The Use of Software as a Service to Facilitate Quality Learning Experience for Students in Higher Education Institutions

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***Abstract*—Higher Education institutions (HEIs) contribute to knowledge creation and the development of individuals which leads to national development and economic growth. Although governments continuously provide funding for HEIs, the ever increasing population of students and changing cost of purchasing and maintaining needed resources makes the funding from governments insufficient for HEIs to provide students with all the necessary resources. One of the resources needed to train students and provide them with quality learning is software and applications which are expensive to buy and maintain. As a result, most HEIs are unable to provide their students with needed software and application and this makes learning process difficult for students. This research suggests that Software as a Service (SaaS) can provide a solution to this problem because HEIs can subscribe at little or no cost to service providers and students can access the needed software or application at any time from any place using any internet enabled device. This will also help HEIs to save a lot on cost as they only pay for the software when it is used thereby ensuring that the use of software and applications is maximized. This research looks into the current use of SaaS in HEIs to identify ways in which SaaS could be used effectively so as to contribute towards the creation of a conducive learning environment which can enhance quality learning.**

***Index Terms*: Software as a Service, SaaS, students, higher education, quality learning**

I. INTRODUCTION

The amount of money spent on education by government and students is huge. Students can be regarded as clients of institutions (Telford & Masson, 2005). As clients, the quality of education they receive is of high concern to them. The government also requires that students should be given quality education because it is believed that quality education has the potential to contribute to national prosperity over time. This will also ensure that students get value for money spent on their education (Yorke, 2000).

Education helps in laying the foundation for a successful society. Higher education (HE) provides students with better knowledge of relevant subjects and contributes towards economic growth (Famade, Omiyale, & Adebola, 2015). Education also helps students in developing talents which is vital for a countries economic growth and national development (Ahmed S., 2015; Ahmed, Ab Rahim, & Abdullah, 2015; Mukred & Zaniyah, 2015; Omede, 2015). As a result, it is important for government and management of HEIs to provide students with necessary resources that can provide students with a conducive academic environment for quality learning experience. HEIs have continued to adopt and implement various forms of SaaS as a way to reduce the cost of software (Weber, 2011) without affecting the quality of learning experienced by students. Although SaaS promises to improve the learning experience of students by providing them with access to needed software at any time in any place, students need to take advantage of the opportunity and make use of SaaS in a way that will benefit their academic experience and improve the quality of learning. In previous studies, some researchers have found that some students make use of some SaaS offerings for reasons other than academic purposes. This can affect the goal of SaaS as a supportive tool in academic environment. This paper investigates the use of SaaS by students in five HEIs in Nigeria and South Africa (SA) and tries to establish whether students from these universities are actively using SaaS to improve their learning experience or they are using it for other activities that will not contribute to improved learning experience. This paper also tries to investigate whether students are well equipped to use SaaS in academic environment with the hope to find ways to assist students make use of SaaS in a way that will contribute to improvement of their academic environment.

II. LITERATURE REVIEW

A. Software as a Service

SaaS is the provision of software and applications by a service provider over a cloud infrastructure (Apaci, 2016). The users can access the applications via a thin client using any internet enabled device (Abu Ghosh, Atallah, & Abu Naser, 2016). The upgrades and other management of the software are done by the service providers and users are able to spend the time needed for upgrades and maintenance of the software on other important activities. In the past, software is installed on local machines and users are unable to access and use the software unless they are in the same physical location with the local machine in which the software was installed.

SaaS has brought about a dramatic change in the way software and applications are accessed as software can now be assessed from any device from anywhere at any time. The way students perform activities such as viewing of assignments,

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transcripts, results, course registration, email and posting of news and announcements have also changed as students can now perform these activities from any place at any time using any internet enabled device.

B. Quality Learning

The provision of quality education is of high concern to countries all over the world (Sofowora , Aina , & Adeleke, 2015). For quality education to take place, this paper proposes that quality learning has to be achieved. Quality learning could be defined from different perspectives based on the stakeholder involved. It could be defined from the perspective of students, lecturers, non-teaching staff, government, funding agencies, parents, community etc. This research will look at quality learning using SaaS from the perspective of students in terms of access, cost, ease of use, communication, improvement in course grades and conducive environment.

This research postulates that quality learning will be experienced and attained by students if they have easy access to needed learning materials at affordable cost, are able to communicate efficiently to share knowledge and ideas, if the learning materials are easy to use and if there is an improvement in the course grades of student as a result of effective use of available learning materials. Figure 1 illustrates quality learning from the perspective of students.

