DEVELOPMENT OF AN AUDIO-VISUAL BASED E-LEARNING SYSTEM TO ENHANCE INTERACTION BETWEEN LEARNERS AND TEACHERS

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Abstract—The Web has radically changed the way people live, the way people communicate, and even the way people learn. Web based learning has been in extensive use for a couple of years now and is being used increasingly both as a learning tool to support formal programmes and as a means of delivering online learning programmes. These Web-learning environments have made learning much more convenient by stretching the spatial and temporal barriers. Their effectiveness, however, leaves much more to be desired. Educators worldwide would like to effectively utilize the potential of the internet to support their students, as it has been noted that students are prone to slow down on their educational efforts when the educator is physically absent, particularly for low self-regulated learners primarily because these environments require students to exercise a high degree of self-regulation to succeed. This research project aims to develop a web based learning system that uses audio-visuals to influence students’ cognitive load and learning performance. This is because interaction is an essential ingredient in any learning process, and researchers have recommended that watching a video or being able to directly communicate with a lecturer for learning purpose can increase learners’ motivation and interests effectively. This research project also aims to test the effectiveness of the method as against traditional web based learning techniques.

Keywords—E-Learning, Audio, Visual, Web, enhancing learning.

I. INTRODUCTION

EARNING is an activity that cannot be dispensed with in the knowledge-based economy of today. Everybody has to learn. However, sometimes intending learners are unable to attend traditional educational institutions because of distance or time and distance learning allows these intending learners to attend their institution of choice. Distance learning is the type of learning where the instructors and the learners are not physically present in the same geographical location but separated by distance, time or sometimes even both [14]. But with the advent of modern technologies, e-learning has transformed the approach to distance learning. Higher educational institutions have taken advantage of Internet-based information and communication technologies to make education to transcend space, time, and political boundaries. E-learning has been in extensive use for a couple of years now and is being used increasingly both as a learning tool to support formal programs and as a means of delivering online learning programs. These E-learning environments have made learning much more convenient by stretching the spatial and temporal barriers.

A typical e-learning environment allows for the provision of teaching/learning materials for the learners, a discussion board for learners to socialize and communicate, a system for assessment, the ability to get their homework’s and assignments from the teacher and to submit it. The teaching/learning materials are usually in the form of PowerPoint slides, MS Word, Acrobat PDF documents that can be accessed by the student anytime and anywhere.

E-learning has four advantages: It allows the learner freedom to decide when and where each online lesson is to be learnt; It allows the learner to learn regardless of the lecturers; it allows the learner freedom to express
his/her thoughts and ask as many questions as possible; it allows the learner to access course materials at their convenience [4].

However with the myriads of benefits that have been attributed to e-learning and the undeniable growth of the e-learning industry in the last decade, research has suggested that a high percentage of students who start e-learning courses do not see them to completion [7]. This is ample evidence to suggest that something is wrong with current e-learning systems. Students also are sometimes dissatisfied with the e-learning experiences. This could be due to a lot of reasons like the lack of a proper framework for learning, absence of self-discipline amongst learners, the absence of an atmosphere suited to learning in an e-learning environment and chiefly among them is the lack of interpersonal interaction between teachers and learners.

Learners in the 21st century who grew up using the internet in the era of facebook, twitter and snapchat appreciate socialization and interaction. As such, trying to allow for a greater level of interaction between teachers and learners is an important step in trying to improve students’ cognitive load and their performance while learning.

The main research question then is: How can we enhance interpersonal interaction between teachers and learners in an e-learning environment? The sub-questions are: How effective is the current e-learning system? How can we use audio-visuals to enhance interaction? How effective is the developed systems?

The significance of this study is to enhance interaction between lectures and students through audio-visual learning based on e-learning. We focus on the live streaming part of audio-visual learning, where classes will be online without geographic boundaries. This could have the potential to increase knowledge and pass rate in e-learning environment.

