A Conceptual Culture-Oriented e-Learning System Development Framework (e-LSDF): A Case of Higher Education Institutions in South Africa

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***Abstract*—The development of educational software cannot be improved without a full understanding of methodologies, techniques, and cultural factors that inform the system development process. In education, technology has become a crucial tool. Computer-based technology brings a positive change, increasing knowledge and information sharing. The software crisis remains an issue in the software development industry. Although several articles have been published to address this problem, no solution has been found. Incorporation of culture into e-learning system cannot be neglected because it can enhance the use of e-learning content and services effectively. This study explores how culture can be captured during e-learning system design in South Africa (SA). SA is a country with eleven (11) official languages and different cultural practices spreading across nine (9) provinces. The study proposes that choice, use and effectiveness of e-learning systems is influenced by these languages and the associated cultures. The current e-learning environment provides a one size fits all type of framework where differences in the cultural background of learners are not considered. To consider difference in culture, a new e-learning framework that will capture these differences is needed. This paper provides a conceptual e-Learning System Development Framework (e-LSDF) which can be used by e-learning system developers in capturing cultural differences in society during the development of e-learning systems.**

Keywords—Cultural-oriented, culture, e-learning, framework, system development.

I. Introduction

The development of educational software in SA cannot be improved without a full understanding of the multicultural realty space in which the software will be used. In addition, culture is a powerful element that impacts behavior, belief and others in determing what is lawful information in any society [1]. Culture element also influences the effective use of e-learning systems. According to this study, failure to achieve quality e-learning can be classified as software crisis [2] a problem that has lasted for decades in system development. According to Haigh [3], software crisis was coined in 1968 at a NATO Conference on Software Engineering in Garmisch, Germany. The phrase was framed as a result of a number of issues like software under budgeted, low quality, lack of functionality. However, the benefits, and significance of including culture in e-learning systems development cannot be over emphasized [4].

Good cultural integration into e-learning cannot be neglected, because it can propel learners to use e-learning content and services effectively. The issue on impact on culture on Information Systems (IS) use has been researched from the 1970's [5]. Hofstede [6] introduced a new cultural dimension on organizational and national culture which are rooted in the role of culture on IS design and management. From induction, many research studies have been resolved around this dimension. Other studies have been done on e-learning methodologies [7]-[9], framework [10]-[12] and e-learning theories [13-14]. However, all these research studies have not shown developers how to capture culture in the development of e-learning systems.

This paper presents a conceptual framework that can be used to capture cultural issues in the development of e-learning systems in diverse learning environments. The rest of the paper is as follows: section two (2) presents Background and Context, section three (3) discussed the Research Motivation, followed by Problem Statement, Research Questions, Literature Survey, Theoretical framework, Conceptual framework, Significance of the Study, and Conclusion.

II. Background and Context

The post-apartheid South Africa (SA) has produced a mixed educational system. SA has 23 universities with two new universities (Sol Plaatje University and the University of Mpumalanga) launched on the 19th September and 31st October 2013, respectively. Some of these universities exist as a result of the merger of other higher institutions. Twenty-first century technology has redefined traditional learning and class-based education [15]. This redefinition is a result of ICT and online resources being enabled by the Internet. This has enabled organizations and individuals to take the destiny of their education in their own hands at their own convenience [15]. The necessity of culture on e-learning is as a result of learner's cultural difference in the field of learning. In the SA education context, students are coming from different backgrounds, societies, culture and with different characteristics, specifications and learning styles [16].

Furthermore, South Africa is a country with eleven (11) official languages and different cultural practices spreading across nine (9) provinces. The choice of e-learning tools should be influenced by these languages and cultures. It is conjectured (proposed that) South African societal values can

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be influential in e-learning systems set-up and environment [15]. As Boondao, Hurst and Sheard [16] added, human learning capacity can be influenced by many factors including culture.

