IntechOpen

Trends in E-learning

Edited by Mahmut Sinecen

TRENDS IN E-LEARNING

Edited by **Mahmut Sinecen**

Trends in E-learning
http://dx.doi.org/10.5772/intechopen.71183
Edited by Mahmut Sinecen

Contributors

Veeramanickam Mrm, Debnath Bhattacharyya, Tai-hoon Kim, Emerson Abraham Abraham Jackson, Moeketsi Letseka, Matsephe M. Letseka, Victor Justice Pitsoe, Vimbi Petrus Mahlangu, Shuti Steph Khumalo, Glenda H. E. Gay, Lucrecia Llerena, Nancy Rodriguez, John W. Castro, Silvia T. Acuña, Rosa Mayra Llerena, Ana Hadiana, Fatih Çağatay Baz

Notice

First published in London, United Kingdom, 2018 by IntechOpen
eBook (PDF) Published by IntechOpen, 2019
IntechOpen is the global imprint of INTECHOPEN LIMITED, registered in England and Wales, registration number: 11086078, The Shard, 25th floor, 32 London Bridge Street
London, SE19SG – United Kingdom
Printed in Croatia

British Library Cataloguing-in-Publication Data
A catalogue record for this book is available from the British Library

Additional hard and PDF copies can be obtained from orders@intechopen.com

Trends in E-learning
Edited by Mahmut Sinecen

p. cm.

Print ISBN 978-1-78923-542-5

Online ISBN 978-1-78923-543-2

eBook (PDF) ISBN 978-1-83881-532-5

Meet the editor

Dr. Mahmut Sinecen was born in Oosterhout, Holland. He worked as an instructor at the Department of Computer Engineering , Pamukkale University between 2005 and 2011. He then worked as an Assistant Professor at the Department of Computer Engineering, Çanakkale Onsekiz Mart University between 2011 and 2013. Currently, he is an Assistant Professor at the Department of Computer Engineering, Adnan Menders University, Aydin, Turkey. He received his BS degree from the Firat University, Elazig, Turkey; his MS degree from the Pamukkale University; and his PhD degree from the Dokuz Eylul University, Izmir, Turkey. His current research interests include industrial image processing, software development, fuzzy logic, artificial neural networks, pattern recognition, e-learning, engineering learning technologies, and STEM.

Contents

Preface

Countries need to use the different methods on learning and training in order to be able to produce individuals who can produce, develop and use information effectively. Nowadays, the Internet, an environment in which information can be accessed freely, easily, quickly and independently from time and space, has been seen as the widest information portal. Using this portal, the education model created by bringing together the educator, the student and the educational materials in the virtual environment is called e-learning. E-learning had begun to use newspapers, postal services, radio, television and so on in the development process, but it had not enabled important developments on the quality and methods of education, because the interaction among the student, educator and materials was incomplete and the information had not been emphasized as necessary. This book intends to provide the reader with information on e-learning and how e-learning can be implemented into education.

I would like to thank the authors for their technical effort while preparing each chapter. Also, my biggest thanks go to Ms. Lada Bozic, Author Service Manager from IntechOpen, who supported and instructed me through all stages from the preparation to the printing process.

I hope that the book entitled *Trends in E-learning* will make a significant contribution to readers, students, scientists and teachers.

Dr. Mahmut Sinecen
Computer Engineering Department
Engineering Faculty
Adnan Menderes University
Aydın, Turkey

Chapter 1

New Trends in e-Learning

Fatih Çağatay Baz

Additional information is available at the end of the chapter

http://dx.doi.org/10.5772/intechopen.75623

Abstract

Guidance work is needed to learn about the current state of e-learning and to guide future research. In recent studies, e-learning environments appear to be under different headings in recent years. These new topics are mainly aimed at providing an up-to-date explanation on e-learning in this section. New trends in e-learning will be covered under artificial intelligence (AI), micro credentials, big data, virtual and empowered reality, blended learning, cloud e-learning, gamification, mobile learning, Internet of things, and online video. With this study, it is aimed to shed light on the concept of e-learning. In addition, e-learning environments focus on new possibilities for learners. Everyday, e-learning environments bring out new antagonistic concepts. As these new concepts rapidly entered our lives, they began to become indispensable materials in the field of education. New e-learning environments are being used as platforms that are related to each other. They essentially support the concept of e-learning.

Keywords: e-learning, learning technology, new trends in e-learning

1. Introduction

As in many subjects, new concepts of technology entered our life in education. The increase in the number of students, technological developments, new learning theories and personal needs have led to the introduction of these concepts into our lives. Moreover, these concepts have undoubtedly brought along interdisciplinary studies. In recent years, rapid and low-cost Internet technology and technical developments in information technologies (IT) have also been supporting this process. The development of this process certainly ensured the formation of new ways of learning about e-learning.

E-Learning is a computer-based educational tool or system that enables you to learn anywhere and anytime [1]. e-Learning strategies are spreading to include different education sectors. In this regard, learners indicate that e-learning has made education effective. It is also stated that the most basic benefit of e-learning is flexibility [2]. e-Learning can be considered as a motivation factor in terms of self-efficacy. Students can organize their motivations on e-learning themselves [3]. e-Learning also serves institutions and organizations that want to provide consistent education in more than one place [4].

How can we tell the difference between traditional learning and e-learning? Traditional education is a way for the teacher to present the learning material to the students in the class. The main difference between e-learning and class-based learning is the way in which education is transmitted. In fact, this is a very basic difference. In traditional learning, the teacher can fully control the learning environment by adapting it and, if necessary, changing it. In traditional learning, the teacher's ability, personality, quality, adaptation to the learning situation, and the creation of course material affect the learning-teaching performance [5, 6].

1.1. What are the new e-learning trends?

New focus of e-learning environments is to identify the content area and individualization. In this sense, learners will be included in different e-learning environments. A personal application can be made to be a candidate. In addition, content is rapidly increasing in our time. For this reason, new e-learning materials for learners need to be developed. The e-learning environments that have recently taken place in our lives are artificial intelligence (AI), micro credentials, big data, blended learning, virtual and empowered reality, cloud e-learning, gamification, mobile learning (m-learning), Internet of objects, and online video titles. These new e-learning trends offer significant benefits, such as creating the best education and development plan, creating it in a flexible environment, and creating and maintaining a personal learning environment and continuity.

2. Overview of new e-learning trends

Let's take these new e-learning trends in turn. Let's also look at the benefits of these e-learning environments in terms of learners.

2.1. Artificial intelligence

It is necessary to ignore the individual differences of learners without learning. It is imperative to configure the learning environment and personalize teaching for each user. Artificial intelligence algorithms are used to design e-learning environments that will be created in this way.

New technologies are now seen as complementary support, not as core techniques of educational practice. The use of artificial intelligence (AI) techniques is beneficial to learners in this sense [7]. Artificial intelligence (AI) operating systems, programming languages, and modern software are realized through computer science. Artificial intelligence (AI) is linked

to "mainstream" computer science studies, time-sharing, interactive interpreters, linked list data types, automatic storage management, and so on. Some of the key concepts of artificial intelligence are object-oriented programming and graphical user interfaces and integrated program development environments. Artificial intelligence (AI) is in the pattern with evolutional algorithms, fuzzy logic, and neural networks concepts [8, 9].

Education and artificial intelligence (AI) are two sides of the same medal: education helps learners learn and expand the accumulated knowledge of a society, and artificial intelligence (AI) provides techniques for understanding the mechanisms underlying thought and intelligent behavior. Because of this, today's artificial intelligence-assisted e-learning scenarios are widely used by educational institutions to provide better teaching and learning experiences throughout their training activities. Artificial intelligence (AI) leads to the development of a wide range of artificial intelligence tools as theory and practice. Sometimes, these tools, working under the guidance of a human being and sometimes without an external guide, can solve or help solve a growing number of problems. Artificial intelligence (AI) has produced many important results for students, teachers, the general education system, and societies over the past 50 years (**Figure 1**) [10–12].

2.2. Micro credentials

In education, teachers need to create experiences for students and to experience competence-based learning. Micro credentials can help teachers build personalized, competency-based learning paths and be recognized for a wide range of valuable and important learning experiences. More demand for micro credentials learning plays a central role in how the learner will be presented and evaluated. Micro credential is a focused, short delivery based on competency.

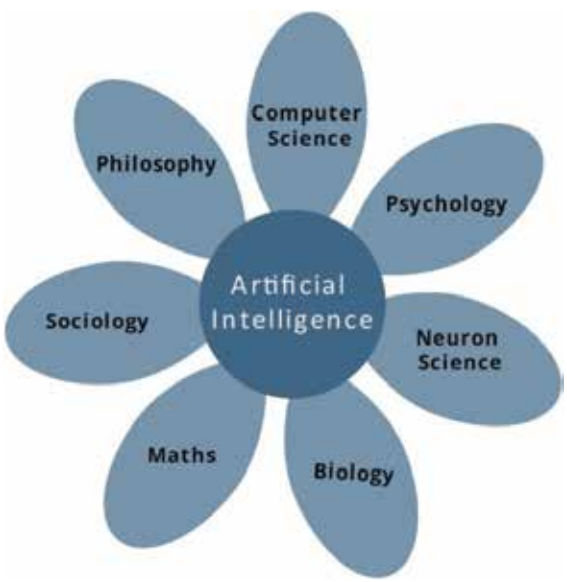

Figure 1. What contributes to artificial intelligence? [13].

Students will receive "deep" knowledge of a specific topic and will show the application of this knowledge [14, 15].

The micro credential is not a single-size fit, it is personalized instead. The micro credential honors the fact that all training professionals and students need something different. And with digital tools, this learning can take place anytime and anywhere [16]. Micro credential offers a strategy for teachers to expand their learning and to confirm and accept recognition as they progress through vocational learning. One of the reasons why micro credential is attractive is that it divides complex teaching skills into basic pieces. Trainees can develop and demonstrate competence at the beginning of each instruction and then link these skills to master competence in complex skills. Teachers can choose which skills or which parts of a skill they will most benefit from professional practice and demonstrate competence by offering what they can do [17].

2.3. Big data

Recent developments in database technologies have made it possible to accumulate and maintain large and complex amounts of data from many forms and from multiple sources. In addition, this complex data is meaningful, and there are analytical tools that can transform the mold. These tools are called big data. It is very important to put teachers into "big data" discussions, because they are the ones that will provide the progress in research and analysis. The projects that teach teachers about which pedagogical techniques are most effective, or how they have changed the way students learn, make it possible for instructors to do a better job. Adapting education to individual students is one of the greatest benefits of technology, and great value helps teachers personalize their learning. In this sense big data holds an important place in education (**Figure 2**) [18, 19].

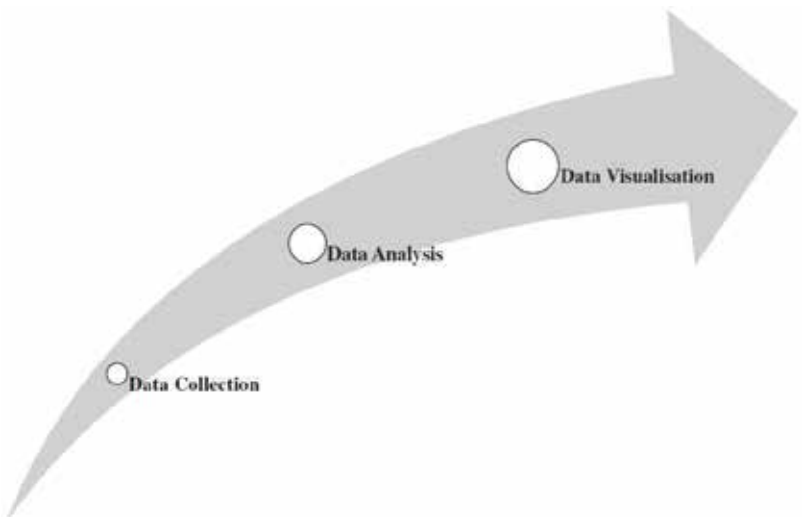

Figure 2. Three essential stages of big data [19].

Student data collected by online learning systems are examined to develop predictive models by applying educational data mining methods that classify or relate data. These models play a key role in shaping adaptations or interventions based on model predictions, to promote adaptive learning systems that can be used to inform learners outside academic services to support what they can learn or to modify student experiences. Two areas specific to big data use in education can be mentioned. One of them is educational data mining and the other is learning analysis [20, 21]. Big data enables a wide variety of data sources to be added, allowing analysis of these various data types. Analytical and predictable options are expanding. This allows for better progress in education [22, 23].

2.4. Virtual and empowered reality

With the use of technologies such as virtual and empowered reality, students can be more visually aware of their classmates and chat with them in real time. They can get immediate feedback from their teachers and get the feeling of being in the same spot with their peers despite their remote physical location. These shared virtual environments also facilitate simultaneous viewing of classroom learning materials and allow group discussions of learning content to be shared at the same time. The use of the virtual reality environment in education and training, which brings many innovative advantages to people of all ages, is impressive [24, 25].

The greatest advantage of using virtual reality to teach purposes in the field of education is that it is highly motivating. In terms of their use in the field of education, for example, when modeled in a molecule virtual and empowered reality, students can examine it in detail and become familiar with molecules, wander, and parts. Virtual and empowered reality allows an object to be examined from a certain distance and shows the whole rather than a piece. The virtual and empowered reality model of a neighborhood offers a different perspective to the connections between residents, buildings, streets, and open spaces [26].

It is also possible to interact based on cooperation with virtual and empowered reality. Therefore, virtual environments also increase the interaction and cooperation between students. These advantages increase student participation by using engaging experiences, reducing attention distractions, and creating positive attitudes when students receive better feedback to easily reach their learning goals [27].

2.5. Blended learning

Blended learning is a case in which a lesson takes place partially online and partly in other ways. In other words, students learn what they learn online in face-to-face environments. In addition, students have control over their own speed. Some researchers believe that this link between a method in a field or in the subject should be included in the definition and the basis for blended learning [28].

Blended learners have a lot to contribute to the field of education. Blended learning enables an enhanced learning experience by enabling various learning environments. It encourages reinforcement. It increases the accessibility of learning materials. It helps create a sense of community and cooperation through forums to share collaborative and communication platforms

and learning experiences. Blended learning models center the student learning process and benefit from the power of technology to create learning environments that are more compelling, effective, and successful [29, 30].

Blended learning is a concept framing the teaching learning process that includes teaching supported by face-to-face and information technologies. Blended learning includes direct teaching, indirect teaching, collaborative teaching, and individualized computer-aided learning concepts [31].

Benefits of blended learning are as follows (**Figure 3**) [32]:

- Expands the areas and opportunities available for learning
- Supports course management activities
- Supports the provision of information and resources to students
- Interacts and motivates students through interaction and collaboration

2.6. Cloud e-learning

The day-to-day growth of data hosting and data processing services on the Internet has enabled the creation of a new concept. Cloud computing for operating companies in various areas such as planning and correction helps to meet the increasing demand. Cloud computing is a promising infrastructure that provides computing and storage resources as a service. Cloud computing can provide services at anytime/anywhere that are accessible from any device from where the users' services or applications are located. All of this and more will be the responsibility of cloud computing [34, 35].

A learning cloud is a cloud computing technology in the field of e-learning, a future e-learning infrastructure, including all hardware and software computing resources to deal with e-learning. After virtual computing resources, they can be services for renting computing resources of educational institutions, students, and businesses (**Figure 4**) [34].

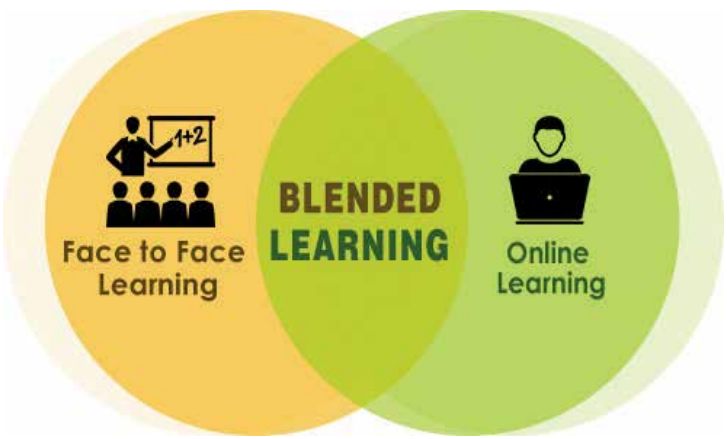

Figure 3. Blended learning [33].

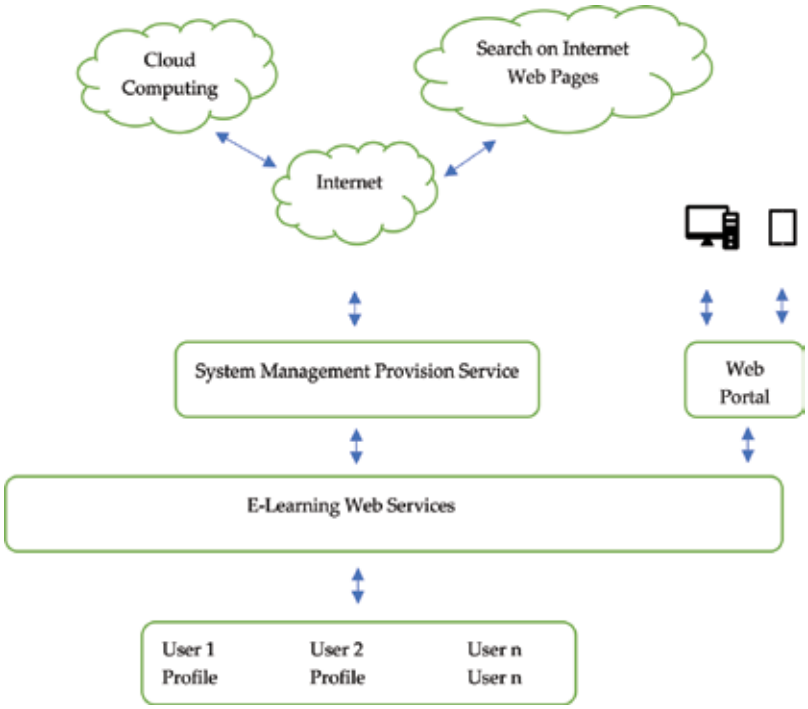

Figure 4. e-Learning services using cache management and cloud computing [36].

2.7. Gamification

Gamification is developing as an academic concept. To achieve this, we need to determine whether the existing gamification structures of the period are significantly different from the research areas and how to relate this to existing sites. Gamification offers new research opportunities. Gamification is the use of game design elements in out-of-game contexts [37]. Gamification is used to motivate gamers to participate in a specific context. In other words, it is the application of fun layers. Most of the existing gamification applications seem to be focused on offering points and rewards to motivate users. Gamification can be a new term. However, game-thinking and game mechanics ideas are not entirely new. These concepts were already used in problem-solving [38, 39].

Gamification is involved in e-learning. In this sense, gamification is the use of a pedagogical system developed in game design but applied in a nonplay context. Game, scoring, level, rosette, or game mechanics are also included in gamification. These are applied in the manner in which a course or module is taught. Game-based learning or play is sometimes used interchangeably. However, they both actually indicate two different pedagogical methods. Game-based learning asks students to play in games designed to enhance their learning rather than integrating the principles of game design into standard classroom instruction. Besides focusing on playing games, they can also be of interest to anyone who wants to introduce game-based learning to their teaching. The addition of game features to learning environments may contribute to the less motivated students' own learning processes and their interactions with other learners (**Figure 5**) [40, 41].

Figure 5. The relevance of serious games, gamification, and playful interaction [37].

2.8. Mobile learning (m-learning)

Today, many technological devices are manufactured in portable form and used by people. These devices shape the daily lives of users differently. Until recently, mobile devices were limited to social communication, and there were few people using it pedagogically. At present, the teaching technology delivered through mobile technology is mostly social and economic (**Figure 6**) [42].

Students can control where and when they want to learn. In addition, all people have the right to access learning materials and information to raise their quality of life, regardless of where they live, their status, and their culture. Mobile learning through the use of mobile technology allows learners to access learning materials and information where they want it. Students do not have to wait a certain amount of time or go to one place to learn. With mobile learning, students are empowered to learn from where they want. They can use wireless mobile technology for learning where they can access learning materials. In this sense, smartphones, tablets, laptop computers, and other mobile devices are great opportunities for learning mobile to offer new and exciting educational experiences. Mobile learning focuses mainly on the development of mobile applications and software platforms used to create digital content in the form of digital textbooks for e-learners and access to educational resources through mobile devices [43–45].

2.9. Internet of things

The Internet of things (IoT) refers to a kind of network that connects everything with the Internet based on prescribed protocols, through information-sensing equipment that conduct

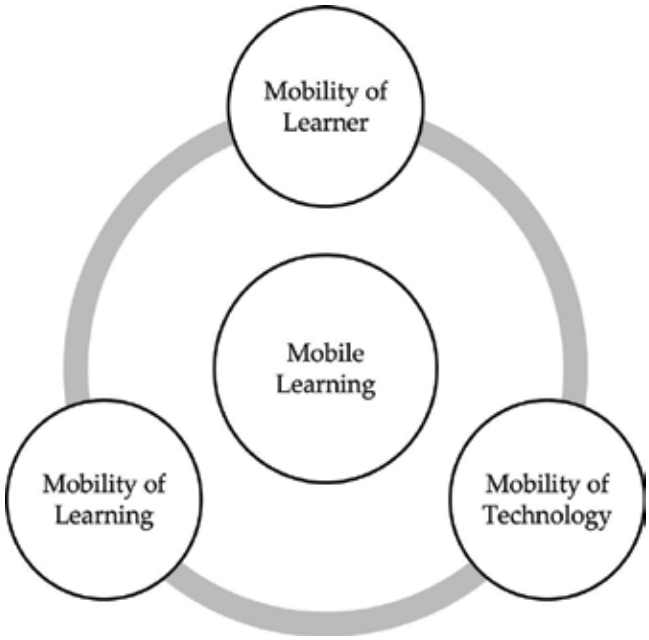

Figure 6. The three concepts of mobile learning [42].

information exchange and communication to provide intelligent recognition, positioning, monitoring, and management. With the advent of the Internet of things (IoT), Internet connections now extend to the physical objects that are not computers in the classical sense and actually serve many other purposes [46, 47].

The purpose of the Internet of things (IoT) is to ensure that things are connected to anything, any place, any person, any way/network, and any service in an ideal way. With the Internet of things (IoT), three main reasons are (1) a common understanding of users and devices, (2) software architects, and (3) distributed communication networks for processing and communicating where contextual information is relevant, providing analytical tools aimed at autonomous and intelligent behavior. With these three main reasons, intelligent connection and context sensitive calculation can be realized. The convergence of wired and wireless control, communications and information technologies that connect many new technologies, various subsystems, and those operating under a jointly managed and intelligently controlled platform is concerned with the Internet of things (IoT) (**Figure 7**) [48–50].

2.10. Online videos

Considering the increase in online education, it is important that students have easier access to video content and user familiarity. It is about the participation and use of video content and achievements of students and instructors in video environments. Online videos have the same content and subject matter as lesson conferences, labs, assignments, and

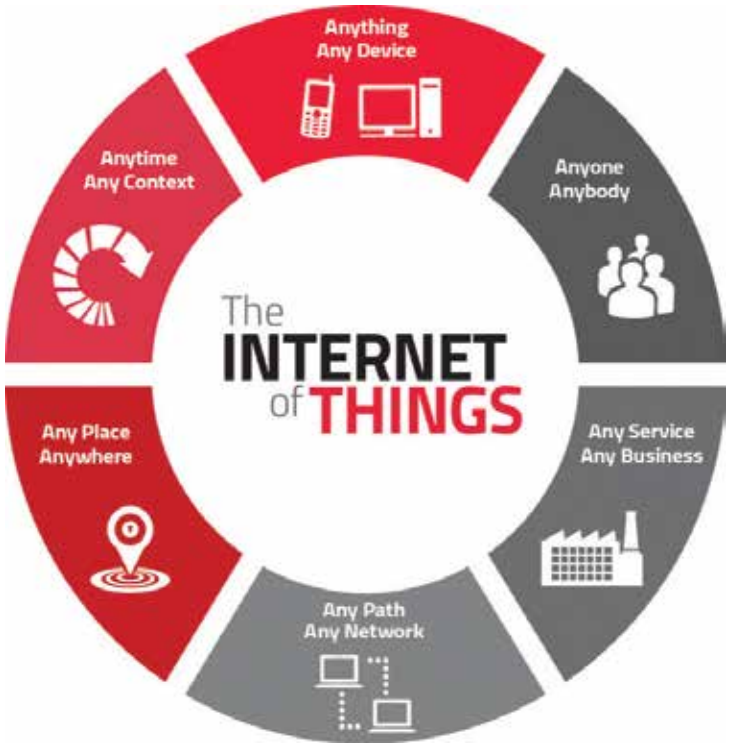

Figure 7. Internet of things (IoT) [51].

exams. In addition, online videos are portable so that a student can connect at anytime. The student can work at this rate at the speed of individual learning. Course processing method is slower and step by step than classroom courses [52, 53]. Video material can be used to enhance learning resources by showing real-life scenarios, explaining concepts, observing social groups, and acting as triggers for discussion. They can also bring learners' expertise and perspectives into their learning experience and inspire them to debate and learn by bringing them to life [54].

Although the impact of video and multimedia technologies on educational output is an ongoing research area, the pedagogical impact of a video can be summarized in three basic concepts [55]:

1. Interaction with content (the student is interested in visual content, orally, taking notes or thinking or applying concepts).
2. Engagement (the student is connected to the visual content, whether it is voluntary or real time, drawn by the video).
3. Knowledge transfer and memory (student concepts can be better remembered and retained in other teaching contexts).

3. Conclusion

This study tried to give information about the current status of e-learning. Although the concept of e-learning has become a new concept in the field of education, it has made rapid progress. In addition to the rapid progress of e-learning, many new concepts have also gained a lot of literature. These concepts are listed in this study as follows: artificial intelligence, micro credential, big data, virtual and empowered reality, blended learning, cloud e-learning, gamification, mobile learning, Internet of things, and online video. These new e-learning trends are explained in this study. In addition, the innovations provided by learners to e-learning environments are explained.

Each of the e-learning environments comes to the forefront with its different features. These concepts are included in the literature under different study titles. But looking at the literature, it is seen that the new trends in e-learning progress step by step. Each new trend actually supports the e-learning environment. For example, with blended learning, online learning and classroom learning are taught. In this way, learners' perception of their learning functions in the most appropriate environment is ensured [56, 57]. Cloud e-learning environment is used to support e-learning environments. e-Learning environments enable identity management, services, data security, application, and resources to be controlled [58]. New e-learning trends are new concepts that support e-learning with different features in this way. These concepts will quickly take place in education in the coming period.

Researchers in the field of new trends in e-learning can conduct research on ten new topics mentioned. Theoretically, more theoretical studies are observed. So, researchers can be found working in the field of application. New trends support each other as explained in this study. That is why researchers can work with new trends together in a related way. For example, gamification and virtual and empowered reality can work together. Or, artificial intelligence and micro credential issues can work together. It is thought that collaborative work to be done in this way may be more effective. In the new era, researchers can suggest that new e-learning environments should be addressed in education rather than in class applications of e-learning.

