the SaaS application which will later be adopted and implemented.

8.5.1.3. Conduct research on the available Software as a Service applications with identified tasks (I), (L).

The next step is to conduct research about all the SaaS applications with the features identified to carry out the intended tasks and activities. It is important to ensure that the application to be selected is better than existing application. It should also have offline functionalities to ensure continuity in cases when there are interruptions in the internet service. Since there are different applications by different providers, HEIs should compare the different applications in terms of features, cost, support, exit strategy, training, ease of use, power/electricity requirements and hardware requirements to ensure that they have the basic infrastructure requirements and that the application can provide them with all the required features. HEIs should also ensure that exit strategies are put in place should the service provider not perform as expected to avoid the data lock-in. The training and support available from the service provider should also be considered at this stage to ensure that the service provider is available to provide support and training when needed. At this stage, the SaaS application identified should be compared with similar in-house (traditional) applications to determine if the SaaS version can provide the same or more functionalities. This can assist to determine whether there is a need for the SaaS application or not.

A comparison of existing applications is needed at this stage. For example, you could have two scenarios, one for a previously unavailable application that was newly introduced and another for a replace server based.

An example of a previously unavailable application is the introduction of Turnitin in HEI1. Before the introduction of Turnitin, there was no plagiarism software and it was not easy to detect plagiarism. As a result, the rate of plagiarism was high and in some cases, the plagiarism was detected long after the student had graduated. The institution (HEI1) adopted Turnitin which is a SaaS based plagiarism detection software to detect plagiarism and improve the quality of research outputs. The implementation was quick and easy because it was available on demand and the scalability of the application made it accessible to all the students. The fact that there was no need for installation also made the implementation faster and easier. The introduction of Turnitin brought about a lot of changes in the way things were previously done. For example, in the past, when a student wants to submit an assignment, he/she just submits it without performing any plagiarism check. With the introduction of Turnitin, the student first has to submit the assignment on Turnitin to check for plagiarism. Turnitin provides the student with immediate feedback by generating a plagiarism report which the student has to submit together with the assignment. The

introduction of Turnitin has reduced the possibility of plagiarism. The possibility of doing what someone else has already done was also reduced. Turinitin has also lead to an improvement in the quality of student work.

HEI1 was able to integrate Turnitin with their LMS (Moodle) and this makes it easy to detect plagiarism on work done via Moodle. The lecturers also benefit from the use of Turnitin because it offers a grading system and the grades are updated automatically to the Moodle grade book. This makes grading of work easier for lecturers. Turinitin also provides the lecturers with the facility to record voice feedbacks for students making it easy to provide immediate feedback. One of the limitations faced with Turnitin is that it is not accessible without an internet connection.

An example of a replace server based is the migration from a server based productivity tool (Microsoft Office) to a SaaS based version (Microsoft Office 365) by HEI3. It was easy for HEI3 to compare the initial cost as the server based version was expensive because they had to purchase their own server, pay for maintenance staff, electricity cost and license fees. They also had to perform the installation and upgrades inhouse. With the introduction of Microsoft Office 365, the responsibility of installing, upgrading and maintaining the software shifted to the service provider. There is also no license fee involved. This saved HEI3 from paying a lot of upfront cost. The cost of paying the maintenance staff and the cost of electricity also shifted to the service provider. HEI3 also benefits from the pay as you go model of Office 365 because they only pay per usage unlike the previous server based Microsoft Office in which they had to pay license fees whether they use it or not. This leads to a lot of cost savings for HEI3 during holidays when the students are on holidays and the usage is low. Furthermore, the backup of data is lies with the service provider thereby freeing the up resources that HEI3 could have dedicated for backup. The introduction of Microsoft Office 365 also brought other benefits for students. The benefits include continuity as students are now able to continue working on their project from another device without having to lose data. Also, the students can now work from any place at any time. The students also benefit as communication among them is improved. The single sign on capability of Microsoft Office 365 reduces the need to have multiple passwords and that makes the login process easier for both students and lecturers. The introduction of Microsoft Office 365 also brought some challenges for HEI3 as the control of their data now lies with the service provider unlike the previous server based Microsoft Office 365 where they had full control of their data. The reliance of Microsoft Office 365 on the internet also minimises access to some features of the application whenever there is no internet access.

8.5.1.4. Ensure that the service provider of the identified Software as a Service application is credible (I), (D), (L).

Once an application is selected, the credibility of the service provider should be investigated. A detailed explanation of how to investigate the credibility of a service provider can be found in section 8.2 of this study.

8.5.1.5. Obtain the basic requirements of the available Software as a Service applications (I).

Once, the institution has confirmed the credibility of the service provider and is satisfied with the findings, the next activity is to find out the basic hardware and other supporting infrastructure requirements for the application to ensure that the available infrastructure meets those requirements.

8.5.1.6. Evaluate the available infrastructure to ensure that it meets the basic requirements (I), (L).

After obtaining the basic requirements, the available infrastructure should be compared with the requirements obtained from the service provider to ascertain whether the requirements are met.

8.5.1.7. Identify the security measures to be used to protect data (I), (L).

The next step will be to identify security measures and put them in place to improve user's confidence on SaaS because security and privacy issues are some of the major concerns of users of SaaS.

8.5.1.8. Create awareness about the application among the entire community (I).

Another important activity to engage in before adopting the selected application is to create awareness of the application across the entire campus so that members of the community can be aware of the benefits and limitations of the application. This will boost their confidence during the implementation phase and help to ensure a successful implementation. In a study on the adoption of cloud computing by HEIs in Malawi, Makoza, (2016) found that management of HEIs in Malawi did not provide support for CC as expected because of the lack of awareness of CC due to the fact that the members of the top management had limited ICT knowledge. This research also found that lack of awareness of SaaS is one of the reasons why the adoption and implementation of SaaS has been slow in the participating HEIs. This framework suggests that steps should be taken to create awareness of the benefits and limitations of SaaS among the management, staff and students in HEIs to improve support for SaaS adoption and implementation.

8.5.1.9. Train all the relevant stakeholders (I), (D), (L).

This research found that some HEIs do not consider training during the pre-implementation stages. Only one out of the four participating HEIs had user training during the pre-implementation stage. This framework suggests that training is important in all the three phases and pre-implementation training plays a significant role in the success of implementation as it increase user confidence and improves usage.

8.5.1.10. Develop a service level agreement (I), (D), (L).

Developing a SLA is essential at this stage. All that is expected of the service provider and the customers (HEIs) should be agreed upon and clearly stated in the SLA. Because of the legal and jurisdictional issues associated with SaaS. This framework suggests that the location of data should be stated in the SLA and the ownership of data should remain with the HEI. The costs involved, number of users and the uptime (percentage of availability) should also be specified in the SLA. The remedies in case there is a breach by the service provider should also be stated in the SLA. This will force the service provider to try and meet up with all the agreements in the SLA.

8.5.1.11. Adopt a suitable change/project management strategy (I), (L).

The implementation of SaaS is a project on its own and like any other projects, it will bring about changes in the ways things are done currently on campus. There is a possibility that some subjects or stakeholders will resist these changes. It is therefore vital for HEIs to adopt suitable change management and project management strategies to minimise the impact of the resistance because of the implementation of SaaS.

8.5.1.12. Management support (I), (L).

The support from management is an important CSF as it will determine the allocation and availability of needed resources for the SaaS project. The project manager in charge of the SaaS implementation should ensure that adequate support from management is available before going ahead with the implementation. The management should also find a way of reassuring the IT staff that the introduction of SaaS will not lead to downsizing of the ICT department. This will eliminate the fear of some It staff that could lose their job because of SaaS as noted by IT3.

Once all the activities suggested for the pre-implementation phase have been concluded successfully, the next step is to proceed to the next phase which is the implementation phase.

8.5.2 The Implementation Phase

8.5.2.1. Provide training for students, staff and other relevant stakeholders on how to use the Software as a Service applications (I).

Training should be ongoing and should not stop at the pre-implementation phase because it is important in ensuring that users possess the required skills to use SaaS effectively. It should be available to users during all the phases. Users should be trained on how to use all the features of the SaaS application for the intended academic activities.

8.5.2.2. Ensure support is available on demand (I).

The availability of support is very important at this stage because the application is still new and users are still finding their ways around the applications. As the users navigate through the features of the SaaS application and perform their academic activities, they may encounter issues and challenges that require immediate support and assistance. HEIs should ensure that adequate provisions are made both within the institution and from the service provider to ensure that the problems encountered by the users are resolved as a matter of urgency as this will create a long-lasting impression on the users about the use of SaaS. The availability of support may also help in reducing resistance to change.

8.5.2.3. Perform pilot testing of the selected Software as a Service applications (I), (L).

Before campus wide implementation, a pilot testing should be performed to identify some of the possible issues and contradictions so that they can be resolved before introducing the application to the entire campus. This will ensure that the issues are identified easily and resolved on time as the number of users in the pilot testing will be smaller and manageable when compared to the number of users in the entire institution.

8.5.2.4. If you are happy with the pilot testing, continue with the implementation otherwise, return to section 8.5.1.3 of the pre-implementation phase (I).

Once the pilot testing is concluded and the issues and contradictions identified during the pilot testing have been resolved, a campus wide implementation can be done. At this stage, some other issues and contradictions may be observed.

8.5.2.5. Identify other issues and contradictions during campus wide implementation as they unfold and try to resolve them immediately (I).

If other issues and contradictions are found during the campus wide implementation, they should be resolved as they unfold. This will ensure that they do not have any negative impact on the implementation success.

8.5.2.6. Implement change management strategy (I), (L).

Since change is inevitable, change management should be part of the process at every stage. The change management and project management strategies identified during the pre-implementation phase should be applied. Changes will be observed at every stage of the implementation and it is therefore important to implement appropriate change management strategies at every stage.

8.5.2.7. Communicate the results of your Software as a Service implementation regularly with all stakeholders (I).

As the implementation progress and benefits are being realized, it is important for the management to communicate the results of the implementation with all stakeholders as this will improve user confidence and encourage more usage of the SaaS applications across campus. This study found that none of the participating HEIs takes the initiative to communicate the results of their SaaS implementation to the stakeholders. This is believed to be one of the reasons why adoption and use of SaaS is very low in these HEIs. This research suggests that HEIs should regularly communicate the results of their SaaS implementation with users and all stakeholders to encourage them as this can contribute to improvement in the usage of SaaS.

Once all the implementation activities have been concluded successfully, the next phase is the post implementation phase where the effects of the implementation are observed and areas where there is a need for improvements are identified.

8.5.3 The Post Implementation Phase

8.5.3.1. Ensure that the service provider meets all the agreement in the service level agreement by evaluating their services regularly (I), (L).

At this stage, it is important to revisit the SLA and ensure that all the agreements specified in the SLA are met by the service provider. If there is any agreement that has not been met, the service provider need to provide the remedies stipulated in the SLA. The issues and contradictions observed during the implementation phase may create the need to update the SLA, the service provider and HEI may therefore need to convey a meeting to agree on the new requirements and update the SLA as required.

8.5.3.2. Perform reviews of the service level agreement as necessary when issues are encountered (I), (L).

A regular review and update of the SLA may be necessary as more and more issues are encountered. The HEI should ensure that any agreement with the service provider is written in the SLA and signed by all parties as this will serve as a proof of the agreement and ensure that all the parties are liable in case of a breach from them.

8.5.3.3. Ensure that there is 24/7 help available for users (I), (D), (L).

The continued success of the implementation relies on the availability of continuous support for users. Since SaaS is available at any time from any place, it is important that support should be available at any time from any place as well. This will ensure effective use of SaaS. For example, a student working from home should be able to access support from home either online or telephonically at any time. This will ensure that the student can resolve the issue and continue with his or her work. The support could be from either the service provider of the ICT department of the HEI. This could also be agreed and stated in the SLA.

8.5.3.4. Ensure that the supporting infrastructure is constantly available and maintained (I), (L).

One of the major issues found in the participating HEIs is the inadequate maintenance plans for supporting infrastructure. For example, there are instances when more than half of the computers in the laboratory at HEI3 were faulty and they were not repaired on time. This could contribute to the shortage of the already inadequate resources. There are also instances where the internet service was down in HEI1 and HEI2 for several hours or even days. This poses a serious challenge for SaaS users because SaaS is totally dependent on the internet. This framework suggests that HEIs should make adequate maintenance plans for supporting infrastructures to ensure that they are available to users as needed.

8.5.3.5. The continuous support of management is essential (I), (L).

Management support is not only needed during the pre-implementation and implementation phases. It is needed even during post implementation phase. It is important that adequate management support is obtained at every stage especially top management support as this will improve the chances of implementation success. The support of top management is important for the allocation of resources towards adoption and implementation of new technologies in HEIs (Makoza, 2016).

8.5.3.6. Obtain regular feedback from the users (I).

Another activity that should be carried out at this stage is obtaining regular feedback from users. Questions should be asked about the benefits and limitations that users have experienced or observed while using SaaS applications. The feedback from users should be communicated with all stakeholders (students, lecturers, management, IT staff, service provider, SaaS developers etc.) on a regular basis as this will help the developers during upgrades. The feedback should also be considered when updating the SLA.

8.5.3.7. Training should be ongoing and available at every stage (I), (L).

Training should be available at every stage as users might experience challenges at any stage. Training should therefore be an ongoing process and not a once of process. This research found that HEIs assume that most students have basic computer skills which they believe to be essential for SaaS usage. Thus, HEIs do not provide SaaS specific training for their students. Only one of the four HEIs that participated in this research provides their students with SaaS specific training and they only offer the training during the pre-implementation phase. This framework suggests that the assumption that most students have basic computer skills is wrong as the researcher found that some students had no prior experience or knowledge of computers before gaining admission into HEI. This research therefore suggests that training should be ongoing and should be provided during the pre-implementation, implementation and post implementation phases.

8.5.3.8. Evaluate the skills of users regularly (I), (L).

Skills assessment programs should organised regularly by HEIs to determine if the users possess the required skills and are using SaaS effectively. The results of the evaluation will assist in streamlining, improving and restructuring the training programmes in a way that it will provide the students with the needed skills.

8.5.3.9. Determine whether the tasks/activities intended are completed successfully using the Software as a Service applications (I).

Finally, it is imperative to determine the output or outcome because of the use of SaaS. The tasks or activities identified during the pre-implementation phase should be evaluated and it should be determined whether the students can complete the tasks and activities successfully using the SaaS applications. Any improvements in the academic performance of the students and improvements in the academic environment should be noted as this will contribute towards improving the usage of SaaS for academic activities.

This research suggests that if the HEIs adhere to all the suggestions in the different phases of this framework, it will impact the adoption, implementation and usage of SaaS positively and assist in providing HEI students with needed resources and contribute towards the creation of a conducive academic environment.

8.5.4 The Framework Validation

There are several lenses identified by Creswell and Miller, (2000) for validation in a qualitative research. In a qualitative research, the researcher may use one or more lenses to validate research outputs (Creswell & Miller, Determining Validity in Qualitative Inquiry, 2000). The lens refers to the viewpoints with which a researcher establishes the validity of a study results. Validity refers to the accuracy of the research results in representing the participants' realities of the social phenomenon. It also refers to the credibility of the research results to the participants.

One lens to determine the validity of a qualitative research output is the researcher himself because the researcher determines the research timeframe, if the data is saturated to create relevant themes and categories, and how data analysis translates into a convincing outcome (Creswell & Miller, Determining Validity in Qualitative Inquiry, 2000). This is an important way to validate a research output because the issue of researcher bias and researcher competency may affect the trustworthiness of data if not taken into consideration (Brink, 1993). In the present study, the researcher explained the reason why the research was being conducted and all ethical issues relating to the research to the participants. These allowed the researcher to gain the trust of the participants because the researcher needs to be trusted by the participants to obtain accurate, reliable or credible data from them (Brink, 1993). During this process, the researcher revisits the data to determine if the constructs, categories, explanations, and interpretations make sense. In the present study, the researcher was in control of the process and determined when the data was saturated and sufficient to create relevant themes and categories. The researcher was also in control of the process of translating the data into convincing research outcome.

Another lens the researcher used in the present study to determine the validity of the research outcome is the research participants. This lens was referred to as member checking by Lincoln & Guba, (1985). The assumption of the qualitative paradigm is that reality is what the participants perceive it to be and it is socially constructed. This implies the need to verify how accurately the participants realities have been represented in the research outcome. This lens requires the active involvement of the participants in assessing whether the interpretations represent them accurately.

This lens (member checking) focuses on the participants and it is the most important technique to establish credibility in a research study (Lincoln and Guba, 1985, p. 314; Long & Johnson, 2000). With this lens, the researcher took the data and his interpretation back to the interview participants for them to confirm whether the interpretations represent what they intended during the interviews. The researcher sent the interview transcripts, the guidelines and the proposed framework to the participants to ensure that they are accurate and signifies what the participants intended. The participants provided valuable feedback to researcher and their feedback was incorporated to further improve the research outputs (the guidelines and the framework). The feedback from the participants confirmed that the data reflect the views of the participants. It also confirmed that the participants agree with the researchers' interpretation of the data (Skovdal & Cornish, 2015). The participants increased the credibility of the output of present research by providing feedback on both the data and research outputs.

Another lens used by the present research is the credibility of the research results by individuals that are not part of the research (Creswell & Miller, Determining Validity in Qualitative Inquiry, 2000). The interview transcripts, the guidelines and the proposed framework were presented at different conferences and valuable feedback was obtained from the conference attendees which include researchers in similar field, reviewers not part of the project and individuals in similar position as the research participants. Refer to section 4.7 for more details on the conferences.

Furthermore, the present study used triangulation as a way of validating the research results. A researcher can triangulate data using different sources of data to examine a phenomenon of interest from different perspectives (Kuper, Lingard , & Levinso, 2008). The main aim of triangulation is to avoid the personal biases of researcher and to overcome the limitations associated with single-sources. For example, single-researcher, single-participant, single-theory, or single-method which helps to increase the validity of the study (Brink, 1993). Data was obtained from multiple sources including institutional documents, literature and interviews. The researcher searched for similarities among the different sources of information to form themes or categories. The presented study also conducted triangulation by obtaining data from multiple participants (students, lecturers and IT staff). The triangulation of data enabled the researcher to come up with corroborating evidence collected through different methods and to locate the major and minor themes.

Finally, another way of validating a research outcome is for researchers to self-disclose their assumptions, beliefs, and biases that may affect the enquiry (Noble & Smith, 2015). In the present study, the researcher

disclosed his assumptions, beliefs, and biases at an early stage in the research process to make his position known to the readers. This would allow the readers to be able to understand and separate the researcher's assumptions, beliefs, and biases from the actual research outcomes.

9. CONCLUSION AND EVALUATION OF STUDY

Many HEIs are faced with issues such as tight budget, high cost of software licensing and maintenance, reduction in government funding, inadequate human resources and lack of adequate infrastructure. Thus, they are unable to meet up with the demand for ICT resources (i.e. SaaS applications) to cater for their students. This affects the students negatively as it affects the ability of the students to perform as expected. To overcome this challenge, many of the HEIs are turning to ICTs such as SaaS applications but the lack of awareness about the benefits and limitations of the applications prevents them from realising the expected benefits. To assist HEIs in resolving these problems, this research identified the benefits and limitations of using SaaS with the hope that it can help to create awareness of SaaS and allow the HEIs and their students to reap the expected benefits of SaaS. This research also identified the issues and contradictions associated with the use of SaaS in HEIs from the perspectives of the students, lecturers and IT staff with the hope that a good understanding of the issues and contradictions will allow the HEIs to resolve the contradictions in a constructive way thereby leading to the creation of a conducive academic environment and consequently contribute towards the improvement of the academic performance of the students.

