

Identifying E-Learning Components at North-West University, Mafikeng Campus

Sylvia Tumelo Nthutang, Nehemiah Mavetera

Abstract—Educational institutions are under pressure from their competitors. Regulators and community groups need educational institutions to adopt appropriate business and organizational practices. Globally, educational institutions are now using e-learning as the best teaching and learning approach. E-learning is becoming the center of attention to the learning institutions, educational systems and software inventors. North-West University (NWU) is currently using eFundi, a Learning Management System (LMS). LMS are all information systems and procedures that adds value to students learning and support the learning material in text or any multimedia files. With various e-learning tools, students would be able to access all the materials related to the course in electronic copies. The study was tasked with identifying the e-learning components at the NWU, Mafikeng campus. Quantitative research methodology was considered in data collection and descriptive statistics for data analysis. The Activity Theory (AT) was used as a theory to guide the study. AT outlines the limitations amongst e-learning at the macro-organizational level (plan, guiding principle, campus-wide solutions) and micro-organization (daily functioning practice, collaborative transformation, specific adaptation). On a technological environment, AT gives people an opportunity to change from concentrating on computers as an area of concern but also understand that technology is part of human activities. The findings have identified the university's current IT tools and knowledge on e-learning elements. It was recommended that university should consider buying computer resources that consumes less power and practice e-learning effectively.

Keywords—E-learning, information and communication technology, teaching, and virtual learning environment.

I. INTRODUCTION

THE term e-learning refers to the use of electronic media and information and communication technologies (ICT) in the process of learning, by using electronic applications and following certain processes to learn [1].

E-learning is a computer based educational system that allows one to learn anywhere at any time. Lately, e-learning is carried out through the use of internet channels although in past learning materials were supplied through computer based methods like CD-ROM [2].

Looking at the characteristics of e-learning, it can readily be concluded that the internet, the web and the electronic media are the most important elements for building an e-learning environment [3].

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II. BACKGROUND AND CONTEXT

The NWU is currently offering courses on a full-time basis; but through the use of e-learning tools, the university could offer courses online, offering opportunities to students and clients on a full time basis. E-learning allows students' to access course materials and other related materials in electronic copies.

The study sought to identify the e-learning components at NWU, Mafikeng Campus. NWU is introducing open distance learning (ODL). ODL is a distinctive way of learning which is also called Open Learning [4]. ODL means students are able to study on their own, at any place by reading, watching or listening to material provided, undertaking activities and doing assignments with the regular support of the facilitator [4]. To successfully implement ODL, a robust e-learning environment is essential. This study used academic staff members and students from various faculties across the campus as research participants in order to determine their knowledge and perspectives about e-learning.

III. E-LEARNING OVERVIEW

A. Definition of E-Learning

Electronic learning (e-learning) refers to the use of ICT to improve and support the learning process from different spatial spaces [5]. It is regarded as the gathering and making use of information that is disseminated and facilitated through electronic channels such as internet, intranet, extranet, CD-ROM, audio records, video records, DVD and TV [2], [6], [8].

E-learning can be either computer based, asynchronous, or synchronous learning. This is an area that the students have full control and take ownership of their learning. Due to unavailable e-learning technologies and expertise a blended-approach is usually implemented [2], [6].

E-learning is the use of any of the new technologies or applications in the service of learning or learner support. It is essential in that e-learning makes a major difference to how students can learn, how fast they master an area of expertise, how easy it is to study; and how considerably they like learning [9]. Technologies associated with e-learning have different effects on the understanding and experience of learning [9].

In cultural terms, students are more comfortable with e-learning methods, as they are comparable to the other forms of information search and communication methods that they practice in their lives.

In practical terms, e-learning provides students with the ability to accomplish quality educational outcomes and share

resources across the organization networks. As a consequence its greater flexibility of provision in time and place makes it good for widening participation.

Several universities are offering new and advanced online courses thereby enlarging their educational environments without the limitations of time and space. They do this by ensuring that there is a support for their traditional class sessions through web-based online educational resources and tools [5].

B. Importance of E-Learning

Recently, technologically advanced countries make use of e-mail and the World Wide Web for teaching and learning which are now regarded as a necessity. These two elements allow the universities and educational centers to offer distance learning without being restricted by time and space. The success of e-learning programme is not possible without the interactivity provided by the internet to both the facilitator and the student [10].

Most universities offer online programmes and they have learning technology professionals within their supporting services. So, e-learning technology has been recognized as important because it plays a big role for the institutions' technical and educational use of technology for teaching and learning purposes [11].