Author details

Fatih Çağatay Baz

Address all correspondence to: fatihcagataybaz@gmail.com

Osmaniye Korkut Ata University, Turkey

References

[1] Epignosis LLC. E-Learning Concepts, Trends, Applications. 2014. Available from: https://www.talentlms.com/elearning/

[2] Childs S, Blenkinsopp E, Hall A, Walton G. Effective E-learning for health professionals and students barriers and their solutions. A systematic review of the literature findings from the HeXL project. Health Information and Libraries Journal. 2005;**22**(2):20-32

[3] Park SY. An analysis of the technology acceptance model in understanding university students' behavioral intention to use e-learning. Educational Technology & Society. 2009;**12**(3):150-162

[4] Welsh ET, Wanberg CR, Brown KG, Simmering MJ. E-learning: Emerging uses, empirical results and future directions. International Journal of Training and Development. 2003;**7**(4):245-258

[5] Georgiev TS, Georgieva E, Smrikarov A. M-learning – A new stage of e-learning. In: International Conference on Computer Systems and Technologies. Rousse, Bulgaria. 17-18 June 2004

[6] Aslan O. New way of learning: E-learning. Fırat University Journal of Social Science. 2006;**16**(2):121-131

[7] Andriessen J, Sandberg J. Where is education heading and how about AI? International Journal of Artificial Intelligence in Education. 1999;**10**:130-150

[8] Russell SJ, Norvig P. Artificial Intelligence A Modern Approach. Upper Saddle River, New Jersey: Prentice-Hall, Inc. and Pearson Education, Inc.; 1995

[9] Ziaaddini M, Tahmasb A. Artificial intelligence handling through teaching and learning process and it' s effect on science – Based economy. International Journal on Soft Computing, Artificial Intelligence and Applications (IJSCAI). 2014;**3**(1):1-7

[10] Woolf BP, Lane HC, Chaudhri VK, Kolodner JL. AI grand challenges for education. Intelligent Learning Technologies, AI Magazine. Special Issue. 2013:1-22

[11] Kose U, Arslan A. E-learning experience with artificial intelligence supported software: An international application on English language courses. GLOKALde. 2015;**1**(3):61-75. ISSN 2148-7278

[12] Moursund D. Brief Introduction to Educational Implications of Artificial Intelligence. 2006. Available from: http://darkwing.uoregon.edu/~moursund/ Books/AIBook/index.htm

[13] TutorialsPoint. Artificial Intelligence. 2015. Available from: https://www.tutorialspoint.com/artificial_intelligence/artificial_intelligence_tutorial.pdf

[14] Priest N. Digital Badging and Micro-Credentialing. 2017. Available from: http://bostonbeyond.org/wp-content/uploads/2016/06/Digital_Badging_Paper_NMEF.pdf

[15] Staub D. Micro credentials, digital badges-motivating students and reshaping vocational education. In: 2nd International Vocational Education and Training Symposium in Higher Education. Ankara. 12-14 October 2017

[16] Moraine K. Micro Credentials, Personalizing the Learning of KM Educators. 2017. Available from: https://www.kmsd.edu/cms/lib/WI01919005/Centricity/Domain/240/KMSD%20MC_Flyer.pdf

[17] Demonte J. Micro-Credentials for Teachers What three Early Adopter States Have Learned So Far. American Institutes for Research. 2017. Available from: https://www.air.org/sites/default/files/downloads/report/Micro-Creditials-for-Teachers-September-2017.pdf

[18] West DM. Big data for education: Data mining, data analytics, and web dashboards. Governance Studies at Brookings. Washington: The Brookings Institution; 2012. https://www.brookings.edu/wp-content/uploads/2016/06/04-education-technology-west.pdf

[19] Daniel B. Big data and analytics in higher education: Opportunities and challenges. British Journal of Educational Technology. 2015;**46**(5):904-920. https://onlinelibrary.wiley.com/doi/pdf/10.1111/bjet.12230

[20] Prakash BR, Hanumanthappa M, Kavitha V. Big data in educational data mining and learning analytics. International Journal of Innovative Research in Computer and Communication Engineering. 2014;**2**(12):7515-7520

[21] Bienkowski M, Feng M, Means B. Enhancing Teaching and Learning Through Educational Data Mining and Learning Analytics: An Issue Brief. U.S. Washington, D.C.: Department of Education Office of Educational Technology; 2012

[22] Drigas AS, Leliopoulos P. The use of big data in education. International Journal of Computer Science Issues. 2014;**11**(5):58-63

[23] Mayer-Schönberger V, Cukier K. Learning with Big Data the Future of Education. Boston, New York: An Eamon Dolan Book Houghton Mifflin Harcourt; 2014

[24] Monahan T, McArdle G, Bertolotto M. Virtual reality for collaborative E-learning. Computers & Education. 2008:1339-1353

[25] Papagiannakis G, Argento E, Baka E, Maniadakis M, Trahanias P. A virtual reality brainwave entrainment method for human augmentation applications. Foundation for Research and Technology – Hellas (Forth) Institute of Computer Science. 2015

[26] Pantelidis VS. Reasons to use virtual reality in education and training courses and a model to determine when to use virtual reality. Themes in science and technology. Education. 2009;**2**(1-2):59-70

[27] Gutierrez JM, Mora CE, Diaz BA, Marrero AG. Virtual technologies trends in education. EURASIA Journal of Mathematics Science and Technology Education. 2017;**13**(2):469-486

[28] Staker H, Horn MB. Classifying K-12 Blended Learning. Innosight Institute; 2012. pp. 1-17. https://www.christenseninstitute.org/wp-content/uploads/2013/04/Classifying-K-12-blended-learning.pdf

[29] Aborisade PA. Blended learning in English for academic purposes courses: A Nigerian case study. In: Tomlinson B, Whittaker C, editors. Blended Learning in English Language Teaching: Course Design and Implementation. London: British Council; 2012

[30] Watson J. Blended Learning: The Evolution of Online and Face-to-Face Education from 2008-2015. International Association for K-12 Online Learning. 2015. https://www.inacol.

org/wp-content/uploads/2015/07/iNACOL_Blended-Learning-The-Evolution-of-Online-And-Face-to-Face-Education-from-2008-2015.pdf

[31] Sharma L, Dangwal KL. Blended learning: An innovative approach. Universal Journal of Educational Research. 2017;**5**(1):129-136. DOI: 10.13189/ujer.2017.050116

[32] Bath D, Bourke J. Getting Started with Blended Learning. Griffith Institute for Higher Education; Griffith University, Australia. 2010

[33] Blended Learning Solutions, Swift e-Learning Services. 2017. Available from: http://www.swiftelearningservices.com/blended-learning-solutions/

[34] Riahi G. E-learning systems based on cloud computing: A review. In: The 2015 International Conference on Soft Computing and Software Engineering (SCSE 2015). California: University of California, Berkeley; 2015. pp. 352-359

[35] El-Ala NSA, Awad WA, El- Bakry HM. Cloud computing for solving E-learning problems. International Journal of Advanced Computer Science and Applications. 2012; **3**(12):135-137

[36] Khaleel M, El-Bakry HM, Saleh AA. Developing e-learning services based on cache strategy and cloud computing. International Journal of Information Science and Intelligent System. 2014;**3**(4):45-52

[37] Deterding S, Khaled R, Nacke L, Dixon D. Gamification: Toward a definition. In: Conference: CHI 2011 Gamification Workshop Proceedings. Vancouver BC, Canada. 7-12 May 2011

[38] Nicholson S. Exploring the endgame of gamification. In: Fuchs M, Fizek S, Ruffino P, Schrape N. Rethinking Gamification. Meson Press; 2014. pp. 289-303

[39] Zichermann G, Cunningham C. Gamification by Design. Canada: O'Reilly Media, Inc; 2011

[40] Schwartz M. Instructional Design and Research Strategist. Learning & Teaching Office; 2017. Available from: http://www.ryerson.ca/lt

[41] Glover I. Play as you learn: Gamification as a technique for motivating learners. In: Herrington J, Couros A, Irvine V, editors. In: Proceedings of World Conference on Educational Multimedia, Hypermedia and Telecommunications; 2013. Chesapeake, VA: AACE (1999-2008); 2013

[42] El-Hussein MOM, Cronje JC. Defining mobile learning in the higher education landscape. Educational Technology & Society. 2010;**13**(3):12-21

[43] Ally M. Mobile Learning Transforming the Delivery of Education and Training. Edmonton: AU Press; 2009

[44] McQuiggan S, Kosturko L, McQuiggan J, Sabourin J. Mobile Learning: A Handbook for Developers, Educators, and Learners. North Carolina: SAS Institute Inc.; 2015

[45] Shuler C, Winters N, West M. The Future of Mobile Learning Implications for Policy Makers and Planners. Paris: United Nations Educational Scientific and Cultural Organization; 2013

[46] Patel KK, Patel SM. Internet of things-IOT: Definition, characteristics, architecture, enabling technologies, application & future challenges. International Journal of Engineering Science and Computing. 2016;**6**(5):6122-6131

[47] Macaulay J, Buckalew L, Chung G. Internet of Things in Logistics. Troisdorf: DHL Customer Solutions & Innovation; 2015

[48] Vermesan O, Friess P, Guillemin P, Sundmaeker H, Eisenhauer M, Moessner K, Gall FL, Cousin P. Internet of things strategic research and innovation agenda. In: Vermesan O, Friess P, editors. Internet of Things – Converging Technologies for Smart Environments and Integrated Ecosystems. Aalborg-Denmark: River Publishers; 2013. pp. 7-151

[49] Gubbi J, Buyya R, Marusic S, Palaniswami M. Internet of things (IoT): A vision, architectural elements, and future directions. Future Generation Computer Systems. 2012; **29**(7):1-28

[50] Mohammed ZKA, Ahmed ESA. Internet of things applications, challenges and related future technologies. World Scientific News. 2017;**67**(2):126-148

[51] Internet of Potatoes, Hot Internet Topics. 2017. Available from: https://www.pei.com/2016/08/internet-of-potatoes/

[52] Draus PJ, Curran MJ, Trempus MS. The influence of instructor-generated video content on student satisfaction with and engagement in asynchronous online classes. MERLOT Journal of Online Learning and Teaching. 2014;**10**(2):240-254

[53] Brecht HD. Learning from online video lectures. Journal of Information Technology Education: Innovations in Prectice. 2012;**11**:227-250

[54] DLF Teaching Development Team. Using Audio and Video for Educational Purposes. 2014. Available from: http://www.deakin.edu.au/__data/assets/pdf_file/0003/179013/Modules_1-4_Using_audio_and_video_for_educational_purposes-2014-02-28.pdf

[55] Greenberg AD, Zanetis J. The Impact of Broadcast and Streaming Video in Education. Wainhouse Research; 2012. https://www.cisco.com/c/dam/en_us/solutions/industries/docs/education/ciscovideowp.pdf

[56] Baz FÇ, Tetik E. The use of blended teaching model with adaptive online learning environment and student expectations. International Journal of Scientific and Technological Research. 2015;**1**(4):22-26

[57] Jeffrey LM, Milne J, Suddaby G, Higgins A. Blended learning: How teachers balance the blend of online and classroom components. Journal of Information Technology Education: Research. 2014;**13**:121-140

[58] Radenkovic B, Depotovic-Zrakic M, Bogdanovic Z, Vujin V, Barac D. Harnessing cloud computing infrastructure for E-learning services. Electronics and Energetics. 2014; **27**(3):339-357

Chapter 2

The Good, the Bad, and the Ugly of Distance Learning in Higher Education

Vimbi Petrus Mahlangu

Additional information is available at the end of the chapter

http://dx.doi.org/10.5772/intechopen.75702

Abstract

The chapter deals with opportunities and challenges of distance learning in higher education. One challenge comes from the changing perceptions of what learning is all about. The second challenge comes from new learning opportunities that technology now affords. Constructivism, interpretivism, and computing technology, separately and often together, have redesigned the conception of the challenges and opportunities of learning, and brought about new learning possibilities for almost all teaching and learning situations, including traditional classroom teaching, distance learning, and self-learning. Computer-supported learning environments could have good problems that will stimulate students to explore and reflect on their knowledge construction. Students who cannot afford higher education are discouraged from seeking or completing a degree. Distance learning-based programs could increase access for students to higher education, whereas open and distance-learning programs may be difficult to implement in the laboratory sciences, but they have real potential to maximize the use of technology.

Keywords: constructivism, interpretivism, computing technology, distance learning, self-learning, computer-supported learning

1. Introduction

The chapter will be dealing with challenges and opportunities of distance learning in higher education. The author has worked closely with students on distance learning for many years and became interested on how students deal with the challenges compared with the opportunities provided by distance learning. The major objective of this chapter is to investigate the opportunities and challenges of distance learning. In recent years, there has been an increasing interest in distance learning in higher education. In this chapter, the term information

communication technology (ICT) will be used and will include communication devises like radio, television, cellular phones, computers, and satellite system [1]. Again, all forms of learning/teaching through ICT will be referred to as e-learning. In distance learning, ICTs can be used in preparing and presenting lectures.

ICT is a tool that can be used in distance learning for addressing challenges in teaching and learning, a change agent, and a central force in economic competitiveness. Yusuf [2] view ICT as a change agent, when it catalyzes various other changes in the content, methods, and general quality of teaching and learning, thereby ensuring constructivist inquiry-oriented students. As a central force in economic competitiveness, it deals with economic and social shifts that have technology skills critical to future employment of today's distance students.

Previous studies have reported that students may use various technologies for e-learning in their chosen settings, while some of the assigned technologies may sometimes be neglected in favor of their own mobile technologies. Whereas technologies-in-practices are seen to be changeable over time as students' knowledge, experiences, contexts, and technology itself might undergo changes through human action [3]. Although extensive research has been carried out on open distance learning, no single study exists which deals about the good, the bad and the ugly of distance learning in higher education. The chapter is divided into seven parts. The first part deals with introduction; the second part deals with method; the third part deals with the good of distance learning in higher education; the fourth part deals with opportunities of distance learning; the fifth part deals with the bad and the ugly of distance learning in higher education; the sixth part deals with challenges facing distance learning; and the seventh part will be the conclusion.

2. Method

An overview of literature review was used as a method in compiling the chapter because it promotes an understanding of the focus area and the criticisms that have been made on the topic [4]. It helps in finding research gaps, bringing scattered pieces of information together, and refining the research topic to an understandable level [5]. In this chapter, constructivism should be understood as a continuum with diverse and overlapping views of "reality," "knowledge," "teaching," and "learning." Constructivism as a theory of knowing assumes that there is no fixed body of truths from the real world that are found by scholars and consequently transmitted to learners [6]. The information need to be interpreted to make sense of what the scholars have found.

2.1. The good of distance learning in higher education

Traditionally, the chapter argues that studying part time while continuing to work can assist students to apply their learning directly to their professional environment [7]. To be able to integrate mobile technology effectively into learning practices will depend on aspects that are related to humans (students and instructors), design (content and technologies), and institutions (policies and strategies) [3]. There are, however, other possible explanations that online

instruction can provide to higher education distinctive opportunities. Online instruction can direct learners through a framework that can also lead to the desired outcomes in a manner that it can encourage best practices [8].

In the twenty-first century, technological learning is expected to include digital literacies, collaboration, complex communication, and systems-thinking skills, among others. In order to be in line with online learning, higher education institutions are expected to offer courses and platforms that support the use of multidimensional abilities and skills and the use of media and technology as supportive systems in higher education [9]. In general, there are three formats that ought to be followed in delivering courses, namely distance learning (DL), face-to-face (F2F), and hybrid (H) learning. There are seven principles for good practice that can be used in distance learning for higher education. These principles for good practice can be divided into the following, namely: encourages student-faculty contact; encourages cooperation among students; encourages active learning; gives prompt feedback; emphasizes time on task; communicates high expectations; and respects diverse talents and ways of learning [8]. These guidelines represent a philosophy of quality distance-learning education that can be widely used for both face-to-face courses and online learning.

Distance learning can benefit universities because it can bring an element of flexibility in the learning process by the use of technologies, and interdisciplinary approaches to teaching and learning. The use of technologies and interdisciplinary approaches are key factors in distance education in higher education. The advantage of technology in distance learning is that students can watch lectures before coming to class and engage in more interactive activities in the class. They can also collaborate with other students and rely on the instructor as a facilitator rather than a lecturer. It also allows for a consistent delivery of content, because online videos can be prerecorded and shared with the rest of the class online [10] as in [9] and in [11]. e-Learning has the possibility to support learning processes, collaboration, flexibility, and the distribution of education and training, as well as evaluation of content and skill in distance learning. A key issue to the successful use of e-learning and blended learning is the combination of educational competence with contextual understanding into a strategy, of how to use digital educational methods [12]. For example, in Finland, previously, the open universities were more often used by young matriculated students who had not gained a study place at a "proper" university; but nowadays, students are more often adults in professional positions who want to enhance their qualifications, skills, and competences via e-learning by enrolling in web-based courses. Another example, in Greece, distance learning offers students the opportunity to combine family life and work with education. ICT-based distance education is good because it is flexible.

e-Learning, despite its virtual nature, its provision, if it is to be perceived as being of quality, it ought to ensure that it neither ignores the physical (i.e., the appearance of learning resources, personnel, and communication materials), or temporal student needs (i.e., a willingness to help learners and provide prompt service) [13]. It is good for the elimination of face-to-face training and development costs both in monetary terms as well as in terms of productivity loss, as learners spend time away from their daily activities and jobs in order to participate in the face-to-face training sessions. e-Learning courses are available 24/7, location independent, and provide effective and efficient training means for learners in geographically dispersed areas and across time zones [11].

2.2. Opportunities of distance learning in higher education

This section is dealing with the opportunities of distance learning in higher education. Opportunities to undertake continuing professional development through distance-learning education remain limited. Distance learning via e-learning can be able to offer a solution, providing opportunities for distance-learning students to further their education while applying new knowledge and skills directly to their practice [7]. e-Learning is a relatively new phenomenon and relates to the use of electronic media for a variety of learning purposes that range from add-on functions in conventional lecture rooms to full substitution for the face-to-face meetings by online encounters [14]. Some students may require digital literacies to participate successfully in everyday life increasingly mediated by technologies. To offer relevant learning experiences in distance learning, lecturers need to develop new skills and knowledge about technologies. Importantly, they should rethink their pedagogies and move beyond using technology as a "fancy typewriter" and a presentation tool. It can be a challenge for lecturers and they may need appropriate professional training [15].

Therefore, distance is not a defining characteristic of e-learning. If students' ICT competencies can be improved and their attitude to online learning influenced to be more positive, distance education in higher education can be used as a tool to increase the range of students who can be involved in distance education [16]. It is presumed that some postgraduate students may prefer online courses owing to their distinctive advantages, such as lower tuition fees, adjustable speed of study, and greater cultural diversity [17]. It is believed that learning at a distance mode in higher education can be as effective as a traditional face-to-face mode learning. Distance learning students can be able to care for their families and incorporate instruction on online courses and this can afford them the opportunity to work while they are raising their family and pursuing their full-time jobs. Distance learning can also benefits students because of flexibility about when and where they can engage in their learning [18].

ICTs can create opportunities for distance-learning institutions to provide distance-learning platforms, which can make it possible for many students situated far from the centers of learning to educate themselves. e-Learning is very important in recent years because it can enable e-learning opportunities that have not been previously available to distance-learning students. Moreover, the use of e-learning systems can provide great opportunities for learning for individual students globally, such as helping in educating and providing training opportunities on different topics from focused educational programs to general hobbies [19].

Generally, it is believed that e-learning was designed for purposeful and disciplined students, because there is no direct contact with the lecturer, which may increase the demand for them to work independently. Distance learning in higher education can teach students skills and competencies of developing professional skills such as the skill of self-study, the ability to plan and organize, time management skills, the ability to solve problems, to take responsibility, to work under pressure, and to be creative and initiative [20]. Understanding that distance learning gives everybody an opportunity to develop these social qualities, which are undoubtedly necessary for modern professionals, e-learning is key for students' success in distance learning. Education of adults appears to be burdensome for the family budget and therefore inadmissible for some families.

Distance learning is one of the most financially affordable and viable forms of education. Adult students generally have many responsibilities connected with their responsibilities due to time and other constraints in their personal life [21]. These responsibilities significantly reduce their opportunity to study both in a foreign country and in another city. Distance education allows them to mitigate these challenges. Distant students suffer to a much lesser extent from cultural, psychological, social, and economic difficulties connected with learning in a distant mode because the pursuit of knowledge is undertaken for its own sake, rather than as an obligation [21].

Distance learning institutions can apply technologies to allow human interactions through the web and promote a self-regulated learning process. Using technology in distance learning can help in crossing boundaries of space and time for lifelong learning. Distance learning can enable flexible/customized ways of education for every learner despite constraints [10]. In online and blended education environment, the types of interactions may include asynchronous online forums, synchronous textual and audio/video chatting, email, and phone conversations, which can afford students the opportunity to share brief profiles, including a photo [22]. e-Learning can also provide unique prospects for building a sense of community engagement among online students in distance learning. Online technology must be able to increase opportunities for students to access higher education, increase retention rates, and increase learning quality, and to result in good outcomes for students. e-Learning in distance higher education has the potential to make different support material available, interaction possibilities, response to the challenges posed by the globalized world, flexibility, reduction in travel costs, and environmental impact [23].

Individuals that have good soft skills, along with technical knowledge, will always be preferred candidates when prospective employers are looking at candidates to employ. It is possible to teach and practice soft skills through an e-learning program [10]. The structure of distance learning can give adult learners the maximum possible control over the time and "pace" of their education. Distance learning is one of the most financially affordable forms of education. Another advantage that can be associated with distance learning in higher education is academic mobility. Distance learning institutions must know that adult students can have many responsibilities connected with their work or families [24]. Therefore, the provision of distance education must be able to allow them to fulfill their responsibilities with ease.

2.3. The bad and the ugly of distance learning in higher education

This section argues that technology can have challenges with connectivity and the use of ICT can be a challenge for some distance-learning students. There is an increasing concern that some students in distance learning are being disadvantaged because of various challenges. It is a widely held view that the pressure for making distance-learning universities more accountable is a worldwide phenomenon, and academics and these institutions around the world are expected in responding to this mounting pressure. In addition, the mounting pressure can develop a complex and thoughtful set of theory-based models that can be tested empirically and used as part of a formative evaluation of distance learning [25].

Students may drop out in higher education because of those employers who may prevent them from studying, such as forcing them to work overtime, and students having no time for study. In such cases, the students' own motivation is not sufficient to prevent them from

dropping out [21]. There are different barriers that can hinder students' access and success in higher education—for example, situational and social barriers. Situational barriers are those barriers that can hinder students' access to higher education, because these learners may drop out because they are unable to cover the costs of their training. Being a busy worker and a student at the same time, some students may not be permitted to join a course, or an employer may not let them learn for higher degrees, and develop their competences. Family responsibilities may also prevent adult learners from actively participating in higher education [21]. The use of modern communications technology in distance learning can easily attract a younger generation than traditional forms of training [21]. Social barriers and administrative barriers can be a challenge for students. This can be a challenge especially if students do not know the best method to communicate with lecturers or what their progress is in a course or module [26].

Education research shows the importance of the community education sector to employment outcomes, given that so many distance-education students come from disadvantaged backgrounds and use technology to access education [27]. New technologies combined with the changing transnational education landscape can give rise to new partnership types and models, creating innovative opportunities in the market, and inevitably more competition.

New technology and online provision can create a market for content providers. This means that the dimensions and scope of international education provision can be transformed with the emergence of new education providers such as publishers, content aggregators and distributors, and professional bodies who can contribute to the diversification of transnational education [28]. e-Learning systems are becoming critical platforms for distance-learning institutions and for general lifelong learning by students [19]. e-Learning is becoming more important in recent years because it can enable e-learning opportunities that have not been previously available to distance-learning students. Moreover, the use of e-learning systems can provide great benefits for individuals worldwide, especially in helping to educate and provide training on different topics from focused educational programs, to general hobbies [19].

2.4. Challenges facing distance learning in higher education

The main purpose of this section is to develop an understanding of the challenges facing distance learning in higher education. The higher education landscape is undergoing significant change because of technological innovations. In addition, the use of various educational technologies has advanced significantly over the past few decades. It is now a common practice to find technology-enhanced learning in many higher learning institutions all over the world [29]. The high cost of information and communication infrastructure, and the dearth of technical expertise are another challenges in distance learning [1].

There are major challenges that are experienced by distance-learning higher education institutions [1], namely:

1. The lack of appropriate business models and educational models, making the study material or open contents developed difficult to follow, and as a result, reducing the enthusiasm of learners in their respective studies;

2. The lack of any clear quality assurance mechanism, which may result in unclear standards and by consequence, poor quality of distance education; and
3. The lack of support from the relevant governing bodies, which may be exhibiting poor participation, brought about by a lack of appropriate human and infrastructure capacity.

Workers with ICT skills are not adequate in South Africa according to the 2011 Joburg (Johannesburg) Centre for Software Engineering (JCSE) Skills Survey, which found that there was a need for 20,000–30,000 ICT-skilled workers amounting to 10–15% of the total ICT workforce. A reason for the lack of skilled ICT personnel is that universities are not graduating enough numbers of graduates with the right levels of technical skills to enable, grow, and competitively position businesses in the African markets [30]. e-Learning is needed in distance learning because it can be inferred that a tremendously large amount of workload is involved in the overall working of an open distance-learning environments, and therefore, it is very difficult to work manually and by referring to school files only [1].

Technology can be used as a tool and it must be utilized only to remove the barriers and challenges present in the distance-learning settings. ICT can provide opportunities to complement on the job training and continuing education for students in a convenient and flexible manner. Use of ICTs in distance education requires major shift in the way content is designed and delivered. New technologies should not be imposed without enabling lecturers and students to understand these fundamental shifts [31]. Given the busy professional life of distance-learning students, with inherent challenges in having to take time off work and to be away from their home commitments, it will not be easy for them to attend taught courses that require them to be away from workplace and home [32]. In this instance, computing technology will be an ideal solution to deal with the challenges of distance learning. ICT often reduces face-to-face interaction among students, which is one reason for the high dropout rates in distance education [33]. In distance-learning marginalized students, for example, the impaired and the economically disadvantaged ones may be further excluded from educational practices when ICT is used. Some students may not afford the use of technology if it is not free or subsidized. These students are also often unable to use the ICT due to institutional failures to comply with legal and technical requirements for impaired students. There is a growing concern that distance learning is compromising the quality of education partly because one of the key challenges is lack of appropriate interaction practices [6]. This is particularly true for international distance students, who encounter, among other issues, culture-dependent social interaction differences in virtual learning environments, which may discourage them from succeeding in or even completing their online courses.

Distance learning institutions generally may face a wide range of strategic, operational, and financial risks from both internal and external sources, which may prevent them from achieving their objectives. Conflicts can also arise in an open distance-learning environment, because there is significant complexity in their structure and the pattern of governance [11]. Governors in distance-learning environments are expected to infuse e-learning in their policies so that lecturers can be supported by policy in using ICT. The lack of appropriate infrastructure for enabling the use of ICT for distance learning in higher education can be a serious challenge. Again, the cost efficiency of an ICT is another aspect that is important that determines its

growth. Language, technology, and culture (knowledge, beliefs, arts, morals, laws, customs, and any other capability and habit acquired by a human being as a member of the society) can easily obstruct the assimilation of ICTs by many distance-learning institutions [34].

Technology is rapidly changing, making it difficult for distance-learning institutions and students to keep pace. With the increasing diversity of the student population, it is vital to identify practices that can better equip students to utilize technology in ways that will promote learning, development, and success for all students [35]. In some distance-learning institutions, technologies used to deliver distance-education programs are typically one way (noninteractive) [36]. The growth of any communication technology and its applicability for distance learning depends largely on the degree to which policy-makers may recognize the importance of ICTs in promoting a knowledge-based society [34]. For example, those countries that have paid relatively little attention to ICT are lagging behind in the field of spreading distance learning using the latest technology. The low awareness of educational technology integration in distance learning can be a barrier to the integration of it in higher education. There are different factors that may limit the use of technology in distance higher education. Some of the limiting factors to the integration of educational technology in distance learning are electricity and power distribution [29].

There are some institutional challenges that can affect distance learning in higher education institutions. Some of these challenges that must be noted in higher education pertaining may be related to the following issues, namely: (a) quality assurance plans are often too broad and not favorable to distance-learning settings; (b) lecturers tend to have a "passive resistance" to getting involved; (c) some lecturers that facilitate distance-learning programs have not been provided enough special training on the delivery of open and distance-learning practices; (d) time restraints for lecturers appear to be a challenge that ought to be overcome along with the development of a common institutional approach to distance learning; (e) shortage of tools and technologies that enable scalability; (f) lack of financial sustainability models; (g) lack of committed and qualified cadre of quality assurors and experts with the relevant distance-learning qualifications [4].