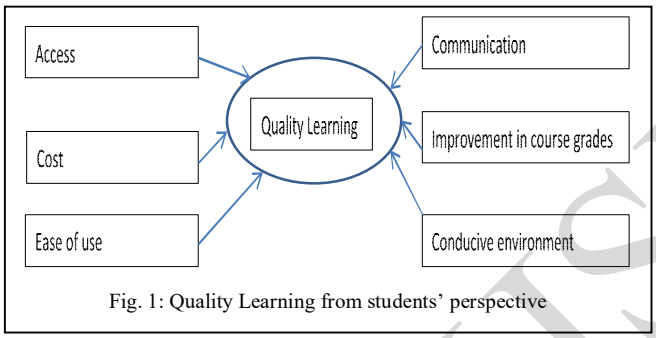


Fig. 1: Quality Learning from students' perspective

C. Software as a Service and Quality Learning

SaaS can help to improve the quality of learning of students in HEIs. In terms of access, more students can access a software or application at any time from any place over several devices such as cell phones, ipads, laptops, desktops etc. This makes it easy for students to access learning materials on demand and as a result SaaS can directly contribute towards the provision of quality learning. Because most SaaS software and applications are free and even when it's not free, the cost of the software and application are covered by the institutions. This makes it affordable for all students as the only cost incurred by most students will be the cost of internet services when they are off campus.

As a result of the low cost of SaaS on the side of students, quality learning is achievable through the use of SaaS. Most SaaS applications are designed in a way that anyone can use them without any difficulties. The fact that there is no need for the maintenance and upgrades of the applications by students also makes it easy for students to use SaaS and this contributes to quality learning as students have more time to concentrate on other important aspects of learning. Communication among students is also improved using SaaS as students are able to send and receive messages, form online discussion groups to discuss issues relating to their learning. This encourages high participation among students as even students that are shy are able to contribute effectively in online forums and discussion.

This therefore has the capability to improve the quality of learning. In order to verify if there is an improvement in the quality of learning of students, there needs to be a gradual and constant improvement in the results and grades of the student. If students are able to use SaaS effectively, there would be notable improvement in their course grades.

D. Advantages of SaaS to Students

The students interviewed mentioned that SaaS has improved their access to needed resources and that they are now able to view and submit assignments on time. They also mentioned that they are able to access the software and applications needed for their studies from any device at any time in any place. SaaS has also improved communication and collaboration among students and encouraged team work as they are able to work on the same projects from different locations at the same time without losing any part of their work.

Students are able to spend the time needed for installation and upgrades on other important activities as the installation and maintenance of SaaS software and applications is done by the service provider. Students are also able to share contents and other course materials using SaaS. This is consistent with the findings of Akande & Van Belle, (2014) and Mathew, (2012). Students have also noticed an improvement in their course grades as a result of SaaS as some of the students interviewed noted that the improved communication with fellow students through the use of SaaS has contributed to the improvement in the academic performance and has increased their confidence. This is also consistent with the findings of Akande & Van Belle, (2014).

E. Disadvantages of SaaS to Students

During the interviews, students mentioned that one of the biggest disadvantages of SaaS is the reliability on the internet as they do not have access to internet at home and are forced to stay on campus and complete their work before going home. Students are also concerned about the security of their data. Some students mentioned that they find using some of the academic software and applications difficult to use as no training was provided to them on how to use the software and applications.

F. Skills Needed for Students to Effectively use Software as a Service

In order to use SaaS effectively, students need some sets of skills such as such as communication skills, data integration and analysis skill for research purposes. Students also need to understand the user interphases of the SaaS software or application so as to be able to navigate through the software or application correctly. Students also need to possess the basic

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computer skills like typing, understanding user interphases, internet skills etc.

III. HIGHER EDUCATION INSTITUTIONS

HE is the education provided by tertiary institutions to students after successful completion of secondary school (Oseni, 2015). Institutions that provide HE include universities, community colleges, technical colleges, vocational schools, technikons and other post-secondary school institutions (Omede , 2015).

HEIs are faced with many challenges one of which is the lack of adequate funds to provide students with all the necessary resources (Ouahabi, Eddaoui, Labriji, Benlahmar, & El Guemmat, 2014). This affects the quality of learning that the students experience as they often learn without access to needed resources that aids proper training (Ige, 2015). The lack of access to needed resources has made it difficult to create a conducive environment for students and is the reason why many students have poor academic grades.