II. LITERATURE REVIEW

A. Introduction
This section details other researchers’ efforts that have been made into the development of an audio-visual based e-learning application to enhance interaction between learners and teachers as well as research related to the methodology and technology to be used in this research project.

B. The Web-based Platform and Multimedia for Learning
Derouin et al. [5] described e-learning as an instructional strategy which consists of the needed knowledge, skills and attitudes. When looking at e-learning today, we look into the learning object where it originates in the world of computer based delivery systems [6]. Today e-learning takes many varieties of forms like online courses where resources are distributed and also to the design of learning materials [6]. With changing demographics of student population and the more consumer/client-centered culture today, society have provided a new climate where the use of student centered learning is thriving.

Learning has been characterized not only for the greater independence of the learner but also for the greater importance of an active learning with creation, communication and participation playing major roles and on changing roles for the teacher [6].

Synchronous e-Learning needs real-time participation of all learners and instructors at different locations, it is usually supported by media such as video conferencing and online chat, it has the potential to support e-learners in the development of learning communities [11]. It can also be considered as scheduled delivery of learning. Synchronous e-Learning allows individuals to feel more like they are members of a learning society than asynchronous learning, and interaction among students and lecturers is done in real-time. However, it loses time flexibility. Currently, some e-Learning systems use asynchronous communication technologies because they are simpler to develop and not too expensive compared to the synchronous ones. Synchronous e-Learning takes a variety of forms such as multicast and real-time interactive conferencing [19].

According to [19] asynchronous e-learning is a learning situation where the learning event does not take place in real-time, meaning people can learn at any time. Thus, asynchronous e-Learning is “on-demand delivery” of learning, which gives learners
more control over the learning process and content. Asynchronous is usually a form of email where learning materials are being delivered (sending or receiving assignments and getting feedback); in a public electronic bulletin board or collaborative systems for discussions; downloading learning materials from knowledge repositories via the internet; and the use of interactive tutorials on the web.

Regardless of learners having more control over the learning processes and content, an Asynchronous learner can be at a disadvantage if the learner is not much of a self-motivated person. This can lead into postponement. The postponement can turn into terror, the terror turns into not finishing the course work within the time limits or at all [16]. The second disadvantage is the potential lack of interaction with other students in the class. The lack of interaction can be lonely and make a learner feel disconnected because this sort of learning requires the student to be a solo learner. Table 1 summarizes when, why, and how to use asynchronous versus synchronous e-learning.

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<tr>
<th>Asynchronous e-learning</th>
<th>Synchronous e-learning</th>
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<td><strong>When?</strong></td>
<td>Getting acquainted and planning tasks in real-time.</td>
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<tr>
<td>Students just have more time to reflect because the sender does not expect a quick response</td>
<td>Students become more motivated because a quick response is expected</td>
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<tr>
<td>e-mail, blackboards, blogs can be used as means of asynchronous e-</td>
<td>Instant messaging and chat, face to face meetings and video conferencing are means of using</td>
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The integration of e-learning has enormous success or advantages and there are many success stories to prove it. However e-learning has also presented great challenges of its own. Andersson and Grönlund [2] propose a conceptual framework for understanding the challenges facing e-learning. The conceptual framework consists of thirty major challenges categorized under four major categories: individual characteristics (both students and lecturers), technological challenges, course challenges, and contextual challenges. Below we discuss the several challenges of individual characteristics of both students and lecturers.

Motivation for students is seen as a very serious factor in a successful implementation of E-learning. According to [12] motivation is seen as a very serious factor when it comes to students. Research has shown that students highly motivated perform well while students that are not motivated tend to drop out or finish the course later. The system needs to have some kind of rewards for the student to be motivated to use e-learning systems. This can be done through making sure that each student has data or internet connection provided by the school at a cheaper rate and commitment from the lecturers. The e-learning must also be associated with the student’s expectations and needs. When the students see that they can complete their educational objectives through e-learning systems, they will be motivated to continue with their studies.