Innovative technology varies a lot and they do have their difficulties. Technology is changing rapidly and there is a little understanding about the affordability of different technology tools [11]. E-learning is also important for academic and support staff who use technology more often for teaching, administration and also for conducting research.

For successful implementation of e-learning at NWU, it is desirable to have an existing application in use. Applications have different interactions; they need internet connection to access blog, online auctions, self-testing websites, and tutorials. According to [12], this would also be achieved by means of combining applications.

ICT allow students to engage in collaborative technology and hence they maintains the listed competencies [9], [12]:

- Opportunity to control access to physical devices that are difficult to access
- Shared problem solving or adaptive tutorials
- Shared educational games
- Provides students with tools for being creative and designing projects
- Provides computer-generated environments for improvement and management of their studies

The most essential objective of e-learning is making it possible to access information and knowledge needed with less financial costs, without time and space limits. It has been determined that e-learning is important because technology now has a huge impact on universities or academic institutions and other organizations. It brings all the organizational structure and individual functions across the organization e.g. administration, teaching and learning and research whereby the organizations transformation enhanced [11]. The main

purpose of this study is to identify e-learning components at NWU, Mafikeng Campus.

The paper focuses on the following two objectives:

- a) Identifying and determining university's current tools (IT tools).
- b) Identifying e-learning components of the NWU.

C. E-Learning Environment

The e-learning environment and classroom environment differ by the way in which commands are provided. This is regarded as the most essential difference. E-learning environments function as an essential feature of universities that permit instructors to deliver to scholars with dissimilar learning styles and capacities an understanding of deliverables that improve communication among instructors and students themselves [13]. For e-learning situations, the instructor and the student are separated but linked by the Internet. There are a number of separating features that influence the teaching and learning classroom and e-learning in, including the instructors' ability, the instructors' personality, the skills, adaptability to the learning environment and also the supporting study material [13].

D. Virtual Learning Environment (VLE)

VLE is a web-based portal that permits students to access various learning material of courses, facilitators' support, discussion forum without time and place limitation [14]. VLE are speedily suitable for teaching and learning developments.

The VLE gives commercial institutions to build its brand reputation through different physical borders and to improve of face-to-face teaching [15]. It also improves communication between the lecturer and the students. The VLE offers a number of opportunities to educational institutions, including the opportunity to control and manage the whole University. [15].

E. ICT

ICT is progressive and elastic equipment with exclusive features that generate new investments. Even though usage of ICT in distance learning has been acknowledged for students not staying at the university, [13] indicated that in higher education, there is also a development in the utilization of e-learning to increase the educational experience and performance of students who reside campus. The consequence of this tendency, is that higher educational institutions across the world are growing their investment opportunities in ICT [13].

A university that wishes to recommend ICT use is obliged to fully understand and take into consideration the facilitators' and the students' attitudes towards ICT, concerning the way it is being used and the reason why it is being used. Instructors' attitudes are important because these can be used as the main forecast of the usage of newly-invented technologies in the teaching and learning environments [16], [17].

IV. THEORETICAL ANCHORS OF THE STUDY

Research theories clarify different types of collective behavior by means of an established set of concepts, proposals, conditions, rules and principal judgments [18]. This study is guided by AT. AT has been described as “the best kept secret in academia” [19]. In the context of technology use, AT allows us, to move away from “the computer as the focus of interest to understanding technology as part of the larger scope of human activities” [19].

AT is regarded as a valuable lens used to evaluate the activity of an institution that regularly implicates the use of computers. From the viewpoint of AT, the computer is just an alternative tool intermediating the relations of humans with their environment [19]. The AT model also analyses the organizational activities that involve the use of computers. In the field of education, AT is helpful understanding how technological improvements influence change [19], [20].

AT observes human action, it is defined and approved to be an action in a precise civic place, such as the working or learning environment. The key element in AT is the activity system which is well-defined as object-oriented, collective and culturally mediated human activity. The ideal organization of activity system is identified by the interrelating mechanisms of subject, object, instruments, division of labor, community, rules and outcomes [19], [20].

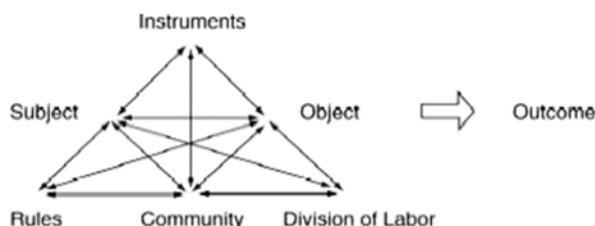


Fig. 1 Components of Activity System [19]-[21]

Activity is a combined system determined by an object. Activity is also an action performed to achieve an objective.