In order to resolve this problem and improve student's access to necessary resources, HEIs are turning to information and communication technology (ICT). SaaS is among the leading ICTs being adopted by HEIs (Akande & Van Belle, 2014) to provide solution to this problem.

IV. METHODOLOGY

Five HEIs were used in this study. The HEIs were selected based on their student's access to needed resources. The criteria used in selecting the HEIs are number of computer per students, number of IT staff, availability of trained personnel to handle ICT equipment, fluctuating budget from government, expertise in purchasing the right resources, plan to maintain resources, access to internet and access to software by students.

V. DATA COLLECTION AND ANALYSIS

This research is a qualitative study. Interviews were conducted with students, lecturers and IT managers of selected HEIs. The interviews were recorded and later transcribed. The transcripts were analyzed using thematic analysis.

A. Activity Theory

In order to uncover the complexities involved in the use of SaaS by students in HEIs, this research used activity theory. Activity theory believes that people's actions lead to the creation of images, intentions, goals, cognitive models and abstract notions such as definition and determinant. Activity theory also believes that human thoughts lead to action and activity is a crucial (Morf & Weber, 2000). In activity theory, activity comprises of three components which are subjects, tools and objects. In this research, the students are the subjects.

The tool is SaaS software and applications used for academic purposes and the objects are the activities performed (Mlitwa, 2007) by students using SaaS such as communication, assignment submission, viewing of course grades etc. Two additional components were added to activity theory in 2001 by Engeström. They are rules which controls how individuals may act as well as the reason why they act in the manner in which they act and division of labour which allows students to share responsibilities to perform a particular action.

For example, some students mentioned that they have used SaaS applications to perform team work and have completed the actions with each team work doing a bit of the work which ensured shared responsibility. With activity theory, this research is able to shift focus from SaaS itself to the way SaaS is being used (Elizabeth, 2010) by students to achieve their academic goals. The community and rules are other components later added to activity theory. In this research, the community is the HEIs such as universities, technikons, and training schools. The community determines the relationship between and students and the academic environment while the relationship between students and the academic environment is controlled by rules.

B. Student's Perception Based on Interviews with Students

Students need continuous and uninterrupted access to the internet in order to be able to make use of SaaS. As a result, HEIs need to ensure there is high quality bandwidth and high quality of service to ensure that students are able to access learning resources without spending any time trying to access learning resources.

VI. FINDINGS AND ANALYSIS

Students need continuous and uninterrupted access to the internet in order to be able to make use of SaaS. As a result, HEIs need to ensure there is high quality bandwidth and high quality of service to ensure that students are able to access learning resources without spending any time trying to access learning resources.

Although Dickinson, Pollock, & Troy, (1995) mentioned that education is unique because it may be difficult for students to access the quality of learning especially while they are still studying because most students only understand the usefulness of what they learnt in school years after they had graduated. This research found that students are able to access the quality of learning they experience while studying using the components of quality learning from student's perspective as illustrated in Figure 1.

Over the past years, there have been significant changes in HE with the number of students growing exponentially and an ever increasing funding concern. These have further strained the budget of HEIs and have resulted in increase in student's fees. Recently in SA, the constant increase in student fees due to several factors such as the growth in the number of students, increase in funding concern, changes in technology and ever increasing price of technology has led to the creation of student movements such as the #FeesMustFall as students could no longer bear the burden of expensive school fees. In this situation, it is urgent for institutions to find ways to reduce cost without reducing the quality of education offered to students.

This research proposes that SaaS can contribute towards reduction of cost without causing a reduction in the quality of education. SaaS is commonly used by students in HEIs and have contributed to improved communication and collaboration among students. Students perform several

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activities such as email, submission of assignments, viewing of course grades, posting of notices, chat, team work, data analysis etc. using SaaS software and applications such as Gmail, Office 365, Goggle apps etc. There is improvement in course grades of students who use SaaS effectively and are confident about their use of SaaS. The confidence gained from the effective use of SaaS contributes towards the creation of a conducive academic environment. Students interviewed from all the participating HEIs mentioned that there is improved access, reduced cost for campus access, improved course grades and improved communication due to their use of SaaS. They also mentioned that the academic environment is more conducive and they are motivated and eager to learn because they know they have access to the tools needed to aid learning.

SaaS applications are widely used across all the HEIs that were included in this research. Students are able to perform activities such as emailing, assignment view and submission, viewing of course grade and even course registration. SaaS provides continuity with the work you do. Users are able to continue from where they stopped using any device with internet access. "What I like about the SaaS application that we use is that it allows me to continue from where I stopped working the previous time whenever I wish to continue no matter where I am or which system I am using" (S2).