There are different barriers to distance learning in higher education that is unique to each and every country. For example, in Finland, there are challenges that are related to: (a) costs (there is a challenge of the high cost involved in network connections); (b) lack of feedback and support (students do not get enough personal support); (c) lack of face-to-face meetings; (d) isolation; (e) insufficiency in self-directed learning; (f) family and work responsibilities; (g) difficulties in network connections; (h) change in one's life situation; (i) difficulties with technology; (j) lack of support from employer, and (k) lack of education [21].

Also, in Germany, the perceived challenges to distance learning are related to the following: namely: (a) costs; (b) lack of feedback and support; (c) lack of face-to-face meetings; (d) isolation; (e) lack of adjusted programs, and (f) lack of formal regulations [21].

On the other hand, in Greece, distance learning has the following challenges, namely: (a) difficulties with technology; (b) negative image of distance-education programs; (c) negative learning experiences; and (d) absence of a system for recognition of prior learning and work experiences [21].

http://dx.doi.org/10.5772/intechopen.75702

On the contrary, in Hungary, distance learning is influenced by (a) cost factors; (b) difficulties with technology; (c) lack of relevant course content; (d) negative learning experiences; (e) insufficient self-directed learning skills, and (f) negative image of distance-education programs [21]. Lastly, in the United Kingdom, distance learning is expected to deal with the following challenges, namely: (a) costs (compared to increased higher education fees—otherwise seen as general advantage); (b) doubt about return on investment; difficulties with technologies; (c) family and work responsibilities; (d) lack of support from employer; and (e) disability [21]. The use of technology can also constitute a barrier in distance learning.

Technical challenge is one of the most important challenges facing the adoption of e-learning in some distance-education institutions. For example, a study conducted at Open University of Tanzania found low level of Internet connectivity and insufficient number of computers were factors influencing the adoption of e-learning in distance learning [37]. Regardless of similarity in African countries, there is also some diversity in infrastructure and technology adopted in terms of availability and accessibility. It was found that low technology level was not a barrier to adopt e-learning especially in African countries such as Kenya, Uganda, and South Africa [37].

Access to computers is another challenge especially the availability of computers for lecturers as instructors and to students during working hours. For example, in developing countries, most of the students and instructors will not acquire their own computer. Difficulty in access to computer will negatively affect the acceptance of technology. It has been reported that unequal access to online learning can lead to inequality among the socioeconomic groups within a society [37].

Some lecturers as instructors in higher education may have a language barrier because of the lack of knowledge, experience, and training in using technology to design online courses, and even unable to use the technology available in distance learning [37]. The rapid growth in the web application requires security for identity management [37]. Therefore, to prevent your web and information available from the foreign attack, an antivirus program must be used. The attitude of a lecturer as an instructor toward e-learning can be a barrier depending on the culture and technological knowledge of the lecturers and students [37]. For example, if an instructor sticks to traditional education instead of using e-learning due to culture or the lack of awareness about e-learning, it can minimize the use of technology in distance education.

On the other hand, some instructors may be afraid of losing control and quality of teaching if they use e-learning. Again, the attitude of lecturers as instructors toward e-learning is an important element that must be considered in using technology in distance learning in higher education [37]. This means that, in providing distance learning in higher education must not differ from ordinary education. Eye contact is a very crucial factor in education but this factor can be limited in e-learning environment because lecturers may be unable to observe the emotions of students and cannot predict their satisfaction which puts burdens on them and make students respond differently toward e-learning [37]. e-Learning should be used to enhance teaching and learning in distance learning.

Distance-learning organizational support of the educational process that depends on the availability and convenience of the administrative system and staff can be a challenge for some

students. The abovementioned challenge may be connected with the accuracy and timeliness of the information provided to the students. Another challenge for distance learning in higher education can be the problem of how the content of the course or module meets the expectations of students oriented on getting the opportunity of career growth, personal and professional development on the basis of distance learning. Other challenges of distance learning can be related to the psychological state of students. Among others, this can include: (a) problems caused by the lack of direct contact between student and lecturer; (b) problems associated with feeling of alienation and isolation from the student community; and (c) problems associated with anxiety and concerns regarding the education process and learning results [24].

3. Conclusion

To minimize the challenges experienced by distance learning, e-learning should be encouraged. Infrastructure can be updated by introducing modern technology, fast Internet connection, continuous power supply, security, regular maintenance, and efficient administration of distance learning. Distance-learning universities should provide a computer lab equipped with sufficient number of computers and connected with fast Internet. Lecturers and students should also have skills and confidence to use electronic equipment, and to have the necessary knowledge about the method in which the information is delivered. Technology can also be used to improve the quality of traditional education rather than changing the methods of instruction. Lastly, e-learning should be supported in distance learning because it can help learners to have access to education irrespective of distance.

Author details

Vimbi Petrus Mahlangu

Address all correspondence to: mahlavp@unisa.ac.za

Department of Educational Leadership and Management, College of Education, University of South Africa (UNISA), Pretoria, Republic of South Africa

References

[1] Martey A. ICT in distance education in Ghana. Library Hi Tech News. 2004;**21**(5):16-18

[2] Yusuf MO. Information and communication technology and education: Analysing the Nigerian national policy for information technology. International Education Journal. 2005;**6**(3):316-321

[3] Viberg O, Grönlund Å. Understanding students' learning practices: Challenges for design and integration of mobile technology into distance education. Learning, Media and Technology. 2017;**42**(3):357-377

[4] Mahlangu VP. Professional development of adult learners through open and distance learning. In: Renes SL, editor. Global Voices in Higher Education. Croatia: Intech; 2017. DOI: 10.5772/intechopen.68818

[5] Yawar SA, Seuring S. Management of social issues in supply chains: A literature review exploring social issues, actions and performance outcomes. Journal of Business Ethics. 2017;**141**:621-643

[6] Tan C. Constructivism and pedagogical reform in China: Issues and challenges. Globalisation, Societies and Education. 2017;**15**(2):238-247. DOI: 10.1080/14767724.2015.1105737

[7] Corlett J, Martindale L. Supporting capacity building in health service provision in Eritrea via distance learning master's programmes: The challenges and rewards. International Review of Research in Open and Distributed Learning. 2017;**18**(5):1-14

[8] Baldwin SJ, Jesús T. Evaluation instruments and good practices in online education. Online Learning. 2017;**21**(2):1-19. DOI: 10.24059/olj.v21i2.913

[9] Vasquez-Colina MD, Russo MR, Lieberman M, Morris JD. A case study of using peer feedback in face-to-face and distance learning classes among pre-service teachers. Journal of Further and Higher Education. 2017;**41**(4):504-515

[10] Bell S, Douce C, Caeiro S, Teixeira A, Martín-Aranda R, Otto D. Sustainability and distance learning: A diverse European experience? Open Learning: The Journal of Open, Distance and e-Learning. 2017;**32**(2):95-102. DOI: 10.1080/02680513.2017.13196382017

[11] Wong A. The importance of e-learning as a teaching and learning approach in emerging markets. iJAC. 2007;**10**(1):45-54

[12] Sonesson L, Boffard K, Lundberg L, Rydmark M, Karlgren K. The challenges of military medical education and training for physicians and nurses in the Nordic countries—An interview study. Scandinavian Journal of Trauma, Resuscitation and Emergency Medicine. 2017;**25**(38):1-10

[13] Uppal MA, Ali S, Gulliver SR. Factors determining e-learning service quality. British Journal of Educational Technology. 2017:1-15. DOI: 10.1111/bjet.12552

[14] Guri-Rosenblit S. "Distance education" and "e-learning": Not the same thing. Higher Education. 2005;**49**:467-493

[15] Tour E. Teachers' self-initiated professional learning through personal learning networks. Technology, Pedagogy and Education. 2017;**26**(2):179-192

[16] Owusu-Boampong A, Holmberg C. Distance education in European higher education—The Potential, Report 3 (of 3) of the IDEAL (Impact of Distance Education on Adult Learning) project. Project number: 539668-LLP-1-2013-1-NO-ERASMUS-ESIN. Norway: International Council for Open and Distance Education; 2015

[17] Damary R, Markova T, Pryadilina N. Key challenges of on-line education in multi-cultural context. Procedia—Social and Behavioral Sciences. 2017;**237**:83-89

[18] Stephens ML, Coryell J, Pena C. Adult education-related graduate degrees: Insights on the challenges and benefits of online programming. In: Adult Education Research Conference [Internet]. 2017. Available from: http://newprairiepress.org/aerc/2017/papers/25

[19] Levy R. The e-learning skills gap study: Initial results of skills desired for persistence and success in online engineering and computing courses. In: Proceedings of the 12th Chais Conference for the Study of Innovation and Learning Technologies: Learning in the Technological Era; 2017. pp. 57E-68E

[20] Markova T, Glazkova I, Zaborova E. Quality issues of online distance learning. In: 7th International Conference on Intercultural Education "Education, Health and ICT for a Transcultural World," EDUHEM 2016; 15-17 June 2016; Almeria, Spain; Procedia—Social and Behavioral Sciences. Vol. 237. 2017. pp. 685-691

[21] Arasaratnam-Smith LA, Northcote M. Community in online higher education: Challenges and opportunities. The Electronic Journal of e-Learning. 2017;**15**(2):188-198

[22] Moreira JA, Reis-Monteiro A, Machado A. Higher education distance learning and e-learning in prisons in Portugal. Media Education Research Journal. 2017;**51**(XXV):39-49

[23] Katoch S, Doan V, Dadashi N. User centred e-learning, opportunities and challenges: A literature review. In: Dron J, Mishra S, editors. Proceedings of E-Learn: World Conference on E-Learning in Corporate, Government, Healthcare, and Higher Education; Vancouver, British Columbia, Canada: Association for the Advancement of Computing in Education (AACE); 2017. pp. 933-942. Available from: https://www.learntechlib.org/p/181288 [Accessed: November 23, 2017]

[24] Pozdnyakova O, Pozdnyakov A. Adult students' problems in the distance learning. Procedia Engineering. 2017;**178**:243-248

[25] Melguizo T, Zamarro G, Velasco T, Sanchez FJ. The methodological challenges of measuring student learning, degree attainment, and early labor market outcomes in higher education. Journal of Research on Educational Effectiveness. 2017;**10**(2):424-448. DOI: 10.1080/19345747.2016.1238985

[26] Jackson P. Perspectives on Addressing Challenges And Lessons Learned in Engaging Online Students. Technology, Colleges & Community Worldwide Online, [S.I.]. Feb 2017. Available from: https://tccpapers.coe.hawaii.edu/index.php/tcc/article/view/10 [Accessed: November 21, 2017]

[27] Perlgut D. The Role of Community Education in Australian Regional and Rural Economic Development. Community Colleges: Australia; 2017. pp. 1-38

[28] Henderson M, Barnett R, Barrett H. New developments in transnational education and the challenges for higher education professional staff. Perspectives: Policy and Practice in Higher Education. 2017;**21**(1):11-19. DOI: 10.1080/13603108.2016.1203366

[29] Mtebe JS, Raphael C. A decade of technology enhanced learning at the University of Dar es Salaam, Tanzania: Challenges, achievements, and opportunities. International Journal of Education and Development using Information and Communication Technology (IJEDICT). 2017;**13**(2):103-115

[30] Khanna P. A conceptual framework for achieving good governance at open and distance learning institutions. Open Learning: The Journal of Open, Distance and e-Learning. 2017;**32**(1):21-35. DOI: 10.1080/02680513.2016.1246246

[31] Odero JO. ICT-based distance education, a study of university students' views and experiences in early post-apartheid South Africa [Academic Dissertation for the Degree of Doctor of Philosophy]; 2017. International and Comparative Education at Stockholm University to be defended on Monday 12 June 2017 at 10.00 in rum 2403, institution for pedagogic och didaktik, Frescativagen 54

[32] Pawar MN. The importance of ICT for quality education in developing India. Vidyabharti International Interdisciplinary Research Journal (Special Proceeding Issue). In: Proceeding of One Day State Level Seminar on The Role of ICT in Quality Education on April 20, 2017. pp. 16-19

[33] Sharma A, Halawa A, Bridson JM, Prescott D, Guha A, Strivens J, Taylor D. Implementation of critical threshold concept in clinical transplantation: A new horizon in distance learning. World Journal of Educational Research. 2017;**4**(2):301-312

[34] Asiimwe EN, Grönlund Å, Hatakka M. Practices and challenges in an emerging m-learning environment. International Journal of Education and Development using Information and Communication Technology (IJEDICT). 2017;**13**(1):103-122

[35] Rajesh M. A study of the problems associated with ICT adaptability in developing countries in the context of distance education. Turkish Online Journal of Distance Education—TOJDE. 2003;**4**(2):1-10

[36] Mouza C. Strengthening the impact, novelty and diversity of research on technology and teacher education. Contemporary Issues in Technology and Teacher Education. 2017;**17**(2):154-159

[37] Usun S. Factors affecting the application of information and communication technologies (ICT) in distance education (a case study of Turkey). Turkish Online Journal of Distance Education—TOJDE. 2004;**5**(1):1-16

Chapter 3

Improving Student Success Rate in Open Distance Learning Settings through the Principle of Constructive Alignment

Shuti Steph Khumalo

Additional information is available at the end of the chapter

http://dx.doi.org/10.5772/intechopen.75637

Abstract

Statistics indicate that participation and access to higher education (HE) improved drastically, particularly through distance education. Despite the generosity of the massification of HE, a sizeable number of students do not complete their programs on record time. The majority of some of these students drop out. A convincing body of knowledge demonstrates that a plethora of factors contributes toward low student success rates in open distance learning (ODL) contexts. The main purpose of this conceptual argument is that technology-mediated constructively aligned pedagogical practices in ODL contexts can leverage student success rates. This chapter is qualitative and constructivist in nature and largely draws from the theory of constructive alignment and extant scholarship analysis to provide insights and understanding in improving students' graduation rates in ODL settings. Drawing from the theory of constructive alignment, in this conceptual argument, it can be concluded that aligning the activities of the pedagogical practices (teaching, assessment, and learning outcomes) and delivering them through information and communication technology promotes students' graduation rates.

Keywords: open distance learning, constructive alignment, student success rates, technology-mediated pedagogical practices, ODL settings

1. Introduction

Most countries in the world prioritized the agenda to expand enrolments in HE through aggressive policy changes. The UN [1] contends that "Higher education (HE) across the world is in a state of change, quickly shifting from being the privilege of an elite few to

mass participation, providing equal access to affordable and quality university education for all women and men, which is a global goal for 2030". Supporting this view, Tsiplakides [2] declares that HE has experienced a significant expansion in many countries and this resulted in the massification of this critical societal sector. Learning in higher education (HE) is accessed through different modes including distance, full time, or part time. Nitecki [3] maintains that the universities that provide open distance learning (ODL) programs rely on technology to make higher education more accessible to students.

The phenomenon of Open and Distance Education is made possible by the advent of technological discoveries, which impact heavily on the mode of curriculum delivery. The challenge to the agenda of wider HE participation is whether the massive student enrolments are translated into success rates or are just statistics of wider HE participation. There are a number of factors that contribute toward low students' success rate. These factors include the following: students' underpreparedness and lack of contact with lecturers and working students [4]. This chapter does not intend to disregard some of the fundamental factors that are contributing to low success rates of students, but its focus is on the assumption that an ODL constructively aligned and technology-mediated teaching can improve students' success rates. The principles of constructive alignment have long been promoted as powerful approaches to facilitating enhanced student outcomes [5]. A number of sections constitute this chapter. In the next section, I explore what open and distance learning entail, and then the concept of constructive alignment will be theorized. The rest of the discussions include the following sections: perspectives on students' success rates in ODL contexts, benefits of students' success rates, the need for constructively aligned and technology-driven ODL curriculum, designing teaching strategies and assessment strategies, and finally the intended learning outcomes for improved student success rates.

2. Describing open and distance learning

Tuition in open and distance learning contexts is conducted differently from face-to-face higher education settings. The economic challenges facing countries are impacting HE participation negatively and demand interventions which will enhance participation and success in HE sector. Manzoor [6] argues that the introduction of open and distance learning universities was regarded as a groundbreaking option in expanding access to higher education. Open and distance education is critical in ensuring that socioeconomic challenges facing the majority of countries of the world are alleviated.

The advent of ODL settings marked an error that is distinct from the traditional Higher Education provision. Open and distance learning is usually contrasted with conventional or face-to-face education, which may be described as the form of education which takes place in a classroom or an auditorium [7, 8]. In ODL settings, students receive tuition away from the physical structure of the institution [9], and this is a distinguishing feature between full-time learning and distance learning. Agiomirgianakis et al. [10] define distance education as any educational process in which all or most of the teaching is conducted by someone geographically removed from the learner, with all or most of the communication between teachers and learners being

http://dx.doi.org/10.5772/intechopen.75637

conducted through electronic or print mediums. Allen and Seaman [11] define distance education as "that which uses one or more technologies to deliver instruction to students who are separated from the instructor and to support regular and substantive interaction between the students and the instructor synchronously or asynchronously". Teaching in ODL "encompasses a broad range of teaching, coaching, mentoring and monitoring activities that guide students through their courses, mediating the packaged learning materials and facilitating the learning process [12]". ODL settings by their nature provide learning opportunities to students who are mature and working and who are unable to acquire access education in full-time, contact, and campus-based institutions [13].

According to Chawinga and Zozie [14], ODL is the type of teaching and learning which does not include face-to-face interaction between the student and the lecturer, and Chawinga and Zozie [14] further argue that the main objective of introducing ODL is to provide education to those students who are geographically distanced from the lecturers. Anderson and Dron [15] contend that since ODL started operating decades ago, distance education experienced different changes, and to these scholars, distance education can be classified into three distinct generations. According to Biggs [16], "the first generation of distance education technology was by postal correspondence, this was followed by a second generation, defined by the mass media of television, radio, and film production. Third-generation distance education introduced interactive technologies, first audio, then text, video, and then web and immersive conferencing."

Flowing from the assertions above, largely, teaching in an ODL context should not be traditionally pedagogical but also technological driven due to the nature of these institutions. This will help in improving students' graduation rate. In view of the above and given the nature of the distance instruction, Biggs [16] advocate for a distance education that is technologically mediated in order for it to reach students who are detached from the real classroom and also breach a gap between them and their teachers.

3. Theorizing constructive alignment

Cain et al. [17] are the advocates of the principles of constructive alignment. The principles of constructivism to teaching were critical when the theory of constructive alignment was formulated. Cain et al. [17] identified two critical important concepts of the constructive alignment theory, namely constructivism and alignment. According to them, the former concept relates to students giving meaning to what they are learning through relevant learning activities and the latter deals with what the teachers are doing. Constructive alignment uses constructivism as a guiding philosophy [18]. Theorists who believe in constructivism view knowledge as a human construction, which denotes the combination of constructivist learning theories and the curriculum that is aligned [18]. Biggs [19] believes in the motto: "It is what the student learns that counts". The constructive alignment theory represents the idea that students should know in advance what is entailed in their learning, how they should learn, and how they are going to be tested in their learning [20, 21]. Cain and Babar [21] further argue that these principles advocate for teaching designed to involve students in learning activities,

teaching that optimizes the chances of student success, with the assessment tasks which are designed to enable clear findings as to how well learning outcomes have been attained [20].

Demuth [22] contends that the constructive alignment theory is a model of teaching that combines constructivist learning theory and aligned instruction design that intends to improve learning. According to Biggs [23], the main concepts of constructive alignment are learning objectives, learning activities, and assessment tasks. Tadesse et al. [24] postulate that the priority thing in the constructive alignment process is the development of intended learning outcomes. To them, teachers should first clarify and define learning outcomes, then describe teaching approaches and activities that will help to achieve the outcomes and ensure that what is being taught is directly linked to what students are expected to learn. The final step is to develop assessment strategies and activities linked to both teaching strategies and learning outcomes. When the elements of teaching such as learning outcomes, teaching, and assessment strategies are not linked, Tadesse et al. [24] describe such an education system as a poor education system.

Teachers through their engagement have to create learning opportunities that have to enable students to create meaning in their learning. The teaching activities decided upon should support the achievement of the learning outcomes. In the next section, it shall be argued that the constructively aligned learning outcomes, teaching and assessment strategies should be taught through technology to help achieve high student success rate.

Figure 1 (attached as appendix) represents the application of the principles of constructive alignment in ODL contexts. The figure also provides a picture of how pedagogy can be mediated through technological advances such as computers platforms such as laptops, tablets, and cell phones. The figure demonstrates a relationship of these constructive and collaborated pedagogical

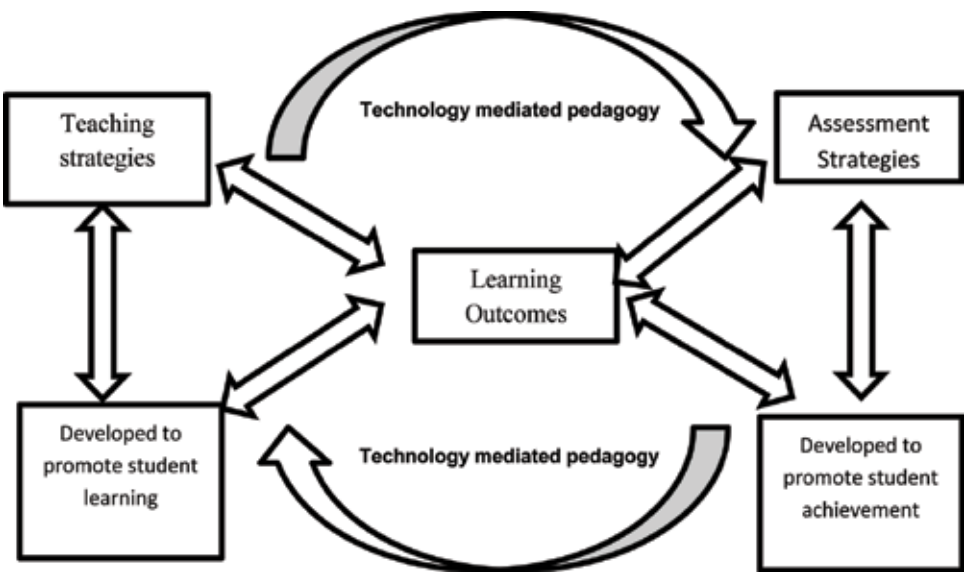

Figure 1. Constructively aligned and technology-mediated pedagogical practices (Adapted from Victoria University of Wellington, (2015) and modified).

http://dx.doi.org/10.5772/intechopen.75637

practices, which promote student graduation rates. Teaching strategies and assessment methods are both designed in a manner that student learning and achievement is promoted.

4. Technology-enabled open and distance learning

The use of Information and Communication Technology (ICT) in ODL institutions is critical in helping improving students' graduation records. Tadesse et al. [24] contend that the use of ICT enhances learning and the organization and the management of learning institutions. Tadesse et al. [24] further argue it is in teaching essential to the progress and development of both teachers and students. Englund et al. [25] maintain that over the last 25 years, educational technology in Higher Education (HE), particularly ODL, has been promoted as having the potential to transform teaching and learning. Adding their views on the importance of technology in HE, Ramdass and Masithulela [26] and Farah [27] are of the view that the advent of the digital era has brought with it very important changes in various aspects of the education system, and it is very difficult to provide tuition to students in ODL environments without the practice of technology and this creates an atmosphere which Farah et al. [27] refer to as the "digital disconnect." Technological advances have radically transformed the way in which education is delivered and received in HE institutions, particularly in ODL settings. Using technological platforms such as smart phones, tablets, and eBooks promote wider participation in HE ODL institutions and provides students with opportunities to understand their learning. Seconding this assertion, Kalelo-Phiri and Brown [28] are of the view that "Open and Distance Learning (ODL) in the form of print, radio/audio or video helps to reach out to learners who do not only experience geographical barriers but time barriers also."

In this chapter, it can be argued that the creation of an environment in which pedagogical practices are aligned and delivered to students through enhanced technology can improve students' success rates in ODL settings. Employing technological platforms such as e-resources constitutes effective learning and teaching tools that help overcome barriers in ODL environments [29]. Research indicates that advances in technologically based approaches enhance tuition in higher education sectors [29]. As argued earlier, students who study in ODL institutions are geographically distanced from the physical environment and the academics. Because of the nature of ODL institutions, tuition is largely dependent on technology-driven platforms and systems that mediate teaching. To this end, there should be an effort in mediating pedagogical practices within a collaborated context. Put simply, to improve the students' success rates, pedagogical practices based on the principles of constructive alignment in ODL contexts should be technology collaborated and driven. The change in curriculum delivery requires ODL staff members to reconsider the manner in which they teach their students. They have to be technology literate to help students achieve their objectives.

5. Perspectives on student success rates in ODL contexts

As argued earlier, open distance education has grown exponentially over the past few years. Credible research statistics on the students' success rates constantly paint a shocking and

uncomfortable picture in the HE sector throughout the world. This happens despite the sectors' efforts of providing opportunities of success to all students [30]. There is an abundance of empirical evidence on the factors that contribute toward low students' success rates [31]. The challenges and the complexities that face HE institutions, especially those that are related to the graduation rates are huge, and Mattie [32] points out that "HE environment continues to be complex, with increasing expectations about performance." Student success rate is understood and described differently by different scholars. Nitecki [3] describes student success rate as the process where students successfully complete their qualifications such as a degree. In this chapter, students' success is described as the ability of HE through ODL mode to help students graduate or complete the programs they are enrolled for in a stipulated time, for example, finishing a three-year qualification within specified record time.

The pass percentage rate at HE, particularly in ODL, is alarming [33]. Brock [34] laments that "although access to higher education has increased substantially over the past forty years, student success as measured by persistence and degree attainment, has not improved at all." Upholding and adding to the viewpoint above, Agiomirgianakis et al. [10] claim that "despite substantial government funding incentives, numerous policy initiatives and well-intentioned institutional efforts, retention and success rates remain extremely poor." Leadership in ODL settings have a huge responsibility and are under pressure to ensure that constructively aligned instruction opportunities are created and technologically mediated to boost the academic achievements of students.

Doley [35] is of the view that students who now participate in HE through ODL system have increased, but despite such growth, ODL institutions continue to face low student graduation rates because some of the enrolled students do not complete their qualifications within regulated specifications and some drop out of the system. Credible empirical research findings conducted by organizations such as UNESCO and UNICEF paint a gloomy picture of matters related to the students' graduation rates across the continents. What makes matters worse is the fact that ODL institutions do not only face low students' pass rates but the majority also drops out from the system. Figures supplied by Van Stolk et al. [36] supported by UNESCO [37] show a sturdy increase in enrolments, and the numbers recorded were above 170 million. Unfortunately, statistics continue to show that despite this increased participation, the majority of these students do not complete their qualifications and some drop out from the system.

The main argument advanced in this chapter is that when teaching and assessment strategies in ODL settings are aligned and students are provided with opportunities to construct their own meaning through appropriate technology, the intended learning outcomes are achieved and result in the promotion of the graduation rates of students. Biggs and Tang [38] are of the view that some HE staff members associate the decline of academic standards with intellectual abilities of today's students. Adding their voices to these debates, Tremblay et al. [39] postulate that "in the context of massive expansion of higher education systems and wider participation, there are persistent concerns related to the quality and relevance of students' preparation for higher education." In the next section, this chapter focuses on the benefits of students' success.

http://dx.doi.org/10.5772/intechopen.75637

6. Benefits of student success rates

An education system that aims at producing high quality graduates assists in solving the challenges the world faces. The majority of countries face challenges, which are socioeconomic and political in nature. These current global socioeconomic and political challenges require a generation that is educationally enlightened, and hence, in 2000, 189 countries of the world came together to chart the strategy in an attempt to propose future solutions, and from that gathering, 59 sustainable development goals (SDGs) were identified. Though 59 sustainable goals have been identified, this section mainly focuses on the implications of improved student success rates on only three SDGs, namely the alleviation of poverty, decent work and economic growth, and industry, innovation, and infrastructure. The intention of HE is to produce the human capital that is able to respond to the societal needs [10]. Individuals who have attended universities become professionals and transformed because they are highly skilled and knowledgeable which is critical and helpful in the societies they come from. Through their skills, the communities they come from are economically advanced than communities with individuals who did not attend HE. The Sustainable Development Goals Report [40] maintains that "the objective of sustainable development goal number one is to ensure that people in every part of the world are given support that they need to lift themselves out of poverty in all its manifestations."