To explore this issues in depth, I conducted a comprehensive literature review which allowed me to understand what has been done by researchers in this research area and similar research areas. I then conducted interviews with selected participants from four HEIs to obtain the qualitative data. The data was then analysed as discussed in Chapters 5 and 6. I will now discuss the summary of the findings in the next section.

9.1 Summary of Findings

9.1.1 Key Findings

This research confirms most of the findings in literature in relation to the phenomenon of interest. One of the findings in literature that was also confirmed by the findings of this research is that the anytime anywhere access of SaaS, ability to access SaaS from any internet enabled device and the elimination of the need to install, upgrade and maintain the software are the main reasons why students are attracted to SaaS. This research also found that the possibility to continue working on a project from another system from anywhere at any time without losing any work also attracts students.

SaaS offers a possible solution to the problem of inadequate access to academic and social software currently encountered by HEIs. The adoption of SaaS can benefit HEIs, students, lecturers and administration staff. SaaS also has the capability to improve communication, research and collaboration among students, lecturers and institutions (Deepa & Sathiyaseelan, 2012). Moreover, SaaS can help to improve governance and management activities in HEIs. This research proposes that HEIs in Nigeria and SA should consider the full adoption and use of SaaS as it can give them access to the software needed to train students. This can also help to increase the support for academic activities and thus improving the quality of education. This research postulates that identifying all the contradictions in the activity systems of the HEIs and resolving the

contradictions can lead to transformation of the system thereby creating improved student access to academic software. The transformation could also lead to creation of a conductive academic environment for students. Although the HEIs used in this study are unique and are separate entities, this research found that they share similar goals and they aim to achieve similar outcomes such as teaching and learning, improving the academic performance of students, producing graduates that are ready to take on the world of work, providing students with quality and affordable education, providing students with the needed resources and creating a conducive academic environment for students. Thus, a similar solution such as SaaS could be applied in all the participating HEIs.

SaaS offers benefits for HEIs and their students but there are also limitations associated with SaaS for both HEIs and students. For HEIs, the cost savings due to no installation, upgrades and maintenance of the software by the institution is the main source of attraction. The minimum hardware requirement is another source of attraction for HEIs. Also, the use of SaaS reduces the need for personnel's as the installation, upgrades and maintenance of the software is performed by the service provider.

The pay as you go model of SaaS also attract HEIs because they can save on cost during school holidays when usage is low. In addition, the scalability of SaaS allows HEIs to reach more students as they can easily increase the number of devices for software access on demand.

The reliance of SaaS on the internet and the security issues are among the top limitations affecting the adoption and implementation of SaaS among HEIs. The lack of adequate change management strategy also affects the adoption and implementation of SaaS by HEIs. The issue of the ownership of data is another issue affecting the adoption and implementation of SaaS among HEIs. This is because the data may be stored in another country by the service provider and the institution may not be protected by laws in the country in terms of data ownership. The service level agreement could be used to resolve this issue as the ownership of data could be agreed upon and stated in the service level agreement. The remedies in case there is a breach of agreement from either of the parties should also be stipulated in the service level agreement.

The HEIs also overlook the changes that may arise from SaaS adoption and implementation because they do not have any change management strategies in place. The lack of proper maintenance plans for supporting ICT infrastructures such as computers also prevents HEIs from maximising the benefits of SaaS.

For the students, acceptance of SaaS is high among them but the usage is low. The main source of attraction of SaaS for the students is the anytime, anywhere access of SaaS but unfortunately, some students are unable to reap that benefit due to the high cost/ lack of internet service of campus.

Another benefit of SaaS for students is improved communication and collaboration. Some of the students also noticed improvement in their confidence as they can now ask questions from lecturers and fellow students without fear using SaaS applications such as Moodle and Office 365.

The device independence of SaaS is also an attractive benefit among students. Thus, students are not forced to buy sophisticated and expensive devices as they can access SaaS with any basic internet enabled device.

For most students, security is not a major concern as they believe that their usernames and password are adequate security measures.

Although the students derive benefits from using SaaS, there are also limitations which prevents them from using SaaS effectively. Firstly, the ICT background of the students affects their ability to use SaaS effectively. Secondly, some students are influenced by their lecturers. For example, if the lecturer does not instruct the students to use the SaaS application for their class activities, some students may not use it. Another issue is the attitude of students as it affects their usage of SaaS. Having a positive attitude could improve usage and negative attitude could reduce usage. The maturity of students is another issue as more matured students tend to use SaaS for intended academic activities while the younger students may get distracted by other features of the application such as unsolicited advertisement.

The reliance of SaaS on the internet also affects SaaS usage by students as the quality of internet access affects the quality of SaaS. In addition, off-campus access is expensive for student's due to the high cost of internet off-campus.

Some students also lack the basic ICT skills needed to use SaaS because of their poor ICT background. Thus, HEIs should provide basic ICT training for students to improve their ICT skills and quip them with the basic ICT skills needed to use SaaS effectively.

The students themselves need to be in control of the learning process to avoid distractions when using SaaS. Furthermore, there is a need to create more awareness of SaaS, its benefits and limitations among students to encourage widespread usage.

In Nigerian public HEIs, the participants claimed that corruption is a major hindrance to the successful adoption and implementation of SaaS because there is no accountability and most of the funds intended for the purchase of ICT resources are often diverted for individual gains.

Another peculiar issue with the Nigerian HEIs is that software piracy is common among students in the Nigerian HEIs because the traditional software is expensive and majority of the students cannot afford it. SaaS could provide a solution to this issue as original copies of the needed software could be made available to students either for free or at a cheaper cost. The issue of cybercrime is also peculiar to the Nigerian HEIs because many students use the internet access provided for academic activities such as access SaaS to engage in illegal activities online.

This research identified both the traditional software and the SaaS applications used in the participating HEIs and found that the use of traditional software is still dominant among the participating HEIs. This was found to be due to resistance to change from the IT staff because of the fear of losing their jobs.

This research identified some of the contradictions in the activity systems of the participating HEIs that affect the Subject-Object-Outcome relationships and prevents the Subjects from achieving the desired outcome. The contradictions identified were discussed in detail in section 6.6.

Identifying the contradictions early and finding ways to eradicate or minimise them will improve the Subject-Object-Outcome relationships and lead to a positive outcome for the Subjects.

The research developed a set of propositions and all the propositions were found to be true when validated against the empirical data. A detailed discussion on the testing of the propositions was provided in section 6.8 of this study.

Although the HEIs with a relative lack of resources appears to be the focus of this study, the resource rich HEIs can equally benefit from the outcome of this research. Hence, they are also encouraged to embrace the adoption and implementation of SaaS for improved access to resources.

This research found little difference between the already established HEIs and the newly established HEIs because the newly established HEI surprisingly made more provisions for more resources than needed. Although, the newly established HEI currently has adequate resources for their students, they are also encouraged to embrace SaaS as their situation might change soon as they expand and their student population grows.

With regards to SaaS specific laws, both Nigeria and South Africa have no SaaS specific laws in place although South Africa has a related law known as 'POPI' act and Nigeria is in the process of passing some data related bills into law. Both countries should follow international standards and develop their own SaaS related laws to guide the adoption, implementation and continued use of SaaS.

In conclusion, there is a great potential in using SaaS for HEIs. This research therefore suggests the increased adoption and implementation of SaaS among HEIs to improve access to resources.

9.1.2 The propositions

The majority of the propositions were supported by the empirical data and most of them were also generalisable. Please refer to Section 6.8 and Section 7.7 for more details. An overall summary of both Section 6.8 (discussion of the propositions) and Section 7.7 (Generalisability) is provided in Table 18.

	Higher Education Institutions				Generalisability
Propositions	**HEI1**	**HEI2**	**HEI3**	**HEI4**	
P1 (*If there are too many contradictions within or between the activity systems, the impact of the tool is likely to be less*)	✓✓	✓	✓	✓✓	**Generalisable** (Falls under both within population generalisability and cross population generalisability because it can be applied across the population and to other external population)
P2 (*If there are too many contradictions within or between the activity systems, there are less chances of realising the desired learning outcomes)*	✓✓	✓	✓	✓✓	**Generalisable** (Falls under both within population generalisability and cross population generalisability because it can be applied across the population and to other external population)
P3 *(The contradictions in the activity systems can improve the overall learning experience of the students if handled in a constructive way)*	✓	?	✓✓	✓✓	**Generalisable** (Falls under contextual generalisability)
P4 *(If the rules are not aligned with SaaS or they are not in place, there are less chances of realising the expected benefits)*	0	0	0	✓✓	**Not generalisable**
P5 *(The actual positive outcomes from the use of SaaS greatly exceeds the actual negative outcomes)*	✓✓	✓✓	✓✓	✓✓	**Generalisable** (Falls under contextual generalisability)
P6 (*The social, cultural and organisational factors within the academic environment mediate the way in which the Subjects conduct activities)*	✓✓	✓✓	✓✓	✓✓	**Generalisable** (Falls under contextual generalisability)
P7 (*The use of SaaS mediates and shapes the way the students and the lecturers do their work)*	✓✓	✓✓	✓✓	✓✓	**Generalisable** (Falls under both within population generalisability and cross population generalisability because it can be applied across the population and to other external population)
P8 (*If there is insufficient or restricted flow of information within the activity system, the desired outcome will not be achieved)*	✓✓	✓	?	?	**Not generalisable**

Table 18: Overall Summary of the propositions and generalisability
Source: Author

✓✓	Strongly Supported
✓	Supported
?	Ambiguous
X	Opposed
XX	Strongly Opposed
0	Insufficient Evidence

9.1.3 The Framework

The proposed framework referred to as "ESIHE" was designed to cater for the issues faced by HEIs during the pre-implementation stage, the implementation stage and the post-implementation stage. The framework provides guidelines on how each of the stages can be conducted successfully to avoid the common problems that HEIs usually encounter during these stages. Please refer to Section 8.5 for a detailed discussion of the proposed framework.

9.2 Research Contributions

9.2.1 Practical contributions

This research developed a set of guidelines which will assist students in their use of SaaS. The set of guidelines will also help students to balance their use of SaaS so as not to be distracted with the non-academic features of SaaS.

The research used the activity theory, the interview, the institutional documents to develop the integrated framework referred to as 'ESIHE'. This framework (ESIHE) can assist HEIs in their adoption, implementation and use of SaaS. The framework would be useful for HEIs, their decision makers, lecturers, IT staff and their students. It will also be beneficial for national policy makers when making decisions regarding infrastructure provision, privacy issues, cost of bandwidth, legal issues relating to technologies and funding. The set of guidelines developed and the recommendations provided would also be useful for HEIs, their decision makers, lecturers, IT staff and their students.

The mini case studies are also practical contributions of this research as they would be useful for HEIs in their decision-making process on the adoption and implementation of SaaS.

This research identified several ICT based academic support tools used in HEIs and the challenges faced by students in accessing these tools. In addition, this research also identified the SaaS options available for HEIs and the level of adoption of SaaS by participating HEIs. The benefits, limitations, and contradictions associated with the use of SaaS in HEIs was also identified in this research. This research also identified the elements of the activity systems and how they interact with each other to produce the expected outcome.

The proposed framework unlike other adoption or usage frameworks view the adoption, implementation and usage as related processes and makes provisions for effective adoption and usage of SaaS from the pre-implementation stage to the post-implementation stage.

The traditional adoption and usage models only focus on individual activity. For example, they focus on the adoption phase only or usage only. The proposed framework goes beyond that by making provisions for every phase from adoption to usage.

9.2.2 Theoretical contributions

The main theoretical contribution of this research is the theoretical understanding made in the area of SaaS adoption and usage in HEIs. This would be useful for academic researchers especially those in the area of SaaS and higher education. This research employed the activity theory to provide an understanding of the processes that students engage in when they use SaaS.

This research also developed a set of propositions and provided a thorough discussion based on the empirical data. The propositions and the rich insight into the SaaS findings are valuable theoretical contributions of this research.

The findings on how the contradictions play out in the activity systems of the participating HEIs is also a theoretical contribution of this research.

Finally, the perspectives of the students and the academic staff has not been well researched because the researchers have always looked at SaaS from an organisational point of view. This research makes a valuable theoretical contribution by looking at this issue from the students' point of view. Hence, it provides an opportunity for researcher to explore this phenomenon from the perspective of the academic staff.

9.2.3 Methodological contributions

This research made a methodological contribution by demonstrating the applicability of a multi-method approach (i.e. the use of the institutional documents, literature and interviews) in investigating the use of SaaS by the students in the selected HEIs. The use of multiple participants (students, lecturers and IT staff) to obtain and triangulate the data is another methodological contribution of this research as it allowed the researcher to gain different perspectives on the usage of SaaS in HEIs. It will also motivate other researcher either in similar fields or unrelated fields to employ a multi method approach and promote the validity of their research outcomes.

Another methodological contribution of this research is the demonstration of the applicability of the activity theory in the use of SaaS in HEIs. The understanding of the contradictions and how they influence the outcomes in an activity system was particularly useful in this research. The understanding and applicability of the relationships or links between the elements of the activity system was also useful in this research. This was useful in uncovering the dynamics and complexities involved with the use of SaaS in HEIs. The use of activity theory yielded insights on the social, cultural and organisational factors associated with the use of SaaS in HEIs. This would otherwise not have been found without the use of the activity theory.

9.3 Limitations of the Study

One of the limitations of this research is that it focused mainly on SaaS and the result may not be applicable to other technologies unless further research is carried out to confirm its applicability to the other technologies.

Another limitation is that the gender of the participants is not balanced. For example, there are more male participants than female participants in the study. All the participating lecturers and IT staff were males and it is impossible to ascertain the result would have been different if the gender was balanced or if they were all female.

Also, the small sample size is a limitation of this research and it could affect the generalizability of the research outcome.

9.4 Recommendations for Future Research

In future studies, there is a need to expand this research to other types of cloud computing like IaaS and PaaS as they are beginning to find their ways into HEIs. For example, HEI3 teaches an IBM course on big data where they use a virtual desktop. The computers run from the service providers data centre and all they do is that they control the computers from their institution. There is also a need to find out why the adoption of SaaS has been slow among HEIs.

Also, the researcher plans to conduct an audit and survey of the SaaS adoption in the HEI's investigated with a broader perspective in the technologies investigated. Future research will also go beyond focus on students' activities and learning by investigating other activities and aspects that enhance, influence and support student activities and learning.

Furthermore, future studies would address the importance of leadership challenges, ICT governance, leadership commitments and competencies to prioritize the appropriate adoption of ICT infrastructure in HEIs as core to the transformation of the learning ecosystems.

Additionally, the investigation could be explored beyond student level by incorporating the entire ecosystem and value chains of HEI's. This could provide further insights and impactful contributions to the literature.

The ESIHE framework was developed and feedback was obtained from the participants. Future studies may use the framework to access the adoption, implementation and continued use of SaaS as this would make a useful and insightful contribution to scientific body of knowledge.

10. REFERENCES

Abdullah, Z. (2014). Activity Theory as Analytical Tool: A Case Study Of Developing Student Teachers' Creativity In Design. *Procedia - Social and Behavioral Sciences, 131*(1), 70 - 84.

Accuosti, J. (2014). Factors Affecting Education Technology Success. *American Society for Engineering Education Zone I Conference* (pp. 1 - 6). Bridgeport: Institute of Electrical and Electronics Engineers.

Addy, N. A., & Ofori-Boateng, P. (2015). ICT and Education: An analysis into Ghana's Universities. *International Journal of ICT and Management, 3*(2), 23 - 28.

Adebisi, A. A., Adekanmi, A. A., & Oluwatobi, A. E. (2014). A Study of Cloud Computing in the University Enterprise. *International Journal of Advanced Computer Research, 4*(2), 450 - 458.

Adelana, O. (2016, November 21). *Nigerian Academics Must Be ICT Compliant - Okojie*. Retrieved from Naij: https://www.naij.com/535777-next-generation-nigerian-students-need-ict-prof-okojie.html

Adeoye, B. F. (2015). Utilization of Cloud Computing in Education. *Journal of Global Research in Computer Science, 6*(4), 10 - 11.

Adrees, M. S., Omer, M. K., & Sheta, O. E. (2016). Cloud Computing Adoption in the Higher Education (Sudan as a model): A SWOT Analysis. *American Journal of Information Systems, 4*(1), 7 - 10.

Aduwa-Ogiegbaen, S. E., & Uwameiye, R. (2008). Assessment of ICT Status in Universities in Southern Nigeria. In L. A. Tomei, *Adapting Information and Communication Technologies for Effective Education* (pp. 216 - 231). Hershey, United States of America: IGI Global.

Africa Ranking. (2017, 08 11). *Top 20 Largest Economies in Africa*. Retrieved from Africa Ranking: http://www.africaranking.com/largest-economies-in-africa/6/

Aginam, E. (2015, January 25). *NIALS to NUC: Upgrade ICT curriculum with cloud computing services*. Retrieved from Vanguard: http://www.vanguardngr.com/2015/01/nials-nuc-upgrade-ict-curriculum-cloud-computing-services/

Ahmed, M., Chowdhury, A. M., Ahmed, M., & Rafee, M. H. (2010). An Advanced Survey on Cloud Computing and State-of-the-art Research Issues. *International Journal of Computer Science Issues, 9*(1), 201 - 207.

Ahmed, S. (2015). Public and Private Higher Education Financing in Nigeria. *European Scientific Journal, 11*(7), 92 - 109.

Ajith , S. N., & Hemalatha, M. (2012). Cloud Computing for Academic Environment. *International Journal of Information and Communication Technology Research, 2*(2), 97 - 101.

Akande, A. O., & Van Belle, J.-P. (2014). Cloud Computing in Higher Education: A snapshot of Software as a Service. *6th International Conference on Adaptive Science and Technology (ICAST)* (pp. 134 - 138). Ota, Ogun State, Nigeria: Institute of Electrical and Electronics Engineers.

Akande, A. O., & Van Belle, J.-P. (2016). The use of software as a service by students in higher education institutions: a systematic literature review. *Proceedings of the 18th Annual International Conference on Electronic Commerce: e-Commerce in Smart connected World* (pp. 1 - 6). Suwon, South Korea: Association for Computing Machinery.

Akinsuyi, F. F. (2015, 04 15). *Data Protection & Privacy Laws Nigeria, A Trillion Dollar Opportunity.* Retrieved from linkedin.com/pulse: https://www.linkedin.com/pulse/data-protection-privacy-laws-nigeria-trillion-dollar-f-franklin

Akpan, C. (2012). Resource Management and Job Involvement among University Lecturers in South-South Nigeria. *European Journal of Business and Social Sciences, 1*(8), 12 - 22.

Al-adwan, A., & Smedley, J. (2012). Implementing E-Learning in the Jordanian Higher Education System: Factors affecting impact. *The international Journal of Education and development using Information and Communication Technology, 8*(1), 121 - 135.

Alam, M. (2016). Use of ICT in Higher Education. *The International Journal of Indian Psychology, 3*(4), 162 - 171.

Alamri, H. B., & Qureshi, M. R. (2015). Usability of Cloud Computing to Improve Higher Education. *International Journal of Information Technology and Computer Science, 7*(9), 59 - 65.