In recent times a call on what is called "status reports" on growth of ICT learning (education) in the South African context was made Ngugi *et al.* [17]. The call was based on the 2004 white paper on e-education published by the National Department of Education (DOE) termed "together a think tank in 2006" on the need for the implementation of e-learning in schools Ngugi *et al.* [17]. According to ICTs and Higher Education in Africa (2007), many researches have been published like "Education as change" published in December 2005; Perspectives in Education published a special paper in December 2005 titled, "Research on ICTs and Education in South Africa"; the South African Journal on Higher Education, published a special edition presented at the National Association of Distance Education and Open Learning in South Africa (Nadeosa), 2006 conference with focus on ICTs in education Ngugi *et al.* [17].

All these publications and many more are asking the same question on where South African e-learning is heading to, realizing that many universities and other higher education institutions have plenty of computer based systems with internet connectivity which are influential in the educational setting in the country Ngugi *et al.* [17]. The Council on Higher Education Sector has provided the nature of ICT utilization in South Africa universities. All these publications however, did not discuss the role of culture in e-learning [15].

E-learning is the capability of learning through ICT components, tools and applications like internet connectivity, software, CD-ROM, electronic media and telecommunication Ngugi *et al.* [17], [15]. On the hand, Blended-learning can be seen as the combination of classroom learning with the aide of computerized tools [18-19]. According to Ngugi *et al.* [17], the literature available shows that the use of e-learning tools in education institutions differs. Also, the available literature on culture in e-learning is heavily focused on organizational and national culture as noted in the problem statement. This difference can be the result of individual, organizational, societal cultures, approaches and learners (students) learning communities. Research shows that web-supplemented (widely used), web-dependent and other online courses are a range of activities performed by SA universities online Ngugi *et al*. [17].

III. Research Motivation

The development of e-learning tools brings a great change in education. The tools may depend on learners having Internet connectivity. The tools can be used to complement or enable "live course" or learning, distance learning or education [20]. However, the availability of the tools does not guarantee effective educational learning. As already proposed, the failure of e-learning systems to capture cultural factors contributes to the failure of e-learning systems. This therefore contributes to the factors that led to the "software crisis". As a result of the phrase, 'software crisis' is not yet over. It was coined "software crisis" as a result of the incapacitation to construct large software application, lack of proper budget and planning and execution, low productivity, lack of quality in the software and inability to meet users' expectations [21]. Till today, much research has been conducted on the causes, effect and solutions to the crisis but to no avail in the development of e-learning system.

Cultural considerations can help to design and implement customized e-learning systems depending on cultural background of the learners. One can say that some of the problems identified in 1968 have been already solved because of the improvement in technology and development procedures [3]. However, in spite of the sophisticated and interactive graphic users' interface, a lot is still missing because end-users' cultural and local language content and icon and symbols are not incorporated into the e-learning systems. For this reason, we can say that the software crisis is not yet completely resolved, because to date the e-learning system do not capture culture and culture-oriented [15], model [18] framework [4].

This discusses culture and how cultural factors are captured in e-learning system development. The study adds knowledge to the body of the academic field. According to Lephalala and Makoe [22], culture and its factors need to be taken into consideration during this development.

IV. Problem Statement

End-user involvement is an important aspect in developing and determining the success of e-learning systems and any other system Sun *et al.* [19]. A learner's action and attitude toward ICT determine his or her satisfaction on e-learning. These are influenced by the Hofstede's [6] cultural dimension of Power Distance, Individualism/Collectivism, Uncertainty Avoidance, Masculinity/Femininity, Long-term orientation and Indulgence/Restraint. Meanwhile, there are many other literature studies floating online, but most of which are based on organizational, national and group culture Hofstede [6], Iivari [23], Myers and Tan [24], Kummer, Leimeister and Bick *et al.* [5], Yeo [25], Huang and Trauth [26]. All the literature mentioned above, deal deeply with the roles of culture in information systems design and management [5]. None of the literature sources above deals with culture in the context of e-learning. Nonetheless, educators are challenged in catering for students from different cultures [27], [28].