It can be argued that constructively aligned and technology-mediated pedagogical practices can help improve student success rates which can indirectly assist in the alleviation of poverty, particularly in most poverty-stricken countries. This constitutes the very essence of sustainable development. "The fundamental goal focuses on ending poverty through interrelated strategies, including the promotion of social protection systems, decent employment and the resilience of the poor [40]." One of the strategies beneficial to societies in alleviating poverty is through the provision of constructively aligned ODL and technology-mediated tuition. Once the majority of the poor receive education, they will be able to sustain themselves either through creating employment or finding employment in the job market.

HE is playing a fundamental role in the countries' economic improvement and development, and through educated graduates, sustainable growth is easy to achieve [41]. The British Council [42] also believes that the massification of HE is a major contributor toward national wealth and economic development. In supporting this assertion, Wood and Breyer [43] postulate that by "providing higher education opportunities to most students, governments adopt a human capital approach by investing heavily in higher education, believing that there are positive associations between higher education, transition to the labor market and economic growth." Further, Wood and Breyer [43] maintain that the fundamental reason for the establishment of HE is mainly for the production of workforce that is adequately capacitated to firstly benefit the individual, secondly the communities, and thirdly the economies of the world. According to Mirowsky and Ross [44], holding a university qualification means status and prestige and improves the socioeconomic positions of individuals.

Industrialization is also critical in the absorption of human capital that is produced through constructively aligned and technology-driven mediated ODL curriculum. Wong [45] supported by Baumol [46] is of the view that "the production of adequate industrialists and graduates who are innovation driven by Higher Education through ODL settings is critical in achieving the goal focusing on industry, innovation and infrastructure." Improved graduation rates are critical in helping in the achievement of sustainable development goals. The British Council [42] claims that the quality of graduates who are produced by HE lacks requisite industrial knowledge needed to boost business performance and confidence. University education provides students with an opportunity to achieve innovative skills that are needed in maintaining sustainable development. Wang [41] contends that universities play a critical role in the training of technically talented graduates for local economic development and innovation and entrepreneurship education. In the next section, the need for designing constructively aligned ODL curriculum shall be explored.

7. Rethinking ODL curriculum development: the need for constructively aligned and technology-driven ODL curriculum

This section provides insights and understanding in the development of constructively aligned and technology driven open and distance education curriculum. The notion curriculum encompasses a number of educationally related aspects, in this chapter without ignoring other critical aspects of this concept; the focus is on the learning outcomes, teaching and assessment strategies. In designing a curriculum in ODL settings, designers should always apply the principles of constructive alignment [7, 8]. Developing a fit-for-purpose curriculum requires the designers to think of the nature and the contexts in which ODL institutions operate. This involves selecting appropriate technology [47] that will enhance students' success rates because technology in ODL settings has proven to be of great help to both students and lecturers [48]. The purpose of using technology in ODL curriculum is to provide opportunities for students to master the content to improve their graduation rates.

In improving the graduation rates at ODL institutions, it is very important to reconsider teacher development. ICT training should constitute the critical part of teacher development and training because introducing technology in education will change the manner in which teaching and learning takes place. The millennial generation understands better when technology becomes part of their studies. Curriculum developers should take into cognizance that for tuition to be effective, the principles of constructive alignment and technology-driven pedagogical practices constitute part of the process because Tadesse et al. [24] postulate that the use of Information and Communication Technology (ICT) can be beneficial for the pedagogy in ODL systems. Supporting the assertion, Henderson et al. [47] contend that "digital technologies currently form an integral feature of the university student experiences and as such, academic research has understandably focused on the potential of various digital technologies to enable, extend and even 'enhance' student learning." For this reason, in this chapter, it is argued that constructively aligned teaching, learning, assessment and using appropriate technological tools improves the graduation rates of students.

http://dx.doi.org/10.5772/intechopen.75637

8. Designing teaching strategies, assessment strategies, and learning outcomes for improved students' success rate

8.1. Learning outcomes

Learning outcomes are foundational, and poorly developed learning outcomes defeat the purpose and the rationale of the program and contribute toward high failure rate. Learning outcomes are foundational in the sense that they predict the kind of teaching and assessment strategies that are supposed to be developed. They also provide opportunities for students to develop their capabilities [49]. It is therefore critical that in designing, defining, and specifying learning outcomes, critical analysis of the nature and the context of ODL be taken into consideration. Designing effective learning outcomes should not be detached from developing the teaching and assessment strategies. This means that the process should not be an isolated process where the three components involved in constructive alignment are individually formulated. Learning outcomes should indicate the content that students are expected to know at the end of the lesson. The learning outcomes are written statements of what the students are expected to know, understand, and be able to do after completion of a learning unit [50]. The learning outcomes should be linked to the purpose and the rationale of the program and take into considerations the nature and mode of learning and teaching which is targeted at ODL students. In designing learning outcomes, developers should avoid crafting vague statements. "Good learning outcomes focus on the application and integration of the knowledge and skills acquired in a particular unit of instruction (e.g., activity, course program, etc.), and emerge from a process of reflection on the essential contents of a course" [51, 52]. According to Centre for Teaching Support and Innovation [53], the following characterizes good learning outcomes: they should be "smart, meaning manageable, applicable, realistic, time-bound, transparent, and transferable. Technological consideration is very critical in the design of learning outcomes [27]".

8.2. Teaching strategies and activities

Developing well-designed components of pedagogical practices such as teaching and learning strategies is very critical, particularly in ODL settings. These teaching strategies and activities should be guided by the learning outcomes that have been defined from the beginning. Teaching, learning, and assessment strategies should be demonstrated by appropriate activities that are intended to help students achieve well-defined learning outcomes. Teaching in an ODL environment is conducted differently from ordinary universities or other institutions of higher learning because as indicated earlier, students are not full time in classes. They are geographically detached from the classes. It is critical that teaching in these contexts take into account that the environments in which learners find themselves differ, they face different challenges and barriers, and because of that, teaching should employ different approaches and strategies that will make learning easier. In their pedagogical practices, teachers should always bear in mind the principles of technology-driven and constructive-alignment curriculum.

8.3. Assessment strategies and activities

Assessment is critical in ODL curriculum [54]. In administering assessment, academics must ensure that the process enhances students' learning experiences and their academic achievement. Assessing students forms an important part of teaching and learning process. It also assists in the identification of the weakness in the teaching process, and the areas which needs improvement. "Assessment also helps students to become more self-regulated, reflexive, independent individuals with the skills to exercise high-level assessment on their own and others' work that enhances lifelong learning" [54]. Cain and Babar [21] identify the following benefits of assessment: making the difference to student motivation, informing students' future study choices, providing a means of measuring the effectiveness of the module content and teaching methods, and providing information to teachers to help facilitate quality assurance and improvement. Cain and Babar [21] are of the view that assessment feedback is critical in constructive alignment and helps students understand their progress. Sadler [49] contends that "assessment should not be poorly designed, should not be ambiguous, should be interpreted the same by different students, should be clearly spelt out and specified and its intentions should be to assist students achieve the intended outcomes." Poorly designed assessment tasks and activities contribute toward low student success rate. Evans et al. [54] point out that even though students might be able to escape the effects of poor teaching, they are unlikely to succeed in escaping the effects of poor assessment. Technology-driven assessment strategies and activities are critical in improving student success rates. Mafenya [55] believes that the use of technology supports assessment and also feedback. The technology tools that are selected in assessing students should not be barriers to students' achievements, and they should rather make it easier for students to understand what they have learnt.

9. Conclusion

This chapter has argued that designing a constructively aligned pedagogy and mediating it through technological tools in ODL settings improve students' success rate. In this chapter, it has been indicated that most of the countries of the world massified higher education through distance education. Yet, despite providing higher education services to the majority of students, there remains a challenge of international proportions of low student success rates. Various critical themes were explored, and among them were included the description of ODL settings, theorization of the principles of constructive alignment, technology enhanced ODL, perspectives on students' success rate, benefits of students' success rate and designing electronically mediated constructively aligned ODL curriculum. It was argued that constructively aligned and technologically mediated pedagogical practices can help improve students' success rates.

Author details

Shuti Steph Khumalo

Address all correspondence to: ekhumass@unisa.ac.za

University of South Africa, Republic of South Africa

References

[1] UN. Transforming Our World: The 2030 Agenda for Sustainable Development [Internet]. 2015. Available from: http://www.un.org/ga [Accessed: November 07, 2015]

[2] Tsiplakides I. Has the expansion of participation in higher education led to a decrease in socio-economic inequalities within it? The role of cultural and social capital. European Journal of Education Studies. 2017;**3**(8):250-261

[3] Nitecki EM. The power of the program: How the academic program can improve community college student success. Community College Review. 2011;**39**(2):98-120

[4] Zerquera DD. Ziskin M, Torres V. Faculty views of "Non-traditional" students: Aligning perspectives for student success. Journal of College Student Retention: Research, Theory & Practice. 2016

[5] Larkin H, Richardson B. Creating high challenge/high support academic environments through constructive alignment: Student outcomes. Teaching in Higher Education. 2013;**18**(2):192-204

[6] Manzoor A. Quality assurance in open and distance learning. Optimizing Open and Distance Learning in Higher Education Institutions. 2017;**195**

[7] Holmberg C. International Council for Open and Distance Education, IDEAL Project [Internet]. 2013. Available from:http://www.uil.unesco.org. [Accessed: October 30, 2017]

[8] Unesco. Open and Distance Learning: Trends, Policy and Strategy Considerations [Internet]. (2002a). Available from https://unesdoc.unesco.org [Accessed: October 31, 2017]

[9] Subotzky G, Prinsloo P. Turning the tide: A socio-critical model and framework for improving student success in open distance learning at the University of South Africa. Distance Education. 2011;**32**(2):177-193

[10] Agiomirgianakis G, Serenis D, Tsounis N. A distance learning university and its economic impact in a country's peripheries: The case of Hellenic Open University. Operational Research. 2017;**17**(1):165-186

[11] Allen E, Seaman J. Distance Learning Compass: Distance Education Enrolment Report 2017 [Internet]. 2017. Available from: https://onlinelearningsurvey.com [Accessed: October 31, 2017]

[12] Unisa, University of South Africa Open Distance Learning Policy [Internet]. 2008. Available from: https://www.unisa.ac.za [Accessed: November 01, 2017]

[13] Ngubane-Mokiwa SA. Implications of the University of South Africa's shift to open distance e-learning on teacher education. Australian Journal of Teacher Education (Online). 2017;**42**(9):111

[14] Chawinga WD, Zozie PA. Increasing access to higher education through open and distance learning: Empirical findings from Mzuzu University, Malawi. The International Review of Research in Open and Distributed Learning. 2016;**17**(4)

[15] Anderson T, Dron J. Three generations of distance education pedagogy. The International Review of Research in Open and Distributed Learning. 2011;**12**(3):80-97

[16] Biggs J. Enhancing teaching through constructive alignment. Higher Education. 1996;**32**(3):347-364

[17] Cain A, Grundy J, Woodward CJ. Focusing on learning through constructive alignment with task-oriented portfolio assessment. European Journal of Engineering Education. 2017:1-16

[18] Biggs J. Aligning teaching for constructing learning. Higher Education Academy. 2003:1-4

[19] Biggs J. What the student does: Teaching for enhanced learning. Higher Education Research & Development. 2012;**31**(1):39-55

[20] Biggs J. Enhancing learning: A matter of style or approach. Perspectives on Thinking, Learning and Cognitive Styles. 2001:73-102

[21] Cain A, Babar MA. Reflections on applying constructive alignment with formative feedback for teaching introductory programming and software architecture. In: Proceedings of the 38th International Conference on Software Engineering Companion (ICSE-C' 16); 14-22 May 2016, Austin-TX, United Sates of America IEEE; 2016. pp. 336-345

[22] Demuth B. Constructive Alignment in Teaching Modelling; 2016

[23] Biggs J. Constructive Alignment in University Teaching. HERDSA Review of Higher Education. 2014;**15**:5-22

[24] Tadesse T, Gillies RM, Campbel C. Assessing the Dimensionality and Educational Impacts of Integrated ICT Literacy in the Higher Education Context. Australasian Journal of Educational Technology 2017;**34**(1):88-101

[25] Englund C, Olofsson AD, Price L. Teaching with technology in higher education: Understanding conceptual change and development in practice. Higher Education Research & Development. 2017;**36**(1):73-87

[26] Ramdass K, Masithulela F. Comparative analysis of pedagogical strategies across disciplines in open distance learning at Unisa. International Review of Research in Open Distance Learning. 2016;**17**(2):2-18

[27] Farah M, Ireson G, Richards R. Developing a predictive model for the enhanced learning outcomes by the use of technology. Imperial Journal of Interdisciplinary Research (IJIR). 2016;**2**(5):1205-1212

[28] Kalelo-Phiri D, Brown I. ICT-Enabled open and distance learning-its influence on career development and employability in least developed countries. Case of Malawi. In: Proceedings of the International Conference on Web-Based Learning (ICWL) 20-22 September 2017, Cape Town, South Africa. pp. 221-226

[29] Ng PL, Tan AK. Determinants of e-resource usage by open distance learning university students. Malaysian Journal of Library & Information Science. 2017;**22**(1):29-44

[30] Coates H, Kelly P, Naylor R. Leading online education for student success. International Journal of Chinese Education. 2017;**6**(1):105-126

[31] Goldrick-Rab S. Challenges and opportunities for improving community college student success. Review of Educational Research. 2010;**80**(3):437-469

[32] Mattie JA. Perspectives in Higher Education [Internet]. 2014. Available from: https://www.pwc.co.za [Accessed: October 11, 2017]

[33] Bound J, Lovenheim MF, Turner S. Why have college completion rates declined? An analysis of changing student preparation and collegiate resources. American Economic Journal: Applied Economics. 2010;**2**(3):129-157

[34] Brock T. Young adults and higher education: Barriers and breakthroughs to success. The Future of Children. 2010;**20**(1):109-132

[35] Doley RK. Distance education: Innovative and effective pedagogy. The Online Journal of Distance Education and e-learning. 2017;**5**(1):19

[36] Van Stolk C, Tiessen J, Clift J, Levitt R. Student Retention in Higher Education Courses, International Comparison. 2007. Available from: https://www.nao.org.uk [Accessed: October13, 2017]

[37] Unesco. Education for All. Is the World on Track? EFA Global Monitoring Report [Internet] (2002b) Available: from: https://unesdoc.unesco.org. [Accessed: October31, 2017]

[38] Biggs J, Tang K. Teaching for Quality Learning and at University. 4th ed. Maidenhead: Oxford University Press; 2011

[39] Tremblay K, Lalancette D, Roseveare D. Assessment of Higher Education Learning Outcomes. Feasibility Study Report; 1. 2012

[40] The Sustainable Development Goals Report [Internet]. 2017. Available from: https://unstats.un.org [Accessed: October 26, 2017]

[41] Wang P. Problems and Countermeasures of Innovation and Entrepreneurship Education in Application-Oriented Universities. 2017

[42] British Council. The Shape of Things to Come: Higher Education Global Trends and Emerging Opportunities to 2020 [Internet]. 2012. Available from: https://www.britishcouncil.rg/higher-education [Accessed: October 31, 2017]

[43] Wood LN, Breyer YA. Success in Higher Education. In: Success in Higher Education. 2017. pp. 1-19. Singapore: Springer

[44] Mirowsky J, Ross CE. Education, Social Status, and Health. Routledge; 2017

[45] Wong KY. Designs of open distance learning (ODL) education: A case of Malaysia industry-focused doctoral studies. The Online Journal of Distance Education and e-learning. 2017;**5**(2):14

[46] Baumol WJ. Education for innovation: Entrepreneurial breakthroughs versus corporate incremental improvements. Innovation Policy and the Economy. 2005;**5**:33-56

[47] Henderson M, Selwyn N, Aston R. What works and why? Student perceptions of 'useful'digital technology in university teaching and learning. Studies in Higher Education. 2017;**42**(8):1567-1579

[48] Marikar FM, Alwis K, Satharasinghe SN, Wickramasinghe DAP, Kariyawasam KKGGS. Effectiveness of using e-board for learning process in a developing country – Case study. The Online Journal of Distance Education and e-learning. 2017;**5**(1):25-34

[49] Sadler DR. Three in-course assessment reforms to improve higher education learning outcomes. Assessment & Evaluation in Higher Education. 2016;**41**(7):1081-1099

[50] Adamson L, Becerro M, Cullen P, González-Vega L, José Sobrino JJ. Ryan R Quality Assurance and Learning Outcomes. ENQA Workshop Report 17 [Internet]. 2010. Available from: https://www.enqa.eu [Accessed: October 12, 2017]

[51] University of Toronto. Characteristics of Good Learning Outcomes [Internet]. Available from: https://www.teaching.toronto.ca. [Accessed: October 12, 2017]

[52] Victoria University of Wellington. Programme and Course Design Handbook, Center for Academic Development [Internet]. 2015. Available from: www.victoria.ac.nz [Accessed: October 12, 2017]

[53] Centre for Teaching Support and Innovation. Characteristics of good learning outcomes [Internet]. 2017. Available from: www.teaching.utoronto.ca/teaching-support/course-design/developing-learning-outcomes [Accessed: November 02, 2017]

[54] Evans J, Jordan S, Wolfenden F. Developing academics' assessment practices in open, distance and e-learning: An institutional change agenda. Open Learning: The Journal of Open, Distance and e-learning. 2016;**31**(2):91-107

[55] Mafenya NP. Effective Assessment in Open Distance and e-learning: Using the Signature Courses at the University of South Africa as a Model for Future Practice [Thesis]. South Africa: University of South Africa; 2016

Chapter 4

Applying a Usability Technique in the Open Source Software Development Process: Experiences from the Trenches

Lucrecia Llerena, Nancy Rodriguez, Mayra Llerena,
John W. Castro and Silvia T. Acuña

Additional information is available at the end of the chapter

http://dx.doi.org/10.5772/intechopen.74862

Abstract

The growth in the number of non-developer open source software (OSS) application users has drawn attention to usability in the OSS community. OSS communities do not generally know how to apply usability techniques and are unclear about which techniques to use in each activity of the development process. The aim of our research is to determine the feasibility of applying the focus groups technique in the OSS ERMaster project. To do this, we participated as project volunteers. We used the case study research method to investigate technique application and OSS community participation. As a result, we identified adverse conditions that were an obstacle to the application of the original technique. We then adapted the technique to make it applicable in an OSS project. We can conclude that was not easy to recruit OSS users and developers to participate in technique application.

Keywords: open source software, usability techniques, requirements engineering, product concept development, focus groups

1. Introduction

Open source software (OSS) has spread so swiftly that it now rivals commercial software systems in terms of deployment [1]. Some OSS communities nowadays do not have processes in place to guarantee that, taking into account the features of this community as a whole, the developed software is good [2]. Shortcomings with respect to process, activity, task and technique definition in the field of OSS development has led researchers from different fields

to take an interest in this field of research and try to remedy the failings [3–5]. The growth in the number of non-developer OSS application users and the escalating use of these applications have created a need for and interest in developing usable OSS [6–10]. However, several authors have acknowledged that the usability of OSS is poor [6, 11, 12]. In this respect, the empirical study conducted by Raza et al. [7] reports that 60% of respondents (non-developer users) stated that poor usability is the main obstacle to be overcome by OSS applications if users are to migrate away from commercial software. On this ground, OSS projects must tackle their level of usability and usability-related problems more conscientiously [12].

On one hand, the human-computer interaction (HCI) field offers usability techniques whose key aim is to build usable software. However, they are applied as part of HCI methods and not within the OSS development process. On the other hand, the OSS development process focuses on source code and thus on feature development. The OSS development process has a number of characteristics (e.g., OSS community developers and users are geographically distributed, code-focused world view). This prevents many of the HCI usability techniques from being adopted directly [13]. Furthermore, these characteristics are not unique to OSS projects, they are also shared by projects carried out in distributed environments. However, our research's interest is focused on the OSS development process.

Even so, the OSS community has now started to adopt some usability techniques. Most of the techniques that the OSS community has taken on board are for evaluating usability [13]. Some usability techniques have been adapted ad hoc for adoption in OSS development projects [13]. This paper addresses the research problem of how to adopt the focus groups usability technique for requirements engineering activities as part of the development process of a real OSS project known as ERMaster[1].

Our research spans two areas: SE and HCI. We use usability techniques as a bridge to communicate these two areas, where our aim is to deploy HCI knowledge in the SE field and especially in the OSS development process. If adapted, usability techniques can be adopted in the OSS development process [13]. Therefore, this paper has two goals. Firstly, we intend to adapt the focus groups usability technique [14] for adoption in the OSS development process. Secondly, we aim to determine the feasibility of adopting this usability technique in a real OSS project.

Requirements engineering activities play a very important role in the success or failure of an OSS project. However, they are sometimes extremely hard to perform because there is no definition of OSS user segments before the software is developed. Also, it is far from straightforward to address all the requirements analysis activities due to the particular characteristics of OSS development groups. On this ground, this paper considers just the product concept development activity. Additionally, OSS projects have not adopted many usability techniques related to the requirements engineering and product concept development activities [13]. The next step after selecting the activity is to pick a related usability technique for adoption in the OSS development process. Our choice consisted of the focus groups usability technique to be incorporated to the OSS development process. It is important to mention that this

[1]https://sourceforge.net/projects/ermaster/?source=updater

research is part of a study where we are applying usability techniques related to the activities of Requirements Engineering in OSS projects, so for the case at hand we report the incorporation of the focus groups technique. This technique has been used to identify functionalities the users need and to improve interaction with the tool. With this technique we are not evaluating the usability of the User Interface because it is not the aim of our research.

The main reasons for the generally poor usability of OSS developments are: OSS developers have tended to develop software for themselves [4, 10] and the developer community is very much in the dark about who its users are [9, 11]. The aim of the focus groups technique is to gather information related to user opinions, problems and concerns at meetings scheduled for this purpose [13–15]. This technique helps to focus product concept design on its hypothetical functionality [14]. The focus groups technique requires a small research sample for the purposes of product evaluation. Consequently, the participation of just a few users is sufficient to represent the product concept model, that is, developers use this technique to discover a user's mental model of the product. On this ground, we selected the focus groups technique for adoption in an OSS project.

This paper makes a significant contribution to the field of SE and particularly to OSS development projects because we have not been able to identify papers reporting the use of the focus groups technique and detailing how it has been applied in OSS development projects [16, 17]. We used a case study as the research method to test the feasibility of our proposal for adopting usability techniques in OSS projects [18]. Consequently, we had to volunteer for the selected OSS project and join the community.

This paper is organised as follows. Section 2 outlines the state of the art. Section 3 illustrates the research method followed to apply the usability technique in an OSS project. Section 4 reports the proposed solution. Section 5 discusses the results. Section 6 reports the lessons learned. Finally, Section 7 outlines the conclusions and future research.

2. State of the art

There are papers in the literature reporting the usability evaluation of some OSS applications [19–21]. Assa et al. [19] studied the usability issues facing software developers using code analysers by evaluating one of the popular open-source static-code analysis tools. Al-Odan and Al-Daraiseh [20] conducted a thorough study, placing five of the most popular free and open source software tools side by side for comparison with respect to both user acceptance and technical specifications. Ternauciuc and Vasiu [21] tried to inventory existing methods for testing and improving usability, with a particular focus on e-learning platforms. However, usability technique definition and integration into OSS projects is a complicated process, which has not been researched at length [6, 22–25]. Existing papers suggest that usability techniques should be reconceptualized. However, they do not explain how the OSS community should go about adaptation. Nichols and Twidale [4] and Ternauciuc and Vasiu [21] are the only authors to put forward some general ideas for improving usability. However, the issues to be taken into account in order to adopt such techniques in OSS developments are unclear.

Usability technique definition and integration into OSS projects is a complicated process, about which there are few papers [6, 23–25]. These papers suggest that usability techniques should be reconceptualized, but they do not explain how the OSS community should go about adaptation. Nichols and Twidale [4] are the only authors to put forward some general ideas for improving usability. However, the issues to be taken into account to adopt such techniques in OSS developments are unclear.

In particular, very few studies have reported the application of the focus groups technique in OSS projects [23, 26, 27] In the study by Terry et al. [23], the focus groups technique was adopted with adaptations in various OSS projects (for example, in a desktop windows environment and in a desktop operating system). For the focus groups technique a usability expert meets the developers either in person or through Internet Relay Chat. These meetings are held periodically (weekly, monthly or annually) and their aim is that the applications or the designs proposed for a new functionality are evaluated by an expert in usability [23]. In this case, the OSS developers are the ones that participate in the Focus Groups, rather than the final users. In Semedo and colleagues' study [26], the participants replied to a questionnaire beforehand to assess their previous experience using the CLASS tool. This OSS application permits the recording, analysis and interpretation of respiratory sounds. The participants received a training session for the application. Two days later, they participated in a focus group session directed by the researchers to better understand their experience when interacting with the application. This focus group lasted approximately 20 minutes and was recorded on video. In Kolagani and colleagues' study [27] the authors developed the Watershed GIS OSS for the management of geographical information. In this study the focus groups technique is adopted with the aim of obtaining the requirements for both types of users (experts and common) of the tool. In the last two studies [26, 27] it is stated that the final users participated in the Focus Group sessions conducted by the researchers themselves.

Although research examining usability in OSS has been published [9, 23, 28, 29], there is no standardised procedure for determining how to adopt usability in OSS development. It appears to be less straightforward to integrate usability into the OSS development process than into commercial development projects due to some of the characteristics of the OSS community, like: (i) feature-centred development, (ii) worldwide geographical distribution, (iii) limited resources, and (iv) a culture that may be alien to interaction designers. Consequently, usability technique adoption is a demanding task because most HCI techniques are not designed for the type of environment in which OSS is developed [13].

In the wake of the literature review, we can say that only one of the research papers reports a general and systematic proposal for integrating usability techniques into the OSS development process [13]. To do this, it considers the particular characteristics, philosophy and idiosyncrasy of the OSS development process, without forfeiting the essence of usability techniques. Two systematic mapping studies (SMS) related to usability in OSS were conducted in advance of our research. A SMS reviews the literature on a particular field of interest [29]. The first SMS was conducted by Castro [13] reviewing papers published up until 30 July 2013. The second SMS was conducted with a search range from 1 August 2013 to 30 April 2015 [30] and later updated considering the 30 July 2017 as the final date.

Castro's work proposes an integration framework that can incorporate most usability techniques in OSS developments. It is important to clarify that this framework only proposes the general adaptations that must be made to the techniques. These adaptations depend on the requirements of the technique that cannot be satisfied by the way the OSS community works. Castro's research [13] was validated on only two OSS projects (OpenOffice Writer and FreeMind) and for three usability techniques (user profiles, direct observation and post-test observation). Therefore, Castro's proposal [13] requires further validation by adapting new usability techniques and participating in more OSS projects.

3. Research method

We used a case study as the qualitative research method to validate our research [31]. From a case study, we learn about the experiences of applying usability techniques adapted to OSS projects. This research method is used when the phenomenon under investigation (in this case, the adoption of an adapted usability technique) is studied within its real setting (in this case, an OSS project). OSS projects are the perfect setting for the case study reported here because OSS communities are generally uninformed about usability techniques, do not have the resources to test usability and cannot usually count on usability expert involvement [4, 9, 11]. Small project teams in particular have little information about what techniques are at their disposal for improving usability [6, 32].

The case study addresses the following research question (RQ): How to incorporate the focus groups technique in a real OSS project?

ERMaster, a graphical editing tool for entity-relation diagrams (ERD), was selected as the OSS project in which to adopt the focus groups technique. In this research, we first identified the obstacles to applying the focus groups technique in the ERMaster project. We then decided how to deal with the obstacles. Finally, we proposed the adaptations necessary to adopt the focus groups technique in this project.

We created web artefacts to improve communication with OSS community members and efficiently synchronise the necessary activities to apply the focus groups usability technique. The web artefact used to test the feasibility of the proposed technique was a forum. Forums are used in the focus groups technique to gather information and compile sketches related to the application user interface. Thanks to this web artefact, we were able to set up a virtual meeting point with OSS users who are geographically distributed all over the world.