Alharbi, S. T. (2014). Trust and Acceptance of Cloud Computing: A Revised UTAUT Model. *International Conference on Computational Science and Computational Intelligence* (pp. 131 - 134). Las Vegas: Insitute of Electrical and Electronics Engineers.

Alharthi, A., Alassaf, M. O., Alzahrani, A. I., Walters, R. J., & Wills, G. B. (2017). Critical Success Factors for Cloud Migration in Higher Education Institutions: A Conceptual Framework. *International Journal of Intelligent Computing Research, 8*(1), 817 - 825.

Aljebreen , B., Dahanayake , A., & Syed, L. (2015). Advances in Higher Educational Resource Sharing and Cloud Services for KSA. *International Journal of Computer Science & Engineering Survey, 6*(3), 25 - 40.

Alotaibi, M. B. (2014). Exploring Users' attitudes and intentions toward the adoption of Cloud Computing in Saudi Arabia: An empirical investigation. *Journal of Computer Science, 10*(11), 2315 - 2329.

Alotaibi, M. B. (2016). Antecedents of software-as-a-service (SaaS) adoption: a structural equation model. *International Journal of Advanced Computer Research, 6*(25), 114 - 129.

Alrasheedi, M., Capretz, L. F., & Raza, A. (2015). Management's perspective on critical success factors affecting mobile learning in higher education institutions – An empirical study. *Journal of Educational Computing Research, 1*(1), 1 - 22.

Al-Shqeerat, K. H., Al-Shrouf, F. M., Hassan, M. R., & Fajraoui, H. (2017). Cloud Computing Security Challenges in Higher Educational Institutions -A Survey. *International Journal of Computer Applications, 161*(6), 22 - 29.

Alshwaier, A., Youssef, A., & Emam, A. (2012). A new trend for E-learning in KSA using Educational Clouds. *Advanced Computing: An International Journal, 3*(1), 81 - 97.

Andersen, N. (2017, July 10). *The South African*. Retrieved from Read: Why are data costs so high in South Africa? ICASA has an explanation: https://www.thesouthafrican.com/read-why-are-data-costs-so-high-in-south-africa-icasa-has-an-explanation/

Anderson, C. (2010). Presenting and Evaluating Qualitative Research. *American Journal of Pharmaceutical Education, 74*(8), 1 - 7.

Anerousis, N., & Mohindra , A. (2006). The Software-as-a-Service Model for Mobile and Ubiquitous Computing Environments. *Third Annual International Conference on Mobile and Ubiquitous Systems: Networking & Services* (pp. 1 - 6). San Jose: Institute of Electrical and Electronics Engineers Xplore.

Anthony, A. B. (2012). Activity Theory as a Framework for Investigating District-Classroom System Interactions and Their Influences on Technology Integration. *Journal of Research on Technology in Education, 44*(4), 335 - 356.

Areekkuzhiyil, S. (2016). Impact of Organisational factors on the Knowledge Sharing Practice of Teachers workin in Higher Education Sector. *Intercontinental Journal of Human Resource Research Review, 4*(8), 23 - 33.

Ashtari , S., & Eydgahi , A. (2015). Student Perceptions of Cloud Computing Effectiveness in Higher Education. *International Conference on Computational Science and Engineering* (pp. 184 - 191). Porto, Portugal: Institute of Electrical and Electronics Engineers.

Asiyai, R. I. (2013). Challenges of Quality in Higher Education in Nigeria in the 21st Century. *International Journal of Educational Planning & Administration, 3*(2), 159 - 172.

Asniar, & Budiawan, R. (2016). Implementation of cloud computing in higher education. *Materials Science and Engineering, 128*(1), 1 - 4.

Astin, A. W. (1993). *Assessment for Excellence: The Philosophy and Practice of Assessment and Evaluation in Higher Education.* Arizona: Oryx Press.

Astin, A. W. (1999). Student Involvement: A Developmental Theory for Higher Education. *Journal of College Student Development, 40*(5), 518 - 529.

Atieno, O. P. (2009). An Analysis of the Strengths and Limitation of Qualitative and Quantitative Research Paradigms. *Problems of Education in the 21st Century, 13*(1), 13 - 18.

Attride-Stirling, J. (2001). Thematic networks: an analytic tool for qualitative research. *Qualitative Research, 1*(3), 385 - 405.

Babbie, E., & Mouton, J. (2001). *The Practice of Social Research.* Cape Town: Oxford University Press.

Babin, R., & Halilovic, B. (2017). Cloud Computing e-Communication Services in the University Environment. *Information Systems Education Journal, 15*(1), 55 - 67.

Bala, S. P. (2010). Intensification of Educational Cloud Computing and Crisis of Data Security in Public Clouds. *International Journal on Computer Science and Engineering, 2*(3), 741 - 745.

Baniwal, W. (2013). Applications of cloud computing in different areas. *International Journal of Computer Science and Communication, 4*(2), 174 -176.

Barhate, S. M., & Narale, S. (2015). Cloud Based Teaching and Learning Environment for Smart Education. *International Journal on Recent and Innovation Trends in Computing and Communications, 3*(2), 38 - 41.

Basal, A. M., & Steenkamp, A. L. (2010). A SaaS-Based Approach in an E-Learning System. *International Journal of Information Science and Management, Special Issue*, 27 - 40.

Basharina, O. K. (2007). An activity theory perspective on student reported contradictions in international telecollaboration. *Language Learning & Technology, 11*(2), 82 - 103.

Baskerville, R. (1996). Deferring Generalizability: Four Classes of Generalization in Social Enquiry. *Scandinavian Journal of Information Systems, 8*(2), 5 - 28.

Baskerville, R., & Pries-Heje, J. (2014). Design Theory Projectability. *Bill Doolin; Eleni Lamprou; Nathalie Mitev; Laurie McLeod. 5th Working Conference on Information Systems and Organizations* (pp. 219 - 232). Auckland, New Zealand: Springer, IFIP Advances in Information and Communication Technology.

Behrend, M. B. (2014). Engeström's activity theory as a tool to analyse online resources embedding academic literacies. *Journal of Academic Language & Learning, 8*(1), 109 - 120.

Benbasat, I., Goldstein, D. K., & Mead, M. (1987). The Case Research Strategy in Studies of Information Systems. *MIS Quarterly, 11*(3), 369 - 386.

Benlian, A., Hess, T., & Buxmann, P. (2009). Drivers of SaaS Adoption - An Empirical Study of Different Application. *Business Information Systems Engineering, 1*(5), 357 - 369.

Berg , G., & Fuchs, M. (2013, August 4). Bank Financing of SMEs in Five Sub-Saharan African Countries: The Role of Competition, Innovation, and the Government. *Policy Research Working Paper 6563*, pp. 1 - 20.

Bibi, S., Katsaros, D., & Bozanis, P. (2012). Business application acquisition: On-premise or SaaS-based solutions? *Institute of Electrical and Electronics Engineers Software, 29*(3), 86 - 93.

Bingimlas, K. A. (2009). Barriers to Successful Integration of ICT in Teaching and Learning Environments: A Review of the Literature. *Eurasia Journal of Mathematics, Science and Technology Education, 5*(3), 235 - 245.

Blin , F., & Munro, M. (2008). Why hasn't technology disrupted academics' teaching practices? Understanding resistance to change through the lens of activity theory. *Computers & Education, 50*(1), 475 - 490.

Blue, T. (2018, January 28). *SaaS 1000*. Retrieved from Top SaaS companies: http://saas1000.com/

Bodker, S. (1990). *Through the Interface: A Human Activity Approach to User Interface Design.* Hillsdale: Erlbaum.

Boja , C., Pocatilu, P., & Toma, C. (2013). The economics of cloud computing on educational services. *Procedia - Social and Behavioral Sciences, 93*(1), 1050 - 1054.

Bojuwoye, O., Moletsane, M., Stofile, S., Moolla, N., & Sylvester, F. (2014). Learners' experiences of learning support in selected Western Cape schools. *South African Journal of Education, 34*(1), 1 - 15.

Boye, R. H. (2015). Grassroots Innovation for Urban Sustainability: Comparing the Diffusion Pathways of Three Ecovillage Projects. *Environment and Planning, 45*(1), 320 - 337.

Brink, H. I. (1993). Validity and Reliability in Qualitative Research. *Curationis, 16*(2), 35 - 38.

Briscoe, G., & Marinos, A. (2009). Digital ecosystems in the clouds: towards community cloud computing. *International Conference on Digital Ecosystems and Technologies* (pp. 103 - 108). New York: Institute of Electrical and Electronics Engineers.

Brown, M. E., & Hocutt, D. L. (2015). Learning to Use, Useful for Learning: A Usability Study of Google Apps for Education. *Journal of Usability Studies, 10*(4), 160 - 181.

Bryman, A., & Bell, E. (2011). *Business Research Methods.* New York: Oxford University Press Incorporated.

Bubnys, R., & Zydziunaite, V. (2010). Reflective Learning Models in the Contecxt of Higher Education:Concept Analysis. *Problems of Education in the 21st Century, 20*(1), 58 - 70.

Buchmann, C., & Parrado, E. A. (2006). Educational Achievement of Immigrant Origin and Native Students: A Comparative Analysis Informed by Institutional Theory. *International Perspectives on Education and Society, 7*(1), 345 - 377.

Buhari, G. (2015, February 25). *Chatam House: The Royal Institute of International Affairs.* Retrieved from Prospects for Democratic Consolidation in Africa: Nigeria's Transition: https://www.files.ethz.ch/isn/189002/20150226Buhari.pdf

Bulla, C., Hunshal, B., & Mehta, S. (2016). Adoption of Cloud Computing in Education System: A Survey. *International Journal of Engineering Science and Computing, 6*(6), 6375 - 6380.

Burke, M. E. (2007). Making choices: Research Paradigms and Information Management: Practical applications of philosophy in IM research. *Library Review, 56*(6), 476 - 484.

Buttar, S. S. (2015). ICT in Higher Education. *International Journal of Social Sciences, 2*(1), 1686 - 1696.

Buyya, R., Broberg, J., & Goscinski, A. (2011). *Cloud Computing: Principles and Paradigms.* Hoboken, New Jersey: John Wiley and Sons Incorporated.

Byrne, E., & Sahay, S. (2007). Generalisations from an interpretive study: The case of a South African community-based health information system. *South Africa Community Journal, 38*(1), 8 - 19.

Cai, Y. (2013). Graduate employability: a conceptual framework for understanding employers'perceptions. *Higher Education, 65*(4), 457 - 469.

Canedo, E. D., de Sousa Junior, R. T., & Albuquerque, R. d. (2012). Trust model for reliable file exchange in Cloud Computing. *International Journal of Computer Science and Information Technology, 4*(1), 1 - 18.

Capper, P., & Williams, B. (2004). Enhancing evaluation using systems concepts . *Evaluation 2004 - Fundamental Issues* (pp. 1 - 23). Atlanta: American Evaluation Association.

Chandra, D. G., & Malaya, D. B. (2012). Role of Cloud Computing in Education. *International Conference on Computing, Electronics and Electrical Technologies* (pp. 832 - 836). India: Institute of Electrical and Electronics Engineers.

Chang, V., & Wills, G. (2013). A University of Greenwich Case Study of Cloud Computing – Education as a Service. In D. Graham, I. Manikas, & D. Folinas, *E-Logistics and E-Supply Chain Management: Applications for Evolving Business* (pp. 232 - 253). Hershey: IGI Global.

Chaudhary , O., & Siddique, A. S. (2017). Cloud Computing Application: Its Security Issues and Challenges Faced During Cloud Forensics and Investigation. *International Journal of Advanced Research in Computer Science, 8*(2), 12 - 15.

Cheun, W. D., Lee, Y. J., Lee, W. J., & Kim, D. (2009). A Quality Model for Evaluating Software-as-a-Service in Cloud Computing. *The 7th ACIS International Conference on Software Engineering Research, Management and Applications* (pp. 261 - 266). Haikou, China: Institute of Electrical and Electronics Engineers.

Chin'anga, F., & Nhundu, N. (2017, April 12). *Centre for Competition, Regulation and Economic development*. Retrieved from Data Must Fall: Evidence from MTN South Africa, Nigeria and Ghana: https://www.competition.org.za/review/2017/4/12/data-must-fall-evidence-from-mtn-sa-nigeria-and-ghana

Chisnall, P. (1997). *Marketing Research (5th Ed).* London: McGraw Hill.

Chou, S.-W., & Chiang, C.-H. (2013). Understanding the formation of software as a service (SaaS). *Decision Support Systems, 56*(1), 148 - 155.

Clemmensen, T., Kaptelinin, V., & Nardi, B. (2016). Making HCI theory work: an analysis of the use of activity theory in HCI research. *Behaviour and Information Technology, 35*(8), 608 - 627.

Collier, D. (1993). The Comparative Method. In A. W. Finifter, *Political Science: The state of the Discipline II* (pp. 105 - 119). Washington DC: American Political Science Association.

Council on Higher Education. (2016, August 11). *Advice to the Minister of Higher Education and Training on Fee Adjustments at Public Universities for 2017.* Retrieved from University of Cape Town news: https://www.news.uct.ac.za/images/archive/dailynews/downloads/2016/CHE_AdviceMinisterFeeAdjustment2017.pdf

Crawford, K., & Hasan, H. (2006). Demonstrations of the Activity Theory Framework for Research in Information Systems. *Austaralasian Journal of Information Systems, 13*(2), 49 - 68.

Creswell, J. W. (2012). *Qualitative inquiry and research design: Choosing among five approaches.* California,: Sage.

Creswell, J. W., & Miller, D. L. (2000). Determining Validity in Qualitative Inquiry. *Theory into Practice, 39*(3), 124 - 130.

Dacin, T. M., Goodstein, J., & Scott, R. W. (2002). Institutional Theory and Institutional Change: Introduction to the Special Research Forum. *The Academy of Management Journal, 45*(1), 45 - 56.

Daniels, H. (2004). Activity theory, discourse and Bernstein. *Educational Review, 56*(2), 121 - 132.

De Montfort University Library. (2013, August 8). *How to undertake a literature search and review for dissertations and final year project*. Retrieved from De Montfort University Library and Learning: http://www.library.dmu.ac.uk/Images/Howto/LiteratureSearch.pdf

De Villiers, M. R. (2005). Three approaches as pillars for interpretive Information Systems research: development research, action research and grounded theory. *Proceedings of Annual Conference of the South African Institute of Computer Scientists and Information Technologists on IT research in*

developing countries (pp. 111 - 120). White River, South Africa: Association for Computing Machinery Digital library.

Deepa, N., & Sathiyaseelan, R. (2012). The Cloud and the Changing Shape of Education - Eaas (Education as a Service). *International Journal of Computer Applications, 42*(5), 4 - 8.

Delmar, C. (2010). "Generalizability" as Recognition: Reflections on a Foundational Problem in Qualitative Research. *Qualitative Studies, 1*(2), 115 - 128.

Demiraslan, Y., & Usluel, Y. K. (2008). ICT integration processes in Turkish schools: Using activity theory to study issues and contradictions. *Australasian Journal of Educational Technology, 24*(4), 458 - 474.

Department of Education. (1997). *Quality Education for all: Report of the National Committee.* Pretoria: Government Printer.

Department of Information Systems, University of Cape Town. (2015, September 14). *Journal Ranking List*. Retrieved from Department of Information Systems, University of Cape Town: http://www.commerce.uct.ac.za/InformationSystems/Pages/Journal-Ranking-List

Dhingra, S., Goyal, V., & Malik, V. (2014). Necessity of Cloud Computing in Education System: A Study. *International Journal of Latest Trends in Engineering and Technology, 3*(3), 367 - 372.

Dhulla, T. V., & Mathur, K. S. (2014). Adoption of Cloud Computing by Tertiary Level Students - A Study. *Journal of Exclusive Management Science, 3*(3), 1 - 15.

Dugguh, S. I. (2013). Entrepreneurship and Small Business: Strategic Approach to Alleviating Poverty and Corruption in Nigeria. *Journal on Business Review, 3*(1), 57 - 66.

Edwards, A. (2014). *Task design, subject pedagogy and student engagement.* London: Routledge.

Egoeze, F., Misra, S., Akman, I., & Colomo-Palacios, R. (2014). An Evaluation of ICT Infrastructure and Application in Nigeria Universities. *Acta Polytechnica Hungarica, 11*(9), 115 - 129.

Elizabeth, B. (2010). Activity theory: what does it offer elearning research? *Dreams Begins Responsiblity* (pp. 1 - 22). Manchester: University of Huddersfield.

Engeström, R. (2009). Who is acting in an activity system? In H. Daniels, K. D. Gutiérrez, & A. Sannino, *Learning and expanding with activity theory* (pp. 257 - 273). Cambridge: University Press.

Engeström, Y. (1987). *Learning by expanding: an activity-theoretical approach to developmental research.* Helsinki: Orienta-Konsultit.

Engeström, Y. (1999). Innovative learning in work teams: analysing cycles of knowledge creation in practice. In Y. Engeström, R. Miettinen, & R. L. Punamäki, *Perspectives on Activity Theory: learning in doing: social, cognitive and computational perspectives* (pp. 377 - 406). Cambridge: Cambridge University Press.

Engeström, Y. (2001). Expansive Learning at Work: toward an activity theoretical reconceptualization. *Journal of Education and Work, 14*(1), 133 - 156.

Engeström, Y., & Miettinen, R. (1999). Introduction. In Y. Engeström, R. Miettinen, & R. L. Punamäki, *Perspectives on Activity Theory: learning in doing: social, cognitive and computational perspectives* (pp. 19 - 38). Cambridge: Cambridge University Press.

Ercan, T. (2010). Effective use of cloud computing in educational institutions. *Procedia Social and Behavioral Sciences, 2*(1), 938 - 942.

Erkoç, M. F., & Kert, S. B. (2011). Cloud Computing For Distributed University Campus: A Prototype Suggestion. *International Conference on Future of Education* (pp. 1 - 5). Firenze, Turkey: Pixel.

Ernst and Young. (2016, December 14). *Transparency International Corruption Perceptions Index 2016.* Retrieved from Ernst and Young: http://www.ey.com/Publication/vwLUAssets/EY-Transparency-International-Corruption-Perceptions-Index-2016/$FILE/EY-Transparency-International-Corruption-Perceptions-Index-2016.pdf

Fakeeh, K. A. (2015). The Realization of Cloud ERP Systems in Higher Education. *International Journal of Applied Information Systems, 9*(5), 37 - 41.

Famade, O. A., Omiyale, G. T., & Adebola, Y. A. (2015). Towards Improved Funding of Tertiary Institutions in Nigeria. *Asian Journal of Humanities and Social Sciences, 3*(2), 83 - 90.

Farooqui, N. K. (2008). Software as a service: Analysis of 'Google Sites' as KM Tool for Academic Environment. *Communications of the International Business Information Management Association, 5*(1), 189 - 197.

Foddy, W. (1994). *Constructing questions for Interviews and Questionnaires: Theories and practice in Social research.* Cambridge, United Kingdom: Cambridge University press.

Free Market Foundation. (2017, July 1). *The Citizen*. Retrieved from Are outraged South Africans wrong about high data prices?: https://citizen.co.za/lifestyle/your-life-technology/1557537/is-sa-wrong-about-its-high-data-prices/

Fuller, S., & McLaren, T. (2010). Analyzing Enterprise Systems Delivery Modes for Small and Medium Enterprises. *Americas Conference on Information Systems Paper 380* (pp. 1 - 9). Lima, Peru: AMCIS. Retrieved from http://aisel.aisnet.org/amcis2010/380

Gangwar , H., Date , H., & Ramaswamy, R. (2015). Understanding determinants of cloud computing adoption using an integrated TAM-TOE model. *Journal of Enterprise Information Management, 28*(1), 1 - 31.