**Conflicting priorities**

The amount of time the student spends on the e-learning systems and the course plays a huge role in the
success of the student to reach his or her course objectives. The time dedicated to education is a vital predictor of a student’s learning and retention. Kwofie and Henten [12] indicate that many learners feel stressed and have problems arranging time for the course due to other commitments. When several activities need the student’s attention, without prioritization and discipline, a small amount of time will be spent by the student on the e-learning system. This belief is based on that with e-learning the level of progress depends on the student. Therefore without making time for studies due to other family or job commitments, this would create dissatisfaction and high dropout rates.

Academic confidence
Students’ academic confidence can easily predict the success or failure of a student in e-learning courses [15]. Prior research shows that academic aspects such as previous academic record can best describe student’s performance [1]. A student’s self-efficacy is the student’s confidence in his ability to successfully complete a course. This is a high potential for positive impact in success of an e-learning systems. Where the self-efficacy is low, it can result in difficulties in the system.

Technological confidence
Computer skills are necessary and confident in the use of computers is needed. The lack of computer skills can be a burden to learning especially for students that are new to computers. many learners might not be introduced to computers or have difficulties in grasping the concepts and skills that are needed due to many factors like no access to computers, little time spent using computers due to number of students wanting to access them, that will make students to have little confidence in their ability to use these types of technology. This will make implementation of e-learning systems become a challenge task both for designers and users.

Motivation and commitment
Lectures also need to be motivated and committed to the e-learning system to be successful like the students. The benefits that comes with e-learning must be explained to the lecture in order to their commitment and raise their motivation. Lack of this can lead to mistrust and resistance to the e-learning system [18]. The motivation would guarantee that the lectures investigate into ways of improving learning objectives of students. Lecture that is not motivated and committed can make a student to be dissatisfied.

Qualification and competence
Qualification and competence of a lecture in general they play an important role in online teaching. There is a belief that the higher qualification a lecture has, the flexibility he or she has to appreciate new things like the use of technology in education to improve learning. (Kwofie and Henten, 2011) Moreover, where the ability of a lecture is enhanced, use of e-learning systems will be reduced and failure will be high. Lectures must be provided with e-learning training because their abilities need to be strengthened through training from time to time.

Time
The time for developing e-learning materials and taking part in e-learning course for lectures plays a very important role. Where time is not invested in developing the materials, the content made available will be of little help to students. Failure of lectures to make time available for developing e-learning materials to improve online learning can greatly affect the e-learning system.

Audiovisuals
Systems that are based on audio-visual technology are television and radio, video-conferencing networks and
satellites. They are seemingly effective in educational terms and for some educational purposes [9]. Audio-visual systems consist of one or more lectures, students and devices interacting over the network to achieve the objective that the student’s needs. A capability, here, is an ability to accomplish other goals in social situation [8]. However, the cost of such systems, chiefly the video-conferencing network, is relatively high.

To respond to this problem is to develop systems based on audio-visuals technology with Information technology that is an educational application with digital networks and computers. Financial barriers over the geographic spread of such systems will be reduced if one can be developed and make it easy to be accessed. This system may offer educational opportunities, such as interactivity and flexibility of learning.

A question could be asked as to why use audio-visuals instead of blackboards? When it comes to e-learning there are many ways that can be used to present audio information on the e-learning course wave which may enhance the feasibility of integrating audio in online learning environments. Audio fall into three primary elements which are used in educational technology are music, speech and sound effect. Through these three primary elements that were mentioned, audio can deliver information and direct the attention, convey the emotions as well as provide feedback. Been able to vary the pace, pitch and qualities of the sound audio can be able to motivate and inform the student and which leads the student to decided how to play their audio according to how they think they can grasp the information (Audio use in e-learning: what, why, when, and how? Audio-visual can motivate students to use the e-learning system, by, using the system and have video conference with the lecture and students it will enhance interactions between them. However, Blackboards do not have any motivation for a student to use it, with blackboards certain operation systems may limit certain option on it and it is not responsive to systems with small screens like mobile phones.