4. Proposed solution

In this section, we describe the focus groups usability technique applied in an OSS project. Firstly, we describe the case study design. Secondly, we specify the characteristics of the selected OSS project. Thirdly, we describe the selected usability technique as prescribed by HCI. We then introduce the adaptations made to the focus groups technique for application in an OSS project. Finally, we report the results of applying this usability technique.

4.1. Case study design

Case studies are one of the most popular forms of qualitative empirical research [33]. A case study investigates the phenomenon of interest in its real-world context. The phenomenon of interest for this research is the adoption of usability techniques with adaptations, whereas the real-world context is OSS projects. It is not easy to run controlled experiments in the field of OSS because the characteristics of OSS communities (for example, age, availability, expertise, experience, etc.) are unmanageable. Since not all OSS project team members have the same characteristics, it is impossible to minimise the effects of external factors (for example, geographic distribution and time differences). This rules out evaluation by means of an experiment. On this ground, we selected the case study methodology to validate the feasibility of our proposal for adopting a usability technique in an OSS project. We describe the case study following the guidelines set out by Runeson and Host [18]. According to these guidelines, we divide our research into two parts: an exploratory part and a descriptive part. We start by looking at what happens in a real-world scenario and then we describe what happens when we apply the adapted techniques to improve application usability [18].

4.2. ERMaster OSS project characteristics

We selected ERMaster as the OSS project in which to adopt the focus groups technique. ERMaster is an Eclipse plug-in and is very useful for novice or expert database (DB) designers. There are several OSS project repositories. One of the most popular is Source-Forge.net. This repository classifies OSS projects by categories. Since this technique is related to requirements engineering for product concept development, we looked at projects with a low level of coding (that is, projects where key features were still being added) that were not overly ambitious and were at the very early development stages (alpha version) in order to select a suitable OSS project in which to adopt the selected usability technique. Considering the above, we selected the ERMaster OSS project. Thanks to the characteristics of this project, we can adopt a usability technique related to a requirements activity (product concept development). Therefore, the benefits of applying the technique will have a bigger impact on the development process and software system usability.

4.3. Focus groups usability technique description

The focus groups technique is a useful tool for evaluating user needs and feelings about a product expressed at group sessions [34]. More formalised definitions in the field of HCI describe the focus groups technique as a qualitative technique whose aim is to gather information about user opinions, problems and concerns at meetings planned for the purpose [13–15]. According to the literature, several authors [13, 15, 35] neither consider the planning required before and after applying the focus groups technique nor propose definite steps for applying the technique either. By contrast, Mayhew proposes a number of specific steps for applying this technique [14]. According to Mayhew [14], the focus groups technique is composed of the five steps described below.

Step 1 (Design the focus groups format) involves designing a script for the purpose of implementing a planned sequence of activities to be performed before, during and after conducting

the focus group in order to achieve the goals set out in this study. Step 2 (Design data collection forms) involves designing a data input form (e.g., to note down the opinions, problems and comments raised by focus group participants). Additionally, a list of specific questions (related, for example, to the user interface and the work environment) has to be compiled and addressed and discussed by the focus group. Step 3 (Conduct the focus group) should take about 1–2 hours. According to Mayhew, a good sized focus group would have between six and eight members. Additionally, she believes that the moderator and note-taker play a very important role with respect to the key information stated by participants [14]. Steps 4 and 5 of the focus groups technique (Analyse data and Draw/document conclusions) address the transcription, analysis and summary of the results to draw and document the focus group conclusions.

4.4. Adaptations of the focus groups usability technique

The focus groups usability technique cannot be applied directly in the OSS development process because this community has features that do not conform to the HCI world, like, for example: the worldwide geographical distribution of its members, a code-centred world view, a shortage of resources and a culture that can be somewhat alien to interaction developers. Even though usability techniques demand conditions that, as a rule, OSS projects cannot meet, the techniques can be adapted to bring them into line with the idiosyncrasy of the OSS world. In the following, we describe the adaptations of the focus groups usability technique for application in OSS projects.

A usability expert is indispensable for applying Step 1 (Design focus group format) of the technique [14]. This expert is needed to structure the scripted objectives, topics and questions to be analysed when the focus group is conducted. We propose to substitute this expert with the principal developer, an experienced OSS project user or a HCI student under the supervision of a mentor to guide the focus groups format development. With regard to Step 2 (Design a data collection form), we found that the topics to be dealt with in the focus group cannot be physically handed out to participants because they are distributed all over the world. On this ground, we suggest that remote participation in the OSS community should be logged (online forum). Additionally, the outline of the topics should be posted on the same online forum so that users can recall their experiences with the software system interface under study.

In Step 3 (Conduct focus groups), we found that users are required to meet face to face to participate in technique application. Additionally, we found that a moderator and a note-taker had to be there in person to guide discussions and take notes during focus group application, respectively. This condition cannot be met due to the characteristics of OSS projects. On this ground, we suggest the following adaptations: (i) users will participate remotely in virtual meetings via the online forum; (ii) the moderator will be replaced by the principal developer, an expert OSS project user or a HCI student under the supervision of a mentor, (iii) there will be no note-taker during the conduct of the focus group because the online forum will be logged automatically.

In Step 4 (Analyse data), the information should be organised and then grouped by characteristics (such as age range, gender, occupation, etc.) before analysis. This simplifies the process of data analysis for the purpose of comparing and correctly interpreting the information gathered in the focus group [36]. Finally, Step 5 (Report conclusions) draws the conclusions with respect

to the opinions expressed by users. We did not identify any adverse conditions for the last two steps, and therefore no adaptations had to be made. **Table 1** summarises the steps, identified adverse conditions and suggested adaptations for the focus groups technique [14]. There are mainly two adaptations. First, users participate online via a forum. Secondly, the usability expert is replaced by a developer, expert user or a HCI student under the supervision of a mentor. In this particular case, a HCI student under the supervision of a mentor substituted the expert.

According to HCI prescriptions, design tips for a new application feature output by the focus groups technique are appraised by a usability expert [15]. In the adapted focus groups technique, the end users submitted their designs and opinions via web artefacts (like forums and emails) and not at face-to-face meetings due to the characteristics of the OSS communities. **Table 2** presents the steps and tasks of the adapted focus groups technique that is proposed as a result of this study for its application to an OSS project.

4.5. Case study results

We applied the focus groups technique in the ERMaster project. We had trouble recruiting real users because it took a long time to get permission from the principal developer. We had

Steps	Adverse conditions	Proposed adaptations
1. Design the focus group script format.	• Usability expert participation is required.	• The expert may be a developer, an expert user or a HCI student (supervised by a mentor).
2. Design the data collection form.	• Usability expert participation in the project is required. • The list of topics to be discussed in the focus groups cannot be handed out as printed matter because the users do not attend in person.	• The expert may be a developer, an expert user or a HCI student (supervised by a mentor). • The outlines and the list of topics to be discussed are published on the online forum.
3. Conduct the focus group.	• Users are required to participate in person to apply this technique. • A moderator, which could be the principal developer or an experienced user, and a note-taker are required to attend in person. • The number of participants is limited (4–9) • The time taken to conduct a focus group is limited (1–4 hours). • There is no assistant to take notes.	• Users participate remotely via the online forum. • The moderator may be an expert OSS project user or a HCI student (supervised by a mentor). • The number of participants in the online forum is unlimited. • The time available for submitting opinions to the online forum will depend on each participant. • The log of each participant in the community is recorded in the online forum (i.e., the forum will play the role of a virtual assistant to take notes).
4. Analyse data.	• No adverse conditions were identified.	• N/A
5. Report conclusions.	• (There are no adverse conditions. The adaptation is the result of the OSS community work method and is not a response to an adverse condition.)	• The focus group conclusions and recommendations are published in forums and distributed by electronic mailing lists to the OSS community.

Table 1. Steps, adverse conditions and proposed adaptations for the focus groups technique.

Steps	Tasks
1. Design the format of the focus group Script.	• Develop step by step the Focus Group script to apply it to the chosen OSS project.
2. Determine who will be the participating users of the focus group.	• Ask the project administrator for permission to act with the community of real users that are working with the chosen OSS project.
3. Define the topics/questions for the focus group.	• Decide what format of focus group to use when the technique is applied.
4. Design the data collection form.	• Design a form on a spreadsheet to register data.
5. Conduct the focus group.	• Conduct the focus group through the online forum
6. Analyse and interpret the data obtained during the focus group.	• Register the results in the previously designed form.
7. Produce a report on the conclusions and recommendations.	• Produce a report with the conclusions and recommendations that resulted from the data analysis of the focus group.
8. Present the results.	• Present the focus group results in the forum to inform the OSS community.

Table 2. Steps and tasks of the adapted focus groups technique.

to contact the principal developer by means of several media (email and personal wiki) before he gave us his consent. Six ERMaster users participated in the focus groups technique application. After designing the focus group format taking into account the stated topics and objectives, we proceeded to phrase the questions in order to apply the focus groups technique. **Table 3** shows the (unstructured) format design.

The questions should be aligned with the objectives addressed in the focus groups and are related to the ERMaster application work environment. The focus groups questions are designed to evaluate usability issues such as ease of learning, efficiency of use, memorability, errors and satisfaction [35]. By studying these factors, we focus on user-centred design, an issue neglected in OSS development projects. Previously, we published the call for participation on the ERMaster forum. **Figure 1** shows an example of a response to the questionnaire, given by one used from the official ERMaster[2] forum. **Table 4** presents the questions and the summary of results obtained from the focus groups questionnaire given by the users on the official ERMaster forum.

We expected a higher rate of participation from the ERMaster community. Since it took a long time to get the principal developer's permission and users did not show much interest in participating in our research, we only managed to recruit six participants. The focus group was moderated by the principal developer. However, he did not comment on the opinions of the users posted on the online forum. We believe that the principal developer did not get involved in the open online forum because he was not unduly concerned about improving the usability of the OSS application. The presence of a note-taker was unnecessary in order to conduct the focus group, as, on one hand, the comments posted on the open online forum were logged automatically and, on the other, the researchers kept all the emails that they received.

[2]https://sourceforge.net/p/ermaster/discussion/855766/thread/77445c51/

Activities	Scenarios	Actors
1. Determine the focus groups objectives.	Emails	• Principal developer, expert user belonging to the ERMaster community or a HCI student (under the supervision of a mentor)
2. Encourage the OSS community to participate in the forum, considering its importance.	SourceForge web site online forum	• ERMaster principal developer • I2-TIC master student
3. Briefly explain the aim and benefits of applying the technique in the OSS project	SourceForge web site online forum	• ERMaster principal developer • I2-TIC master student
4. Determine the topics to be addressed (with regard to the user interface and work environment).	Focus group format	• ERMaster principal developer • I2-TIC master student
5. Design the questions in line with the focus group topics.	Question format design	• I2-TIC master student
6. Conduct the online forum.	SourceForge forum	• OSS community
7. Review the focus group participant responses (forum/email). Email was an easy option for users due to time constraints. The responses to the questions were sent to one of the researchers.	Emails and SourceForge forum	• I2-TIC master student
8. Compile the data and enter in data collection form (using an Excel spreadsheet designed for the purpose).	Focus groups application data collection form (Excel)	• I2-TIC master student
9. Analyse and interpret the collected data.	Results reporting	• I2-TIC master student
10. Submit a report with the conclusions.	Report containing the conclusions and recommendations of the focus groups data analysis	• ERMaster principal developer • I2-TIC master student

Table 3. Focus groups technique format.

The principal developer sent an introduction and formal invitation to the ERMaster project community to participate in the open online forum. For many application users, however, their forum registration is the only record available as they did not post any opinions. Some users answered the questions and submitted their responses by email instead of publishing them on the forum. Other users eventually responded to one or two questions related to their major field of interest but failed to complete the entire questionnaire. A few other users stated that they were happy with the tool and did not answer any of the questions. We then screened all the feedback, and selected the contributors who answered all or most of the questions. As a result of this screening, we got a sample of six users for our research.

The noteworthy results of the application of the focus groups technique considering the data gathered include: (i) novice users had problems with installation (because it is an Eclipse

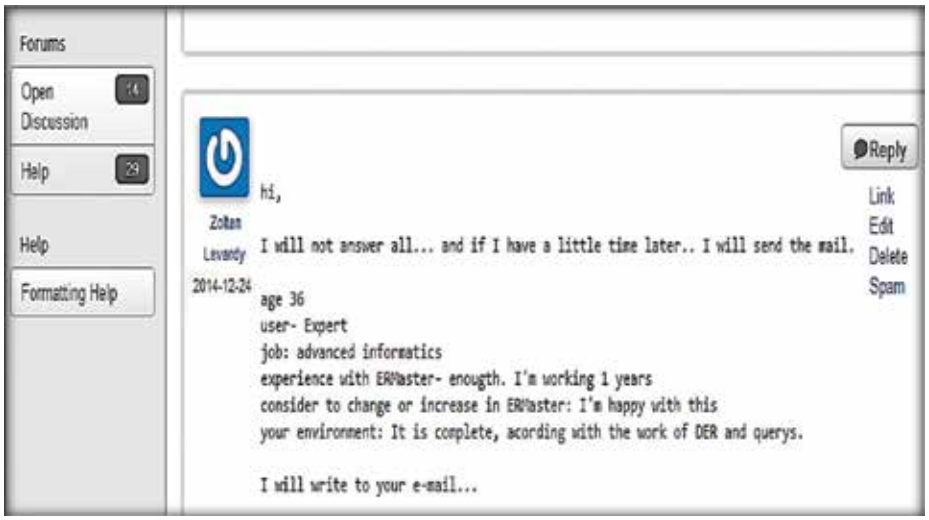

Figure 1. Focus groups online forum executed on SourceForge.

Points to be considered		Summary of results
1.	E-mail address:	
2.	Age	The ages of participants in the focus group were in the range of 36 to 40 years old.
3.	Gender	Participants were predominantly male (83%)
4.	Occupation	The majority of users work in Information Technology related areas.
5.	What experience do you have with ERMaster	17% of participants consider they have an intermediate level of experience using ERMaster and 83% state they have an advanced level using this tool.
6.	How long have you been using ERMaster?	The majority of participants have used this tool between 1 and 3 years.
7.	What do you like about working with the ERMaster environment?	They all expressed that the graphic environment allows them to design DER with ease and that it reduces the amount of coding work due to it being a good multiuse tool to work with different Database motors.
8.	Do you think the ERMaster menus are suitable for purpose?	83% considered menus were complete.
9.	What utilities, menus, options, etc., would you like to change or add to in ERMaster?	83% believed they should only need one or two shortcuts to perform certain specific activities (for example, DER design and DER data dictionary obtainment).
10.	How good do you think the environment is for entity-relationship diagram design?	The majority of participants believed ERMaster's graphic environment did not need any improvements. However, they do mention the tool should be installed independently, i.e. without needing the prior installation of Java and Eclipse.
11.	Is the ERMaster query environment pleasant to work with?	All participants mention ERMaster's query environment is pleasant to work with; the majority consider the toolbars, options and colours are sober and adequate for the work done with the application.
12.	Are the ERMaster icons, menus, options, etc., easy to understand?	All users considerate easy to learn how to use and to use the icons, menus and options.

Points to be considered		Summary of results
13.	What problems have you often come across as an ERMaster user?	83% of users consider it is an easy to use tool, once it is installed. However, they consider that only expert users or those with an advanced level of average knowledge could easily install the tool due to the need of installing first Java and then Eclipse. Certain novel users complain about not having access to this tool due to the difficulty of installing it.
14.	Do you think that the ERMaster interface is easy to remember?	All users consider ERMaster's interface is easy to remember even through some time may have passed since they last used it.
15.	How do you think the ERMaster interface should be changed or added to?	Menus, action bars and icons are easily accessible, but some users asked for the addition of an extra 10% of options of interest (for example, template editing, edit tracing, etc.)

Table 4. Summary of the results obtained from the questionnaire.

plug-in), (ii) expert users regard ERMaster is being a tool that is easy to learn, easy to use and easy to understand and had no trouble remembering how to use it, (iii) ERMaster is designed ergonomically using menus, action bars and easy access icons, but some users requested the addition of options of interest (for example, export DBs to Excel), and (iv) users consider the ERMaster work environment to be adequate, as there are Help and Query tools.

5. Discussion of results

In this section we discuss and answer the research question of this study.

RQ: How to incorporate the focus groups technique in a real OSS project?

The usability techniques have been created for another type of software developments, i.e. they have not been conceived with the specific characteristics of the OSS development process in mind. For this reason, it is necessary to adapt these techniques. These adaptations are based on the adverse conditions these techniques present. Some adverse conditions can be overcome using certain web artefacts (for instance, wikis, forums, blogs, etc.), which are known by the OSS community. As a result, many of these adaptations will be familiar to the members of this community, which favours to a certain extent the application of these usability techniques.

The adaptations of the focus groups technique are mainly two. Firstly, users participate online though a web artefact: a forum. Secondly, the usability expert is replaced by a developer, an experienced user or an HCI student under supervision of a mentor. In our particular case, the expert was replaced by an HCI student under the supervision of a mentor.

After applying the focus groups technique to the ERMaster project, we were able to confirm that it is very hard to get a representative set of users. We believe that the main reason for this is that users are unmotivated. We had to be persistent and use different communication mechanisms (for example, personal wikis and electronic mails) to get the consent of the principal developers (only one out of five principal developers responded). The biggest problem with applying the focus groups technique was user availability: most users are volunteers and had very little spare time. In fact, the participants did not have the time to enter their

comments in the online forum and ended up emailing their opinions to one of the researchers. Since the focus groups participants had a medium level of experience with respect to both the ERMaster tool and the field of computing, they did not pinpoint any major problems which novice users may have had.

The adoption of the adapted focus groups technique was acceptable as this technique requires a small number of participants to get reliable results. With regard to our proposal of substituting a developer, expert user or HCI student under the supervision of a mentor for the usability expert, the expert was replaced in this case by a HCI student supervised by a mentor. Note that this student was in his final year of the Master of Information and Communication Technologies Research and Innovation at the Autonomous University of Madrid and was taking two HCI courses. Additionally, the student was supervised by two usability experts. On this ground, there is no risk of the proposed adaptation for the selected technique having a negative impact on the quality of the software.

We can conclude that the results of the adoption of the focus groups usability technique were not what we expected. Firstly, we banked on the participation of a large number of users based on the statistics provided on the application web site. Secondly, it was hard to contact and recruit users to participate in the research. Note that OSS community members are all volunteers, and they participate in their spare time. Despite all these problems, however, the adaptation of the focus groups technique was reliable for adoption in the ERMaster project, as it does not take many users to get a reliable result.

The main limitation of our research is the number of case studies (only one). This is preliminary research. Therefore, more cases studies are required to validate the proposed adaptations. Note that there are other usability techniques (for example, user profiles, heuristic evaluation) that might benefit from the proposed adaptations (e.g., HCI students supervised by a mentor standing in for experts) to enhance technique adoption in the OSS development process. Briefly, the results of our research are not very generalizable because we conducted only one case study. Therefore, the focus groups technique needs to be applied to other OSS projects. However, the preliminary results provide a basis on which we can build to improve the performance of other case studies.

6. Lessons learned

The lessons that we have learned from applying the focus groups technique in the OSS project are as follows:

- OSS project administrators (particularly of small projects) must start to attach importance and become aware of the impact of the issues dealt with by HCI in the development of usable software. We believe that this could motivate users to participate in the application usability techniques. This finding is consistent with the proposals of other authors [23, 37].
- As the developer team of a small OSS project is likely to have limited knowledge of usability techniques and interaction design, we suggest recruiting a community user who has some knowledge of or is enthusiastic about these issues to contribute in the early stages of the OSS project development.

- OSS projects that want to apply the steps to incorporate techniques and need to find an expert in HCI or an HCI student guided by an expert mentor can do so by publishing advertisements in the webpage, forum, wiki and blogs of the project. Furthermore, the administrator of the OSS project can get in touch with universities to encourage expert usability students to collaborate in the application of techniques to improve the usability of an OSS application.
- One of the underlying principles of the OSS community is collaboration [23, 38]. However, we did not get much collaboration during the application of the technique because real users (i.e., users registered at the project Source-Forge website) are perhaps short of time or unaware of the importance of usability. On this ground, we suggest that technique application should be publicised through social networks to recruit as many participants as possible.
- The OSS community should (with the administrator's permission) provide incentives to encourage users to participate in this type of initiatives (i.e. participate in the application of usability techniques). A possible example of one such incentive would be public acknowledgement of users that have made contributions towards improving the application interaction design in a section of the project website.
- By adapting this technique in particular, we were able to determine that it is possible to incorporate it into small OSS projects. Because these techniques demand conditions that OSS projects generally cannot meet, it is necessary to make adaptations to bring them closer to the idiosyncrasy of OSS projects. This result reinforces the theory that it is possible to incorporate adapted usability techniques in OSS projects considering Usability Framework proposed by Castro.

7. Conclusions and future research

The goal of this research was to evaluate the feasibility of adopting HCI usability techniques in OSS projects. We adapted the focus groups technique for adoption. Through adaptation, we were able to account for some OSS development characteristics that pose an obstacle to the application of the technique as per HCI recommendations (for example, OSS developers and users are geographically distributed). In particular, we adapted the focus groups usability technique for application in the ERMaster OSS project.

It is not easy to recruit volunteer users to participate in OSS usability projects. As already mentioned, users often do not have much time, and it is hard to get them to take part without an incentive. With the focus groups technique, although we did not get much collaboration from users or even the principal developers, we did manage to apply the technique because it requires only a small number of participants to get a reliable result [14, 15, 34–36]. Author opinions differ as to the number of users to be taken into account for the focus groups technique to be successful [14, 15, 34–36]. Most of these authors agree that a focus group should include from six to nine users if it is to work. Fewer than six participants would not generate enough ideas for discussion. In this research, however, any users that are willing to collaborate are allowed to, that is, there is no limit on the number of users because this would go against

the working philosophy of the OSS community where anyone who wants to is welcome to participate. In sum, our proposed adaptation does not place any constraints on the number of technique participants. This adaptation is a response to the OSS community working philosophy rather than to an adverse condition posing an obstacle to technique application.

The focus groups technique is useful for gathering opinions and suggestions from participant users for the product concept development activity and its results are descriptive. After analysing and applying the focus groups usability technique in requirements engineering activities in OSS developments, we found that there are adverse conditions that are an obstacle to its application like, for example, the shortage of OSS users interested in applying the technique, community geographical and temporal distribution and OSS community motivation.

We believe that, in order to improve the integration of usability techniques in OSS projects, the OSS community has to start attaching importance to and raising awareness about the repercussions that the issues addressed by the HCI field have on software development. Additionally, as HCI techniques need to be adapted to overcome the adverse conditions for adoption in OSS development projects, the OSS community also has to broaden its view of software development in order to consider usability and not focus exclusively on feature development. In the future, we aim to conduct further case studies to adapt and apply other usability techniques in OSS projects. We will analyse other web artefacts that can be adapted to improve communication in OSS communities (e.g., social networks) and gradually raise the awareness of OSS developers about the benefits of applying HCI usability techniques.

Acknowledgements

This research was funded by the SENESCYT-Ecuador, and Quevedo State Technical University. Also this research was funded by the Spanish Ministry of Education, Culture and Sports FLEXOR (TIN2014-52129-R) and TIN2014-60490-P projects and the eMadrid-CM project (S2013/ICE-2715). Finally, this research received funding from the "DIUDA 22316 Project" of the University of Atacama.

Author details

Lucrecia Llerena[1]*, Nancy Rodriguez[1], Mayra Llerena[2], John W. Castro[3] and Silvia T. Acuña[1]

*Address all correspondence to: lllerena@uteq.edu.ec

1 Department of Computer Engineering, Autonomous University of Madrid, Madrid, Spain

2 Department of Education Didactics, Autonomous University of Madrid, Madrid, Spain

3 Department of Computer Engineering and Computer Science, University of Atacama, Copiapó, Chile

References

[1] Schryen G, Kadura R. Open source vs. closed source software. In: 2009 ACM Symposium on Applied Computing – SAC '09 [Internet]. New York, NY, USA: ACM; 2009. pp. 2016-2023. Available from: http://portal.acm.org/citation.cfm?doid=1529282.1529731

[2] Noll J, Liu W-M. Requirements elicitation in open source software development: A case study. In: 3rd International Workshop on Emerging Trends in Free/Libre/Open Source Software Research and Development – FLOSS '10 [Internet]. New York, NY, USA: ACM; 2010. pp. 35-40. Available from: http://portal.acm.org/citation.cfm?doid=1833272.1833279

[3] Madey G, Freeh V, Tynan R. The open source software development phenomenon: An analysis based on social network theory. In: Proceedings of the 8th Americas Conference on Information Systems [Internet]. Dallas, Texas, USA: AMCIS; 2002. pp. 1806-1813. Available from: http://www3.nd.edu/~oss/Papers/amcis_oss.pdf

[4] Nichols DM, Twidale MB. The usability of open source software. First Monday [Internet]. Jan 3, 2003;**8**(1):21. Available from: http://www.firstmonday.org/ojs/index.php/fm/article/view/1018/939 [Accessed: Jul 5, 2015]

[5] Raza A, Capretz LF, Ahmed F. Maintenance support in open source software projects. In: 8th International Conference on Digital Information Management (ICDIM 2013) [Internet]. Washington, DC, USA: IEEE; 2013. pp. 391-395. Available from: http://ieeexplore.ieee.org/lpdocs/epic03/wrapper.htm?arnumber=6694005

[6] Çetin G, Gokturk M. A measurement based framework for assessment of usability-centricness of open source software projects. In: 4th International Conference on Signal Image Technology and Internet Based Systems – SITIS'08 [Internet]. IEEE; 2008. pp. 585-592. Available from: http://ieeexplore.ieee.org/lpdocs/epic03/wrapper.htm?arnumber=4725858 [Accessed: Aug 18, 2015]

[7] Raza A, Capretz LF, Ahmed F. An empirical study of open source software usability: The industrial perspective. International Journal of Open Source Software and Processes [Internet]. 2011;**3**(1):1-16. Available from: http://www.igi-global.com/viewtitlesample.aspx?id=54243&ptid=47737&t=an+empirical+study+of+open+source+software+usability%253a+the+industrial+perspective

[8] Smith S, Engen D, Mankoski A, Frishberg N, Pedersen N, Benson C. Sun GNOME Human Computer Interaction (HCI). Sun Microsystems, Inc.; 2001

[9] Nichols DM, Twidale MB. Usability processes in open source projects. Software Process: Improvement and Practice [Internet]. 2006;**11**(2):149-162. DOI: http://doi.wiley.com/10.1002/spip.256 [Accessed: Aug 18, 2015]

[10] Raza A, Capretz LF, Ahmed F. An open source usability maturity model (OS-UMM). Journal of Computers in Human Behavior. 2012;**28**(4):1109-1121

[11] Benson C, Müller-Prove M, Mzourek J. Professional usability in open source projects: GNOME, OpenOffice.org, NetBeans. In: CHI'04 Extended Abstract on Human Factors

in Computing System – CHI EA'04 [Internet]. ACM; 2004. pp. 1083-1084. Available from: http://delivery.acm.org/10.1145/990000/985991/p1083-benson.pdf

[12] Raza A, Capretz LF, Ahmed F. Users' perception of open source usability: An empirical study. Engineering with Computers [Internet]. 2012;**28**(2):109-121. Available from: http://link.springer.com/article/10.1007/s00366-011-0222-1

[13] Castro JW. Incorporating usability in the open source software development process [thesis doctoral]. Departamento de Ingeniería Informática, Universidad Autónoma de Madrid; 2014

[14] Mayhew DJ. The Usability Engineering Lifecycle: A Practitioner's Handbook for User Interface Design. San Francisco, USA: Morgan Kaufmann; 1999

[15] Ferré X. Marco de Integración de la Usabilidad en el Proceso de Desarrollo Software. [thesis doctoral]. Facultad de Informática. Universidad Politécnica de Madrid; 2005

[16] Beckert B, Grebing S, Böhl F. A usability evaluation of interactive theorem provers using focus groups. In: Software Engineering and Formal Methods Lecture Notes in Computer Science. Cham, Switzerland: Springer; 2015. pp. 3-19