Garraway, J. (2011). University and work – curriculum inquiry from an activity theory perspective. In E. Bitzer, & N. Botha, *Curriculum inquiry in South African Higher Education: some scholarly affirmations and challenges* (pp. 195 - 212). Stellenbosch: SunMedia.

Garrison, G., Kim, S., & Wakefield, R. L. (2012). Success factors for deploying Cloud computing. *Communications of the Association for Computing Machinery, 55*(9), 62 - 68.

Gaya, H. J., Struwig, M., & Smith, E. E. (2013). Creating a sustainable competitive advantage at a high performing firm in Kenya. *African Journal of Business Management, 7*(21), 2049 - 2058.

Ghaffari, S., Burgoyne, J., Shah, I. M., & Nazri, M. (2017). Perceptions of Learning Organization Dimensions among Non-academic Employees of Top Public Universities in Malaysia. *Australian Journal of Basic and Applied Sciences, 11*(1), 107 - 116.

Ghilic-Micu, M. M., & Stoica, M. (2011). Main aspects of the adoption of cloud solutions in managing service-oriented organizations - the case of higher education. *Economy Informatics, 11*(1), 27 - 36.

Gilakjani, A. P., Leong, L.-M., & Ismail, H. N. (2013). Teachers' Use of Technology and Constructivism. *International Journal of Modern Education and Computer Science, 5*(4), 49 - 63.

Gital, A. Y., & Zambuk, F. U. (2011). Cloud Computing: Solution to ICT in Higher Education in Nigeria. *Advances in Applied Science Research, 2*(6), 364 - 369.

Giyane, M., & Buckley, S. (2015). Cloud Computing Adoption in Zimbabwean State Universities: An Empathetic Examination. *IST-Africa Conference Proceedings* (pp. 1 - 8). Lilongwe, Malawi: Institute of Electrical and Electronics Engineers Xplore.

Gonzalez-Martínez, J. A., Bote-Lorenzo,, M. L., Gomez-Sanchez, E., & Cano-Parra, R. (2015). Cloud computing and education: A state-of-the-art survey. *Computers and Education, 80*(1), 132 - 151.

Google. (2014, September 15). *Google for Education.* Retrieved October 14, 2016, from Google for Education: http://www.naperville203.org/cms/lib07/IL01904881/Centricity/Domain/1216/GAFE%20one%20sheet.pdf

Gregor, S., & Hevner, A. R. (2013). Positioning and Presenting Design Science Research for Maximum Impact. *MIS Quarterly, 37*(2), 337 - 355.

Greve, N. (2017, January 19). *#FeesMustFall: Primed for explosion*. Retrieved from Fin24: https://www.fin24.com/Finweek/Featured/feesmustfall-primed-for-explosion-20170116

Griffin, C. (2004). The advantages and limitation of qualitative research in psychology and education. *Scientific Annals of the Psychological Society of Northern Greece, 2*(1), 3 - 15.

Guba, E. G., & Lincoln, Y. S. (1989). *Fourth generation evaluation.* Newbury Park: Sage Publications.

Gupta, P., Seetharaman, A., & Raj, J. R. (2013). The usage and adoption of cloud computing by small and medium businesses. *International Journal of Information Management, 33*(5), 861 - 874.

Gupta, S. (2012). Cloud Computing in Education in Current Financial Crisis. *International Conference on Technology and Business Management*, (pp. 325 - 330). Dubai, United Arab Emirates.

Gutiérrez-Carreón , G., Daradoumis, T., & Jorba, J. (2015). Integrating Learning Services in the Cloud: An Approach that Benefits Both Systems and Learning. *Educational Technology and Society, 18*(1), 145 - 157.

Hadzhikoleva, S., & Hadzhikolev, E. (2016). QAHEaaS or Quality Assurance in Higher Education as a Service. *Technology, Education, Management, Informatics (TEM) Journal, 5*(3), 363 - 370.

Hakkinen, H., & Korpela, M. (2006). A participatory assessment of IS integration needs in maternity clinics using activity theory. *International Journal of Medical Informatics, 76*(11 - 12), 843 - 849.

Halidu, S. (2015). An evaluation of University funding in Nigeria: Evidence from University of Ibadan. *Fountain Journal of Management and Social Sciences, 4*(2), 127 - 144.

Harding, A. (2014, October 27). *What is the difference between an impact and an outcome? Impact is the longer term effect of an outcome.* Retrieved from London School of Economics Impact Blog: http://blogs.lse.ac.uk/impactofsocialsciences/2014/10/27/impact-vs-outcome-harding/

Hardman, J. (2005). Activity theory as a potential framework for technology research. *South African Journal of Higher Education, 19*(2), 378 - 392.

Hashim, N., & Jones, M. L. (2007). Activity theory: a framework for qualitative analysis. *4th International Qualitative Research Convention* (pp. 1 - 16). PJ Hilton, Malaysia: University of Wollongong.

Hauser, C. (2016, 12 13). *'Fees Must Fall': Anatomy of the Student Protests in South Africa*. Retrieved from The New York Times: https://www.nytimes.com/2016/09/23/world/africa/fees-must-fall-anatomy-of-the-student-protests-in-south-africa.html

Heaney, D. (2017, December 27). *Broadband Choices*. Retrieved from Our pick of the 12 best SIM only deals for December 2017: https://www.broadbandchoices.co.uk/guides/mobile/best-sim-only-deals

Heart, T. (2010). Who is Out There? Exploring the Effects of Trust and Perceived Risk on Saas Adoption Intentions. *The DATA BASE for Advances in Information Systems, 41*(3), 49 - 68.

Heinle, C., & Strebel, J. (2010). IaaS adoption determinants in enterprises. *Conference on the Economics of Grids, Clouds, Systems, and Services* (pp. 93 - 104). Ischia: Springer.

Hevner, A., & Chatterjee, S. (2010). Design Research in Information Systems. *Integrated Series in Information Systems, 22*(1), 9 - 22.

Howcroft, D., & Trauth, E. M. (2005). Choosing Critical IS Research. In D. Howcroft, & E. M. Trauth, *Handbook of Information Systems Research: Critical Perspectives on Information Systems Design, Development and Implementation* (pp. 1-15). Cheltenham, United Kingdom: Edward Elgar Publishing.

Hughes, J., & Jones, S. (2003). Reflections on the Use of Grounded Theory in IS Research. *Proceedings of the 11th European Conference on Information Systems*, (pp. 1 - 10). Naples, Italy.

Hussein, N., Mohamad, A., Noordin, F., & Ishak, N. A. (2013). Learning Organization and its Effect on Organizational Performance and Organizational Innovativeness: A Proposed Framework for Malaysian Public Institutions of Higher Education. *Procedia - Social and Behavioral Sciences, 130*(1), 299 - 304.

Ibrahim, M. A., & Ameen, A. F. (2015). Exploring the Feasibility of Adopting Cloud Computing in Computer Center Taiz University. *International Journal of Advanced Networking and Applications, 6*(4), 2359 - 2366.

Ibrahim, M. S., Salleh, N., & Misra, S. (2015). Empirical Studies of Cloud Computing in Education: A Systematic Literature Review. *International Conference on Computational Science and Its Applications* (pp. 725 - 737). Alberta, Canada: Springer.

Idumange, J., & Major, B. N. (2006). Private Universities in Nigeria: Implications for Quality Control. *30th Annual Conference Of The Nigerian Association For Educational Administration & Planning (NEAP)*, (pp. 1 - 16). Enugu, Nigeria.

Ifijeh, G., Osinulu, I., Esse, U., Adewole-Odeshi, E., & Fagbohun, M. (2015). Assessing E-Learning Tools in an Academic Environment: A Study of Availability and Use among Undergraduate Students in a Nigerian University. *International Journal of Progressive Education, 11*(2), 76 - 87.

Ige , A. M. (2015). Wastage Factor in Universal Basic Education Programme Implementation in Nigeria: The Way out. *The Online Journal of Counseling and Education, 4*(1), 1 - 12.

Information and Communication Technology Services. (2016). Staff mailboxes heading to the cloud. *Bits & Bytes, 6*(5), 1 - 3.

Information and communication Technology Services. (2017, December 26). *Cloud applications at UCT*. Retrieved from Information and communication Technology Services: http://www.icts.uct.ac.za/cloud-apps

Information and Communication Technology Services, University of Cape Town. (2017, November 07). *Zero-rated mobile data access to specific UCT online resources*. Retrieved from Information and Communication Technology Services: http://www.icts.uct.ac.za/Zero-rated-access-some-UCT-websites

International Business Machines. (2018, January 5). *SPSS Statistics*. Retrieved from Features and Modules: https://www.ibm.com/products/spss-statistics

Irlbeck, E., Adams, S., Akers, Burris, S., & Jones, S. (2014). First Generation College Students: Motivations and Support Systems. *Journal of Agricultural Education, 55*(2), 154 - 166.

Irshad, M. B. (2015). The Study on Awareness and Adoption of Cloud computing by Academics in Sri Lankan Universities. *In Proceedings of 4th Annual International Research Conference, on Innovative Perspective in Business, Finance and Information Management* (pp. 300 - 306). Oluvil, Sri Lanka: Faculty of Management and Commerce South Eastern University of Sri Lanka (SEUSL).

Iruonagbe, C. T., Imhonopi, D., & Egharevba, M. E. (2015). Higher Education in Nigeria and the Emergence of Private Universities. *International Journal of Education and Research, 3*(2), 49 - 64.

Islam, S., & Grégoire, J. C. (2012). Giving users an edge: A flexible Cloud model and its application for multimedia. *Future Generation Computer Systems, 28*(6), 823 - 832.

Jaffer, S., Ng'ambi, D., & Czerniewicz, L. (2007). The role of ICTs in higher education in South Africa: One strategy for addressing teaching and learning challenges. *International Journal of Education and Development using Information and Communication Technology, 3*(4), 131 - 142.

Jain, A., & Pandey, U. S. (2013). Role of Cloud Computing in Higher Education. *International Journal of Advanced Research in Computer Science and Software Engineering, 3*(7), 966 - 972.

Jansen, J. D. (2003). Educational Change in South Africa 1994-2003: Case Studies in Large-Scale Education Reform. *Education Reform and Management Series, 2*(1), 1 - 51.

Jansen, M., Bollen, L., Baloian, N., & Hoppe, H. U. (2012). Cloud Services for Learning Scenarios: Widening the Perspective. *International Workshop on Cloud Education Environments* (pp. 33 - 37). Antigua, Guatemala: International Workshop on Cloud Education Environments.

Janssen, M., & Joha, A. (2011). Challenges for adopting cloud-based software as a service (SAAS) in the public sector. *19th European Conference on Information Systems Paper 80*, (pp. 1 - 12). Helsinki, Finland.

Javadi, M., & Zarea, K. (2016). Understanding Thematic Analysis and its Pitfall. *Journal of Client Care, 1*(1), 33 - 39.

Jiang, B., Chen, P., & Mukhopadhyay, T. (2007). *On-demand enterprise software: the software as a service model.* Pittburgh: Tepper School of business Carnegie Mellon University.

Jonassen, D. H., & Rohrer-Murphy, L. (1999). Activity Theory as a Framework for Designing Constructivist Learning Environments. *Educational Technology Research and Development, 47*(1), 61 - 79.

Joshua, J. A. (2015). Challenges and Prospects of Vocational and Technical Education: Most Important Tool for Enhancement and Innovations in Higher Education in Nigeria. *Journal of Research Development, 24*(1), 1 - 8.

Kalpeyeva, Z. B., & Mustafina, A. K. (2013). IT-infrastructure of university based on cloud computing. *International Journal of Computer Science Issues, 10*(5), 176 - 179.

Kanwal, F., Rehman, M., Bashir, K., & Qureshi, U. (2017). Critical Factors of E-Learning Adoption and Acceptance in Pakistan: A Literature Review. *Engineering, Technology & Applied Science Research, 7*(4), 1888 - 1893.

Kaptelinin, V. (2005). The Object of Activity: Making Sense of the Sense-Maker. *Mind, culture and activity, 12*(1), 4 - 18.

Katzan, H. J. (2010). The Education Value Of Cloud Computing. *Contemporary Issues In Education Research, 3*(2), 37 - 42.

Katzan, H. J., & Dowling, W. A. (2010). Software-As-A-Service Economics. *Review of Business Information Systems, 14*(1), 27 - 38.

Kaur, R., & Ghumman, N. S. (2017). A Review on Resource Allocation Mechanism in Cloud Environment. *International Journal of Computers and Technology, 16*(1), 7562 - 7566.

Keshavarz, N., Nutbeam, D., Rowling, L., & Khavarpour, F. (2010). Schools as social complex adaptive systems: A new way to understand the challenges of introducing the health promoting schools concept. *Social Science & Medicine, 70*(1), 1467 - 1474.

Khan, S. H., Hasan, M., & Clement, C. K. (2012). Barriers to the Introduction of ICT into Education in Developing Countries: The example of Bangladesh. *International Journal of Instruction, 5*(2), 61 - 80.

Khorshed, T. M., Ali, S. A., & Wasimi, S. A. (2012). A survey on gaps, threat remediation challenges and some thoughts for proactive attack detection in cloud computing. *Future Generation Computer Systems, 28*(6), 833 - 851.

Klein, H. K., & Hyunh, M. Q. (2004). The Critical Social Theory of Jurgen Habermans and its Implications for IS Research. In J. Mingers, & L. Willcocks, *Social Theory and Philosophy for Information Systems* (pp. 157 - 237). Chichester: Wiley.

Klein, H. K., & Myers, M. D. (1999). Set of Principles for Conducting and Evaluating Interpretive Field Studies in Information Systems. *MIS Quarterly, 23*(1), 67 - 93.

Klug, W., & Bai, X. (2015). Factors affecting cloud computing adoption among universities and colleges in the United States and Canada. *Issues in Information Systems, 16*(3), 1 - 10.

Kourik, J. L., & Wang, J. (2012). Cloud Computing's Software-as-a-Service (SaaS) Delivery Model Benefits Technical Courses in Higher Education. *International Journal of Social, Behavioral, Educational, Economic, Business and Industrial Engineering, 6*(5), 922 - 926.

Kraaijenbrink , J., Spender, J. C., & Groen, A. J. (2010). The resource-based view: A review and assessment of its critiques. *Journal of Management, 36*(1), 349 - 372.

Kumar, P. B., Kommareddy, S., & Rani, U. N. (2013). Effective ways Cloud Computing can contribute to Educational Success. *Advanced Computing: An International Journal, 4*(4), 17 - 32.

Kumar, R. (2005). *Research Methodology - A step by step Guide for Beginners.* California: SAGE Publications Incorporated.

Kuper, A., Lingard , L., & Levinso, W. (2008). Critically appraising qualitative research. *British Medical Journal, 337*(1), 687 - 692.

Landry-Hyde, D., & Cantwell, L. P. (2013). Virtually Yours: Online Embedded Librarianship in Higher Education. *Internet Learning, 2*(2), 21 - 37.

Larkin, H. (2010). "But they won't come to lectures…" The impact of audio recorded lectures on student experience and attendance. *Australasian Journal of Educational Technology, 26*(2), 238 - 249.

Lee, A. S., & Baskerville, R. L. (2003). Generalizing Generalizability in Information Systems Research. *Information Systems Research, 14*(3), 221 - 243.

Lee, A. S., & Liebenau, J. (1997). *Information systems and qualitative research.* London: Chapman and Hall.

Leont'ev, A. N. (1981). The problem of activity in psychology. In J. V. Wertsch, *The concept of activity in Soviet psychology* (pp. 37 - 71). New York : M E Sharpe.

Levy, Y., & Ellis, T. J. (2006). A Systems Approach to Conduct an Effective Literature Review in Support of Information Systems Research. *Informing Science Journal, 9*(1), 181 -212.

Liao, H., & Tao, C. (2008). An Anatomy to SaaS Business Mode Based on Internet. *International Conference on Management of eCommerce and eGovernment* (pp. 215 - 220). Institute of Electrical and Electronics Engineers Computer Society Press.

Liao, K., & Luo, J. (2012). Knowledge Management in Collaborative Product Design-An Activity Theory Perspective. *Journal of Software, 7*(1), 17 - 24.

Liaw, S. S., Huang, H. M., & Chen, G. D. (2007). An activity-theoretical approach to investigate learners' factors toward e-learning systems. *Computers in Human Behavior, 23*(4), 1906 - 1920.

Lim, C. P., & Hung, D. (2003). An Activity Theory Approach to Research of ICT Integration in Singapore Schools. *Computers & Education, 41*(1), 49 - 63.

Lim, S., Saldanha, T. J., Malladi, S., & Melville, N. P. (2013). Theories Used in Information Systems Research: Insights from Complex Network Analysis. *Journal of Information Technology Theory and Application, 14*(2), 5 - 46.

Lin , Y., & Wu, L.-Y. (2014). Exploring the role of dynamic capabilities in firm performance under the resource-based view framework. *Journal of Business Research, 67*(1), 407 - 413.

Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic inquiry.* Beverly Hills, CA: Sage.

Long , T., & Johnson, M. (2000). Rigour, reliability and validity in qualitative research. *Clinical Effectiveness in Nursing, 4*(1), 30 - 37.

Macharia, J., & Nyakwende, E. (2010). The influence of e-mail on students' learning in higher education: An extension to the Technology Acceptance Model. *Asian Journal of Information Technology, 9*(3), 123 - 132.

Makoza, F. (2016). Cloud computing adoption in Higher Education Institutions of Malawi: An exploratory study. *Journal of Computing and Information and Communication Technology Research, 9*(2), 37 - 54.

Mangula, I. S., van de Weerd, I., & Brinkkemper, S. (2015). Why do Companies Adopt or Reject SaaS? Looking at the Organisational Aspect. *Pacific Asia Conference on Information Systems* (pp. 1 - 13). Association for Information Systems Electronic Library.

Manikas, K., & Hansen, K. M. (2013). Software ecosystems – A systematic literature review. *The Journal of Systems and Software, 86*(1), 1294 - 1306.

Mariya, S. (2011). Cloud computing – an advanced e-learning platform of school education? *International Conference on Interactive Collaborative Learning (ICL2011)* (pp. 569 - 570). Piešťany, Slovakia: Institute of Electrical and Electronics Engineers.

Marshall, S. (2010). Change, technology and higher education: are universities capable of organisational change? *ALT-J, Research in Learning Technology, 18*(3), 179 - 192.

Mason, J. (2002). *Qualitative Researching.* London: Sage Publications.

Mason, R., & Rennie, F. (2008). *E-Learning and Social Networking Handbook: Resources for Higher Education.* New York: Routledge.

Matavire, R., & Brown, I. (2008). Investigating the use of Grounded Theory in Information Systems research. *Proceedings of the South African Institute of Computer Scientists and Information Technologists Conference* (pp. 139 - 147). Wilderness, South Africa: Association for Computing Machinery Digital Library.

Mathew, S. (2012). Implementation of Cloud Computing in Education - A Revolution. *International Journal of Computer Theory and Engineering, 4*(3), 473 - 475.