In terms of security, some students mentioned that they are worried about the security of their sensitive data. They are also concerned that someone might have access to their 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" S7. This is a case of malicious insider and is consistent with the findings of (Akande & Van Belle, 2013) which said that there could be instances where an employee of a service provider may have access to confidential data and expose it to an unauthorized third party.

This research looks at student's use of SaaS in HEIs with the hope of contributing towards quality learning. Students from five HEIs were interviewed in this research. The students are referred to as S1, S2, S3 etc. All the students interviewed have experience using SaaS. S1 defined SaaS as "the provision of Software to users via the internet on a pay as you go basis".

S8 said "SaaS provides users with access to software over the internet. Users are able to use the software and pay for only what they use". The various definitions and explanations of SaaS provided by majority of the students interviewed shows that SaaS is well known among students of HEIs. Although most of the students interviewed could define or explain SaaS, there was a student who could not define it. The researcher later found out that the student has been using SaaS applications such as Gmail, Office 365, and Facebook etc. but did not realize that they were examples of SaaS applications.

Only when the researcher explained to the students did the student realize that he had been using SaaS. All the students interviewed mentioned that they are currently using one or more SaaS applications with the common ones being Office 365, Gmail, Facebook, Twitter, Yahoo Google docs and drop box. S10 mentioned that having a SaaS learning management system has changed the way she does things and has made her more organized.

Out of the five participating HEIs, there is only one HEI that is not currently using a SaaS learning management system. S7 is one of the students from the HEI that does not currently have such systems. "It takes a lot of time before we see our marks for our courses. If the lecturers were using SaaS, it would have been easier to upload and students can see their marks easily. Instead they post the results on a notice board in the department and we have to physically go and view it on the department's notice board" (S7). Students from the remaining four HEIs noted that they are able to view their course grades from anywhere at any time using their institutions SaaS application.

S1, S2, S5, S8 and S9 mentioned that Gmail is the most common SaaS application among students in their institutions. "I think Gmail is the most common SaaS application here at our university. We all have a Gmail account" (S5). Gmail is definitely the most common SaaS application that we use" (S9). When asked about the skills needed to use SaaS effectively, S4 said that "You need to know how to use a computer, phone or any other device you want to use to access SaaS", S8 said that "I think one needs general computer skills like typing and understanding the basics". Training is of high importance to students from most of the HEIs as they all mentioned that training is important with S3 saying that "I would like them to train students on how to use SaaS because many students struggle with it and are discouraged or scared away because of their lack of training".

Internet access is important for the success of SaaS. All the HEIs that participated in this research have internet access and students are able to use SaaS applications via the internet from anywhere on campus. "Our university is really trying because we have internets access that is reliable and there are several computer labs, software etc. available for students use at any time" (S6). "We have internet access; we also have access to some software and other resources like computers in the labs and in the library" (S4).

In terms of the motivation to use SaaS, S9 said he is a lover of technology because he believes that technology makes life easier and that is why it was easy for him to use the available SaaS applications on campus. S3 also said that he loves technologies and he is always willing to learn about new technologies.

In terms of general SaaS usage across campus, S3, S4, S7, and S8 said that the use of SaaS is not enough on campus because not all courses and lecturers make use of SaaS applications in their teaching. They believe that it should be introduced in all courses as it will make learning process more efficient. Apart from introducing SaaS applications across all courses, more students should be made aware of SaaS and its benefits so as to encourage students to use SaaS to contribute to quality learning. "More emphasis needs to be placed on the benefits of SaaS to encourage more students to use it" (S9). "I

think we need to improve on our use of SaaS because we still have a long way to go" (S2).

In terms of the benefits of SaaS, all the students mentioned that SaaS improves communication and collaboration. "Communication with my friends and course mates has improved since we started using Gmail" (S1). "Dropbox really helped us during our Second year projects as we were able to share documents and files easily. It was so easy to collaborate with team mates during our project" (S2). "It makes our work easier. It also assists us in communicating with our pairs and lecturers easily" (S3). "We share different course materials using SaaS applications and there is improved collaboration especially when we do group assignments" (S7). "My use of Gmail has helped me improve my communication skills" (S6).