[17] Olembo MM, Volkamer M. E-voting system usability: Lessons for interface design, user studies, and usability criteria. In: Proccedings of the Human-Centered System Design for Electronic Governance [Internet]. Hershey, PA, USA: Information Science Reference; 2013. pp. 172-201. Available from: http://www.scopus.com/inward/record.url?eid=2-s2.0-84898186776&partnerID=tZOtx3y1

[18] Runeson P, Host M, Rainer A, Regnell B. Case Study Research in Software Engineering: Guidelines and Examples. Hoboken, New Jersey, USA: John Wiley & Sons; 2012. pp. 1-241

[19] Assa H, Chiasson S, Biddle R. Cesar: Visual representation of source code vulnerabilities. In: 2016 IEEE Symposium on Visualization for Cyber Security. Washington, DC, USA: IEEE; 2016. pp. 1-8

[20] Al-Odan HA, Al-Daraiseh AA. Open source data mining tools. In: 2015 International Conference on Electro/Information Technology. Washington, DC, USA: IEEE; 2015. pp. 369-374

[21] Ternauciuc A, Vasiu R. Testing usability in moodle: When and how to do it. In: 2015 IEEE 13th International Symposium on Intelligent Systems and Informatics (SISY). Washington, DC, USA: IEEE; 2015. pp. 263-268

[22] Rajanen M, Iivari N. Examining usability work and culture in OSS. In: Proceedings of the 11th IFIP WG 213 International Conference [Internet]. Cham, Switzerland: Springer; 2015. pp. 58-67. DOI: http://link.springer.com/10.1007/978-3-319-17837-0

[23] Terry M, Kay M, Lafreniere B. Perceptions and practices of usability in the free/open source software (FOSS) community. In: Proceedings of the 28th International Conference on Human Factors in Computing Systems CHI 2010 [Internet]. New York, NY, USA: ACM; 2010. pp. 999-1008. Available from: http://portal.acm.org/citation.cfm?doid=1753326.1753476

[24] Çetin G, Verzulli D, Frings S. An analysis of involvement of HCI experts in distributed software development: Practical issues. In: Shuler D, editor. Online Communities and Social Computing – OCSC'07 [Internet]. Springer; 2007. pp. 32-40. DOI: http://link.springer.com/chapter/10.1007/978-3-540-73257-0_4

[25] Hedberg H, Iivari N, Rajanen M, Harjumaa L. Assuring quality and usability in open soruce software development. In: Proceedings of the First International Workshop on Emerging Trends in FLOSS Research and Development – FLOSS'07 [Internet]. Washington, DC, USA: IEEE; 2007. pp. 1-5. Available from: http://ieeexplore.ieee.org/lpdocs/epic03/wrapper.htm?arnumber=4273073 [Accessed: Aug 18, 2015]

[26] Semedo J, Oliveira A, Machado A, Moreira J, Rodrigues J, Aparício J, et al. Computerised lung auscultation – Sound software (CLASS). Procedia Computer Science [Internet]. 2015;**64**: 697-704. Available from: http://linkinghub.elsevier.com/retrieve/pii/S1877050915027246 [Accessed: May 13, 2017]

[27] Kolagani N, Ramu P. A participatory framework for developing public participation GIS solutions to improve resource management systems. International Journal of Geographical Information Science [Internet]. 2016;**8816**(July):1-18. DOI: http://www.tandfonline.com/doi/full/10.1080/13658816.2016.1206202

[28] Paul CL. A survey of usability practices in free/libre/open source software. Proceedings of the IFIP International Federation for Information Processing. 2009;**299**:264-273

[29] Kitchenham B, Budgen D, Pearl Brereton O. Using mapping studies as the basis for further research-a participant-observer case study. Information and Software Technology [Internet]. 2011;**53**(6):638-6651. DOI: http://dx.doi.org/10.1016/j.infsof.2010.12.011

[30] Llerena L. Transformación de Técnicas de Usabilidad Relacionadas con las Actividades de Ingeniería de Requisitos para su Incorporación en el Proceso de Desarrollo Open Source Software. Trabajo de Fin de Master, Departamento de Ingeniería Informática. Universidad Autónoma de Madrid; 2015

[31] Coutaze J. Evaluation techniques: Exploring the intersection of HCI and software engineering. In: Taylor RN, Coutaz J, editors. Software Engineering and Human-Computer Interaction [Internet]. Vol. 896. Lecture Notes in Computer Science. Springer; 1995. pp. 35-48. DOI: http://link.springer.com/10.1007/BFb0035799 [Accessed: Jun 19, 2015]

[32] Nielsen L, Bødker M. To do or not to do: Usability in open source development. Interfaces (Providence). 2007;**71**:10-11

[33] Runeson P, Höst M. Guidelines for conducting and reporting case study research in software engineering. Journal of Empirical Software Engineering. 2009;**14**(2):131-164

[34] Hernández P, Cortés C, Balboa A, Montes R, Solís B. Métodos Cualitativos para Estudiar a los Usuarios de la Información. Vol. XVII. México DF: Universidad Nacional Autónoma de México; 2008. p. 212

[35] Nielsen J. Usability Engineering [Internet]. San Francisco, USA: Morgan Kaufmann; 1993. 362 p. Available from: https://goo.gl/hT9BSz [Accessed: Jul 6, 2015]

[36] Hernandez Sampieri R, Fernandez Collado C, Baptista LP. Libro Metodología de la investigación. México DF: McGraw-Hill; 2014

[37] Apache OpenOffice Wiki. Apache OpenOffice User Experience [Internet]. Available from: https://wiki.openoffice.org/wiki/Apache_OpenOffice_User_Experience [Accessed: Apr 29, 2017]

[38] Raymond ES. The cathedral and the bazaar: Musings on linux and open source by an accidental revolutionary. Sebastopol, CA, USA: O'Reilly & Associates; 2001

Chapter 5

Fixing the 'Ready' in E-Learning Readiness

Glenda H. E. Gay

Additional information is available at the end of the chapter

http://dx.doi.org/10.5772/intechopen.74287

Abstract

Evaluating the effectiveness of e-learning systems (ELSs) for course delivery can be achieved by measuring the user's level of readiness for the ELS. While e-learning readiness (e-readiness) is well researched using several models, studies generally provide recommendations for the institution or instructor. However, most students are typically not equipped for using the ELS. This chapter focuses on assisting students in online and face-to-face courses who have e-readiness challenges when accessing an ELS throughout a semester. A survey captures responses on their technological, lifestyle and learning preparedness for the ELS to produce an e-readiness score. A modified DeLone and McLean model evaluates the impact of their level of e-readiness during their use of the ELS. Identifying where and when students have difficulties, pinpointing their deficits or recommending the more appropriate modality could help students achieve a positive course outcome.

Keywords: e-learning readiness, e-learning systems, student preparedness, blended course, online course

1. Introduction

Electronic learning (e-learning) has become an essential feature in the delivery of distance education. Its effectiveness relies on a stable network with specific software, a repository for managing the delivery of content, and a good social environment created by the online interaction among students [1]. This interaction at any time and from anywhere has resulted in extensive integration of e-learning systems (ELSs) in most universities [2]. With the major shift in how students learn and therefore how they are taught, there is an increasing need to understand what contributes to student satisfaction when using an ELS. These systems can be used to enhance students' learning in a classroom setting by incorporating online resources including discussion boards, quizzes, chat sessions and assignment tracking [3]. However,

instructors tend to be unaware of the level of their students' social, communication, and technological competencies that are necessary for ELSs [4]. Indeed, the strength of the connection among students' as they interact socially and academically during their courses influences retention rates [2].

ELSs, such as Blackboard and Moodle facilitate instruction in courses that offer face-to-face, blended, or online delivery to students. However, blended learning emphasizes the central role of the ELS, thus enabling access and flexibility but reducing face-to-face contact hours, while online learning relies solely on the ELS with no face-to-face contact hours [5]. Studying via a blended or online modality has its benefits. Student interaction in the ELS involving group and individual projects, discussions, and assignments were reported to be the most effective learning activities in both modes of study [6]. Furthermore, students who initially enrolled in either mode were better prepared and performed significantly better in subsequent courses of the same modality [7, 8]. Students who have the ability to understand course materials in an online format and interact with an ELS could be well suited to a blended course where there is less need to meet as often with the instructor [9, 10], or in a fully online course if they are comfortable with working independently [9]. Researchers who examined differences in learning outcomes for students in either mode concluded that there was little effect on their learning or application of learning [6], little to no significant differences among students regarding their final grades [9], and no significant differences among demographics such as age, gender, area of residence, and academic class level [8]. Despite these two modes of delivery, it is the students' experiences, expectations and perceptions of the ELS and its tools that influence successful e-learning outcomes [7].

Even though students may be reasonably prepared to deal with the technology of e-learning, major weakness were reported in lifestyle and learning preparedness regarding the quality of academic work required, including synthesizing ideas and working with others [11, 12]. While the network infrastructure, hardware and software address the technical side of an ELS, students' interaction in a course provides necessary non-technical aspects of the e-learning experience. Therefore, a core requirement in assessing the effectiveness of a course is students' level of preparedness at course orientation, and engagement during course delivery [13, 14]. E-learning readiness (e-readiness) encompasses the seamless nature of students' technological, lifestyle, and organisational preparation for the ELS, and is characterized by their competence in "using" an ELS and its technology tools [14]. In 2015, the World Economic Forum assessed 143 countries on their state of e-readiness regarding ICT infrastructure, affordability of ICTs, and capacity of the population to make effective use of ICTs. However, these e-readiness ranks were not inclusive of tertiary level education. With the intention of developing countries to create an effective knowledge economy and enhance lifelong learning, additional research is necessary to evaluate the success of students in both developed and developing countries who are enrolled in courses at tertiary level that incorporate online components [15, 16]. In an educational context therefore, e-readiness is defined as the capability of e-learning users to adapt to a new learning environment, using new technologies, and be involved in self-directed learning [14]. However, there are students who have returned to further their education tertiary level, are doing so for the first time using an unfamiliar

interface such as an ELS [17]. An e-ready student should be capable of efficiently and effectively applying the essential technology tools in an ELS in order to satisfactorily interact with the content and engage other students [13, 18]. Additional reports of an underutilization of ELSs by students in developing countries, also identifies a need to understand why and how this can be addressed [17, 19].

While research on e-readiness using several models is not new, much of it is still limited [13], and has not been able to keep apace of new technologies that support the social and interactive nature of e-learning [20, 21]. Few studies using e-readiness factors have developed benchmarks on the e-readiness of students. One study assessed the preparedness of students for a range of e-learning competencies and identified an overall 'low level' of perceived student preparedness [12]. It was attributed to students having little or no exposure to ELSs prior to their university studies. Another study that evaluated students' use of technology prior to taking an online course showed that they had 'less than average' training in technology requirements [14]. Further examination of students' e-readiness with course structure and interaction in the ELS found that 'higher levels' of e-readiness were positively associated with increased students' interactions and less reliance on the need for structure and guidance in an online course [20]. Some researchers sought to categorize an e-ready student as having a high rating in three readiness scales: technical competence, lifestyle aptitude, and learning preference [22]. Their study however, did not generate scores that could be used as an initial benchmark or self-evaluation for students.

A relationship was found between e-readiness and factors such as students' self-directed learning, and self-motivation [20], as well as use of technology [23]. In reality, many students most likely have experienced traditional classroom environments for most of their primary and secondary education, but may not have sufficient experience with ELSs as they pursue higher education [17, 24]. Some researchers therefore proposed that students be assisted in more accurately gauging their readiness for online learning before they start a course [4]. Others believe that as students acquire new skills and knowledge during a course to enhance their learning, their level of e-readiness could still affect their interaction, resulting in positive or negative benefits at course completion [20]. Nevertheless, readily available access to course materials in an ELS does not always guarantee successful outcomes, since social and learning readiness factors also contribute to the overall measure of a student's capabilities in an online environment [4]. Therefore, preparing students with suitable techniques and enhancing their ability to integrate socially and academically during their online courses could reduce the risks of attrition [3, 25]. This preparation should be more than a pre-course familiarization exercise on using the ELS for first-time students [26]. The use of an e-readiness assessment instrument to identify students' strengths and challenges could also be an important tool in improving success rates in higher education [24]. Continued evaluation of students' readiness skills prior to, and during a course of study is necessary in order to address any challenges that could prevent their successful course completion [4].

This chapter therefore focuses on identifying the characteristics of students who register for blended or online courses but may be unprepared for studying using an ELS. It also determined to what extent students' level of preparedness influenced their experience at the start

of the course, and during course delivery. The findings could be used to compare these characteristics among various groups of students in order to implement measures for improving their success.

2. Research framework

An e-readiness framework was first proposed in the late 1990s to evaluate the depth and breadth of the digital divide between developed and developing countries [27]. The framework used for this study was adapted from two previously tested models [22, 28]. This model tests the effect of e-readiness (a) at course orientation when the student first accesses the course and evaluates the quality of the ELS, initial course materials, and support services, (b) during course delivery when students regularly use and become satisfied with the ELS, and (c) at course completion where the students' experiences influence their decision about registering for another blended or online course. **Figure 1** illustrates the proposed framework comprising student e-readiness and the six contributing factors at the course orientation, delivery and completion phases.

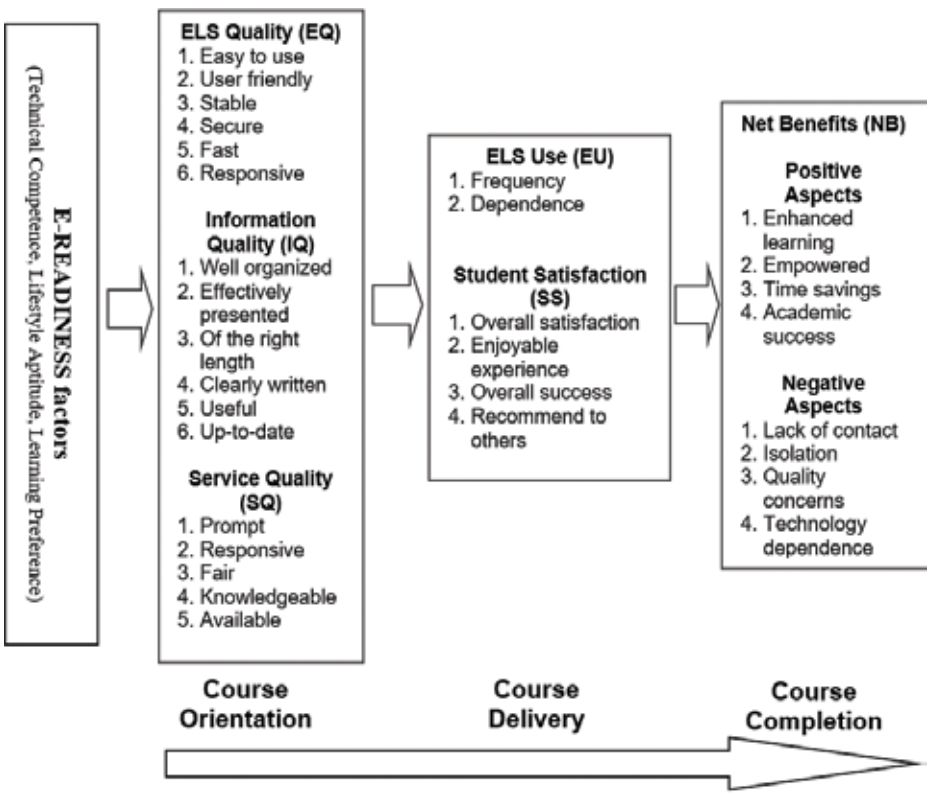

Figure 1. Conceptual framework for student e-readiness at course orientation, delivery and completion.

2.1. Student e-readiness

E-readiness evaluates students' level of preparedness for an ELS though their technical competence, lifestyle aptitude, and learning preference [22]. These factors are described in more detail below:

- **Technical competence**: This factor evaluates students' tendency to comfortably use new technologies [18]. Students who are technically skilled, are able to easily access the Internet, maintain a dedicated network connection, and possess a level of competence when using essential technology tools required for the ELS are considered to be e-ready [22]. While technical competencies are necessary for successful learning experiences when using the ELS, students should still be evaluated to address any perceived disconnect between institutional expectations for technology use and students' technology practices [24].
- **Lifestyle aptitude**: This factor assesses students' study habits and communication patterns when using the ELS [22]. This includes whether they are able to devote uninterrupted time to assignments and activities in the ELS, or post messages to other students or the instructor via the ELS. Students' course participation is also based on their comfort level, and the ability to understand course material without the face-to-face interaction with an instructor [22].
- **Learning preferences**: This factor detects students' values and learning styles that are suitable for a blended or online modality [22]. Positive benefits from the ELS experience and successful learning outcomes are produced when students are highly motivated and self-confident [26], self-directed, and interactive with other students in the ELS [20]. Students are therefore more likely to be successful when they are committed to or possess a high level of interest in completing the course [21, 26]. In contrast, students who lack adequate technology skills and have a preference for face-to-face interaction may be accustomed to this lifestyle of learning prior to tertiary level and could have challenges with working in the ELS [12]. More so, students who have challenges with reading, comprehension, essays and other higher education writing skills are more prone to underachieving in courses with an online component that provide mostly written text and instructions [12, 21].

This section explains the factors associated with the three phases of a course, namely course orientation, course delivery and course completion.

2.2. Course orientation

At this stage, students access the blended or online course for the first time. It is an important phase since their initial active involvement during these early weeks can influence their persistence in the course [29]. This phase therefore focuses on the interaction between students and the quality of the ELS, information provided in the ELS, and support services:

- **ELS quality:** The quality of the ELS is measured by its stability, ease of use, and responsiveness to students who may not persist if they experience technical problems at this early stage [15, 22, 28]. ELS quality can therefore be hampered by inconsistent connectivity, system crashes, insufficient bandwidth, infrastructure or software maintenance, and accessibility issues [30].

- **Service quality:** Students could become frustrated if assistance is not available when problems arise with the ELS, or if they do not know how to contact technical support [30]. Timely and effective assistance could include an online 'help desk', 'frequently asked questions' forum, and email support [31].
- **Information quality:** Once students have accessed the ELS, they are exposed to course content and other information. Poorly designed course materials could also affect their enthusiasm that is necessary for early engagement [13, 27]. Instructional material should therefore be clear, up to date, written at a level that is easily understood, and formatted to cater to different learning styles [21, 26].

2.3. Course delivery

This active phase evaluates the students' actual use of and satisfaction with the ELS during the course.

- **ELS use**: Students' perceptions of how regularly and consistency they access the ELS is evaluated [10]. Students depend on the ELS for their class materials and to submit assignments. ELS use is therefore determined by whether the ELS adds value to their learning experience [9, 31].
- **Student satisfaction**: This factor evaluates students' interaction and experiences as they use the ELS. Consistent interactivity, commitment, and increasing familiarity with the ELS during the course could influence student satisfaction, which subsequently increases ELS use resulting in academic success [7, 14, 21, 26]. However, student satisfaction could also decrease if information quality decreases, resulting from inadequate study materials, assignment instructions, or even out-of-date, confusing, or unimportant notices [6].

2.4. Course completion

As students evaluate their ELS experiences at course completion, these benefits could influence their overall satisfaction with the ELS and determine whether they will consider taking another blended or online course. Therefore, having a positive experience at course orientation, and enhancing these experiences during the course could increase their confidence and intention to register for more courses in that modality [22, 26]. Online students could benefit from becoming empowered with enhanced online skills, but could also be discouraged by dependence on the technology and feelings of isolation [22].

3. Materials and methods

3.1. Context and participants

The University of the West Indies is a multi-site institution affiliated with 17 countries in the region. There are three main campuses with a fourth campus that caters specifically to online students who rely on the ELS. Online students from non-campus territories who do not own,

have access to, or lack adequate computer or Internet facilities at home may visit their country site to access resources including microcomputer laboratories and libraries. With the introduction of ELSs, instructors on the main campuses have been trained to offer blended courses (classroom-based or computer laboratory-based with online components). Students in either cohort can complete a three-year undergraduate degree with full-time registration.

This study analysed students in a blended and an online course pursuing the same second-year undergraduate core management course at the university. The courses were offered through one campus and the online campus respectively. Both courses had the same instructor and four teaching assistants. All course content, course assignments, and proctored course exams were developed by the instructor using the same criteria and standards. The course content was identical and located on a Moodle-based ELS in both courses comprising digital-learning materials including videos, PDF slides and laboratory exercises. The course assessments were uploaded to each ELS for grading. Once a week, tutorial assistance was provided in computer laboratories on the campus for students in the blended course, while live online sessions and supplementary videos are provided for the online students. No compulsory ELS training was provided for students in either cohort.

3.2. Survey instrument

A web-based survey instrument was used to capture responses from the students in each course. The items were reviewed by four experienced instructors and pilot-tested before posting in the student forum of each course. The instrument was posted in the ELS of both courses and was set to allow only one submission from each student. Responses were captured over two consecutive semesters. The instrument comprised an e-readiness section, and ELS section, and a section to capture demographics:

- The 18-item e-readiness section captured responses on three factors: students' technical competence, lifestyle aptitude, and learning preference when studying. The technical competence items captured responses on computer knowledge and technical literacy, such as whether students knew how to use software applications such as a word processor, had access to a printer, the Internet, a dedicated network connection, or knew how to contact the ELS' help desk. The lifestyle aptitude items captured responses on whether students had a place that could be used uninterrupted for extended periods to study, routinely communicated with other students using electronic technologies such as e-mail, and had either persons or resources nearby who could assist with any technical problems. The learning preference items captured responses on students' self-motivation, eagerness to use new software applications, preference for face-to-face or online courses, and preference for written or verbal feedback. All items used a five-point Likert-type scale, ranging from '1 = strongly-disagree' to '5 = strongly-agree'.
- The ELS section comprised 30 items that captured responses on six factors from students' perceptions during the phases of the course. At course orientation, the quality of the ELS, information provided on the ELS, and quality of support services were obtained. During course delivery, students' perceptions on their use of the ELS, and their satisfaction with the ELS, and at course completion their positive or negative experiences of the ELS were obtained. All items used a five-point Likert-type scale, ranging from '1 = strongly-disagree' to '5 = strongly-agree'.

- Demographic data of the respondents was also captured, including gender, age range, the number of courses registered for the semester, and whether the student resided on a campus territory.

3.3. Procedure

Incomplete responses were removed before analysing the data using SPSS version 22.0. The means of each factor were calculated. The attributes of an e-ready online student were then highlighted using the items with the highest mean in the technical competence, lifestyle aptitude, and learning preference scales, while items with the lowest mean were identified as possible challenges. A mean of at least four of a maximum of five points was used as an indication of an acceptable level of e-readiness [22]. Therefore, a student was categorized as e-ready if four or more points in *each* of the three e-readiness scales were achieved, while the level of e-readiness for a cohort was calculated using the aggregate score of all three e-readiness scales.

Linear regression was used to check the effect of students' level of e-readiness on ELS quality, information quality, and service quality during course orientation. Multiple regression was performed to test the effect on ELS use and their satisfaction during course delivery, as well as their perceived benefits at course completion. An independent samples T-test was used to determine whether there were any significant differences among the demographic features of the students.

4. Results and discussion

A total of 963 completed responses were analysed, comprising 539 from the blended course and 424 from the online course. The demographic data for both cohorts revealed that the median age range of respondents was 29 years or younger, the majority were female and in their second year of the programme. In keeping with the course registration patterns, students in the blended cohort registered for five courses, while those in the online cohort registered for three courses. Although over 90% of the students in the blended course lived in the country of the campus, about 56% of the students in the online course also lived the country where a main campus was located. The demographic results of the students are presented in **Table 1**.

The internal consistency of the survey items was tested using Cronbach's alpha, a reliability coefficient that indicates how well the items in a set are positively correlated to one another. The alpha coefficient for each scale was greater than 0.70 confirming that the survey instrument was reliable. Pearson correlation analysis was used to examine the strength of the association between the students' level of e-readiness and demographic variables. There was no significant association between level of e-readiness and demographic variables for either cohort, such as gender for the blended cohort ($\chi(1) = 2.519$, $p = 0.112$) or the online cohort ($\chi(1) = 0.017$, $p = 0.897$); age range for the blended cohort ($\chi(1) = 3.614$, $p = 0.306$) or the online cohort ($\chi(1) = 1.522$, $p = 0.677$); and territory of residence for the blended cohort ($\chi(1) = 2.117$, $p = 0.146$) or the online cohort ($\chi(1) = 0.817$, $p = 0.366$). These results support other published research of no significant differences among demographics such as age, gender, or territory of residence [8].

		BLENDED 539 Students		ONLINE 424 students	
Category	**Variables**	**N**	**%**	**N**	**%**
Gender	Male	124	23	74	17.5
	Female	400	74.2	350	82.5
Age Range	29 or under	355	65.9	216	50.9
	30 – 39	96	17.8	131	30.9
	40 – 49	72	13.4	62	14.6
	50 – 59	16	3	15	3.5
Courses	1	3	0.6	9	2.1
	2	14	2.6	87	20.5
	3	114	21.2	216	50.9
	4	193	35.8	84	19.8
	5 or more	215	39.9	28	6.6
Year level	First Year	54	10	114	26.9
	Second Year	355	65.9	257	60.6
	Third Year	130	24.1	53	12.5
Territory of Residence	Campus	506	93.9	237	55.9
	Non-Campus	33	6.1	187	44.1
Students'	E-ready	124	23	146	34.4
	Not E-ready	415	77	278	65.6

Table 1. Demographic features of students in blended and online courses.

4.1. Characteristics for student e-readiness

The highest means of the three e-readiness factors suggest that whether in a blended or online course, an e-ready student routinely communicates with persons using electronic technologies, and is a self-motivated and independent learner. Other research also reported that highly motivated and self-confident students could produce better e-learning outcomes [21, 22].

The highest scores of other items also identified e-ready students in each cohort. An e-ready student in the blended course should also have access to the Internet for substantial periods of time, perhaps 45 minutes or so, at least 3 times a week. This seems reasonable as these students would also need to spend time watching lecture videos, downloading course materials or

submitting assignments that supplement their face-to-face classes. Both cohorts also showed much higher means in the technical readiness scale than the lifestyle aptitude, and learning preference scales. This is valid since students at the university have access to a dedicated network connection, printers and various software applications, either personally or in the computer laboratories on campus.

In comparison, an e-ready student in the online course should also be eager to try new technology tools, and be able to receive emails sent to the online campus email address. This would be expected since online students are exposed to new technology tools in the ELS due to the various methods in which instructors may present their course and tutorial materials. Using the online campus' email is the primary method of contacting instructors and administrative staff. These attributes align with other research that identifies online students as having a tendency towards adapting to new technologies [14, 18].

Previous research reported that although most students have been exposed to and possess basic technological skills (computer and Internet literacy), significant challenges remain in adapting their lifestyle and learning to interacting with an ELS [21]. This was shown by the lowest means in the items which identified students who were classified as not e-ready. Students in both cohorts were unable to access support services, and preferred immediate verbal feedback compared to written feedback. If students have technical issues with the ELS that are not resolved quickly, they may be hindered from progressing in the course. Furthermore, students in the blended course preferred to attend face-to-face classes on campus. It could be that they were more comfortable with and expected a traditional course structure, or had difficulty adapting to a new modality of learning. Students in the online course had challenges with finding persons and/or resources nearby to assist with any hardware or software problems. This could cause further frustration if these students have difficulty in accessing support services along with a lack of technical assistance from persons nearby. Apart from delays in keeping up with the course work or failure to submit assignments on time, these challenges could also impact their final grades. A summary of the highest and lowest means and standard deviations of items are presented in **Table 2**.

4.2. Level of student e-readiness

Table 3 presents the results and ratings of students' e-readiness for the three factors. The overall score for the cohort in the blended course was 3.88 (77.5%), and 4.01 (80.2%) in the online course. However, when each student's level of e-readiness was calculated, only 124 (33.0%) in the blended cohort and 146 (34.4%) in the online cohort were deemed to be e-ready. Students in the blended cohort were seemingly not prepared for engaging in an ELS, while those in the online cohort were minimally ready. This is in stark contrast with research on online instructors where the cohort was 91% prepared and 73% individually e-ready [32]. These instructors completed mandatory training for the ELS, and were not allowed to facilitate in the ELS if they were not deemed to be e-ready. For students, no mandatory training exists, and they were not counselled on expectations prior to registering for blended or online courses. Nevertheless, while training of students for the ELS is highly recommended, there are mixed outcomes resulting from students' general lack of interest in completing ELS training [23].