Maurer, M., Emeakaroha, V. C., Brandic, I., & Altmann, J. (2012). Cost - benefit analysis of an SLA mapping approach for defining standardized Cloud computing goods. *Future Generation Computer Systems, 28*(1), 39 - 47.

McKendrick, J. (2012, August 27). *Forbes*. Retrieved February 13, 2014, from The 8 Most Important Skills Needed for Cloud Computing Today: http://www.forbes.com/sites/joemckendrick/2012/08/27/the-8-most-important-skills-needed-for-cloud-computing-today/

Mell, P., & Grance , T. (2009). *Effectively and Securely Using the Cloud Computing Paradigm.* Gaithersburg: National Institute of satandard and Technology.

Memeti, A., Selimi, B., & Çiço, B. (2014). Integration of Several University e-Services in the Cloud. *UKSim-AMSS 8th European Modelling Symposium* (pp. 360 - 365). Pisa, Italy: Institute of Electrical and Electronics Engineers.

Meske, C., Stieglitz, S., Vogl, R., & Rudolph, D. (2014). Cloud Storage Services in Higher Education - Results of a Preliminary Study in the Context of the Sync&Share-Project in Germany. In P. Zaphiris, & A. Ioannou, *Learning and Collaboration Technologies. Designing and Developing Novel Learning Experiences. First International Conference, LCT 2014, Held as Part of HCI International 2014, Heraklion, Crete, Greece, June 22-27, 2014, Proceedings, Part I.* (pp. 161 - 171). Münster, Germany: Springer International Publishing.

Mew, L. (2015). Information Systems Education: The Case for the Academic Cloud. *The EDSIG Conference on Information Systems and Computing Education* (pp. 1 - 9). Wilmington, North Carolina: Information Systems & Computing Academic Professionals (ISCAP).

Meyer, R. E., & Höllerer, M. A. (2014). Does Institutional Theory Need Redirecting? *Journal of Management Studies, 51*(7), 1221 - 1233.

Mirriahi, N., Dawson, S., & Hoven, D. (2012). Identifying key Actors for Technology Adoption in Higher Education: A social network approach. *In M. Brown, M. Hartnett & T. Stewart (Eds.), Future challenges, sustainable futures. Proceedings of ascilite 2012* (pp. 664 - 674). Wellington: Massey University.

Miseviciene, R., Budnikas, G., & Ambraziene, D. (2011). Application of Cloud Computing at KTU: MS Live@Edu Case. *Informatics in Education, 10*(2), 259 - 270.

Misra, S. C., & Mondal, A. (2011). Identification of a company's suitability for the adoption of cloud computing and modelling its corresponding Return on Investment. *Mathematical and Computer Modelling, 53*(3 - 4), 504 - 521.

Mittler, P. (2006). *Special Needs Education.* London: Routledge.

Mlitwa, N. B. (2007). Technology for teaching and learning in higher education contexts: Activity theory and actor network theory analytical perspectives. *International Journal of Education and Development using Information and Communication Technology, 3*(4), 54 - 70.

Mlitwa, N. W. (2010). Integration of e-Learning Systems into Academic Programmes in South African Universities. *A doctorsl thesis submitted to the department of Information Systems, University of Cape Town for the degree of Doctor of Philosophy (PhD) in Information Systems*. University of Cape Town Library.

Momoh, M., & Abdulsalam, D. O. (2014). Information Management Efficiency in Universities in Northern Nigeria: An Analysis. *World Journal of Social Sciences, 4*(1), 107 – 116.

Monobe, R. J. (2011). IT Implementation in ITE in the Limpopo Province (South Africa): A Dream or Reality? *US-China Education Review, 6*(1), 885 - 893.

Morf, M. E., & Weber, W. G. (2000). I/O Psychology and the Bridging Potential of A. N. Leont'ev's Activity Theory. *Canadian Psychology, 41*(2), 81 - 93.

Muhammed, K., Zaharaddeen, I., Rumana, K., & Turaki, A. M. (2015). Cloud Computing Adoption in Nigeria: Challenges and Benefits. *International Journal of Scientific and Research Publications, 5*(7), 1 - 7.

Muli, E., & Kimutai, J. (2015). Adoption of Cloud Computing for Education in Kenyan Universities: Challenges and Opportunities. *International Journal of Advanced Research in Computer Engineering & Technology, 4*(6), 2854 - 2860.

Murgor, T. K. (2015). Challenges Facing Adoption of Information Communication Technology in African Universities. *Journal of Education and Practice, 6*(25), 62 - 68.

Muriithi, G. M., & Kotzé, J. E. (2012). Cloud computing in higher education: implications for South African public universities and FET colleges. *14th Annual Conference on World Wide Web Applications* (pp. 4 - 24). Durban, South Africa: Cape Peninsula University of Technology.

Mushtaq, I., & Khan, S. N. (2012). Factors Affecting Students' Academic Performance. *Global Journal of Management and Business Research, 12*(9), 1 - 6.

Mybroadband. (2016, September 26). *Mybroadband*. Retrieved from #DataMustFall mobile prices misleading: https://mybroadband.co.za/news/cellular/180730-datamustfall-mobile-prices-misleading.html

Myers, D. M. (2009). *Qualitative Research in Business & Management.* London: Sage Publications.

Myers, M. D. (1997). Qualitative research in information systems. *MIS Quarterly, 21*(2), 241 - 242.

Naik, A. B., Ajay, A. K., & Kolhatkar, S. S. (2013). Applicability of Cloud Computing in Academia. *Indian Journal of Computer Science and Engineering, 4*(1), 11 - 15.

Nan. (2016, July 30). *NUC, ICT firm to deploy solar power in universities*. Retrieved from The Guardian: https://guardian.ng/technology/nuc-ict-firm-to-deploy-solar-power-in-universities/

Narkar, S. V., & Shaharkar, B. B. (2014). Cloud-based Education: For Improving Efficiency, Cost and Convenience. *Proceedings on National Seminar on Recent Trends in Cloud Computing* (pp. 13 - 15). Tamil Nadu, India: International Journal of Computer Applications.

Nashash, H. A., & Gunn, C. (2013). Lecture capture in engineering classes: Bridging gaps and enhancing learning. *Educational technology and Society, 16*(1), 69 - 78.

Nawaz, A., Awan, Z., & Ahmad, B. (2011). Integrating Educational Technologies In Higher Education of the Developing Countries. *Journal of Education and Practice, 2*(2), 1 - 14.

Ndukwe, I. G., & Amadi, E. C. (2013). Cost Benefits of Cloud vs. In-house IT for Higher Education. *International Journal of Computer Science and Security, 7*(1), 1 - 14.

Nhlapo, Z. (2017, August 22). *Huffpost*. Retrieved from In Case You're Wondering, Here's Why Data Is So Expensive in South Africa: http://www.huffingtonpost.co.za/2017/08/22/in-case-you-re-wondering-heres-why-data-is-so-expensive-in-south-africa_a_23156646/

Nkwanyane, T. (2017, September 27). *Vodacom announces free internet access for students and staff.* Retrieved from University of Cape Town: http://www.uct.ac.za/sites/default/files/image_tool/images/328/media/releases/2017/2017-09-27.Release.Vodacom.pdf

Noble , H., & Smith, J. (2015). Issues of validity and reliability in qualitative research. *Evidence-Based Nursing, 18*(2), 34 - 35.

Nowell, L. S., Norris, J. M., White, D. E., & Moules, N. J. (2017). Thematic Analysis: Striving to Meet the Trustworthiness Criteria. *International Journal of Qualitative Methods, 16*(1), 1 - 13.

Obal, M. (2013). Why do incumbents sometimes succeed? Investigating the role of interorganizational trust on the adoption of disruptive technology. *Industrial Marketing Management, 42*(6), 900 - 908.

Odeh, M., Warwick, K., & Garcia-Perez, A. (2015). The impacts of cloud computing adoption at Higher Education Institutions: A SWOT analysis. *International Journal of Computer Applications, 127*(4), 1 - 8.

Oh, H. K., & Sim, H. (2014). New EaaS Cloud Service Model Implementation for Smart Education. *International Journal of Innovative Research in Computer and Communication Engineering, 2*(1), 2082 - 2092.

Okeke, C. C. (2015, August 31). *ICT: NUC harps on better access to education*. Retrieved from Daily Trust: http://www.dailytrust.com.ng/news/education/ict-nuc-harps-on-better-access-to-education/108804.html#uW1lq31a4eCTTEuO.99

Okoli, C., & Schabram, K. (2010). A Guide to Conducting a Systematic Literature Review of Information Systems Research. *Sprouts: Working Papers on Information Systems, 10*(26), 1 - 49.

Olutola, A. T., & Olatoye, O. O. (2015). Challenges of E-Learning Technologies in Nigerian University Education. *Journal of Educational and Social Research, 5*(1), 301 - 306.

Omede , A. A. (2015). The challenges of educating the visually impaired and quality assurance in tertiary institutions of learning in Nigeria. *International Journal of Educational Administration and Policy Studies, 7*(7), 129 - 133.

Orlikowski, W. J., & Baroudi, J. J. (1991). Studying Information Technology in Organizations: Research Approaches and Assumptions. *Information Systems Research, 2*(1), 1 - 28.

Oseni, M. (2015). Effectiveness and Desirability of Private Higher Education in Nigeria. *Journal of Educational and Social Research, 5*(1), 151 - 158.

Owen, C. (2008). Analysing joint work between activity systems. *Activités, 5*(2), 52 - 69.

Oye, N. D., Salleh, M., & Iahad, N. A. (2011). Challenges of E-learning in Nigerian University Education Based on the Experience of Developed countries. *International Journal of Managing Information Technology, 3*(2), 39 - 48.

Oyeleye, C. A., Fagbola , T. M., & Daramola , C. Y. (2014). The Impact and Challenges of Cloud Computing Adoption on Public Universities in Southwestern Nigeria. *International Journal of Advanced Computer Science and Applications, 5*(8), 13 - 19.

Parvin, S. (2013). Integrations of ICT in Education Sector for the Advancement of the Developing Country: Some Challegnes and Recommendations - Bangladesh Perspective. *International Journal of Computer Science & Information Technology, 5*(4), 81 - 92.

Patrizio, A. (2017, October 19). *Datamation*. Retrieved from 50 Leading SaaS Companies: https://www.datamation.com/cloud-computing/50-leading-saas-companies.html

Peffers, K., Tuunanen, T., Rothenber, M. A., & Chatterjee, S. (2007). A Design Science Research Methodology for Information Systems Research. *Journal of Management Information Systems, 24*(3), 45 - 77.

Peng, G. C., & Gala, C. (2014). Cloud ERP: A New Dilemma to Modern Organisations? *Journal of Computer Information Systems, 54*(4), 22 - 30.

Plakitsi, K. (2013). *Activity Theory in Formal and Informal Science Education.* AW Rotterdam, The Netherlands: Sense Publishers.

Pocatilu, P., Alecu, F., & Vetrici, M. (2010). Measuring the Efficiency of Cloud Computing for E-learning Systems. *WSEAS Transactions on Computers, 9*(1), 42 - 51.

Price, D., & Almpanis, T. (2015). Student and Staff Perceptions on the Impact of Lecture Capture. *International Conference on Information Communication Technologies in Education* (pp. 215 - 225). Kos, Greece: Greg Anderson.

Radović-Marković, M., & Alecchi, B. A. (2016). *Qualitative Methods in Economics.* New York: Routledge.

Rai, A., & Shakya, M. (2015). Cloud Technology in Higher Education: A Review. *International Conference on Software, Knowledge, Information Management and Applications* (pp. 279 - 283). Kathmandu, Nepal: Skima.

Rao, K. S., & Challa, R. K. (2013). Adoption of Cloud Computing In Education and Learning. *International Journal of Advanced Research in Computer and Communication Engineering, 2*(10), 4160 - 4163.

Reeves, S., Albert, M., Kuper, A., & Hodges, B. D. (2008). Why Use Theories in Qualitative Research? *British Medical Journal, 337*(7670), 631 - 634.

Robertson, C. A. (2015). Leadership development for technical and vocational education and training college leaders in South Africa: a post-graduate curriculum framework. *A doctoral thesis submitted to the department of Curriculum Studies, Faculty of Education, Stellenbosch University for the degree of Philosophy*. Stellenbosch University Library.

Robson, C. (1993). *Real World Research: A Resource for Social Scientists and Practitioner-Researchers.* Hoboken, New Jersey: Blackwell Publishing.

Roth, W. M. (2009). On the inclusion of emotions, identity and ethico-moral dimensions of actions. In A. Sannino, H. Daniels, & Gutiérrez, *Learning and expanding with activity theory* (pp. 53 - 74). Cambridge: University Press.

Roth, W.-M., & Lee, Y.-J. (2007). "Vygotsky's Neglected Legacy": Cultural-Historical Activity Theory. *Review of Educational Research, 77*(2), 186 - 232.

Runeson, P., & Höst, M. (2009). Gudelines for Conducting and Reporting Case Study Research in Software Engineering. *Empirical Software Engineering, 14*(2), 131 - 164.

Safari, F., Safari, N., & Hasanzadeh, A. (2015). The adoption of software-as-a-service (SaaS): ranking the determinants. *Journal of Enterprise Information Management, 28*(3), 400 - 422.

Sales force. (2016, October 14). *Sales force for Higher Education.* Retrieved October 14, 2016, from Salesforce.org: http://www.salesforce.org/highered/student-success/

Sam, C. (2012). Activity Theory and Qualitative Research in Digital Domains. *Theory Into Practice, 51*(2), 83 - 90.

Santoso, B. I. (2014). Designing Network Security for EucalyptusPrivate Cloud Infrastructure using SSL-VPN . *National Seminar on Information and Communication Technology (SENTIKA)* (pp. 452 - 460). Yogyakarta: Universitas Atma Jaya.

Sarker, S., & Lee, A. (2000). Using a Case Study to Test the Role of Three Key Social Enablers in ERP Implementation. *International Conference on Information Systems* (pp. 414 - 425). Brisbane: Association for Information Systems.

Sasikala, S., & Prema, S. (2010). Massive Centralized Cloud Computing (MCCC) Exploration in Higher Education. *Advances in Computational Sciences and Technology, 3*(2), 111 - 118.

Saunders, M., Lewis, P., & Thornhill, A. (2007). *Research Methods for Business Students.* London, United Kingdom: Prentice Hall.

Scanlon, E., & Issroff, K. (2005). Activity Theory and Higher Education: evaluating learning technologies. *Journal of Computer Assisted Learning, 21*(6), 430 - 439.

Scott, R. W. (1987). The Adolescence of Institutional Theory. *Administrative Science Quarterly, 32*(4), 493 - 511.

Seethamraju, R. (2015). Adoption of Software as a Service Enterprise Resource Planning Systems in Small and Medium Sized Enterprises. *Information Systems Front, 17*(1), 475 - 492.

Seidmann, A., & Ma, D. (2004). ASPs vs Enterprise Software Solution. *Workshop on Information Systems and economics* (pp. 1 - 5). Washington, DC: Institute of Electrical and Electronics Engineers.

Seke, M. M. (2015). Higher Education and the Adoption of Cloud Computing Technology in Africa. *International Journal on Communications, 4*(1), 1 - 9.

Sharma, A. K., & Ganpati, A. (2013). Cloud Computing: An Economic Solution to Higher Education. *International Journal of Application or Innovation in Engineering and Management, 2*(3), 200 - 206.

Sharma, S. K., Al-Badi, A. H., & Govindaluri, S. M. (2016). Predicting motivators of cloud computing adoption: A developing country perspective. *Computers in Human Behavior, 62*(1), 61- 69.

Singh, G., Singh, H., & Sodhi, N. K. (2012). Cloud Computing - Future Solution for Educational Systems. *International Journal of Enterprise Computing and Business Systems, 2*(1), 1 - 17.

Singleton, R. A., & Straits, B. C. (2005). *Approaches to Social Research, 4th Edition.* New York: Oxford University Press.

Skovdal, M., & Cornish, F. (2015). *Qualitative Research for Development: A Guide for Practitioners.* Rugby, United Kingdom: Practical Action Publishing.

Sokola, A., Gozdek, A., Figurska, I., & Blaskova, M. (2015). Organizational climate of higher education institutions and its implications for the development of creativity. *Procedia - Social and Behavioral Sciences, 182*(1), 279- 288.

Soria, K. M., Fransen, J., & Nackerud, S. (2014). Stacks, Serials, Search Engines, and Students' Success: First-Year Undergraduate Students' Library Use, Academic Achievement, and Retention. *The Journal of Academic Librarianship, 40*(1), 84 - 91.

SouthAfrica.info. (2013, July 25). *Education*. Retrieved October 13, 2016, from SouthAfrica.info: http://www.southafrica.info/about/education/universities-250713.htm#.V_9Tx1t96M8

Stefan, D. C., Elzawawy, A. M., Khaled, H. M., Ntaganda, F., Asiimwe, A., Addai, B. W., . . . Adewole, I. F. (2013). Developing cancer control plans in Africa: examples from five countries. *The Lancet Oncology, 14*(4), 189 -195.

Steyn, H. J., & Wolhuter, C. C. (2008). *Education systems: Challenges of the 21st century.* Potchefstroom: Keurkopie.

Sultan, N. (2010). Cloud computing for education: A new dawn? *International Journal of Information Management, 30*(2), 109 - 116.

Sutherland, R. (2004). Designs for learning: ICT and knowledge in the classroom. *Computers and Education, 43*(1 - 2), 5 - 16.

Suttner, R. (2015, 11 03). *Polity*. Retrieved from #Fees must fall and the status of “post-apartheid South Africa”: http://www.polity.org.za/article/fees-must-fall-and-the-status-of-post-apartheid-south-africa-2015-11-03

Tanasychuk, M. (2017, October 16). *Android Central*. Retrieved from These are the cheapest data plans you can buy in the United States of America: https://www.androidcentral.com/these-are-cheapest-data-plans-you-can-buy-us

Tashkandi, A., & Al-Jabri, I. (2015). Cloud Computing Adoption by Higher Education Institutions in Saudi Arabia - Analysis Based on Technology Organization and Environment (TOE). *International Conference on Cloud Computing* (pp. 1 - 8). Riyadh, Saudi Arabia: Institute of Electrical and Electronics Engineers Xplore.

Teradata Corporation. (2018, January 28). *Teradata* . Retrieved from Teradata University Network: http://www.teradatauniversitynetwork.com/

Tibebu, D., Bandyopadhyay, T., & Negash, S. (2009). ICT Integration Efforts in Higher Education in Developing Economies: The Case of Addis Ababa University, Ethiopia. *International Journal of Information and Communication Technology Education, 5*(3), 34 - 58.

Toro, U. G., & Joshi, M. (2012). ICT in Higher Education: Review of Literature from the Period 2004-2011. *International Journal of Innovation, Management and Technology, 3*(1), 20 - 23.

Tout, S. (2014). The Need for Strategic Planning Toward Adopting Cloud Computing in Higher Education. *International Journal of Information and Communication Technology Research, 4*(7), 255 - 263.

Traphagan, T., Kucsera, J. V., & Kishi, K. (2010). Impact of Class Lecture Webcasting on Attendance and Learning. *Educational Technology Research and Development, 58*(1), 19 - 37.

Tripathi, S., & Jigeesh, N. (2015). Task-Technology Fit (TTF) Model to Evaluate Adoption of cloud computing: A Multi-Case Study. *International Journal of Applied Engineering Research, 10*(3), 9185 - 9200.