According to Olaniran [15], universal e-learning lacks culture-orientation. This paucity can be seen as a crisis. The questions that most researchers ask themselves are: Is e-learning design wrong? Do e-learning developers ignore influencing factors during development? There is nothing wrong with the first question, but the second question shows that something is missing and that is what this paper aims to address. The reason being that many characteristics exist among students who come from different cultures and countries as seen in SA. According to Boondao, Hurst and Sheard [16], little research has been conducted on the influence of ethnicity, background and culture on e-learning. The consideration of culture in e-learning systems development is very important in designing systems that can suit all students from different cultural backgrounds [16], [1]-[29].

According to Mohammed and Mohan [4], e-learning and its content were originally developed without considering effects of culture. For example, Hofstede's [6] dimension shows the role of culture in IS but not on how to represent culture on e-learning system design [5]-[30]. The negligence of how to represent culture on e-learning systems can hamper its effectiveness. However, from the pedagogy model, culture is placed within the ethical component in the framework feature [31]. This is serious gap in the development process which can be regarded as a major problem.

Culture can be individual or collective [4]. Individual cultures are defined as cultural knowledge acquired individually while collective cultures are defined as grouped customs, usage, artistic, intellectual and religious that influence and define group or society [4]. Individual culture is framed by interest, beliefs, inclination and misconception while collective cultures are independent of ethical identity, societal values, norms, local, regional and geographic locations [4].

Although, South Africa's learning platform as a context on this study is culturally diverse, culture can positively or negatively impact e-learning educational space. Presently, cultural consideration and impact in setting-up e-learning systems from the start has been ignored by many because of the lack of a guiding framework [4]. Again, in accordance with Ngugi *et al.* [17], the challenges confronting online learning materials and environment are in the area of catering with students across different societies and cultures. Addressing this challenge shows a movement from technological content to active e-learning platforms. But the reverse is the case as cultural influence and impact have been ignored by e-learning promoters [4]. This paper presents a guided framework on e-LSDF to include individual and collective culture in e-learning. This also combines with learner's learning style. The next section covers the research questions that have been raised by the problem statement.

V. Research Question

The primary research question is:

1) What are the cultural factors that should be considered when designing the e-Learning System (e-LS)? This question seeks to understand cultural issues to be considered in e-learning development.

The secondary research questions are:

1) What is culture?
2) What are the effects of culture on e-learning?
3) How do cultural differences impact on e-learning design and implementation in SA? From the problem statement, different cultures exist among the users of the e-learning systems. The question seeks to understand how the cultural difference impacts the design of e-learning systems.

The following objectives were derived from the problem statement and will be addressed in this paper:

1) Understanding the cultural factors that should be considered when designing the e-Learning System (e-LS).
2) Determining the effects culture on e-learning.
3) Understanding how cultural differences impact on e-learning design and implementation in SA.

According to Olaniran (2009) [15], lack of culture is the major challenge to e-learning globally.

VI. Theoretical Framework

This section discusses the theoretical principle that guided this study. A theoretical framework binds together the social system and theories used in a study showing why the problem under investigation exists [32]. It also presents possible solutions and remedies to the problem that are applicable to the study. As such, the integration of pedagogical models should be considered by designers and teachers using e-learning systems [33]. In reality, some e-learning systems do not depend on the pedagogical model, but a pedagogical model shows tools for e-learning development. But in some cases, tutors can choose their own design which suits their instructional models. However, many e-learning tools in operation overrule the key pedagogical principles.