Some students also noted that it has made them more organized. "It has helped me to organize myself better" (S9). "I use it to manage my time properly so it keeps me organized" (S4). In terms of the disadvantages of SaaS, S5 said that "It can be frustrating if you don't know how to use computers or any device you are using very well. I am from a poor background and never had access to computers until I got to university. I struggled a bit in my first year but I am fine now. I am a fast learner so I now know how to use computers and applications very well". "Many students in our university are not comfortable using technologies because they don't have proper training on how to use these technologies" (S7). The point from S5 links back to training. Training is important as some students with poor backgrounds might not be proficient in the tools needed to access SaaS. This may discourage them and as a result they might be afraid to use SaaS. If proper training is given to them on how to use SaaS, they will be confident and can benefit from the use of SaaS.

Contrary to what most literature has reported about security concern, it is surprising to find that most students think that there is adequate security measure and that the username and password that they use to access their SaaS applications is enough to protect their data. "We use usernames and passwords to protect our data" (S8). S4 and S9 mentioned that their use of SaaS applications like Gmail and Dropbox has contributed towards the improvement of their academic performance by creating a better learning atmosphere and a conducive environment. "It has contributed positively to my academic performance. I now communicate with my lecturer via email easily and I get response to my answers on time" (S4). "I communicate well with fellow students and lecturers and I have noticed significant improvement in my academic performance" (S9).

When asked to make a wish with regards to SaaS usage in their institution, most students wish it could be used across all the courses they are enrolled in. S3, however said his wish would be to be able to access SaaS application without internet access as he does not have internet access at home and would like to make use of SaaS applications from home. Although, it is not possible to access SaaS without internet access, it would be beneficial to S3 and other students in similar situation if the government can assist in providing basic infrastructure that will ensure that internet services are affordable for all.

In terms of background, this study found that the background of students played an important role in their ability to use SaaS because students from rich background who had access to technologies such as computer and smart phones with internet access at home are more confident in using SaaS applications when compared with their peers from poor background who only had access to such technologies when they got to the university. "I have been using computers since I was in primary school and I am very good with computers. I also know how to use different software and applications so I think that boosted my confidence in using SaaS" (S4). "I was not very good with computers before I got to the university.

I think if I was already very good with computers before university, I would have benefited even more from the use of SaaS" (S3). S3 and S4 are examples of students in these two categories. Government should provide computers and other educational technologies to students from primary schools through to HE. It is also recommended that the government should introduce computer training and other technology to students from early school days as early as from primary school as that is an important foundation that would boost the confidence of every student in the use of technology when they get to high school and later at HEI. This will also ensure that all students have equal opportunity and are able to compete effectively with peers.

The flexibility of SaaS allowing anytime anywhere access is a source of attraction to many students but some students are not attracted by that because they only have access to internet on campus and can only access SaaS on campus because of its reliance on the internet. "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).

In general, students believe that SaaS is a good technology and has improved the way they learn. They also believe that more should be done by their institutions to encourage more students to use SaaS applications. "I think SaaS 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 SaaS to improve our academic environment" (S8).

VII. CONCLUSION AND RECOMMENDATIONS

In conclusion, SaaS has the potential to improve the quality of learning of students by providing them access to needed software and application. Training should be provided for students to equip them with the necessary skills needed to use software and applications effectively. SaaS provides an alternative way for students to access needed resources at little or no cost to them. This serves as a source of motivation to most students as majority of the students interviewed mentioned that they are motivated to work hard because they have free and easy access to the software and other applications needed for their studies.

However, some students also noted that it would be nice if internet service was cheaper and they could afford to have

internet access at home as that would also motivate them to spend time doing their academic work while at home. SaaS provides more students with the opportunity to access software and applications at the same time. This helps to eliminate the problem faced by students in the past when there was a limited number of computers in the computer laboratory with needed software installed.

The availability of SaaS has helped eradicate the problem of lack of access and it is evident in the timeous submission of student assignments. It is important for governments to assist HEIs in providing necessary bandwidth and infrastructure that would ensure that internet cost is reduced thereby making sure that students can afford internet services and are able to use SaaS while at home. HEIs also need to provide training for students on how to use SaaS offerings to ensure that students use it effectively.

VIII. FUTURE WORK

There is a need for future research to investigate whether SaaS is being used effectively in HEIs to achieve the expected benefits and find out how students can improve on their use of SaaS. Although Platform as a Service and Infrastructure as a Service are not as popular as SaaS in HEIs, there is a need for researchers to investigate how they can benefit students so as to encourage their use in HEIs.

ACKNOWLEDGMENT

The authors would like to thank God almighty for the successful completion of this research. The authors would also like to thank Chief Samuel Oladapo Akande, Mrs Florence Ajoke Akande and Nozuko Aurelia April for their support and encouragement which has contributed towards the success of this research. This research was funded by the South African National Research Foundation (NRF).

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