Subject of an activity system is the individual or users involved throughout the activity.

Object is a raw material combined with activity to attain the results which answer the question of why the specific action has been performed.

Instruments assist the object of activity; this refers to external, material (e.g., a textbook, a computer) or internal, symbolic (e.g., language).

Community refers to the participants in activity system e.g. students and staff members.

Division of labor connects to tasks and roles that are separated among members of the community and the separations of access control and status e.g. lecturer, programme manager, and rector.

Rules are standards that command activities and interactions contained by the system; by covering the norms, rules, regulations of the activity.

Outcome denotes the projected results of the action performed.

V. RESEARCH METHODOLOGY

References [22], [4] reflect that research methodology must determine type of required data, the techniques used when gathering and analyzing the data. This study uses a quantitative method. Quantitative methodology is an independent, organized and recognized procedure where numerical data are used in order to obtain measured amount or quantity [23], [24]. Data were gathered in numerical form and surveys were employed as data gathering.

Quantitative research is formal in nature its scope is clearly well-defined and manageable [22]. Reference [18] also indicated that quantitative research is a formal, objective, demanding, and organized way of producing information about incidents. Therefore in quantitative research, formal instruments are used in order to gather data.

The study population was the NWU Mafikeng Campus academic staff members, and students. The estimated number of the NWU academic staff members at the Mafikeng Campus is 200-300. The sample of 300 students of total population were selected for data collection. A random sampling method was applied for collection of data.

Those who were willing to participate received and filled a questionnaire. 376 printed (hard copy) questionnaires were distributed to undergraduate students (first, second, third and fourth year). Out of 376 questionnaires that were disseminated, 361 (96%) were returned. A hyperlink of questionnaires was distributed through email to academic staff and 83 academic staff participated in the survey. The Statistical Package for the Social Sciences (SPSS version 22) was used to collate, interpret and analyze the data. Descriptive statistics were used to analyze the data.

The researcher does not pursue for results that support past ideas but to predict what they may find in the area of interest. Therefore the hypothesis is developed to determine if the theory is correct [25].

In this study a descriptive hypotheses was used for a simple exploration.

- **H₀**: NWU does not have enough information technology infrastructure in order to practice e-learning.
- **H₁**: NWU has enough information technology infrastructure in order to practice e-learning.

VI. DATA ANALYSIS AND RESULTS

TABLE I
 PARTICIPANTS BY GENDER (STUDENTS) [26]

Gender	Frequency	Percent	Valid Percent	Cumulative Percent
Male	168	46.5	46.5	46.5
Female	193	53.5	53.5	100.0
Total	361	100.0	100.0	

TABLE II
 PARTICIPANTS BY GENDER (ACADEMIC STAFF) [26]

Gender	Frequency	Percent	Valid Percent	Cumulative Percent
Male	37	45.1	45.1	45.1
Female	45	54.9	54.8	100.0
Total	82	100.0	100.0	

Tables I and II show the majority of participants who responded were female and in Table II one respondent did not state their gender.

TABLE III
PARTICIPANTS' AGE (STUDENTS) [26]

Age	Frequency	Percent	Valid Percent	Cumulative Percent
17-31	354	98.1	98.1	98.1
32-41	7	1.9	1.9	100.0
Total	361	100.0	100.0	

TABLE IV
PARTICIPANTS' AGE (ACADEMIC STAFF) [26]

Faculty	Frequency	Percent	Valid Percent	Cumulative Percent
18-29	15	18.1	18.1	18.1
30-44	39	46.9	46.9	65
45-59	20	24.1	24.1	89.1
60+	9	10.8	10.8	100
Total	83	100.0	100.0	

Tables III and IV show the age of respondents. The highest number of students who responded are between 18 and 31. Table IV depicts that the highest number of academic staff respondents are between 30 and 44.

TABLE V
PARTICIPANTS PER FACULTY (STUDENTS) [26]

Faculty	Frequency	Percent	Valid Percent	Cumulative Percent
Law	20	5.5	5.5	5.5
Human Social Sciences	87	24.1	24.1	29.6
Agriculture Science and Technology	106	29.4	29.4	59.0
Education	52	14.4	14.4	73.4
Commerce	96	26.6	26.6	100.0
Total	361	100.0	100.0	

TABLE VI
PARTICIPANTS PER FACULTY (ACADEMIC STAFF) [26]

Faculty	Frequency	Percent	Valid Percent	Cumulative Percent
Law	3	3	3	3
Human Social Sciences	18	21	24	27
Agriculture Science and Technology	21	25	25	52
Education	13	15	15	67
Commerce	28	33	33	100.0
Total	83	100.0	100.0	

Tables V and VI show that the highest number of students who participated are from the Faculty Agriculture Science and Technology. The highest number of academic staff members who also participated in the survey are from the Faculty of Commerce and Administration. The objective of the survey was to determine the technology infrastructure at NWU. Table VII A presents the highest number of the respondents for each statement. The results show that the university is far ready to implement e-learning based on the technology infrastructure that apparently benefits the institution and students in different ways. The objective of this segment (Table VII B) was to identify technological devices that students own for their own

personal use. Each student at least has one of the mentioned device which they use for both personal and learning purposes. Based on these results, students are able to learn inside or outside the boundaries of the university because they can access the learning material.