Troshani, I., Rampersad, G., & Wickramasinghe, N. (2013). Managing SaaS risk in higher education organisations: A case study. *International Journal of Electronic Business Research, 9*(2), 8 - 23.

Tsang, E. W., & Williams, J. N. (2012a). Generalization and Induction: Misconceptions, Clarifications, and a Classification of Induction. *Management Information Systems Quarterly, 36*(3), 729 - 748.

Tsang, E. W., & Williams, J. N. (2012b). Generalization and Induction: More Misconceptions and Clarifications. *Research Collection School of Social Sciences, 1*(1), 1 - 23.

Tumbas , P., Matkovic , P., Sakal, M., & Tumbas, S. (2014). Exploring the potentials of CLoud Computing in Higher Education. *International Technology, Education and Development Conference* (pp. 2624 - 2631). Valencia, Spain: International Academy of Technology, Education and Development.

Tuomi-Gröhn, T., Engeström, Y., & Young, M. (2008). From transfer to boundary-crossing between school and work as a tool for developing vocational education: an introduction. In T. Tuomi-Gröhn, & Y. Engeström, *Between school and work: new perspectives on transfer and boundary-crossing* (pp. 1 - 18). Bingley, United Kingdom: JAI Press.

Universities South Africa . (2013, December 14). *Higher Education South Africa Annual Report.* Retrieved March 19, 2017, from http://www.usaf.ac.za/wp-content/uploads/2016/09/Hesa-Annual-Report-2013.pdf

Universities South Africa. (2016a, October 13). *Public Universities in South Africa.* Retrieved March 19, 2017, from http://www.universitiessa.ac.za/public-universities-south-africa

Universities South Africa. (2016b, October 13). *The Matriculation Board.* Retrieved March 19, 2017, from http://www.universitiessa.ac.za/matriculation-board

Universities South Africa. (2016c, November 16). *Strategic Framework 2015-2019 promotes interests of South African Universities.* Retrieved March 19, 2017, from http://www.usaf.ac.za/strategic-framework/

Universities South Africa. (2016d, December 18). *Universities Funding in South Africa; A Fact Sheet.* Retrieved March 19, 2017, from http://www.uct.ac.za/usr/news/downloads/2016/UniversitiesFundingSouthAfrica_FactSheet.pdf

Usluel, Y., Mumcu, F., & Demiraslan, Y. (2007). ICT in teaching-learning process: Teachers' views on the integration of ICT and on the perceived obstacles to this integration. *Hacettepe University Journal of Education, 32*(1), 164 - 179.

Van Aken, J., Chandrasekaran, A., & Halman, J. (2016). Conducting and publishing design science research Inaugural essay of the design science department of the Journal of Operations Management. *Journal of Operations Management, 47*(1), 1 - 8.

Velte, T., Velte , J., & Elsenpeter, R. (2009). *Cloud Computing: A Practical Approach.* New York, United States: McGraw - Hill.

Venable, J., Pries-Heje, J., & Baskerville, R. (2012). A Comprehensive Framework for Evaluation in A Comprehensive Framework for Evaluation in A Comprehensive Framework for Evaluation in A ComprehensivA Comprehensive Framework for Evaluation in Design Sience Research. *Advances in Theory and Practice, 7286*(1), 423 - 438.

Vodacom Foundation. (2017, October 04). *Vodacom announces free internet access for university students*. Retrieved from Sowetan Live: https://www.sowetanlive.co.za/news/2017-10-04-vodacom-announces-free-internet-access-for-university-students/

Vygotsky, L. (1981). The instrumental method in psychology. In J. V. Wertsch, *The concept of activity in Soviet psychology* (pp. 134 - 143; 144 - 240). New York : M E Sharpe.

Wade, M., & Hulland, J. (2004). The Resource Based View and Information Systems Research: Review, Extension, and Suggestions for Future Research. *MIS Quarterly, 28*(1), 107 - 142.

Webbstock, D. (2016). *South Africa Higher education reviewd: Two Decades of democracy.* Pretoria: The Council on Higher Education (CHE).

Weber, A. S. (2011). Cloud computing in education in the Middle East and North Africa (MENA) region: Can barriers be overcome? *The seventh international scientific conference on elearning and software for education* (pp. 1 - 6). Bucharest: Caroli national defence university.

Widmer, U. (2009, 07 24). *Cloud Computing and Data Protection.* Retrieved from Whos who legal: http://whoswholegal.com/news/features/article/18246/cloud-computing-data-protection/

Wu, W.-W., Lan, L. W., & Lee, Y.-T. (2013). Factors hindering acceptance of using cloud services in university: a case study. *The Electronic Library, 31*(1), 84 - 98.

Xin, M., & Levina, N. (2008). Software as a service model: elaborating clientside adoptionfactors. *The 29th International Conference on Information Systems*, (pp. 1 - 12). Paris, France.

Yadav, K. (2014). Role of Cloud Computing in Education. *International Journal of Innovative Research in Computer and Communication Engineering, 2*(2), 3108 - 3112.

Yang, Z., Sun, J., Zhang, Y., & Wang, Y. (2015). Understanding SaaS adoption from the perspective of organizational users: A tripod readiness model. *Computers in Human Behavior, 45*(1), 254 - 264.

Yataghene, L., Ait-Idir, K., Deba, E., & Eddoud, A. (2014). A Cloud Computing model for Algerian universities. *International conference on Information Technology for Organization Development* (pp. 95 - 100). Algeria: Institute of Electrical and Electronics Engineers.

Yin, R. K. (1994). *Case Study Research, Design and Methods 2nd Edition.* Newbury Park: Sage Publications.

Zhang, Q., Cheng, L., & Boutaba, R. (2010). Cloud computing: state-of-the-art and research challenges. *Journal of Internet Services and Applications, 1*(1), 7 - 18.

Zheng , Y., Sun, W., Jiang, Z., Cao, R., & Zhang, K. (2006). Practical Application of FDC in Software Service Pricing. *International Conference on eBusiness Enginering* (pp. 352 - 357). Shanghai, China: Institute of Electrical and Electronics Engineers Computer Society Press.

Zissis, D., & Lekkas, D. (2012). Addressing cloud computing security issues. *Future Generation Computer Systems, 28*(3), 583 - 592.

11. APPENDICES

Appendix A: Ethics Form

UNIVERSITY OF CAPE TOWN
FACULTY OF COMMERCE
Igniting Knowledge and Opportunity

Commerce Faculty Ethics in Research Application Form

Any individual in the Faculty of Commerce at the University of Cape Town undertaking any research that involves the use of human subjects, or research that may hold ethical consequences for the University of Cape Town, is required to complete this form and obtain approval before conducting research. The completed form should be submitted as an electronic document to departmental Ethics Committee representatives for submission to the Commerce Faculty Ethics in Research Committee. Please also submit electronic copies of your research proposal, informed consent form or other information used to obtain consent, and any questionnaires other material shown to subjects.

1. PROJECT DETAILS

Project title: Using Software as a Service to Support the Academic Activities of Students in Higher Education Institutions with a Relative Lack of Resources.

Principal Researcher/s:	Akinlolu Olumide Akande	**Email address(es):**	Akinlolu.Akande@uct.ac.za
Research Supervisor:	Professor Jean-Paul Van Belle	**Email address(es):**	Jean-Paul.VanBelle@uct.ac.za
Co-researcher(s):		**Email address(es):**	

Brief description of the project:
The project aims to identify the benefits and drawbacks associated with the use of Software as a Service in higher education. The project also aims to develop a framework which would serve as a tool which higher education institutions can use to determine the benefits and drawbacks they derive from their use of Software as a Service.

☒ ☐ ☐ ☒ ☐

Data collection: (please select)

Interviews Questionnaire Experiment Secondary data Observation

☐ Other (please specify):

Procedure: (please describe)
The researcher will arrange interviews with participants from the participating universities. The interview will each last for about 45minutes to 1 hour and the researcher would record all the conversations during the interview and later transcribe the data for analysis.

2. PARTICIPANTS

Characteristics of participants:

Gender:	Any
Race / Ethnicity:	Any
Age range:	20 years and above
Location:	Nigeria and South Africa
Other:	Registered students involved with the use of Software as a Service for their stud

Race / Ethnicity:

Have you included a "**Prefer not to Answer**" response category in your questionnaire? (please select)

☒ Yes ☐ No ☐ Not applicable

If you answered 'No' why not?

Affiliations of participants: (please select)

☐ Company employees ☒ UCT staff ☐ General public ☒ UCT Students

☒ Other (please specify): Students, lecturers and IT staff from all the participating universities

If your sample includes children (aged 18 and below), mentally incompetent persons, or legally restricted groups please explain below why it is necessary to use these particular groups. If subjects are minors or mentally incompetent, please describe how and by whom permission will be granted? If you are including children under the age of 18 and are not getting parental consent, please explain why you believe that their parents would consent if it was possible to contact them.

N/A

My sample does not include children aged 18 and below

3. ORGANIZATIONAL PERMISSION

If your research is being conducted within a specific organization, please provide organizational permission or explain how permission will be obtained.

A letter would be sent to the managements of all the participating universities requesting their permission to interview their students, lecturers and IT staff.

Are you making use of UCT students as respondents for your research? (please select) ☒ Yes ☐ No

If yes, have you contacted Executive Director: Student Affairs for permission? (please select) ☒ Yes ☐ No

Was approval granted? (please select) ☐ Yes ☐ No ☒ Awaiting a response

Are you making use of UCT staff as respondents for your research? (please select) ☒ Yes ☐ No

If yes, have you contacted Executive Director: Human Resources for permission? (please select) ☒ Yes ☐ No

Was approval granted? (please select) ☐ Yes ☐ No ☒ Awaiting a response

Contact Emails: Executive Director: Human Resources (**Miriam.Hoosain@uct.ac.za)**
Executive Director: Student Affairs (**Moonira.Khan@uct.ac.za)**

4. INFORMED CONSENT

What type of consent will be obtained from study participants?

☒ written consent

☐ anonymous survey

☐ oral consent (please justify)

☐ other (please specify)

- ○ Oral Consent
- ◉ Written Consent
- ○ Anonymous survey questionnaire (covering letter required, no consent form needed)
- ○ Other (please specify)

How and where will consent/permission be recorded?

Permissions will be recorded in a consent form which would be given to all participants at the premises of their respective universities.

What precautions will be taken to safeguard identifiable records of individuals? Please describe specific procedures to be used to provide confidentiality of data by you and others, in both the short and long run. This question also applies if you are using secondary sources of data that is not anonymous.

In order to safeguard the identifiable records of individuals, personal information like name, address, phone number, student number and any other identifiable records will not be requested in the interviews. The research will also ensure that no personal information of any of the participants will be included in the final paper.

Does the proposed research pose any physical, psychological, social, legal, economic, or other risks to study participants you can foresee, both immediate and long range? **(please select)**

Yes	No
☐	☒

If yes, answer the following questions:

1. Describe in detail the nature and extent of the risk and provide the rationale for the necessity of such risks
2. Outline any alternative approaches that were or will be considered and why alternatives may not be feasible in the study
3. Outline whether and why you feel that the value of information to be gained outweighs the risks

1.

2.

3.

What authorship agreement have you reached with your co-researchers or supervisor?

☐ This research is not intended for publication

☒ Standard authorship agreement (principal researcher first author, co-researcher(s) and supervisor(s) co-authors)

☐ Customised agreement (please specify below):

I certify that we have read the the UCT Authorship Policy, and Commerce Faculty Authorship Guidelines (http://www.commerce.uct.ac.za/Commerce/Information/research.asp) ☒

I certify that that the material contained herein is truthful and that all co-researchers and supervisors are aware of the contents thereof. ☒

I understand that it is my responsibility to conduct research in accordance with the ethical requirements of ☒ UCT. —

Signed by candidate

Applicant's signature:

Date: 20 October 2015

CHECKLIST	SELECT
A full copy of a research proposal or a literature review with methodology is attached	☒
Research proposal/ interview schedules / cover letters / questionnaires / forms and other materials used in the study are attached/ consent form	☒
Organizational consent letter / UCT student or staff approval letter	☒
On your cover letter to your questionnaire have you included the following?	**NA** ☐
1. The following UCT Logo 	☒
2. A sentence explaining the aim of the research	☒
3. Sentences of a similar nature to below must be included in the cover letter or consent form:	
This research has been approved by the Commerce Faculty Ethics in Research Committee.	☒
Your participation in this research is voluntary. You can choose to withdraw from the research at any time.	☒
The questionnaire will take approximately X minutes to complete	☒
You will not be requested to supply any identifiable information, ensuring anonymity of your responses.	☒
Due to the nature of the study you will need to provide the researchers with some form of identifiable information however, all responses will be confidential and used for the purposes of this research only.	**OR** ☒
Should you have any questions regarding the research please feel free to	☒

contact the researcher (insert contact details).

4. Have you scanned in your signature for the last section of the form?	☒

FOR ETHICS COMMITTEE REPRESENTATIVE ONLY
Recommendation(s): **Signature:** **Date:**
FOR ETHICS COMMITTEE CHAIRPERSON ONLY
Recommendation: **Signature:**

Appendix B: Ethics Approval Letter

Faculty of Commerce

Private Bag X3, Rondebosch, 7701
2.26 Leslie Commerce Building, Upper Campus
Tel: +27 (0) 21 650 4375/ 5748 Fax: +27 (0) 21 650 4369
E-mail: com-faculty@uct.ac.za
Internet: www.uct.ac.za
@Commerce_UCT **UCT Commerce Faculty Office**

18 November 2015 Ref:2110201501

Akinlolu Akande

Project title: Using Software as a Service to Support the Academic Activities of Students in Higher Education Institutions with a Relative Lack of Resources.

Dear Researcher,

This letter serves to confirm that this project as described in your submitted protocol has been approved. You will need to obtain permission from the Executive Director, Department of student Affairs and the Executive Director of Human Resources before commencing data collection.

Please note that if you make any substantial change in your research procedure that could affect the experiences of the participants, you must submit a revised protocol to the Committee for approval.

Regards,

Ms. Samantha Alexander
Administrative Assistant
University of Cape Town
Commerce Faculty Office
Room 2.24 | Leslie Commerce Building

Office Telephone: +27 (0)21 650 2695
Office Fax: +27 (0)21 650 4369
E-mail: samantha.alexander@uct.ac.za
Website: www.commerce.uct.ac.za<http://www.commerce.uct.ac.za/>

Appendix C: Letter to the management for student's participation in the interviews

PERMISSION LETTER FOR STUDENTS PARTICIPATION IN INTERVIEW

Department of Information Systems

Leslie Commerce Building

Engineering Mall, Upper Campus

OR Private Bag, Rondebosch, 7701

Cape Town

Tel: 650-2261

Fax No: (021) 650-2280

REQUEST FOR PERMISSION TO INTERVIEW YOUR STUDENTS IN A RESEARCH INTERVIEW

Dear Sir/Madam,

I am currently pursuing my PhD in Information Systems at the University of Cape Town. I am conducting a research on "Using Software as a Service to Support the Academic Activities of Students in Higher Education Institutions with a Relative Lack of Resources". This research has been approved by the University of Cape Town's (UCT) Commerce Faculty Ethics in Research Committee.

SaaS is a new technology that promises a lot of benefits such as cost reduction, faster time to market and flexibility to mention just a few. SaaS has the capability to improve the learning experience of students and it can also improve collaboration among students.

This interview will contribute towards identifying the benefits and drawbacks of using SaaS in higher education and lead to the development of an integrated framework which will serve as an instrument by which higher education institutions can identify the benefits and drawbacks of using SaaS. The study will benefit your organisation by providing a framework which will guide you on the right steps to follow in order to mitigate the drawbacks and increase the benefits associated with the use of SaaS. The study will collect information through face to face interviews.

I would like to use this medium to request your permission to interview your students in order to obtain necessary data which would be used in developing the framework. The interview will take 40 to 60 minutes to finish depending on the participants understanding of SaaS. The data gathered from the interview will be kept confidential and your student's identity and that of your organisation will be made anonymous. Your students personal details such as name, address or telephone contact will not be included in the research publication. I would also like to note that participation is voluntary and your students will not be forced to participate because of your approval. A copy of the final report will be sent to you on your request. I thank in anticipation of your permission to interview your students.

Kind Regards,

Akande Akinlolu Olumide.

For enquiries, please contact:

Researcher: Akande Akinlolu Olumide

E-mail: Akinlolu.Akande@uct.ac.za

Cell: +27 723135908

OR

Supervisor: Professor Jean-Paul Van Belle

Department of Information Systems

University of Cape Town

E-Mail: Jean-Paul.VanBelle@uct.ac.za

Phone: +27 (0)21 650 4256

Appendix D: Letter to the management for staff participation in the interviews

PERMISSION LETTER FOR STAFF PARTICIPATION IN INTERVIEW

Department of Information Systems

Leslie Commerce Building

Engineering Mall, Upper Campus

OR Private Bag, Rondebosch, 7701

Cape Town

Tel: 650-2261

Fax No: (021) 650-2280

REQUEST FOR PERMISSION TO INTERVIEW YOUR STAFF IN A RESEARCH INTERVIEW

Dear Sir/Madam,

I am currently pursuing my PhD in Information Systems at the University of Cape Town. I am conducting a research on "Using Software as a Service to Support the Academic Activities of Students in Higher Education Institutions with a Relative Lack of Resources". This research has been approved by the University of Cape Town's (UCT) Commerce Faculty Ethics in Research Committee.

SaaS is a new technology that promises a lot of benefits such as cost reduction, faster time to market and flexibility to mention just a few. SaaS has the capability to improve the learning experience of students and it can also improve collaboration among students.

This interview will contribute towards identifying the benefits and drawbacks of using SaaS in higher education and lead to the development of an integrated framework which will serve as an instrument by which higher education institutions can identify the benefits and drawbacks of using SaaS. The study will benefit your organisation by providing a framework which will guide you on the right steps to follow in order to mitigate the drawbacks and increase the benefits associated with the use of SaaS. The study will collect information through face to face interviews.

I would like to use this medium to request your permission to interview your staff members in order to obtain necessary data which would be used in developing the framework. The interview will take 40 to 60 minutes to finish depending on the participants understanding of SaaS. The data gathered from the interview will be kept confidential and your staff identity and that of your organisation will be made anonymous. Your staff personal details such as name, address or telephone contact will not be included in the research publication. I would also like to note that participation is voluntary and your staff will not be forced to participate because of your approval. A copy of the final report will be sent to you on your request. I thank in anticipation of your permission to interview your staff.

Kind Regards,

Akande Akinlolu Olumide.

For enquiries, please contact:

Researcher: Akande Akinlolu Olumide

E-mail: Akinlolu.Akande@uct.ac.za

Cell: +27 723135908

OR

Supervisor: Professor Jean-Paul Van Belle

Department of Information Systems

University of Cape Town

E-Mail: Jean-Paul.VanBelle@uct.ac.za

Phone: +27 (0)21 650 4256

Appendix E: Informed Consent Form

Department of Information Systems

Leslie Commerce Building

Engineering Mall, Upper Campus

OR Private Bag, Rondebosch, 7701

Cape Town

Tel: 650-2261

Fax No: (021) 650-2280

INFORMED CONSENT FORM

I/we .....certify that my/our participation in the study: "Using Software as a Service to Support the Academic Activities of Students in Higher Education Institutions with a Relative Lack of Resources" by Mr Akinlolu Olumide Akande is voluntary. I/we also certify that I/we am/are in the right state of mind to participate in this research.