III. METHODOLOGY

This section explains the methodology that is employed in the development of the system to enhance interaction between learners and teachers through distance learning. The mixture of qualitative and quantitative approach will be involved. Design science stipulates that identified problems are to be resolved through procedural guidance. Von Alan et al. [17] argues that design science creates and valuates IT artifacts that are identified for resolving problems especially in IS research project cycles.

Awareness of problem: Identification of requirements needed in order to tackle problems at hand, need to be resolved during this daunting stage. Firstly a field of interest has to be identified, there after users & members of design team have to debate vigorously as to what is the problem, how can it be solved and what is needed to achieve results-exponent we will find fulfilling. Researching through using multiple sources in trying to find the best ways to solve particular problems is vital during this process. Findings can be reviewed as handwritten proposal.

Suggestion: Proposal findings as a result of best suitable suggestions for identified problems can be presented in a form of a tentative design. This type of design is not the final agreed procedure to be used, but it is a blueprint of possible ideas that are not to be overlooked. A tentative design can be manipulated over and over using the first phase in a quest to find the ideal design prototype. The suggestion phase is accustomed to rapid changes.

Development: Implementation of a suitable tentative design is then constructed within the development phase. This phase is eligible to several development techniques. Development should not have restrictive barriers as long as end results are in line with requirement objectives for intended system. This phase can require an increased awareness of user experience. System development is cycle driven, therefore it can consume a lot of time & effort. By increasing development awareness the production of a robust system is highly possible. Development prototypes allow users to tweak requirements and system
functionalities before a final product is created. Far too often user participation will be used as a reviewing method.

**Evaluation:** On completion of developed product, the artifact will be criticized and inspected in relation to awareness phase guidelines. A successful prototype is only classified as perfect if it bypasses the evaluation phase. Artifact performance always has to be measured thus feedback is critical within this phase, any concerns or new “suggestions” can call out for artifact to be re-implemented. Until all parties involved are satisfied.

**Conclusion:** This phase is judgment day of the entire artefact research project. The end result is judged on its quality levels. Further research projects for a new artefact of better quality can be created to reach a better level of artefact sophistication based on past concluded projects. The effort make about the deployment of a new product also has to stand trial against similar products of the same nature. The use of the Design Science methodology therefore implies the use of Prototyping in the Development phase and the use of Survey in getting people to evaluate the developed system.

A. **Prototyping**

A prototype is usually referred to as a representation of a part or the whole of an interactive system [3]. It can also be said to be a simplified program or system that acts as some sort of guide for the complete program. They are usually constructed because they have some characteristics of the complete system and are as such easier to develop.

A prototype usually only contains the aspect of the system that is to be developed and other aspects not being studied are not contained in the prototype. In research, prototypes are used to provide a simpler system that can be studied [13]. And as such are used to demonstrate or prove to show off the merits of a particular idea or concept.

A prototype force a researcher to focus on details that might otherwise been overlooked. This may call into focus, decision options that were wrong and needed to be changed in the model before it progressed too far [13].

However, prototype on their own do not add much scientific value, to be of any value, experiments have to be conducted on the prototype to test the relevant aspect of the system realistically. And as such serves as an excellent way to demonstrate [13].

B. **Survey for the Evaluation of the System**

According to [13], survey are conducted using questionnaires that are either distributed to a sample (or to the entire population) for completion, or complete by means of interviews.

There are aspects that are contained by a survey to make it interesting, the first aspect is counting the entire population is often too large to count, what we can do in research is to count a sample of population and generalize the finding to the entire population. Another aspect is if you are dealing with human population it is necessary to use a questionnaire to determine the opinions of the humans you are interested in. And, lastly surveys are not conducted to simply determine the current status of the population, but to prove theories about the population members.