TABLE VII A
DESCRIPTIVE STATISTICS FOR TECHNOLOGY INFRASTRUCTURE (STUDENTS)

Question/ Statement	Majority Response
1. The university has enough computers.	38 Disagree
2. The university has energy-efficient computers.	45.7 Neutral
3. The university offers wireless connection to the internet.	83.6 Agree
4. The university uses physical (wired) connection in the computer laboratories.	73.7 Agree
5. You have access to computer resources around campus.	81.1 Agree
6. It is difficult to have access to the computer laboratory.	53.2 Disagree
7. The university computer resources are easy to use.	83.6 Agree
8. Students with disability have access to computer resources.	71.2 Agree
9. The electronic devices support disabled students.	59.8 Agree
10. The computers are maintained regularly and they are free from viruses.	55.4 Agree
11. Users need to be offered training on how to use computer resources.	61 Agree
12. The university has enough skilled IT personnel who maintain the technological infrastructure and systems.	63.4 Agree

TABLE VII B
DESCRIPTIVE STATISTICS FOR THE MOSTLY USED TECHNOLOGY ELEMENT (STUDENTS)

Question/ Statement	Majority Response
1. The device you own	41.3% Laptop
2. The storage media you use.	74.2% USB
3. A place where you access the internet.	89.9% University

TABLE VIII
DESCRIPTIVE STATISTICS FOR KNOWLEDGE ON E-LEARNING SYSTEMS (STUDENTS)

Question/Statement	Majority Response
1. You are computer literate.	67.9 Agree
2. University offers computer training to students.	69.3 Agree
3. University have e- LMS called eFundi.	95.3 Agree
4. You have used eFundi before.	79.2 Agree
5. You have access to eFundi.	95.3 Agree
6. You currently use eFundi.	94.7 Agree
7. eFundi is helpful.	88.6 Agree
8. Training is offered on how to use eFundi.	64.5 Agree
9. Information that I need is always available on eFundi.	52.6 Agree
10. You are aware of other related e-learning platforms.	36.2 Neutral
11. You have used other e-learning platforms other than eFundi e.g. website offering course online like www.w3schools.com	54.1 Disagree

Table VIII shows results on the student knowledge about e-learning systems. The table presents the highest number of the respondents for each statement. Statements on this survey, refer to the LMS that is currently used by the university, students' responses, indicated that they are aware and familiar with the system. More to the results students are aware of the

available learning platforms they can use even though they have not yet used them.

TABLE IX A
 DESCRIPTIVE STATISTICS FOR KNOWLEDGE ON E-LEARNING SYSTEMS
 (STUDENTS)

Question/Statement	Majority Response
1. The university has enough computers.	45.2 Agree
2. The university has high energy-efficient computers (use less power).	45.21 Neutral
3. The university offers a wireless connection to the internet. e.g. WIFI connection	89.04 Agree
4. The university uses a physical (wired) connection in the computer laboratories.	71.23 Agree
5. You have access to computer resources around campus.	73.97 Agree
6. It is difficult to have access to the computer laboratory.	39.7 Disagree
7. The university computer resources are easy to use.	69.86 Agree
8. Students with disability have access to computer resources.	53.4 Agree
9. The electronic devices supports disable students.	56.16 Agree
10. The computers are maintained regularly and they are free from viruses.	41.67 Agree
11. Users need to be offered training on how to use computer resources.	82.19 Agree
12. The university has enough skilled IT personnel who maintain the technological infrastructure and systems.	54.79 Agree

TABLE IX B
 DESCRIPTIVE STATISTICS FOR THE MOSTLY USED TECHNOLOGY ELEMENT
 (ACADEMIC STAFF MEMBERS)

Question/statement	Majority Response
1. The device you own (personal device)	61.97% Laptop
2. The storage media you use.	35.21% USB
3. A place where you access internet.	89.99% University

TABLE X
 DESCRIPTIVE STATISTICS FOR KNOWLEDGE ON E-LEARNING SYSTEMS
 (ACADEMIC STAFF MEMBERS)