	Blended M (SD)	Online M (SD)
An E-Ready learner…		
(LP) Is self-motivated, and independent learner	4.04 (0.86)	4.20 (0.80)
(LA) Routinely communicates with others using electronic technology	4.26 (0.84)	4.12 (0.82)
(TC) Has access to the Internet for substantial periods of time, perhaps 45 minutes or so, at least 3 times a week.	4.25 (0.88)	—
(TC) Receives emails sent to my Open Campus email address even though it may not be my primary account	—	4.30 (0.69)
(LP) Is eager to try new technology or software applications	—	4.20 (0.82)
A learner who is not E-Ready…		
(TC) Does not know how to access the online help desk	3.74 (1.03)	4.06 (0.80)
(LP) Is not comfortable giving written feedback; prefers giving immediate verbal feedback	3.17 (1.05)	3.34 (1.12)
(LA) Does not need flexibility; prefers to come to campus to attend a traditional class	3.36 (1.22)	—
(LA) Does not have persons or resources nearby to help with technical problems soft/hardware	—	3.55 (0.61)

TC, technical competence; LA, lifestyle aptitude; LP, learning preparedness.

Table 2. Characteristics of an e-ready student using highest lowest mean (M) and standard deviation (SD).

Further analysis was conducted on the 415 (77.0%) students in the blended cohort and 278 (65.5%) in the online cohort who were not deemed to be e-ready. There were 104 (25.1%) students in the blended cohort and 62 (22.3%) in the online cohort who were deficient in all three scales. This group of students could be at a distinct disadvantage for studying via an ELS since they seem to be more suited to a traditional classroom environment. Introducing online components in traditional courses may therefore hinder students who require face-to-face interaction in a traditional classroom environment. Also, while not all students in an online course are able to adapt to working in an ELS, some mandatory orientation or support during their studies could still improve their chances for successful completion of the course.

Factor	Reliability		Blended M (SD)	Online M (SD)
TC	0.96	0.89	4.25 (0.56)	4.33 (0.49)
LA	0.71	0.72	3.75 (0.68)	3.85 (0.63)
LP	0.72	0.74	3.69 (0.60)	3.86 (0.61)
Overall means	**0.90**	**0.89**	**3.88 (0.50)**	**4.01 (0.46)**

TC, technical competence; LA, lifestyle aptitude; LP, learning preparedness.

All items were measured via a 5-point Likert scale: 1 = strongly-disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly-agree.

Table 3. Cronbach's alpha, means (M) and standard deviation (SD) of e-readiness factors.

4.3. E-readiness during the course

Table 4 presents the means and standard deviations in each cohort for the factors at course orientation, course delivery and course completion.

Factor	Reliability		Mean (SD)	
	BL	**OC**	**BL**	**OC**
Course orientation				
ELS quality (EQ)	0.76	0.85	3.72 (0.52)	3.93 (0.56)
Information quality (IQ)	0.82	0.89	3.79 (0.50)	3.86 (0.56)
Service quality (SQ)	0.76	0.76	3.35 (0.69)	3.70 (0.65)
Course delivery				
ELS use (EU)	0.75	0.75	4.11 (0.76)	3.86 (0.81)
Student satisfaction (SS)	0.86	0.89	3.89 (0.67)	3.98 (0.64)
Course outcome				
Net benefits (NB)	0.62	0.75	3.58 (0.45)	3.65 (0.42)

BL, blended course; OL, online course.

All items were measured via a 5-point Likert scale: 1 = strongly-disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly-agree.

Table 4. Cronbach's alpha, means and standard deviation (SD) for ELS quality (EQ), information quality (IQ), service quality (SQ), ELS use (EU), student satisfaction (SS), and net benefits (NB).

4.4. E-readiness at course orientation

During course orientation, students in blended course found that the ELS was easy to use (M = 4.11, SD = 0.69), provided information relevant to their learning (M = 4.12, SD = 0.59), and the support specialists were helpful (M = 3.40, SD = 0.79). The students in the online cohort found that the ELS was always available (M = 4.11, SD = 0.76), provided information relevant to their learning (M = 4.11, SD = 0.58), and the support specialists provided adequate assistance and explanations for their issues (M = 3.75, SD = 0.81).

The concerns from the blended cohort revealed that the ELS lacked attractive features (M = 3.16, SD = 0.85), while it was not responsive enough (M = 3.66, M = 0.82) for the students in the online course. However, students in both courses complained that the ELS contained insufficient information (M = 3.64, SD = 0.77 for blended, and M = 3.71, SD = 0.82 for online), and that the support specialists were unavailable when they had a technical problem (M = 3.26, SD = 0.85 for blended, and M = 3.66, SD = 0.81 for online).

The most important focus at the start of a course should be reducing early frustrations with the ELS. Introducing more shifts or additional support staff during the first few weeks of the semester could alleviate these problems. Students need timely assistance during this phase to quickly have passwords reset and other log in issues settled in order to help them focus on interacting with peers and becoming acquainted with the ELS. According to Chyung [29],

students' active participation in the first few weeks of an online course more likely results in course completion.

Further evaluation of students' level of e-readiness at course orientation confirmed that for students in the blended course, the level of e-readiness was indeed a predictor of ELS quality ($\beta = 0.37$, $p < 0.001$), information quality ($\beta = 0.31$, $p < 0.001$), and service quality ($\beta = 0.22$, $p < 0.001$). E-readiness accounted for 13.9% of the variance in ELS quality, 9.8% of the variance in information quality, and 4.6% of the variance in service quality. For students in the online cohort, the level of e-readiness was also a predictor of ELS quality ($\beta = 0.41$, $p < 0.001$), information quality ($\beta = 0.43$, $p < 0.001$), and service quality ($\beta = 0.37$, $p < 0.001$). E-readiness accounted for 17.1% of the variance in ELS quality, 18.2% of the variance in information quality, and 13.5% of the variance in service quality. Higher levels of e-readiness seem to be necessary for students in the online course, so that they could quickly and efficiently access the ELS to start gathering information, complete orientation activities, and start interacting with their peers.

4.5. E-readiness during course delivery

Students were asked about their use of and satisfaction with the ELS. The highest means for the items indicated that students in both courses frequently used the ELS (M = 4.21, SD = 0.86 for blended; M = 3.96, SD = 0.87 for online), and were pleased with the experience of using the ELS (M = 3.91, SD = 0.71 for blended; M = 3.99, SD = 0.72 for online). Once there are no major setbacks during course orientation, students' satisfaction with the ELS increases since they were able to easily access course materials, interact and become comfortable with the ELS during this second phase. Details on the effect of students' level of e-readiness with other items during course delivery are explained in the following sections.

- **ELS use:** The model accounted for 16.0% of the variance on ELS use for the blended cohort ($F(4, 534) = 25.75$, $p < 0.001$, $R^2 = 0.16$), where the level of e-readiness (17.6%), the quality of the ELS (18.2%), and the information posted in the ELS (15.6%) influenced ELS use. However, for students in the online cohort the model accounted for 12.0% of the variance, where only e-readiness (11.4%) and the ELS' quality (18.2%) influenced ELS use ($F(4, 419) = 14.66$, $p < 0.001$, $R^2 = 0.12$). For students in both cohorts, it appeared that the quality of the ELS was more important when interacting in the ELS than their level of e-readiness. One can appreciate that frequently accessing the ELS during this active phase is the primary focus for students who expect the ELS to be available and ease of use in order to complete their course assignments. While students in the online course depend on using the ELS for the all components of their courses, those in the blended cohort may use the ELS at intervals since they still have a face-to-face component. Nevertheless, students would not want to be disappointed with quality concerns when uploading assignments to meet deadlines.
- For students in the online course, information quality ($p = 0.106$) along with service quality in both courses ($p = 0.981$ for blended; $p = 781$ for online) had no influence on ELS use. One could also envision that by now students would have become familiar with the rhythm of the course, along with provision of up-to-date course-related materials. This could reduce the number of times a student accesses the ELS as it minimizes the need for them to repeatedly check the ELS for these course updates.

- **Student satisfaction:** The model accounted for 47.8% of the variance on student satisfaction for the blended cohort ($F(4, 534) = 122.171$, $p < 0.001$, $R^2 = 0.478$), and 50.1% of the variance for the online cohort($F(4, 419) = 105.278$, $p < 0.001$, $R^2 = 0.501$). This may imply that the more prepared students are for the ELS, then the more satisfied they are with the experience and confidence in interacting with the ELS.

Information quality (30.5% for blended; 33.4% for online) was the largest contributor to student satisfaction in both cohorts followed by ELS quality (30.9% for blended; 21.5% for online), and service quality (17.6% for blended; 15.9% for online). Studies support the strong link between information quality with user satisfaction [33] since the very nature of online learning mandates that instructional materials be clear, easily understood and accessible by students [11]. The low percentages for support services may suggest that satisfied students rarely require the help desk services if their technology issues are minimized.

The level of e-readiness contributed 20.6% to students' satisfaction with the ELS only for the online cohort. This implies that high levels of e-readiness enhance their competence in knowing how to quickly navigate and interact constantly in the ELS.

4.6. E-readiness at course completion

At the end of the course, students in both courses assessed the benefits obtained from their experiences with the ELS. The students in the blended cohort indicated that they saved time by using the ELS (M = 4.10, SD = 0.70). This provides them with the opportunity to upload course assignments and review course materials using the ELS without having to travel to a physical campus to deliver a printed assignment. Those in the online course expressed that the ELS contributed to their academic success (M = 4.23, SD = 0.66), which suggests that the ELS provides a meaningful avenue for them to further their academic studies while staying fully employed or remaining in their home country.

The challenge for the students in the blended course was feelings of isolation (M = 3.71, SD = 0.70) while those in the online course reported a lack of contact with others (M = 3.48, SD = 0.99). These results also support findings that students who take online courses especially for the first time tend to feel lonely and socially isolated, mainly because they are not familiar with the social interaction of ELS environment [4].

At the end of the blended and online courses, the model accounted for 40.8 and 35.1% of the variance in net benefits ($F(3, 535) = 122.986$, $p < 0.001$, $R^2 = 0.408$, and $F(3, 420) = 75.688$, $p < 0.001$, $R^2 = 0.351$) respectively. Student satisfaction was the largest contributor in both courses (47.2% for the blended course and 39.9% for the online course). As the courses come to an end, there is less use of the ELS but overall satisfaction with the experience, which is consistent with research that found user satisfaction to be the most significant contributor of ELS success [14].

For students in the blended cohort, using the ELS contributed 19.3% of the variance for the net benefits of taking the course, followed by 14.6% for their level of e-readiness. Having the convenience of submitting course assignments via the ELS could be more beneficial for students. Conversely, for the online cohort, their level of e-readiness contributed 19.5%, with 13.3% for

using the ELS. This could imply that high levels of e-readiness are most beneficial to these students who depend on the ELS.

An independent samples t-test was conducted to examine whether there was a significant difference between students in either course who were e-ready from those who were not, based on their net benefits at course completion. The test revealed a statistically significant difference for students in the online course ($t = -6.95$, $df = 270.57$, $p < 0.000$). Those who had higher levels of e-readiness ($M = 3.89$, $SD = 0.53$) seemed to have benefited more by the end of the course than those who were not e-ready ($M = 3.52$, $SD = 0.48$).

The overall influence of students' e-readiness showed a positive impact on ELS quality, information quality, and service quality for both cohorts during course orientation. This influence was greater for the students in the online course which steadily diminished during course delivery to the end of the course. In contrast, the influence steadily increased with the blended cohort where student satisfaction was strongest during course delivery through to the course completion. The positive benefits of having high levels of e-readiness saved the students' time in the blended cohort and contributed to online cohorts' academic success. The negative outcome was lack of contact with others for the blended cohort and feelings of isolation for the online cohort. It may appear that the students in the blended course benefit from having higher levels of e-readiness to help them through their course. **Figure 2** shows the impact on each factor at each stage, with the strongest influence of the two cohorts shown in bold.

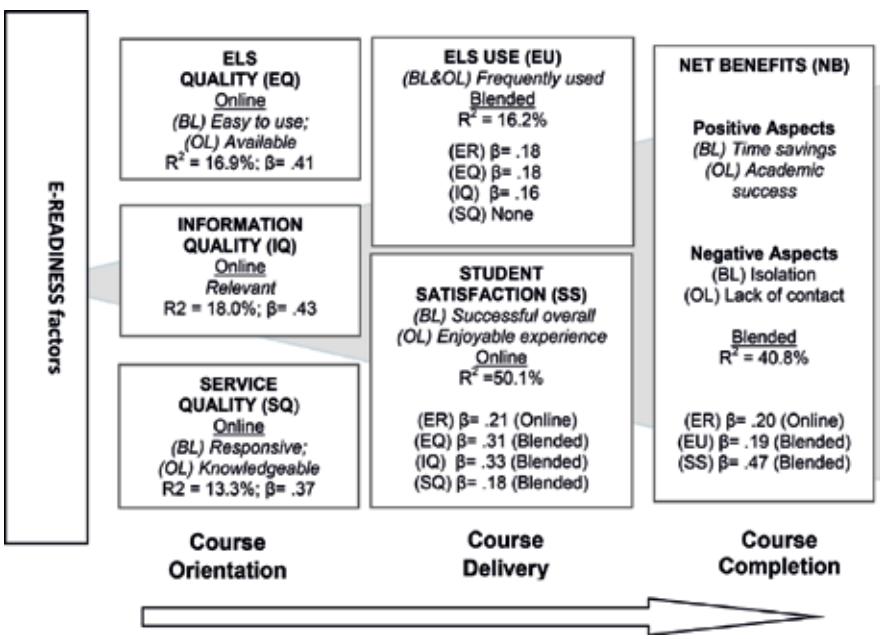

Figure 2. Summary results of influence of students' readiness at course orientation, during course delivery, and at course completion. Only the results of the strongest impact of the two cohorts (blended; online) at each stage are shown. None indicates no influence for the factor.

5. Conclusions and future research

The framework seems to effectively evaluate the levels of e-readiness throughout a blended or online course. The results suggest that students' level of e-readiness contributes to their academic success via different pathways. While students often have a choice of selecting a blended or online course, it should not be assumed that the provision of an ELS could replace the traditional classroom. Evaluating their suitability for different modalities should be paramount so that they are given the best options, and advice, to make an informed decision. One can only wonder how the experiences of the 166 students who were deficient in all three scales could have been improved with pre-course screening and ELS training. These methods should be embedded in courses with an online component, where students can be assessed, and if necessary exposed to technical and social skills required for the ELS. Failure to do so could result in missed opportunities for improving expectations in online environment and unnecessary increases in attrition rates. Another recommendation of fixing the 'ready' in e-readiness would be to increase the visibility and accessibility of help desk services for students in both cohorts, by possibly embedding email contacts and online chat facilities with every ELS log in screen and on every course page. While it may initially seem trivial to do so, it could improve retention rates of those who would otherwise become frustrated with the ELS and drop the course.

There were some limitations to the study. First, students in the region who still pay high 'per minute' fees, use 'dial-up' to access the Internet, do not own a computer or have reliable Internet access are less likely to spend extra time completing an online survey. More so, students who were not categorized as e-ready and were still not familiar with the ELS could have possibly contributed to under-reporting of responses if they were not keen on completing a non-essential task such as an online survey. These findings could be used as a benchmark for comparisons of levels and characteristics of e-readiness in other blended and online courses. However, tracking students' levels of e-readiness, whether categorized as e-ready or not, in subsequent courses through to graduation would be a most useful study for university administrations and instructors in an effort to understand and use key indicators to reduce attrition rates.

Author details

Glenda H. E. Gay

Address all correspondence to: glenda.gay@cavehill.uwi.edu

The University of the West Indies at Cave Hill, Bridgetown, Barbados

References

[1] Allen IE, Seaman J. Grade Change: Tracking Online Education in the United States 2014 [cited 2016 April 2]. Available from: http://www.onlinelearningsurvey.com/reports/gradechange.pdf

[2] Vanslambrouck S, Zhu C, Lombaerts K, Philipsen B, Tondeur J. Students' motivation and subjective task value of participating in online and blended learning environments. The Internet and Higher Education. 2017;**36**:33-40

[3] van Rooij SW, Zirkle K. Balancing pedagogy, student readiness and accessibility: A case study in collaborative online course development. The Internet and Higher Education. 2016;**28**:1-7

[4] Yu Y, Richardson JC. An exploratory factor analysis and reliability analysis of the student online learning readiness (SOLR) instrument. Online Learning 2015. 2016;**19**(5):22; [cited 2016 March 31]

[5] Lim DH, Morris ML, Kupritz VW. Online vs. blended learning: Differences in instructional outcomes and learner satisfaction. Journal of Asynchronous Learning Networks. 2007;**11**(2):27-42

[6] Lim HL. Community of inquiry in an online undergraduate information technology course. Journal of Information Technology Education. 2007;**6**:153-168

[7] Artino AR Jr. Online or face-to-face learning? Exploring the personal factors that predict students' choice of instructional format. The Internet and Higher Education. 2010; **13**(4):272-276

[8] Burns K, Duncan M, Sweeney DC, North JW. A longitudinal comparison of course delivery modes of an introductory information systems course and their impact on a subsequent information systems course. MERLOT Journal of Online Learning and Teaching. 2013;**9**(4):453-467

[9] Wagner SC, Garippo SJ, Lovaas P. A longitudinal comparison of online versus traditional instruction. MERLOT Journal of Online Learning and Teaching. 2011;**7**(1):68-73

[10] Cole MT, Shelley DJ, Swartz LB. Online instruction, e-learning, and student satisfaction: A three year study. The International Review of Research in Open and Distance Learning. 2014;**15**(6):111-131

[11] Mandernach BJ, Mason T, Forrest KD, Hackathorn J. Faculty views on the appropriateness of teaching undergraduate psychology courses online. Teaching of Psychology. 2012;**39**(3):203-208

[12] Parkes M, Stein S, Reading C. Student preparedness for university e-learning environments. The Internet and Higher Education. 2015;**25**(1):1-10

[13] Darab B, Montazer GA. An eclectic model for assessing e-learning readiness in the Iranian univerisities. Computers & Education. 2011;**56**(3):900-910

[14] Hashim H, Tasir Z. E-Learning Readiness: A Literature Review. 2014 International Conference on Teaching and Learning in Computing and Engineering (LaTiCE). Kuching: IEEE; 2014

[15] Bhuasiri W, Xaymoungkhou O, Zo H, Rho JJ, Ciganek AP. Critical success factors for e-learning in developing countries: A comparative analysis between ICT experts and faculty. Computers & Education. 2012;**58**(2):843-855

[16] World Economic Forum. The Global Information Technology Report 2015. Geneva: Johnson Cornell University; 2015

[17] Warrican SJ, Leacock CJ, Thompson BP, Alleyne ML. Predictors of student success in an online learning environment in the english-speaking Caribbean: Evidence from the University of the West Indies Open Campus. Open Praxis. 2014;**6**(4):331-346

[18] van Zyl JM, Els CJ, Blignaut AS. Development of ODL in a newly industrialised country according to face-to-face contact, ICT, and e-readiness. The International Review of Research in Open and Distance Learning. 2013;**14**(1):84-105

[19] Enightoola K, Fraser S, Brunton T. Exploring the community of inquiry model: Students' attitudes towards e-learning. Caribbean Teaching Scholar. 2014;**4**(2):81-98

[20] Kaymak ZD, Horzum MB. Relationship between online learning readiness and structure and interaction of online learning students. Kuram ve Uygulamada Egitim Bilimleri. 2013;**13**(3):1792-1797. PubMed PMID: 1416275786. English

[21] Mandernach BJ, Donnelli E, Dailey-Hebert A. Learner attribute research juxtaposed with online instructor experience: Predictors of success in the accelerated, online classroom. Journal of Educators Online. 2006;**3**(2):17. PMCID: July 26

[22] Holsapple CW, Lee-Post A. Defining, assessing, and promoting e-learning success: An information systems perspective. Decision Sciences Journal of Innovative Education. 2006;**4**(1):67-85

[23] Emelyanova N, Voronina E. Introducing a learning management system at a Russian university: Students' and teachers' perceptions. The International Review of Research in Open and Distance Learning. 2014;**15**(1):273-289

[24] Watkins R, Leigh D, Triner D. Assessing readiness for e-learning. Performance Improvement Quarterly. 2004;**17**(4):66-79

[25] Tinto V. Reflections on student retention and persistence: Moving to a theory of institutional action on behalf of student development. Studies in Learning, Evaluation, Innovation and Development. 2005;**2**(3):89-97

[26] Baturay M, Yukselturk E. The role of online education preferences on student achievement. Turkish Online Journal of Distance Education. 2015;**16**(3):1-10

[27] Mutala SM, van Brakel P. An evaluation of e-readiness assessment tools with respect to information access: Towards an integrated information rich tool. International Journal of Information Management. 2006;**26**(3):212-223

[28] DeLone WH, McLean ER. The DeLone and McLean model of information systems success: A ten-year update. Journal of Management Information Systems. 2003;**19**(4):9-30

[29] Chyung S. Systematic and systemic approaches to reducing attrition rates in online higher education. The American Journal of Distance Education. 2001;**15**(3):36-49

[30] Al-Busaidi KA. An empirical investigation linking learners' adoption of blended learning to their intention of full e-learning. Behaviour & Information Technology. 2013;**32**(11):1168-1176

[31] Klobas JE, McGill TJ. The role of involvement in learning management system success. Journal of Computing in Higher Education. 2010;**22**(2):114-134

[32] Gay GHE. An assessment of online instructor e-learning readiness before, during, and after course delivery. Journal of Computing in Higher Education. 2016:1-22

[33] Petter S, McLean ER. A meta-analytic assessment of the DeLone and McLean IS success model: An examination of IS success at the individual level. Information Management. 2009;**46**(3):159-166

Chapter 6

Research Study on Significance of Gamification Learning and i-Campus Using Internet of Things Technology-Enabled Infrastructure

Veeramanickam Murugappan,
Debnath Bhattacharyya and Tai-hoon Kim

Additional information is available at the end of the chapter

http://dx.doi.org/10.5772/intechopen.75744

Abstract

In this chapter, we discusses the importance of smart i-campus in educational institutes and gamification-based learning to be an integral part of the Internet of Thing (IoT) enabled the smart campus to explain its significance in terms using modern technology in teaching and learning. This research study related to two dimensions different fields, one perspective on fully engaged and enthusiastic learners from gamification part and another perspective on enhanced technology accessibility for the dream i-campus will pretend to be realistic in the near future. Analytical study of smart campus architecture with all features includes classroom laboratories… etc… And the gamification significance in terms of knowledge transfer, assessments, microlearning, competition among learners, to engage maximum level, rewards on achievements. It's emphasis on the need for both approaches in a single platform to the learners for efficient and smart learning environments to set up.

Keywords: gamification learning, internet of things, smart campus, e-learning

1. Introduction

In a modern day as technologically advanced in all domains related to mankind, so very important to concern about the need of the hour to utilize modern technologies in traditional classroom and college campus in term of attracting students with the internet of things enabled smart campus. In future, any academic institutes need to adopt such technologies without

any choice of away from modern world necessity, especially in teaching and learning system. Today so many challenges as we have a different way of learning so teaching becomes unconcerned because in many institute's modern infrastructures is lagging especially in Asian countries and developing countries. Students are in the speedy world using internet maximum timing. So this increased more opportunity to engage them gamification learning mode easily to any individual learners thinking methods and to progress in their various skills, it was quite difficult to engage them in the traditional classroom campus become challenging factors.

In academics, lecturers are compelled to work on normal blackboard and chalk piece of teaching methods. To overcome this campus infrastructure needs to be enhanced in such way to adopt the internet of things platform based smart classrooms, smart campus, smart lab…etc. So it will help many students to enhance the professional way and in-depth academic way of performance with highly configured resource availability. For this, here we propose two major factors in terms higher engagement level will be addressed for more active learners and incorporate them to be part of smart campus maximum timings inside their institute's location. However, simply providing smart, modern campus is not enough to rectify this problem so need of gamification e-learning platform model vital within the campus network. While various factors are concerned to modernize smart campus, but this research study took major factors concern to improve efficiency in terms of engaging student learners in improving their focus on learning and being inside the campus for a longer duration to part various learning models and assessments toward gamification functionalities.

As per **Table 1** from HP estimation, they conducted the survey, all prediction figures are drastically increasing over a period of time and the results are quite surprising factors to understand the need for modern infrastructure in academic Campus too. So global level all fields are moving toward for completely automated is understandable. "43% IoT data processing at done before sent to cloud data center, 38% application's data have economic impact on which it required interoperability between one IoT platform to another systems, 85% of industry will adopting IoT platform by 2019." [1] So many devices help to link among the physical world and digital platform to progress life of productivity, highly skilled society and maximum automated smart industries and their products finally a great platform to Produce skilled workers more knowledge with highly engaged to be part of growth for the country. Smart homes are gradually trending among all builders; construction to provide people with a comfortable zone level of high technologies enhanced smart homes. Wearable's devices rapidly

Year wise	Number of connected devices (IoT)
1990	0.3 Million
1999	90.3 Million
2010	5.0 Billion
2013	9.0 Billion
2025	1.0 Trillion

Table 1. Connected devices estimation [1].

http://dx.doi.org/10.5772/intechopen.75744

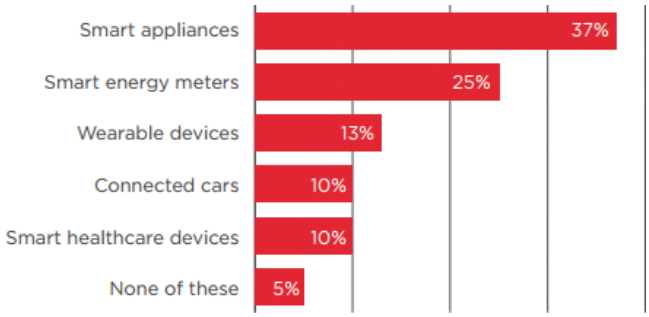

Figure 1. Customer's connected device preferences: Source GSMA report [2].

increasing among students and adult user's usage level need to be considered to utilize in gamification platform to connect applications with user's real-world environments.

As **Figure 1** about GSMA study finds customers interest for possible connected device they likely to use for home appliance [2]. As Campus modernization is very important in Smart Campus for academic institutions so usage of Internet of Things (IoT) becomes evidently are important across the globe and all colleges and institutes need to prepare for data collection from different sets of sensors, smart device applications and various platforms of technologies, which insist on upgraded more efficient network model. Future i-campus using connected devices turn out to be a collection of sensors, big data application and data analytics for prediction, and other application of IoT technologies to make enhanced smart campus.

2. Gamification in learning platform: study

As a part of routine life, games not only entertain users, but also represent their behaviors also. The same can be used in e-learning by applying crux to learn and get a maximum number of the process. The techniques in games tend to provide simplification to learning approaches. The customization of e-learning processes with this approach can make it easy as ever. It is the use of gameplay mechanics used for Non-game applications where any process can be gamified. Its main goal is to engage learners by using gamification techniques in routine Teaching-Learning Processes. By keeping attention to the integration of tasks, we can motivate learners too [3].

To engage users in learning gamification is an efficient approach which can make content more attractive. B.J. Fogg argues that people respond to computers as they were persons, especially when gaming. To trigger certain behavior, it needs to be motivated. Gamification also extends the social interaction with other users. Fogg explains that when people perceive social presence, they naturally respond in social ways and have feelings of empathy or anger, or following social rules such as taking turns [3].

Gamification is mainly for usage of gamifying features in other than games, applications also, predominantly consumer is focused on the web-based the platform and mobile

application too. Gartner Group predicts gamification will be a key trend that every CIO, IT planner and enterprise architect must be aware of as it relates to business. As the view of the gamified learning approach through a context-aware mobile learning environment, which gives motivation to students for learning by developing and implementing gamification strategies by using questionnaire with the help of a Smartphone and its functions. Pre and post-test results demonstrated that use of gamification increases the throughput of the overall process. Further, they revealed a positive relationship between learning achievement and motivation [4].