There are tools that capture our world and make sense out of it [33], like the theories Activity Theory (AT) and Actor-Network Theory (ANT). To bridge the gap between the nature, organization and development framework, Activity Theory (AT), proposed by Vygotsky and Leont'ev as a framework for context and situation description [34] can be used. The model seeks to understand cognition and activity in an environment and captures "knowledge and conceptual knowledge" that is integrated into intelligence systems [34]. The tool can be applied in capturing learners capture in designing e-learning system. According to Hashim and Jones [35], AT is a theoretical model used for analyzing and getting knowledge via "tools and artifacts". AT discovers contextual knowledge that can assist "qualitative and interpretative" study in understanding important cultural and historical environments which are dynamic and rapidly changing purposes, objectives, tools and process. AT sees activity as primary, with the perception "that goals, images, cognitive models, intentions, and abstract notions like "definition" and "determinant" grow out of people doing things" [35]. Kuutti [36] defines AT as a framework for understanding human and social practices as development procedures, which interlink sequentially. According to the study, AT is a framework or model used to understand the cognition and activities through interpretive research to change and innovate social processes on learning (e-learning). With AT, knowledge about learners is able to be captured into the design of learning systems.

Actor-Network Theory (ANT) is also a theoretical framework of research on design and conversion of the varied network. It includes agents, people, machines, organizations and other objects and entities that constitute the human and non-human in our world [37]. ANT is ontological grounding that studies the link between actors [38], as the link between learners and culture. The increasing innovation in technology may assist ANT to improve activity and management at large understanding the relationship between learners and culture. According to Cordella (2010: 2) [38], "ANT recognizes that technology and people are not distinct pre-existing actors which influence each other through their relationships", they

relationships can be culture diversification. Both tools can be used in this study to understand how culture can be present on e-learning systems.

VII. Conceptual e-LSD Framework

This framework is motivated by the "blended learning platform" integrating classroom learning (face-to-face) pattern with web-based learning (virtual classroom) approaches [39]. The conceptual framework in Figure 1. contains cultural factors, community factors, ANT and administration factors (student, content factor, learning style and activity/exercise factor). Each factor influences and is controlled by static and dynamic culture, because some cultures are static (cannot change overtime) and others dynamic (changing as days pass-by). According to Blanchard *et al*. [17], paradigm shift is needed to capture different cultures. This framework is aimed at achieving lack of culture-mindedness in e-learning design. As is shown in Fig. 1, the cultural factor covers other factors in the learning environment. Each of the components on the framework is discussed below the diagram:

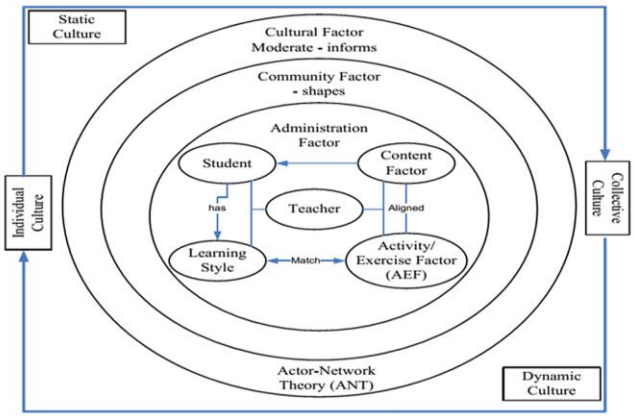

Fig. 1. Conceptual culture-oriented e-LSD framework: Adapted from: Georgouli *et al*. [39] and Blanchard *et al*. [17].

The **cultural factor**, according to the study, e-learning factors is the factors that affect e-learning systems towards success or failure. According to Lephalala and Makoe [22], e-learning systems like honor, obedience, respect and regard for authority, mutual bond and friendship are based on the attribute and definition of culture as noted earlier, the attributes impact on learners related to e-learning in the learning process. So the factors focus more on all those characteristics being collective, individual, static and dynamic factors that heavily influence a learner knowingly and unknowingly. This factor is grounded on static and dynamic culture because nature of learners environment that confine on culture.

In alliance with the cultural factor, **static culture** focuses on peoples' actions, behaviors and many more that cannot change soon. These attributes can be realized on e-learning ensuring that each one of the features brings positivity to the learning platform while **dynamic cultures** are rules and laws followed by learners in the learning environment that are band to change. The learning environment is inversely influenced by the community factor where the study takes place. Individual cultures are those acquired personally while collective cultures are embedded societal values and beliefs which are defined by the cultural factor attributes. Individual cultures are defined as cultural knowledge acquired individually while collective cultures are defined as grouped customs, usage, artistic, intellectual and religious that influence and define group or society [4].