Question/Statement	Majority Response
1. You are computer literate.	97.22 Agree
2. University offers Computer training to students.	72.22 Agree
3. University has e- LMS system called eFundi.	97.22 Agree
4. You have used eFundi before.	92.96 Agree
5. You have access to eFundi.	94.44 Agree
6. You currently use eFundi.	90.14 Agree
7. eFundi is helpful.	90.28 Agree
8. Training is offered on how to use eFundi.	81.69 Agree
9. Information that I need is always available on eFundi.	55.56 Agree
10. You are aware of other related e-learning platforms	51.39 Agree
11. You have used other e-learning platforms other than eFundi e.g. website offering courses like www.w3schools.com	57.75 Disagree

The objective of this survey was to determine the technology infrastructure at NWU. Table IX A presents the highest number of the respondents for each statement. The results are as positive as student's responses suggest that the university could implement e-learning since the technology infrastructure permits this for the benefit of the students and the institution.

The objective of survey data captured in Table IX B was to identify technological devices that staff own for their personal use. Each academic staff member at least has one of the

mentioned devices which they use for both personal teaching and learning purposes. These results show that academic staff communicate inside or outside the boundaries of the university because they are able to access and disseminate the learning material.

Table X shows that academic staff have sufficient knowledge about e-learning systems. The table presents the highest number of respondents for each statement. Most of the statements refer to the LMS (eFundi) that the university uses, where staff showed that they are aware and familiar with the system. More academics seem to be aware of the available learning platforms but they have not yet used them.

VII. RESEARCH FINDINGS

The objective of the first research question was to identify and determine the campus's current information technology infrastructure. 12 sub-questions were asked to address the objective [4]. According to the findings, students and academic staff have identified that the university's current information technology infrastructure is adequate and sufficient to engage in the practice of e-learning.

The aim of the second research question was to identify e-learning elements and knowledge on e-learning systems. 14 sub-questions were also asked in order to address the research question fully. Based on this finding, the respondents are aware of e-learning systems. Results also show that the respondents do have personal devices, they have access to internet and they use different types of storage media for data which are elements of e-learning environment. These results, in terms of knowledge and technology elements, demonstrate that the campus university is ready to practice e-learning which could enhance teaching and learning of the students and their lecturers.

Testing the hypothesis: From a sample of 445 participants, the majority of the respondents indicated that the university has enough computer resources, they use the university e-LMS system and they access the university internet connection on their personal devices around the university environment. The use of eFundi by students and academic staff members indicate that they have accepted the system. This conclusion suggest that the null hypothesis is not accepted and the alternative hypothesis is accepted because the respondents agree that the university has technology infrastructure and they are using the LMS; which are the components or building blocks of and e-learning environment.

VIII. CONSIDERATION OF AT IN THE E-LEARNING ENVIRONMENT

The AT theory contributed to this study in that components of the activity system were considered in the development of the questionnaire. The components of AT were evaluated by asking questions regarding components of the activity system. Questions under the technology infrastructure addressed the instruments as some of the activity system components, knowledge on e-learning systems, instruments, object and the outcome. Activities are done on the system and the subjects of

the system are students and academic staff members, including other members such as e-LMS coordinators. The theory guided the study by influencing which factors to address during the survey.

IX. RECOMMENDATIONS AND CONCLUSION

The study aimed at identifying components that guide whether or not university could teach and allow students to learn electronically. The availability of infrastructure resources also indicated whether or not the institution is well equipped to practice e-learning effectively. According to students' responses, the university has computer resources even though they are not enough. The students also indicated that the university should consider buying infrastructure resources that consume less power. The university offers internet connection to students and academic staff who use personal devices. The technology infrastructure at the Mafikeng campus also supports disabled students. Furthermore, the results indicated that students and academic staff are aware of e-LMS that the university uses they also find it beneficial to the users [26].

It is recommended that the university has to increase computers by buying more computers that are energy efficient [26]. The university should also run an awareness campaign for students and academic staff members about other available e-learning platforms. Universities should also provide training on how to use e-learning systems. This would also encourage the community to use the system and allow others to further their studies through the e-learning support.

An e-learning environment needs ICT to provide course material for education and training. E-learning tools consist of technology infrastructure that may be used in determining ways in which learning is delivered irrespective of the environment in which they are adopted [4].

Technology has affected our lives were students are exposed to all the newly-invented technology. This growth in technology brings a lot of opportunities to all types of industries were they help in the operation of business set-ups [4]. The opportunities include giving other individuals an opportunity to further their studies, including people who are working and they do not have time to study full time [26].

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