By signing this form you confirm your participation in the research on "Using Software as a Service to Support the Academic Activities of Students in Higher Education Institutions with a Relative Lack of Resources" either through face to face interviews or telephone interviews.

Signature..... Date: .....

Appendix F: Interview Guide – Student

Department of Information Systems

Leslie Commerce Building

Engineering Mall, Upper Campus

OR Private Bag, Rondebosch, 7701

Cape Town

Tel: 650-2261

Fax No: (021) 650-2280

The Interview Guide - Students

Introduction

Good day, thank you for your willingness to participate in this interview. The objective of this research project is to identify ways in which Software as a Service can help in addressing the barriers to learning to create a conducive learning environment and contribute to the improvement of the academic performance of students. I am interviewing students like you because you are the focus of this research and this research is aimed at how Software as a Service can improve your academic performance by creating a conducive learning environment. This research has been approved by the Commerce Faculty Ethics in Research Committee of the university of Cape Town. I would also like to let you know that your participation in this research is voluntary and you can choose to withdraw from the research at any time should you be uncomfortable with anything during the interview. This interview will take approximately 45 minutes to 1 hour. You will not be required to provide any personal information to ensure the anonymity of your responses. Any information you provide will be confidential and used only for this research. I would like to seek your permission to record this interview. You will be sent summaries or recordings of this interview for validation. If you have any question, please feel free to contact the researcher, Akinlolu Olumide Akande on telephone 0723135908 or via email on Akinlolu.Akande@uct.ac.za.

Do you have any question?

Ok, shall we begin with the interview?

Section A: General questions

1. Name of institution
2. How many students does your institution have?
3. Which faculty are you from?
4. Which department are you from?
5. What year of study are you?
6. Are you doing any IT enabled course?
7. Sex M/F?
8. Do you have any cloud computing/Software as a Service experience?

Section B:

This section aims assess the Software as a Service usage in selected higher education institutions. The answers to the questions in this section will be used in answering the research questions and developing a framework which will serve as an instrument by which higher education institutions can improve their software as a service implementation and usage to maximize their benefits of using SaaS and minimize the limitations.

9. What is your understanding of Software as a Service?
10. Have you used any Software as a Service offering?
11. What other Software as a Service offering do you know?
12. Is there any course/module that you think should introduce the use of Software as a Service to improve learning outcomes?
13. If you have identified a course/module in question 12, why?
14. If you were to change something about how your institution uses Software as a Service, what would it be?
15. Which is the most common Software as a Service offering available at your institution?
16. In your opinion, what skills do you require to use Software as a Service?
17. What ICT based academic support tools are available to students at your institution?
18. How easy is it accessing these tools?
19. What are your views of Software as a Service usage in your institution?
20. In your opinion, what are the advantages of Software as a Service?
21. In your view, what are the disadvantages of Software as a Service?

22. How would you describe management capabilities of your Software as a Service environment?
23. What security measures do you have for your Software as a Service environment?
24. What skills assessment and training plans does your institution have for your Software as a Service initiative?
25. What steps have been taking around communicating the results of your Software as a Service initiative?
26. Is there any improvement in your performance that you can attribute to the use of Software as a Service?
27. What is the level of acceptance of Software as a Service among students?
28. Are your lecturers using Software as a Service effectively to improve your academic environment?
29. In your own words, how has the use of Software as a Service contributed to your academic performance?
30. Has Software as a Service in any way contributed towards the creation of a conducive academic environment?
31. Does your background / prior experience before you were admitted into the university have any effect on your ability to use Software as a Service effectively?
32. If you were to go back in time, what would you have done differently before you gained admission into the university that would have improved your chances of using Software as a Service efficiently?
33. Which on premises software do you use at your institution?
34. Is there any government support for Software as a Service that can benefit your institution?
35. Apart from government support, which other form of support is available for your Software as a Service initiative?

Thank you very much for your participation in this interview. Your contributions would be used only for this research. Once this research is concluded you will be sent a copy of the research containing the proposed framework and the set of guidelines for validation purposes.

Have a good day.

Appendix G: Interview Guide – Lecturer

Department of Information Systems

Leslie Commerce Building

Engineering Mall, Upper Campus

OR Private Bag, Rondebosch, 7701

Cape Town

Tel: 650-2261

Fax No: (021) 650-2280

The Interview Guide - Lecturers

Introduction

Researcher: Good day, thank you for your willingness to participate in this interview. The objective of this research project is to identify ways in which Software as a Service can help in addressing the barriers to learning to create a conducive learning environment and contribute to the improvement of the academic performance of students. I am interviewing lecturers like you because you important in ensuring that Software as a Service is used effectively to maximise the benefits and minimise the risks involved in the use of Software as a Service. This research has been approved by the Commerce Faculty Ethics in Research Committee. I would also like to let you know that your participation in this research is voluntary and you can choose to withdraw from the research at any time should you be uncomfortable with anything during the interview. This interview will take approximately 45 minutes to 1 hour. You will not be required to provide any personal information to ensure the anonymity of your responses. Any information you provide will be confidential and used only for this research. I would like to seek your permission to record this interview. You will be sent summaries or recordings of this interview for validation. If you have any question, please feel free to contact the researcher, Akinlolu Olumide Akande on telephone 0723135908 or via email on Akinlolu.Akande@uct.ac.za.

Do you have any question?

Ok, shall we begin with the interview?

Section A: General questions

1. Name of institution
2. Organisational sector
3. What is your organisation's core business?
4. How many employees does your organisation have?
5. How long have you been working for your organisation?
6. What is your role in your organisation's IT decision?
7. Do you have any cloud computing/Software as a Service experience?

Section B:

This section aims to assess the Software as a Service usage in selected higher education institutions. The answers to the questions in this section will be used in answering the research questions and developing a framework which will serve as an instrument by which higher education institutions can improve their software as a service implementation and usage to maximize their benefits of using SaaS and minimize the limitations.

8. What ICT based academic support tools are available at your institution?
9. How easy is it accessing these tools?
10. What is your understanding of Software as a Service?
11. Is your organisation already using Software as a Service?
12. What Software as a Service offering do you use?
13. What skills do you require to use Software as a Service?
14. Are your students equipped with the required skills?
15. What is the attitude of your students towards the use of the Software as a Service offering(s) you currently use?
16. Is your institution having adequate Software as a Service support tools like computers, bandwidth, etc.?
17. Since the introduction of Software as a Service, did you notice any improvement in your students that you can attribute to the use of Software as a Service?
18. Is there any negative impact of Software as a Service on your students?
19. What features influence you to use Software as a Service for your courses?
20. How do you feel about the cost of Software as a Service?
21. What are your views of Software as a Service usage in your institution?

22. Do have anything else you would like to say?
23. How would you describe management capabilities of your Software as a Service environment?
24. Does your institution have employees with Software as a Service experience?
25. What skills assessment and training plans does your institution have for your Software as a Service initiative?
26. What steps have been taking around communicating the results of your Software as a Service initiative?
27. How will you identify the right Software as a Service offering for your course(s)?
28. Do you know the legislations and laws relating to Software as a Service?
29. Is there any government support for Software as a Service that can benefit your institution?
30. Apart from government support, which other form of support is available for your Software as a Service initiative?
31. Which on premises software do you use?

Researcher: Thank you very much for your participation in this interview. Your contributions would be used only for this research. Once this research is concluded you will be sent a copy of the research containing the proposed framework and the set of guidelines for validation purposes.

Have a good day.

Appendix H: Interview Guide – IT Staff

Department of Information Systems

Leslie Commerce Building

Engineering Mall, Upper Campus

OR Private Bag, Rondebosch, 7701

Cape Town

Tel: 650-2261

Fax No: (021) 650-2280

The Interview Guide – IT Staff

Introduction

Good day, thank you for your willingness to participate in this interview. The objective of this research project is to identify ways in which Software as a Service can help in addressing the barriers to learning to create a conducive learning environment and contribute to the improvement of the academic performance of students. I am interviewing IT staff like you because you are involved with the adoption, implementation and maintenance of Software as a Service. Thus, you are very important in ensuring the success and continued use of Software as a Service. This research has been approved by the Commerce Faculty Ethics in Research Committee of the University of Cape Town. I would also like to let you know that your participation in this research is voluntary and you can choose to withdraw from the research at any time should you be uncomfortable with anything during the interview. This interview will take approximately 45 minutes to 1 hour. You will not be required to provide any personal information to ensure the anonymity of your responses. Any information you provide will be confidential and used only for this research. I would like to seek your permission to record this interview. You will be sent summaries or recordings of this interview for validation. If you have any question, please feel free to contact the researcher, Akinlolu Olumide Akande on telephone +27723135908 or via email on Akinlolu.Akande@uct.ac.za.

Do you have any question?

Ok, shall we begin with the interview?

Section A: General questions

1. Name of institution
2. Organisational sector
3. What is your organisation's core business?
4. How many employees are in your IT department?
5. How long have you been working for your organisation?
6. What is your role in your organisation's IT decision?
7. Do you have any cloud computing/Software as a Service experience?

Section B:

This section aims to assess the Software as a Service usage in selected higher education institutions. The answers to the questions in this section will be used in answering the research questions and developing a framework which will serve as an instrument by which higher education institutions can improve their software as a service implementation and usage to maximize their benefits of using SaaS and minimize the limitations.

8. What ICT based academic support tools are available at your institution?
9. What is your understanding of Software as a Service?
10. Is your organisation already using Software as a Service?
11. What Software as a Service offering does your institution currently use or is planning to use?
12. What skills do you require to use Software as a Service?
13. In your opinion, how does SaaS benefit students?
14. What are the challenges or limitations faced by students in using the available SaaS offerings?
15. Who is responsible in the case of data loss or breach of privacy?
16. What security measures do you have for your Software as a Service environment?
17. How would you describe your IT architectural capabilities for Software as a Service?
18. How will you identify the right Software as a Service vendor for your institution?
19. What are indicators that a Software as a Service vendor is trustworthy?
20. How do you feel about the cost of Software as a Service?
21. What are your views of Software as a Service usage in your institution?

22. Do have anything else you would like to say?
23. How would you describe management capabilities of your Software as a Service environment?
24. Does your institution have employees with Software as a Service experience?
25. What skills assessment and training plans does your institution have for your Software as a Service initiative?
32. What steps have been taking around communicating the results of your Software as a Service initiative?
33. Do you know the legislations and laws relating to Software as a Service?
34. Is there any government support for Software as a Service that can benefit your institution?
35. Apart from government support, which other form of support is available for your Software as a Service initiative?
36. Which on premises software do you use at your institution?

Thank you very much for your participation in this interview. Your contributions would be used only for this research. Once this research is concluded you will be sent a copy of the research containing the proposed framework and the set of guidelines for validation purposes.

Have a good day.

Appendix I: Some of the On Premises Software used in the Participating Higher Education Institutions

Name of Software	Developer	What it's used for	Commerce Department(s) using the Software in HEIs
1. **Sql server**	Microsoft	It's a relational database management system. It is used for transaction processing, business intelligence and analytics.	Information Systems
2. **Microsoft expression web**	Microsoft	It is used to design, develop, and publish fascinating websites with several features	Information Systems
3. **Visual studion.net**	Microsoft	It is used to develop computer programs that are compatible with Microsoft windows. It is also used to develop web sites, web applications, mobile applications and web services	Information Systems
4. **Microsoft Office**	Microsoft	It is an office productivity tools for document creation	Information Systems, Accounting, Economics, Management Studies and other commerce departments
5. **Math lab**	SourceForge, Inc	It is a tool to work with math functions. It is also used in drawing 2D graphs and 3D graphs of any function and to calculate complicated expressions	Economic and Management Studies
6. **Mathematica**	Wolfram Inc.	It is used for analysing data, solving complex differential equations, develop numeric and symbolic computation. It is also used to for 2D and 3D data visualization and programming.	Economic and Management Studies
7. **Stata**	StataCorp	It is used for data management, statistical analysis, graphics, simulations, regression, and custom programming.	Economics, Sociology, Political Science
8. **Pastel**	SoftLine Pastel	It is used for book keeping, invoicing and general accounting services	Accounting
9. **Statistica**	It was originally developed by StatSoft and acquired by Dell in March 2014	It is an analytics software package that is used for statistical analysis, data management, statistics, data visualization, data mining, machine learning and text analytics	Statistics
10. **Visio BPM**	Microsoft	It is a business process management software	Information Systems
11. **IBM Cognos**	IBM Corporation	It is used for data analysis and business intelligence	Information Systems

12. SPSS	IBM Corporation	It is used for statistical analysis	Economic and Management Studies
13. Scientific Workplace	MacKichan Software	It is a graphical user interface that is used for scientific word processing. It is also used for editing LaTeX source files.	Economic and Management Studies
14. SAP	SAP SE	It is an enterprise resource planning software	Information Systems
15. Visio	Originally developed by Shapeware Corporation and acquired by Microsoft 2000	It is part of the Microsoft office suites. It is used for drawing diagrams and vector graphics application	Information Systems
16. Microfit	Oxford University Press	It is used for making estimates, testing hypothesis, processing data, file management, graphic display and forecasting.	Economics
17. Time series explorer		Used for time series analysis and statistical analysis	Economics
18. iNet bridge	I-Net bridge (Pty) Ltd	It's a live Johannesburg Stock Exchange link	Finance, Tax and Accounting
19. GenStat	VSN International	Used for data analysis	Statistics and Finance
20. EViews	Quantitative Micro Software	It is used to teach econometrics and time series analysis. It is also used for statistical analysis, forecasting and data modelling.	Accounting, Economics and Management studies
21. Aris	Software AG	It is used for business process analysis	Information Systems
22. AMOS	IBM Corporation	It is a statistical software that is part of SPSS. It stands for analysis of a moment structures. It is used for structural equation modelling. Confirmatory factor analysis and path analysis. It is also known as analysis of covariance or causal modelling software	Accounting
23. NetBeans	It was originally developed by Sun Microsystems and acquired by Oracle Corporation	It is used for software development	Information Systems

Table 19: On premises software used in the participating higher education institutions as mentioned by the participants

Appendix J: Research Time Frame

Activity	Description of the activity	Duration in months	Completion Dates
Research Proposal	Document that describes the research area.	6	04 January 2015
Literature Review	Document that discusses the findings of other literature in the same research area as the current research.	2	27 March 2015
Research Design	Document that describes the intended research method and approach for this research. It explains the processes that will be followed during the research as well as the ethical issues relating to the research.	1	24 July 2015
Research Ethics Approval	The research design and other relevant documents will be submitted to the ethics in research committee of the Information Systems department, University of Cape Town for approval. The research design and other relevant documents will also be submitted to the selected HEIs for ethics approval and clearance.	3	15 October 2015
Data Collection	This involves sending survey questionnaire to participants and interviewing participants.	4	29 February 2016
Data Analysis	This involves obtaining meaningful information from the data obtained during the interview. The processes involved include transcribing the data, data familiarization, generation of code, searching for themes, defining and naming of themes.	4	24 June 2017
Dissertation Draft	This is the first draft of the dissertation. It contains information about literature review, research design, data collection and analysis, findings, conclusions, recommendations and areas of future research.	5	28 November 2017
Final Dissertation	This is the complete dissertation. It is the final copy that will be submitted for evaluation.	3	15 February 2018

Table 20: Research Activities and Deliverables

Appendix K: SaaS Applications used in the Participating Higher Education Institutions

Higher Education Institution	General Academic computing/ Research Specific/ Subject Specific	SaaS Applications Used
HEI 1	General Academic Computing	Office 365
		Moodle
		Google Apps for Education
		Google Docs
		Dropbox
		Facebook
		Twitter
		Instagram
	Subject Specific	Teradata University Network
		SPSS Subscription
		SAS Software
	Research Specific	Turnitin
		Wunderlist
		Mendeley
HE2	General Academic Computing	Office 365
		Moodle
		Google Apps for Education
		Google Docs
		Dropbox
		Facebook
		Twitter
		Instagram
	Subject Specific	SPSS Subscription
	Research Specific	Evernote
HE3	General Academic Computing	Office 265
		Google Apps for Education
		Dropbox
		Facebook
		Twitter
		Instagram
	Subject Specific	SPSS Subscription
	Research Specific	Turnitin
		RefWorks (for referencing)
		Mendeley
HE4	General Academic Computing	Office 365
		Moodle
		Google Apps for Education
		Google Docs
		Dropbox
		Facebook
		Twitter
		Instagram
	Subject Specific	SPSS Subscription
	Research Specific	Turnitin

Table 21: SaaS applications used in the participating Higher Education Institutions

Appendix L: Evaluation and Comparison of the Mobile Data cost in Selected Countries

To show that the mobile data cost in Nigeria and South Africa are expensive and unaffordable for students, this research compares the Nigerian and the South African mobile data prices with those in other African countries, United Kingdom and the United States of America.

The mobile network operators (MNOs) offers mobile data as either prepaid or postpaid. Since the majority of the students are not working and do not qualify for most postpaid contracts, the prepaid option is the most viable option for the students. Thus, this evaluation was conducted using only the prepaid mobile data statistics. The average prepaid price of data in Nigeria and South Africa are compared with Ghana, Kenya and Rwanda, United Kingdom and the United States of America. The prices indicate the average price for 1 Gigabyte of data charged by the mobile network operators (MNOs) in these countries.

Ghana and Kenya were included in the comparison because they are among the leading African countries in terms of ICT infrastructural developments. Rwanda was included in the comparison because they have less ICT infrastructural facilities compared to Nigeria, South Africa, Ghana and Kenya and it would add robustness to the comparison to see how they compare with countries with better ICT infrastructural facilities.

The United Kingdom and the United States of America were included in the comparison because they are more advanced in ICT infrastructure and mobile data prices in both countries are relatively cheap compared to other countries in the world. Thus, they were used as a benchmark for the comparison.

For comparison, the cost of prepaid mobile data in the countries included in the evaluation is calculated in South African Rands (R). The cost of 1 gigabyte of prepaid mobile data in Nigeria is R32, South Africa is R153, Ghana is R58, Kenya is R66, Rwanda is R21 (Chin'anga & Nhundu, 2017), the United Kingdom is R18 (Heaney, 2017) and the United States of America is R186 (Tanasychuk, 2017).

The results show that price of mobile prepaid data is significantly higher in South Africa than the other African countries (Mybroadband, 2016) and it's among the highest in the world (Andersen, 2017). For example, it is about five times more than Nigeria. The price of mobile prepaid data in Nigeria is also higher than Rwanda and the United Kingdom. The United States of America has the highest prepaid mobile data rates among the countries under investigation.

The high price of prepaid mobile data in South Africa is due to the limited availability of spectrum and expensive infrastructure (Nhlapo, 2017), policy uncertainty, and overregulation (Free Market Foundation, 2017). The limited availability of spectrum means that competition is reduced as the small service providers are restricted from entering the market (Nhlapo, 2017).

The differences in the mobile prepaid data prices may be due to the competition dynamics within each country (Chin'anga & Nhundu, 2017), currency/dollar exchange rate of each country, population density

of a country, cost of telecommunications equipment, the regulatory environment, number of subscribers or the distance between the country and the northern hemisphere where internet is mostly located (Free Market Foundation, 2017).

The mobile prepaid data price in Nigeria is cheaper compared to South Africa possibly due to the high number of subscribers in Nigeria due to its dense population. Although, mobile prepaid data price in Nigeria is cheaper compared to South Africa, it is still expensive for an average Nigerian student. Hence, there is a need for cheaper mobile prepaid data in both Nigeria and South Africa as that will aid the off-campus usage of SaaS.