The survey in this research is quantitative meaning data will be quantified and results will be generalized from the sample to the population of interest. The structured technique that we used in this survey is an based on online questionnaires.

The data collection tool of this survey is a structured questionnaire, formulated using a scale of one to six. The scale will have answers of 1. Strongly agree, 2. Agree, 3. Neutral, 4. Disagree, 5. Strongly disagree 6. Don’t know, to answer each question posted on the structure. The population that was chosen to participate in this study are respondents responsible for using IT for learning at Tshwane University of Technology (TUT). Purposive sampling will be used to target IT students in TUT who are comfortable in using computers. The random sampling could not be used because not all students are aware of audio visual technology.
IV. SYSTEM DEVELOPMENT RESULTS

A. Overview of the System Output

The system consists of user login, Profiles of users, The courses consists of the dashboard for admin to maintain the learning materials, Live streaming or video conference for students and lectures to have online classes, it also contain lessons or module that each courses must have together with online quizzes. The homepage of the system explains what the system does and how it can help in flexibility of time and devices, and how to reduce traveling cost. On the top left side of the system in shows the login part where a student or a lecture can use to login to the system and do their activities of that time or day.

When a student login, he or she can easily see what course is he or she doing. The user profile also enables the student to update their information of links he or she has, the settings of his profile e.g. changing password and his profile as well.

The dashboard helps the lectures to maintain the learning materials add courses add new students if they want to be registered on that course. The dashboard also helps to set up media that is needed on the system together with settings of the system itself.

B. Results of the Evaluation of the System

In order to make validation corrects and improvements to our prototypes, users at this institution had to be used in order to evaluate our system. The system evaluation is for testing if the system can have self-hosted videos and audio media for students to use them anytime for tutorials in a particular course. In the system we also test if Mconf is...
really giving us the live streaming class that we need in this research, to achieve our objectives. Below there are findings of the system through questionnaire that was developed using monkey survey tool. The findings were specified in different parts of the system and those parts are technical functions, level of interactivity, visual impact and language.

Technical functions

The respondent used the system comfortably and intuitively, it was easy for them to navigate throughout the interface we have on the system. Content display and sound were all working fine for them, meaning content was easily accessible. All links and buttons were working and respondents did not have any complaints about them.

Level of interactivity

Respondents enjoyed the engagement of the content in the system, even the asynchronous on that were have for students to learn on their own when they have time. The different delivery of content make the student to engage more with the system and the more the students engage with the content, the better the learning experience and potentially, the retention.

Visual impact.

The look and feel of the learning content is engaging and professional according to the respondents. They also showed that the graphics and text is relevant, meaning the content is for the right audience and its impact will not disengage the students.

Results below will show the results of the targeted students, lectures and other users that are not in the IT field, they all showed that the system can be used to improve the interaction between students and lectures and also improve pass rate of e-learning courses.

Live streaming output

Live streaming class helps them to interact straight with the lecture on things they did not understand and be able to raise hands on the system functionality, making it easy for the lecture to see if a student wants to ask a question, and be able to attend to the student’s question right away. The live streaming also help the students to manage their time because they have to attend classes online, that made lectures to really love the system.

V. CONCLUSION

Our goal was to improve the interaction between students and lectures using audio-visual based on e-learning, we describe types of e-learning that’s asynchronous and synchronous, comparing them. The significance of the study was to develop a live streaming class that will help students to use e-learning and be motivated to continue learning because they get response fast and at the same time they can see the lecture. We discuss several reasons why we should use audio-visuals on e-learning instead of blackboards and blogs and also the drawbacks of e-learning. A system was developed and tested by developers and users. They both agreed that audio-visual e-learning will help enhance the interaction between students and lectures in audio-visual based on e-learning.

Our future works will consider having a built-in live streaming environment instead of the outsourced one we had in this study. The system must end up considering even students that don’t use computers that much, and give them a training phase before they start interacting with the system. The system implementation must use framework that offer more security benefits.

REFERENCES