Individual culture is framed by interest, beliefs, inclination and misconception while **collective cultures** are independent of ethical identity, societal values, and norms, local, regional and geographic locations [4]. This means that culture can directly or indirectly impact on learner(s) learning style and choice of whether to use e-learning tools/system or not as controlled by cultural factors. This influence can be effectively represented and managed through e-LSDF.

Culture exists in a community together with cultural factor that co-exist with the **Community factor** that ensures effective communication, collaboration in dissemination and gathering of information and working with course-mates in group discussion forum, chat-rooms, news, announcements, wiki, bulletin and others [39], learners use these tools to stay connected in a community forum of learning. Interaction between teachers and learners, learners and material, and among learners, assists in improving knowledge and resolving difficulties [17]. The use of modern gadgets like mobile phone, tablet computers and many more affirming information sharing and service and content delivery helps in building an effective learning community. E-learning should be developed to increase consistent interaction, quality content and updated content that will improve learners' satisfaction and expectation [19]. As a result of roles played by above mentioned factors that ensure students are able to engage in an interactive process in the learning environment made possible by administrative factors.

Administrative factors are tools that enable the gathering of statistical data and course evaluation documentation but it is not part of the pedagogical model section [39]. Administrative factors constitute an essential part in the design of a web-based learning system which is known as e-course in the community factor. According to Lubega and Mugarura [40], administrators are the people who carry out all the administrative work in the learning process, like student support, for the courses offered by the tutor. The major activities performed at the level of administration phase are formulation of e-course policy(ies) (either public or private), registration set-up and a few more [39]. Administrators include mentors, managers (e-learning), network administrators, policy makers and departmental heads, who are key players in managing e-learning education [40]. Administrative roles include enhancing the effective roles of cultural, and community factors as to delivery learning platform to students. Also, they are able to manage and report student's welfare and manage them.

Students use and learn with e-learning systems in sharing and advancing knowledge [41]. Students are the final users of e-learning systems [42] to stay involved in the learning community as influenced by community and cultural factor. According to Lubega and Mugarura [40], students are the people that enter into learning contents to engage in the learning process. However, learners' attitude toward computer media determines success or failure of e-learning;

positive attitude brings success while negative attitudes determine failure [19]. At this level, students are registered at the university or college, either for undergraduate or post-graduate study. Students are motivated in using e-learning for many reasons like access to education anytime, anywhere all year around influenced by cultural factor using the same community factor features. Some may not have attended any educational institution had it not been for e-learning [42]. However, students learning ambition is realize through content factor as discussed next section.contract using e-learning. These students are assembled from different cultural backgrounds with different learning motives. Students use

Content factor is facilitated by administrative factor and teachers. The factor realized using method, location and time are flexible on e-learning content. Well-designed content should be considered when designing e-learning material [19]. Content factors are those materials that influence the learning process and satisfaction like guide study, textbook, hand-out, journals, magazine and many more. Quality designed material determines learner satisfaction. Content is designed and delivered according to learner needs, with the aims of delivering effective learning materials [42]. Learning style is the preferred mode or system that suits learners to understand content in the learning environment. According to Joy and Kolb [27], learning style explains individual learning processes. The attributes of this factor is vital for student in the learning process.

Learning style influences content factor that enable administrators in coming up with different styles that impact learners. The factor is attributed to personal experience, needs, demands and expectation. It is embedded in "dialictic modes" like Diverging (learners in the category use "concrete experience and observation"), Assimilating learners favor ('reflection observation and abstract conceptualization'), Converging learners like 'abstract conceptualization and active experimentation' and Accommodating learners prefer the use of (the power of observation) [27]. The Activity/Experience factor is the task engaged in by learners to effectively use the learning system as the mandate of e-learning to be achieved.