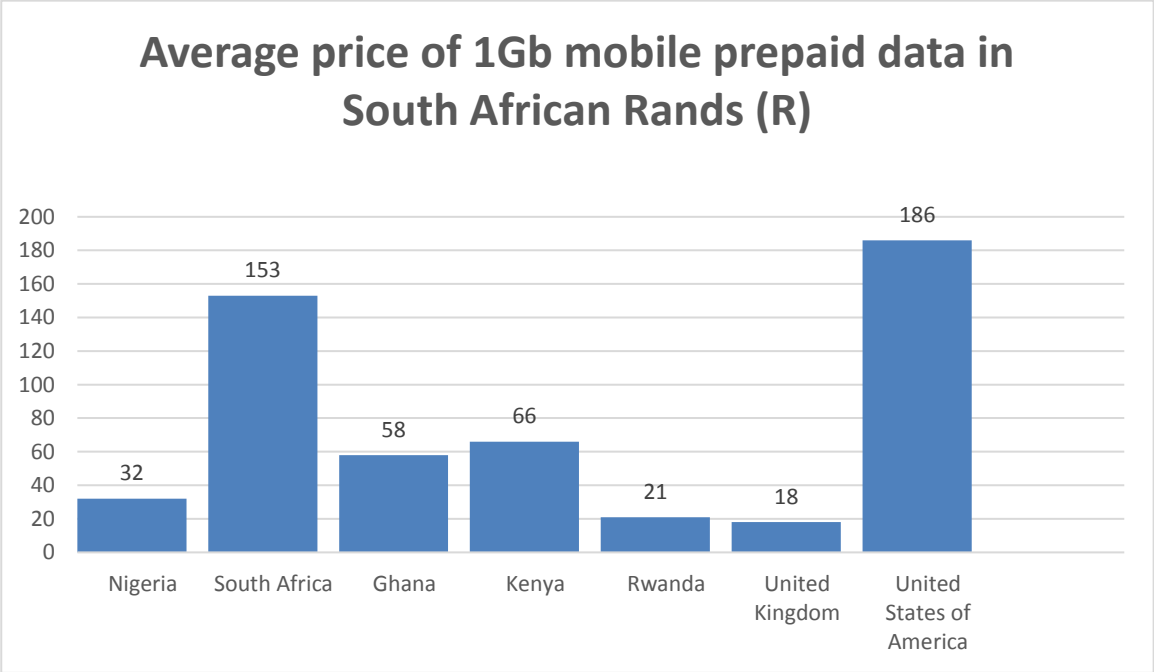

Figure 22: Average price of 1Gb mobile prepaid data in South African Rands (R) adapted from Chin'anga & Nhundu, (2017, Pg.1)

The comparisons show that the prepaid mobile data cost in South Africa is significantly high and need to be reduced to ensure affordability among students. Although, the prepaid mobile data cost in Nigeria is cheaper than in South Africa, Ghana, Kenya and the United States of America, it is more expensive than in Rwanda and in the United Kingdom. This shows that there is a possibility to reduce the data price in Nigeria further especially if the MNOs leverage the high number of subscriptions due to the dense population as this would increase the affordability for the students.

Appendix M: Examples of Confusion Caused by Lee and Baskerville, 2003

Confusion	Example
Conflating induction with deduction	When discussing the advantages and possible difficulties of professionally qualified doctoral students, Klein and Rowe (2008) adopt Lee and Baskerville's classification. In their Table 2, which is adapted from Lee and Baskerville's Figure 5, they follow Lee and Baskerville in calling Type TE generalizability deduction. But generalization is a form of induction, not deduction.
Misunderstanding the nature of statistical generalization	Olsson et al. (2008, p. 265) state that Lee and Baskerville "present an overarching framework that proposes four distinct categories of generalizing, only one of which corresponds to statistical sampling-based generalization." Statistical generalization is included by Lee and Baskerville under Type EE generalizability which, as we will show, is problematic. In contrast, statistical generalization is properly typified in our classification as within-population generalization.
Misunderstanding the relationship between theory and generalization	When discussing the implications of their action research results, Lindgren et al. (2004, p. 466) highlight Lee and Baskerville's point that "a theory may *never* be generalized to a setting where it has not yet been empirically tested and confirmed" (p. 241). As we will show, this claim is inconsistent with the meaning of theory.
Conflating empirical testing with generalization	Venkatesh and Ramesh (2006, p. 184) say that "Lee and Baskerville (2003) highlight the importance of establishing generalizability of a theoretical concept to different settings" (i.e., Type TE generalizability) and use Type TE generalizability to justify the contribution of their two empirical studies. But Type TE generalizability is empirical testing, not generalization.
Conflating empirical testing with generalization	When discussing the limitations of their study, Ragu-Nathan et al. (2008, p. 430) note that "replicating this study in other sectors, such as health care, for example, would lead to empirical generalization of these theoretical relationships (Lee and Baskerville 2003)." By "empirical generalization" they appear to mean Type TE generalizability. But replicating their studies in other sectors is testing, not generalizing, the theoretical relationships.

Figure 23: Examples of confusion caused by Lee and Baskerville, 2003

Source: Tsang & Williams, 2012a; Pg. 730

Appendix N: A Summary of Solutions to the Major Problems in Lee and Baskerville, 2003

Problem	Evidence	Solution
Hume's problem of induction		
Non-recognition of the serious implications of accepting that Hume's problem of induction is irremediable	" there is no prohibition of the conclusion that an increase in sample size leads to an increase in the generalizability of one sample to other samples that the same sampling procedure would produce" (p. 228)	Adopt a two-stage balance-of-evidence argument that it is reasonable to assume that there is some plausible solution to Hume's problem, even if we do not know which solution it is
Definitions of generalization and induction		
Definition of generalization is not consistent with the sense used by researchers in the natural and social sciences	" to form general notions by abstraction from particular instances" (p. 221)	Adopt an alternative definition: for any two statements *P* and *Q*, *Q* is a generalization of *P* when and only when 1) *Q* is inferred from *P*, and 2) *Q* is more general than *P*
Definition of induction is too narrow	" a reasoning process that begins with statements of particulars and ends in a general statement" (p. 224)	Adopt an alternative definition: an inference is inductive when and only when it goes from observed matters of fact to unobserved matters of fact
Statement about generalizability contradicts Lee and Baskerville's own definition of generalization	" the generalizability of an IS theory to different settings is important" (p. 221)	Replace "generalizability" in the statement by "applicability"
Definitions of empirical and theoretical statements		
Definition of empirical statements is circular	"Empirical statements can refer to data, measurements, observations, or descriptions about empirical or real-world phenomena" (p. 232)	Adopt an alternative definition: a statement is empirical when and only when it cannot be ascertained to be true or false without observation or experience
Definition of theoretical statements as necessarily positing the existence of entities and relationships that cannot be directly observed	" theoretical statements posit the existence of entities and relationships that cannot be directly observed, and hence can only be theorized" (p. 232)	Adopt an alternative definition: a statement is theoretical when and only when it is a generalization that purports to predict and explain the phenomena to which it refers
Type EE generalizability		
Example of deduction illustrates the generalization of data to a measurement	The example of calculating the sample mean from sample points on pp. 233-234	Drop the example or use it to illustrate deduction
Statement about validating measurement instrument does not involve any sense of generalization that characterizes inference	"In the situation where the measurement instrument has not been validated, the data collected from a research subject would lack generalizability to any valid measurement for that individual" (p. 234)	Delete the statement and its related discussion
Statement about field data contradicts Lee and Baskerville's own definitions of empirical and theoretical statements	"From this particular set of field data, an ethnographer could generalize the description that, in the world of these officers, autonomy is indeed highly valued — so much so, in fact, that the officers will conjure up busywork to satisfy their sergeant, distract his attention, and thereby otherwise preserve their autonomy" (p. 234)	Adopt the above-stated definitions of empirical and theoretical statements and place the statement and its related discussion under Type ET generalizability
Type ET generalizability		
Statement about "theories" generalized from case study descriptions entails that these are not theories	" a theory generalized from the empirical descriptions in a particular case study has no generalizability beyond the given case" (p. 236)	Delete the statement and its related discussion
Type TE generalizability		
Definition of Type TE generalizability contradicts Lee and Baskerville's own definition of generalization	"Type TE generalizability…involves generalizing from theoretical statements…to empirical statements (here, descriptions of what the practitioner can expect to observe in his specific organization if he were to apply the theory)" (p. 237)	Relabel Type TE generalizability as "empirical testing" or "deductive prediction" and revise the discussion accordingly
Nonrecognition that Type TE generalizability *is* empirical testing and not generalization	"Type TE generalizability happens to be closely related to empirical testing" (p. 237)	Relabel Type TE generalizability as "empirical testing" or "deductive prediction" and revise the discussion accordingly
Type TT generalizability		
Unintelligible and internally inconsistent stipulation	"In Type TT generalizability, a researcher generalizes from theoretical propositions in the form of concepts … to the theoretical propositions that make up a theory" (p. 238)	Delete the stipulation and its related discussion
Discussion of inconsistent operationalization of constructs is unrelated to generalization	Discussion of the first form of Type TT generalizability on p. 238	Delete the reference to generalization and focus on discussing the operationalization of constructs
Discussion of constructing a theory from concepts extracted from the literature is unrelated to generalization	Discussion of the other form of Type TT generalizability on p. 238	Delete the reference to generalization and focus on discussing the construction of theories

Figure 24: A Summary of Solutions to the Major Problems in Lee and Baskerville, 2003
Source: Tsang & Williams, 2012a; Pg. 738 – 739

Appendix O: Transparency international Corruption Perceptions index 2016

RANK	COUNTRY/TERRITORY	SCORE
1	Denmark	90
1	New Zealand	90
3	Finland	89
4	Sweden	88
5	Switzerland	86
6	Norway	85
7	Singapore	84
8	Netherlands	83
9	Canada	82
10	Germany	81
10	Luxembourg	81
10	United Kingdom	81
13	Australia	79
14	Iceland	78
15	Belgium	77
15	Hong Kong	77
17	Austria	75
18	United States	74
19	Ireland	73
20	Japan	72
21	Uruguay	71
22	Estonia	70
23	France	69
24	Bahamas	66
24	Chile	66
24	United Arab Emirates	66
27	Bhutan	65
28	Israel	64
29	Poland	62
29	Portugal	62
31	Barbados	61
31	Qatar	61
31	Slovenia	61
31	Taiwan	61
35	Botswana	60
35	Saint Lucia	60
35	Saint Vincent and The Grenadines	60
38	Cape Verde	59
38	Dominica	59
38	Lithuania	59
41	Brunei	58
41	Costa Rica	58
41	Spain	58
44	Georgia	57
44	Latvia	57
46	Grenada	56
47	Cyprus	55
47	Czech Republic	55
47	Malta	55
50	Mauritius	54
50	Rwanda	54
52	Korea (South)	53
53	Namibia	52
54	Slovakia	51
55	Croatia	49
55	Malaysia	49
57	Hungary	48
57	Jordan	48
57	Romania	48
60	Cuba	47
60	Italy	47
62	Sao Tome and Principe	46
62	Saudi Arabia	46
64	Montenegro	45
64	Oman	45
64	Senegal	45
64	South Africa	45
64	Suriname	45
69	Greece	44
70	Bahrain	43
70	Ghana	43
72	Burkina Faso	42
72	Serbia	42
72	Solomon Islands	42
75	Bulgaria	41
75	Kuwait	41
75	Tunisia	41
75	Turkey	41
79	Belarus	40
79	Brazil	40
79	China	40
79	India	40
83	Albania	39
83	Bosnia and Herzegovina	39
83	Jamaica	39
83	Lesotho	39
87	Mongolia	38
87	Panama	38
87	Zambia	38
90	Colombia	37
90	Indonesia	37
90	Liberia	37
90	Morocco	37
90	The FYR of Macedonia	37
95	Argentina	36
95	Benin	36
95	El Salvador	36
95	Kosovo	36
95	Maldives	36
95	Sri Lanka	36
101	Gabon	35
101	Niger	35
101	Peru	35
101	Philippines	35
101	Thailand	35
101	Timor-Leste	35
101	Trinidad and Tobago	35
108	Algeria	34
108	Côte d'Ivoire	34
108	Egypt	34
108	Ethiopia	34
108	Guyana	34
113	Armenia	33
113	Bolivia	33
113	Vietnam	33
116	Mali	32
116	Pakistan	32
116	Tanzania	32
116	Togo	32
120	Dominican Republic	31
120	Ecuador	31
120	Malawi	31
123	Azerbaijan	30
123	Djibouti	30
123	Honduras	30
123	Laos	30
123	Mexico	30
123	Moldova	30
123	Paraguay	30
123	Sierra Leone	30
131	Iran	29
131	Kazakhstan	29
131	Nepal	29
131	Russia	29
131	Ukraine	29
136	Guatemala	28
136	Kyrgyzstan	28
136	Lebanon	28
136	Myanmar	28
136	Nigeria	28
136	Papua New Guinea	28
142	Guinea	27
142	Mauritania	27
142	Mozambique	27
145	Bangladesh	26
145	Cameroon	26
145	Gambia	26
145	Kenya	26
145	Madagascar	26
145	Nicaragua	26
151	Tajikistan	25
151	Uganda	25
153	Comoros	24
154	Turkmenistan	22
154	Zimbabwe	22
156	Cambodia	21
156	Democratic Republic of Congo	21
156	Uzbekistan	21
159	Burundi	20
159	Central African Republic	20
159	Chad	20
159	Haiti	
159	Republic of Congo	
164	Angola	
164	Eritrea	
166	Iraq	
166	Venezuela	
168	Guinea-Bissau	
169	Afghanistan	
170	Libya	
170	Sudan	
170	Yemen	
173	Syria	
174	Korea (North)	
175	South Sudan	
176	Somalia	

Figure 25: Transparency international Corruption Perceptions index 2016
Source: Ernst & Young, 2016; pg. 5

Appendix P: An Eight-Step Guide to Conducting a Systematic Literature Review

1. *Purpose of the literature review:* The first step in any review requires the reviewer to clearly identify the purpose and intended goals of the review. This is necessary for the review to be explicit to its readers.
2. *Protocol and training*: For any review that employs more than one reviewer, it is critical that the reviewers be completely clear and in agreement about the detailed procedure to be followed. This requires both a written, detailed protocol document, and training for all reviewers to ensure consistency in the execution of the review.
3. *Searching for the literature*: The reviewer needs to be explicit in describing the details of the literature search, and needs to explain and justify how the comprehensiveness of the search was assured.
4. *Practical screen*: Also known as screening for inclusion, this step requires that the reviewer be explicit about what studies were considered for review, and which ones were eliminated without further examination (a very necessary part of any literature review). For excluded studies, the reviewer must state what the practical reasons were for their non-consideration, and justify how the resulting review can still be comprehensive given the practical exclusion criteria.
5. *Quality appraisal*: Also known as screening for exclusion, the reviewer needs to explicitly spell out the criteria for judging which articles are of insufficient quality to be included in the review synthesis. All included articles need be scored for their quality, depending on the research methodologies employed by the articles.
6. Data extraction: After all the studies that should be included in the review have been identified, the reviewers need to systematically extract the applicable information from each study.
7. *Synthesis of studies*: Also known as analysis, this step involves combining the facts extracted from the studies using appropriate techniques, whether quantitative, qualitative, or both.
8. *Writing the review*: In addition to the standard principles to be followed in writing research articles, the process of a systematic literature review needs to be reported in sufficient detail that the results of the review can be independently reproduced.

Figure 26: An Eight-Step Guide to Conducting a Systematic Literature Review adapted from Okoli & Schabram, 2010; Pg. 7

Appendix Q: A systematic guide to literature review development

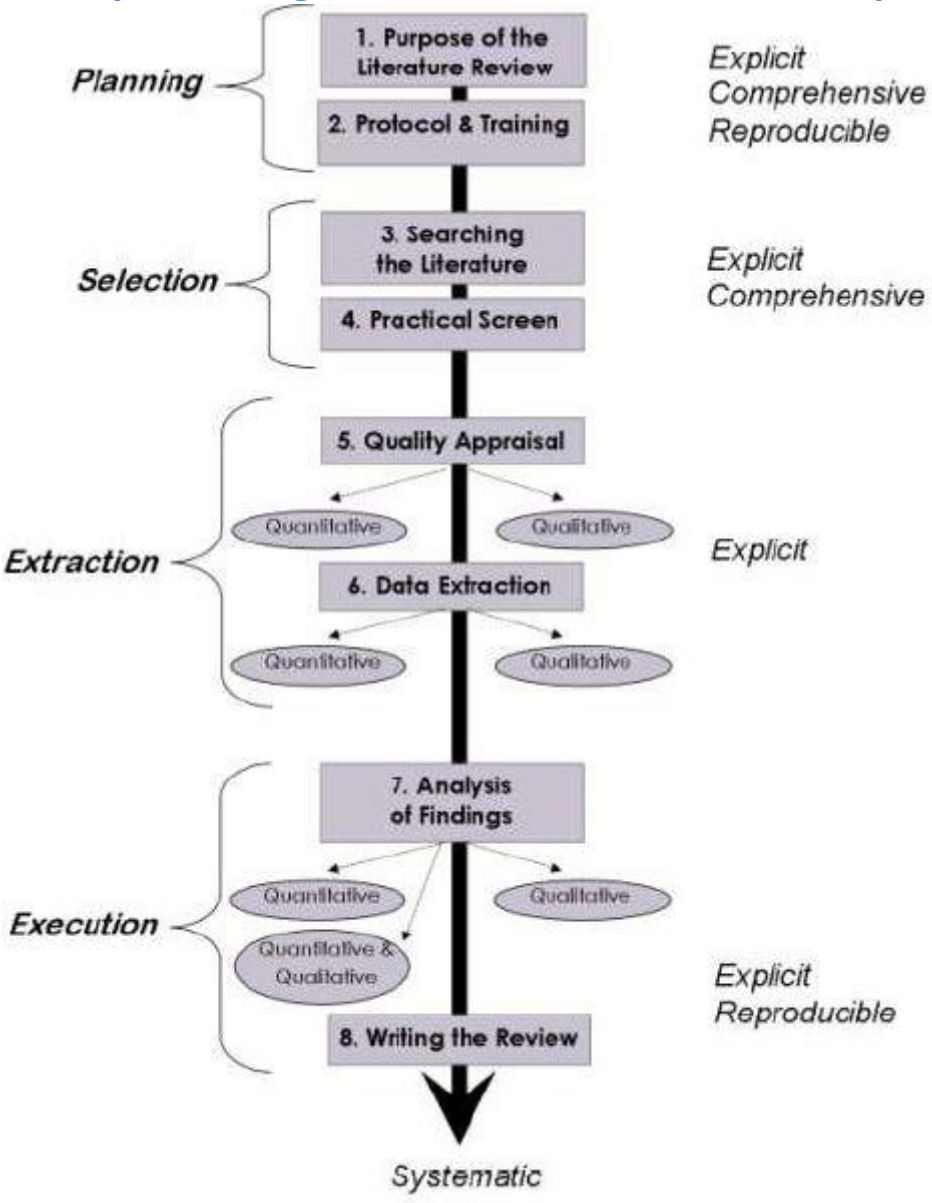

Figure 27: A systematic guide to literature review development adapted from Okoli & Schabram, 2010; Pg. 9