The provision of all learning materials and support are teachers' responsibility [41]. They guide, teach, design and provide learning materials to learners electronically in the process [40]-[42]. Teachers may be motivated to use e-learning because of the ability to reach wider learners. Studies have shown that the timely response of teachers increases learners satisfaction in e-learning, for example, learners facing difficulties online learning need quicker response, if not, the learner will be discouraged in the learning [19].

Teachers are intermediate persons between administrators and students, content, learning and activity; teachers are the people that administer content factors in the learning environment influenced by cultural factors. Teachers need to understand the culture and cultural factors that impacts learning for them to remain active in the learning process. The Figure 1. framework can be used as a general e-learning development guide at instructional model level in integrating pedagogical set-up which unites "learning and learner-centered" in e-LSDF and e-learning development centers. According to Lubega and Mugarura [40], teachers design learning materials that concord with methodology standards like Sharable Content Object Reference Model (SCORM), they monitor learners' progress and provision of feedback, without proper engagement, e-learning will fail.

Activity/Experience Factor (AEF): This is an assignment platform that enables effective management of students' academic related work or activities by the tutor [39]. Through this platform, learners can download, upload assignments, learning materials, read and add comments, announcements and many others. However, this factor brings closer all the activities associated with learning online like cultural, content, administrator, teachers and learning factors to the learners more effectively and allowing them to be frequently informed on any activities on-going. Though at this factor, the activities and roles of other factors shaped it usage and value.

For this study, **ANT** emphasis is on the use of framework to present cultural influence and the relationship with learners on e-learning system as to enhance teaching and learning. As seen on the diagram (Fig. 1), ANT is the same ring with cultural factor in order to understand the heart culture on e-learning system development and how culture can be managed properly and how knowledge is disseminated via technological media. The common attributes among these factors and tool is the ability to integrate learner's culture into the design of learning system.

VIII. Significant of the Study

In education, technology has become a crucial tool. Computer-based technology brings a positive increasing knowledge sharing and information. Software crisis remains an issue in the software development industry. The multi-cultural setup of e-learning demands for a new methodological paradigm that will unite cultures and learners unique differences [17].

Learners drop-out of education despite the existence of e-learning [44]. The study formulated an e-LSDF which can be used in capturing cultural factor in society during e-learning system development phase. Earlier, e-learning aimed at supporting and representing classroom-based teaching and learning online (internet), but nowadays, it tries to establish virtual classrooms [44]. The first generation of e-learning provided a single instruction mode while the second provided combined instruction mode when properly delivered, giving more choices effectively [44]. However, the proposed e-LSDF includes individual and collective culture in e-learning systems development as stated earlier.

This proposed framework will serve as theory and practice for developers and learners in education learning process. This framework acts as theory by which practical e-learning system can be built in an effort to making e-learning more practical in a learning practice. To this point, this conceptual framework is a theory of development knowledge for the integration of existing learner culture in the design of e-learning.

In reality, learners' (individuals) choice and expectation varies, and then organizations and individual developers must embrace e-LSDF approach and strategy that aims to

satisfy different sections of the cultural background. In an attempt to achieve this, e-LSDF will act as a mechanism that will assist developers in managing cultural differences while developing e-learning system and tools that are cultural balanced and friendly at all levels of society in South Africa and beyond and adding knowledge to academics.

IX. Conclusion

Culture impacts on how people use and value communication media, especially in an e-learning. Cultural differences should be considered when developing or integrating and making choices involving technology and media. The roles of culture in e-learning in SA cannot be ignored in the development of e-learning systems. For this ignorance to be overcome, e-LSDF is necessary in the heart of SA e-learning growth. In summation, the potential influence of e-learning at large in the higher education platform across SA has not yet been fully explored.

This study has designed a conceptual framework that will act as a guide for culture-oriented e-learning system developer. Future work looks at operationalizing the framework, firstly by collecting empirical evidence to support the role and existence of these elements in SA learning environment. Secondly, the framework needs to be used by developers of e-learning system.

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