A game-informed approach being a learning activity, it recognizably uses game-like elements. The process of engaging new approaches to teaching and delivering personalized, context-sensitive content, via the game-informed, technology-supported, learning activities, has been reported to have significant beneficial effects on the academic outcomes of students in primary schools. Gamification still needs to pay attention to individual learners and their performances by using two approaches to learn the games and gamification of educational contents. Where learning for games refer to the use of digital games for learning purposes. Gamification is "the use of game design elements in non-gaming contexts" [4].

Personalized Gamification: In order to personalize gamification as: applications that are plugged into another application without being essential. Giroux et al. Describe epiphytic features as follows: i) such system cannot be existent without a host system, ii) the hosting system can able to exist without epiphyte iii) both can have independent presences in the network, and finally, such system cannot affects its hosting application [5].

As video games are becoming more popular among games, there is huge potential to use it for gamification of learning content. Social networking, gamification and traditional e-learning approaches are compared. Participants in novel approaches get better results concerning skill acquisition. The traditional approach yields better results for knowledge acquisition. Students' attitude toward the new tools is positive. Participation rates are low challenging assumptions found in current literature. With best use of social networking in e-learning, gamification is the use of game-thinking and playful design in non-game contexts, has only shown its potential as a motivational tool [6].

The effects of a gamification plug-in deployed in a learning management system were compared to those of a social networking site in the same educational setting. We found that both approaches presented better performance than a traditional e-learning approach in terms of academic achievement for practical assignments, but that, when it came to assessing knowledge, the traditional e-learning approach was better. Also challenging current assumptions, participation rates and scores remained low with the new tools, although students' attitudes were positive. [7] Even if there are many negative views toward games, there are great advantages and benefits of it to engage and incorporate features that are extremely compelling. Online learning is assessed using studying time. Numerous numbers of connections and many other parameters have its impact. IoT allows interaction among various physical spaces to learn the problem objectively and communicate among themselves. The connection between device endpoint to all users to make smart i-campus to produces effective campus outcomes [8].

http://dx.doi.org/10.5772/intechopen.75744

2.1. Gamification for campuses learning

Major fact is objective in attempting to sustain good communications for supporting feedback and strengthening learning platform, instructors, student's users, this collectively interactive model between all users and good level of control features in gaming to engage users, helps to design ineffectual ways of fun learning [9].

- Duo Lingo: language learning from Web translates.
- Ribbon Hero: Teach how to use Microsoft Office and learning.
- Class Dojo: Class learning becomes Game of Rewards & Feedback assessment
- Goal Book: Individual students learning Plans together
- The World Peace Game: Game-based Simulation for Classroom learning
- Coursera: Interactive Education from your Home
- Mr. Pai's Class: The Digitally Assistance for a Class
- Course Hero: Teacher and Student Interactions in Online
- Brain scape: Confidence on Basis of Repetition from games
- Socrative 101: Mobile interaction among Teacher & Student [9]

2.2. Top 10 productivity application uses gamification

The main focus and practical usage of gamification toward help people their productivity plan and manageable task and challenges into reality. So the consistent way is to achieve it from the small goals [10].

- Habitica (HabitRPG)
- Super Better
- To-Doist Karma
- Epic Win
- Task Hammer
- Doable
- Chore Wars
- Mind Bloom
- Fitocracy
- Smarty Pig
- ABCya
- FunBrain
- Carmen Sandiego [10]

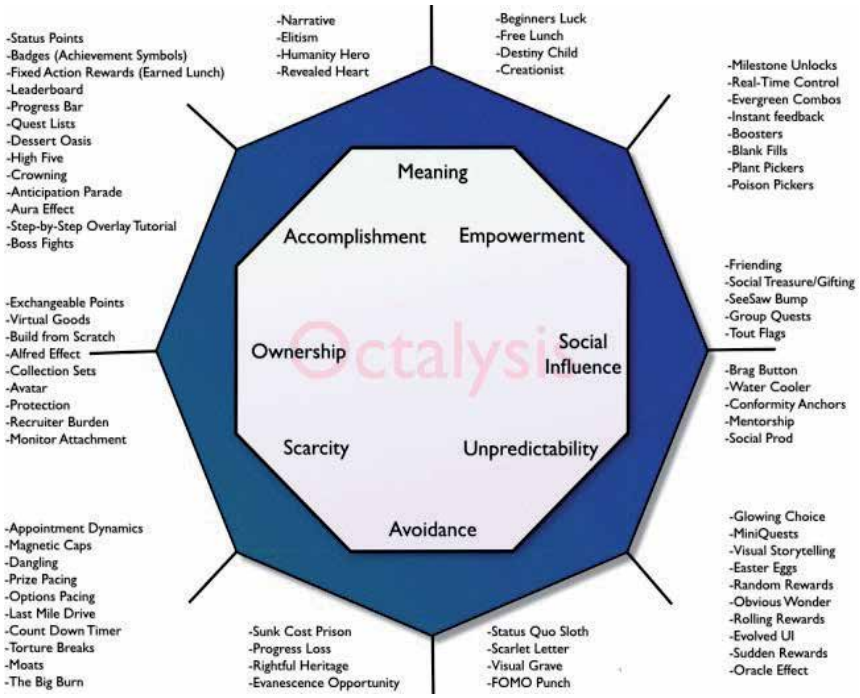

Figure 2. Gamification frameworks –Octalysis. [11].

Octalysis – Gamification Framework: Octalysis is Gamification Framework I shaped past 10 years of gamification-based research work. It's translated into nine languages globally and become necessary literature for Gamification model domain worldwide. [11] (**Figure 2**).

3. Study of i-campus technologies

As of June 2017, survey data from 138 educational institutions from the Center for Digital Education to conclude about the various projects of connected campus. To better understanding of about connected devices for i-campus. Queries like questions about education, user's engagement, and campus safety and network efficiencies.

The campus, which working on Smart i-campus is using numerous technologies using connected devices in the form of different domains. Dominant methods like classrooms with intelligence blended learning platform and digital signage.

This study clearly states that various models of smart technologies used in that 138 HE institution like an Intelligent classroom, collaborative learning space, Data-driven decision-making and research work, Analytics of data, Cyber platform, signage digital oriented. Etc. But not listed on the gamification domain platform for learning model [12] (**Figure 3**).

As digital signage come out at the top of second priority because technology is comparatively less expensive and very simple to implement. The objective of institutions to use signage like to include directing their students, to deliver weather data and news updates, information, provides an activity to engage users and post menus and major things are used for communication during an emergency situation. Smart lighting to automatically brighten for the presence of the populace and also can able to generate self-reports of its maintenance requirements and helps to improve energy efficiency.

As per experts predicts and expect the various outcomes from IoT like which includes for better accessibility for innovative resources, to increase the student engagement and to extend higher capacity in data analytic prediction. Some HE user's benefited from technology like experiencing from the IoT platform.

User's expectation from cost reduction, very but a few percents of the respondents realize about cost savings. In the same manner, 54% forecast for increasing capacity in data analytics platform and only 27% achieved in data analytics. As a major element of this smart campus is a data analytics toward explorations for benefits in more decision-making. Saving time expectation is higher in data management on the basis of streamlining data records (**Figure 3**).

As per CDE reports students getting more benefits from smart campus, teaching faculty and non-administrative too. So every new innovation from i-campus for classrooms and teaching tool for faculties are in terms of creating higher engagement to the experiences of all student users. And also for all stakeholders, the satisfaction level is good in i-campus new initiatives which are important for successes (**Figure 4**).

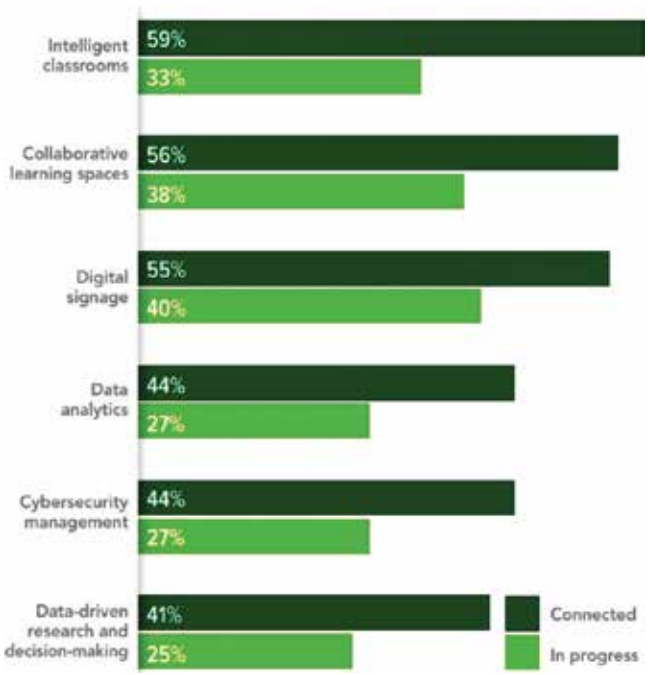

Figure 3. Smart technology usage: CDE surveys among 138 higher education [12].

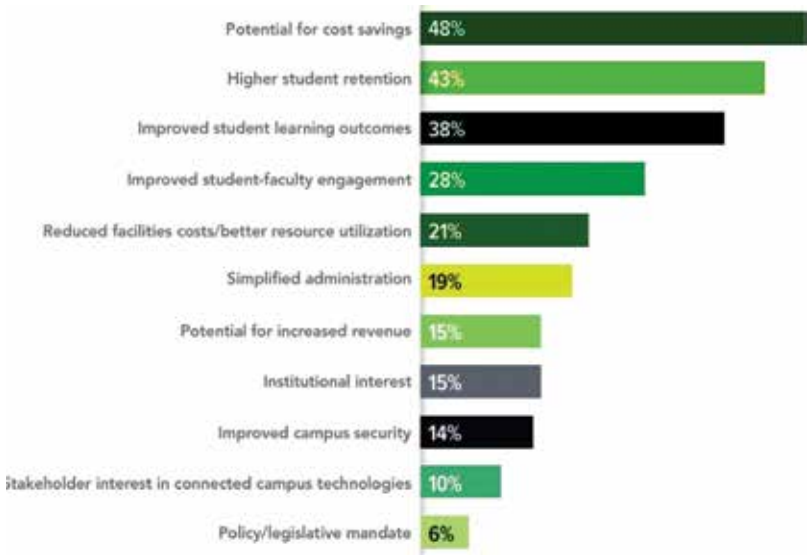

Figure 4. Driving factors for connected campus: CDE 138 higher education. [12].

3.1. Preparation for IOT in i-campus

To incorporate intelligence in campus using smart technologies for classrooms, all located within a smart campus required most reliable and very high-computing efficiency campus infrastructure. Only 23% believe their existing computing can able to sustain it in connected devices for campus activities. Then 36% believed that infrastructure would improve next year, but not a regular basis. Then 22% accepted as their infrastructure as of current state not adequate to do i-campus model.

So performance computing 4 out of 10 institutions which are 39% is required for improvements in the bandwidth of campus networks. Around 36% need network booster to improve data analytics and higher cybersecurity. Almost thirty-three expected to increase their cloud infrastructure model. Relatively 3 out of 10 which are 28% as they do not know about what technologies are required for their campus. [12] So still it does not convey as they are unconcerned or indifferent. Some likely as individual's users working for shadow IT operations. But still many are lagging in broader understanding about institutional infrastructure requirements, even though they are capable to deploy connected devices for their campus to deliver services for all the stakeholders.

Many of this expected provision are cost investment for campus's technologies toward cyber security as highly needed for their demands. 19% says about data analysis in decision-making, 17 for network infrastructure platform (**Figure 5**).

3.2. Applicatioxn of IoT in industry

3.2.1. Smart home

Smart home clearly opts out to be the odd technology out, seeming to overtake another breed of the Internet of Things applications as the topmost rank comparing all measured channels.

http://dx.doi.org/10.5772/intechopen.75744

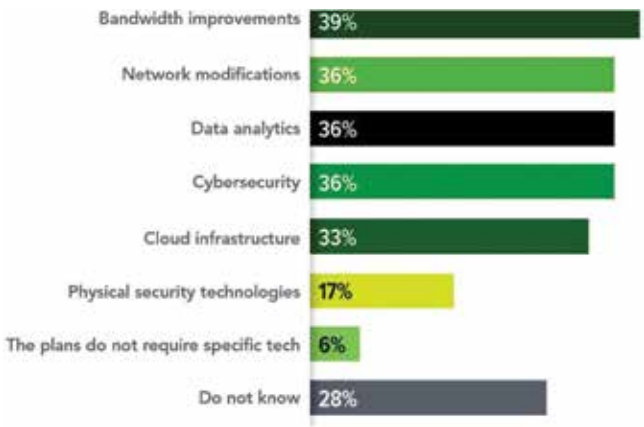

Figure 5. Technologies required for connected campus: CDE 138 higher education. [12].

The numbers of people are currently searching for the term 'Smart home 'seems to be increasing every month. A surprise whooping people of about 60,000 plus and odd keep searching the internet for the term the total revenue invested for Smart Home startups funding is a whopping amount which greatly exceeds $2.5 billion.

The prominent startups which are involved in IoT-based applications are Nest or Alert Me. The MNC's which are involved in IoT-based applications are Philips, Haier or Belkin. A Data Analytics survey for the database for Smart Home includes 256 companies and startups. More companies which are more active in the smart home than any other applications in the field of IoT are huge in number.

3.2.2. Wearables

The wearable's remains seem to be the talk of the ICT Revolution. Among all the IoT startups, wearable's maker Jawbone is the biggest game player funding to date in the development process, accounting for about more than half a billion dollars as of today's market.

The Apples' new smartwatch is about to be released in April 2015. The consumers eagerly wait for the same: and there are plenty of stakes to unearth: like the Sony Smart B Trainer, the Myo gesture control, or Looksee bracelet… As consumers, there are plenty of other wearable innovations to be excited about: like the Sony Smart B Trainer, the Myo gesture control, or Looksee bracelet.

3.2.3. Smart city

The Smart city project initiatives by the Government spans a wide range of opportunities of use cases, from traffic management, water distribution, green buildings, urban security, environmental monitoring, Waste management techniques, Eco – friendly initiatives, Pollution restriction issues, Urbanization issues and Wastewater management Techniques. The innovative techniques in the most popular Smart City Solutions lay a strong emphasis on the fact to alleviate the atrocious pains of the people living in the cities. The IoT solutions in the area

of Smart Cities solve Traffic Congestion problems in reducing noise and pollution levels and help make the cities safer.

3.2.4. Smart grids

The era now is into the Smart grids. On the establishment of a Smart, the grid emphasizes on the information application about the behaviors of the electricity suppliers, consumers, mediators and the flow analysis. The process of improving the efficiency is based on economic usage of electricity, reliability and improvisation density. The number of hits and Google documents after the semantic infusion reaches new heights. But the tweets, density seem to be very low in the case of smart grids, giving a descending correlation of the above-mentioned technology.

3.2.5. Industrial internet

The Internet is an integral part of routine comes from Industrial Internet which is one of the special Internet of Things applications. There are a number of Market Researchers such as Gartner or Cisco with the Industrial Internet IoT Concept bagging the overall potential. The Industrial Internet has got the highest number of tweets in Social Media compared to other non – consumer applied IoT concepts. The tweets per month account around 1700. It is not as much popular as the smart home or the wearables. It has got a very long way to reach the domestic market.

3.2.6. Connected car

There is a very slow process in the connected car. In spite that there is a very slow approach, the fact that the development of cycles in the Automotive Industry to make this fact come into reality, take at least a minimum of 2-4 years. BMW's and Fords of this world should start to foray into the market. If this does not happen at the present, then the next generation of Internet connected cars should soon be taken up by other well-known giants such as Google, Microsoft, and Apple which has announced its own Connected Car platforms [13].

4. Smart connected campus

The IoT connected the device in some institution has its presence over campuses. Such institutes have found the way to bridge the gap for new sources of data for improving their data analysis by building potential infrastructure platform which will differentiate from the way student's skill improvement, faculty smart campus utilization, non-teaching like administrators data management, academic scholars and every other stakeholder in i-campus.

4.1. Research question

Research issues identified in this article are about for possibilities findings the solution to the list of question given below to get better understanding of the article purpose and findings to society

http://dx.doi.org/10.5772/intechopen.75744

- Is it i-campus (IoT-enabled infrastructure for the campus.) need of the hour?
- Whether all academic institutes are equipped with high-end configuration technologies?
- Students provided all training and skill oriented facilities for regular teaching only?
- Whether all classrooms in every educational organization looking to upgrade to connected devices?
- All stakeholders from the educational field are aware of the need to upgrade their campus with modern technologies?
- IoT application's growth in industry market will have an impact in the educational sector?
- Is it needed to move on from regular blackboard teaching mode to gamification-based learning?
- Learning made easy by using gamification?
- Octalysis – gamification framework state importance of gamification learning?
- Is needed for gamification for the campus in teaching and learning?

So this IS interesting fact for innovation of many connected devices to the campus. So IoT expectation helps to engage the students and educate them more efficient manner, also reduce function operational costs and helps to improve security model on the campus. Institutions also gain many advantages, so major factors are to put building infrastructure in place which will support for smart technologies.

4.2. Applications of IoT

- Smart home
- Wearable's
- Connected cars
- Industrial internet
- Smart cities
- IoT in agriculture
- Smart retail
- Energy engagement
- IOT in healthcare
- IoT in poultry and farming
- i-Campus (IoT in smart campus)
- Medical field

- Retail market
- logistics for supply chain
- Transportation
- Insurance with automation
- Energy management and distribution
- Cyber security
- Smart home automation
- The environmental monitoring
- Manufacturing, automobile industry
- Agriculture field
- Education for the e-learning domain
- Telecommunications

4.3. i-Campus benefits

The advancements on IoT in smart campus have enormous advantages. For all campus users like students and teachers, administrators all are new to this technology usage because they are not aware of this earlier. By using technology advancement students can be monitored and each other's too. It helps to utilize efficient energy consumption and also reduce energy burning for a range of all resources utilized within campuses for saving energy.

Automated lighting system and from air conditioner energy saving. The precise value of metering from resource utilization using sensors and institute has to pay as per resources being used. Education quality improvement: the IoT used in education field not only have a key impact in that field and also helps to improve the quality of the education. As millions of students studying global level at every college campus are fitted by this technology advancement [14].

In the near future, this goes to be a new trend in quite a large scale with IoT supported infrastructure build, So even rural students can able to be part of this global level accessibility of smart campuses which will uphold their life with highly skilled people in global market demands as changes in need according to scope of ROI in real markets [14].

Security is also a main concern due to the data breach occurrence every giant software application provider. So IoT-based i-campus may be exposed to large range possibilities of attacks. Hence Security model of i-campus highly concerned issues first among all other major functionalities. Smart Campus Challenges like stakeholders, members should be skilled, with more guidance able to deploy all devices with functionally capable, Sharing among the teacher for best practices, To engage all stakeholders among interested users, address all potential issues among iot project application approaches [15].

4.4. Smart campus expectations

- Transferring knowledge to others
- Technology dispersion among all
- Benefits of the stakeholder in long-term focus
- Smart campus enhances the skilled employee to produce a smart society
- Student success ratio by using i-campus
- Smart infrastructure for indoor and outdoor games
- Highly secured physical space on campus
- Connected smart vehicles
- Challenges on a the campus-like way of handling huge data
- Challenges in network security operation
- Usability among all users
- The project tracking and mentoring
- Mentoring and mentoring for research work
- To engage researchers
- Faculty mentoring
- Connected Device Management
- Inventory management of devices
- Guidelines for mobile devices in i-campus
- Infrastructure is supporting owned IoT devices from BYOD.

4.5. Gamification: educational point of view

How we can gamily educate in our classroom: So many educators are testing gamification learning in the classroom and getting a good positive outcome. A wide variety of learning available introduces ant classroom on basis of gamification.

Some of the gamifying education as listed here for learner's understanding and gamification objective is to make learners highly engaged [16].

- *Gamily using awards and grade, Students awarded the using badge.*
- *Educational video games integrated into our syllabus.*
- *Blend users using to gamily competition* [16]

Games have many elements that make them powerful vehicles for human learning. They are commonly structured for players solve a problem; an essential skill needed for today and tomorrow. Many games promote communication, cooperation, and even competition among players. Some of the most immersive games have a rich narrative that spawns creativity and imagination in its players. Finally, depending on how they are designed, games can both teach and test their players. They are incredible packages of teaching, learning, and assessment [17].

5. "Futurus" i-campus for e-learning model

In the Internet of Things domain, rapid development is happening. So in the digital era, a college campus should be part of IoT technology enhanced infrastructure. All institutes campuses are lagging for utilization modern devices in e-learning platform. **i-Campus (IoT in Smart Campus)** future is going to be the drastic difference for students to enhance their learning skill from i-campus. Smart campus using ANN-Cumulative Dragonfly based training secured marks pattern to predicted new marks with rmse of 4.66 for improving the student's performance using neural network learning model also helps to build a modern smart campus for increased focus on student's growth using new technologies [18].

5.1. IoT-enabled e-learning and its importance

The Internet of Things (IoT) is used for sensing nearby location efficiently for data collection from various functionalities. Multiple inter-connected devices are able to form a chain of networks. i-Smart campus formation is possible for data collection using the device for the e-learning platform. The IoT platform is sharing information using M2M, M2 human, M to Mobile.

The IoT intelligently connects humans, devices and systems. Analysts describe two distinct communications in the IoT: thing to the person and thing-to-thing communication. [19] Communication from the machine to the human using a mobile device, connected devices to share and collect data from endpoints for the e-learning platform. The enhanced classroom for data collection is to store data on the digital platform in e-learning application. Learning platform created using IoT technology will have an impact on the user's engagement and ability to create curiosity among students for enthralling learning experiences using the smart classroom.

5.2. i-Campus under single platform functionality

Campus under Single platform functionality can be combined using many smart things collectivities in a single model platform like following

- e-Learning Application incorporated the IOT platform.
- IOT enabled the smart classroom, Advanced LAB Room uses IoT

- Sensor for subjects, notes distribution, Sensor with Mobiles Devices and application
- Hotspot for campus with the highest configuration
- Possible potential services for future IOT campus accessible using connected devices for connection between things for integration of e-learning platform [20].

5.3. Significance of using smart classroom in e-learning model

- Every user is able to share notes using modern classroom's connected devices.
- The teacher can able to share notes with all students using an e-learning application which is easily assessable.
- Blended learning uses the smart classroom; Institutes Progress is on the next level.
- Allow the teacher to numbers of students makes like single classroom like virtual.
- Highly potential to expand its next level for teachers is to reach every student.
- Competitiveness among all others campuses due to localization connected devices.
- It enhances communication among users. In a single instance to send a notification to all users. Free accessible notes to all users [20].

5.4. Enhancement of connected IoT devices for the smart classroom

- Smart Board & e-note's, New Communication model
- Classroom Monitoring, Collaborating with multiple classrooms
- Energy utilization, BYOD Gadgets in the smart learning platform
- Data Traffic in the network, Interoperability of multiple devices in IoT [20]

6. IoT-based e-learning application model

e-Learning platform model helps to understand infrastructure setup requirements and communication model among all entities in architecture. Below listed features are about possibilities to build new functionalities in every communication model set up like adding AR, 3D Visual in learning, Smartboard, Most compatible mobile application, new AI objects to e-learning platform etc. [21] All listed proposing new models such as 1) Augmented reality for IOT smart campus, 2) 3D objects based learning using IOT. 3) Display Board with IOT, 4) A mobile application with IoT platform data collection. 5) New Intelligent objects.

Architecture model depicts connected device setup for note's sharing in e-learning model for any college campus to build i-campus. This is one of the communication models among teachers, students and administrators. Data collection in IoT-enabled campus and sharing that among users using IoT in i-campus (**Figures 6** and **7**).

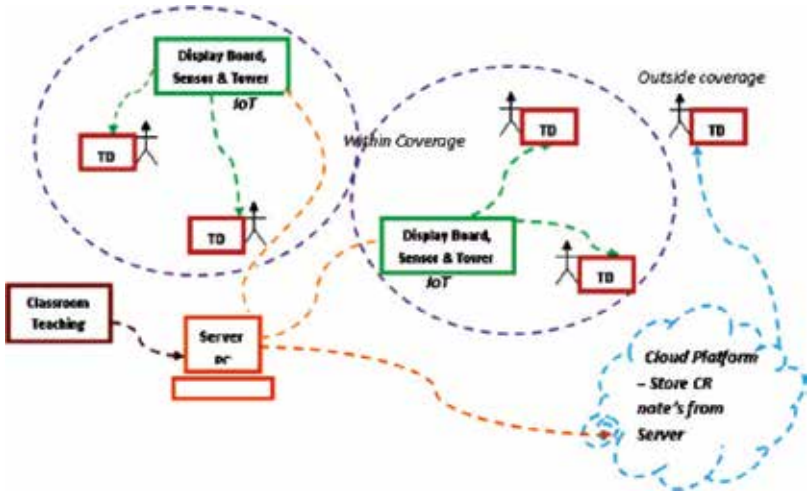

Figure 6. Note's sharing medium using IoT in i-campus.

Data model flow depicts flow in the complete model to smart campuses. This implementation works in favor of the new trend in demand market to allow everyone upgrade campus setup. This sharing data from one endpoint to another endpoint in network setup using iot build infrastructure. The classroom learning platform generates notes and carrying on sharing the medium with iot and accessible among end users students through a mobile application at the endpoint (**Figure 8**).

This implementation setup on the part of i-campus model explains the possibility of making communication model for note's sharing among all stakeholders. i-Campus vision is building infrastructure for making a more efficient model with maximum connected devices on that platform. Here Raspberry Pi is used to communicate with application to collect data from classroom teaching and learning model.

MySQL DB implemented for e-learning application for students registration and users log in features. Connection deployed using Apache server and Raspberry Pi computing device.

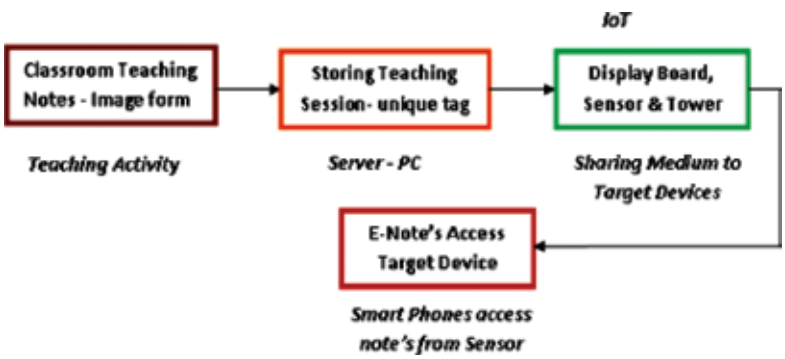

Figure 7. Classroom Note's sharing & IoT -concept model.

http://dx.doi.org/10.5772/intechopen.75744

Figure 8. Smart Note's sharing in i-campus.

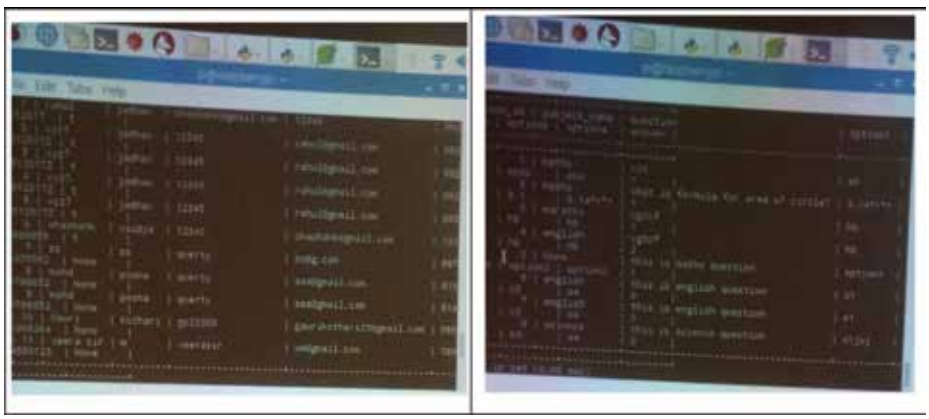

Figure 9. Database connection of notes sharing application in smart campus.

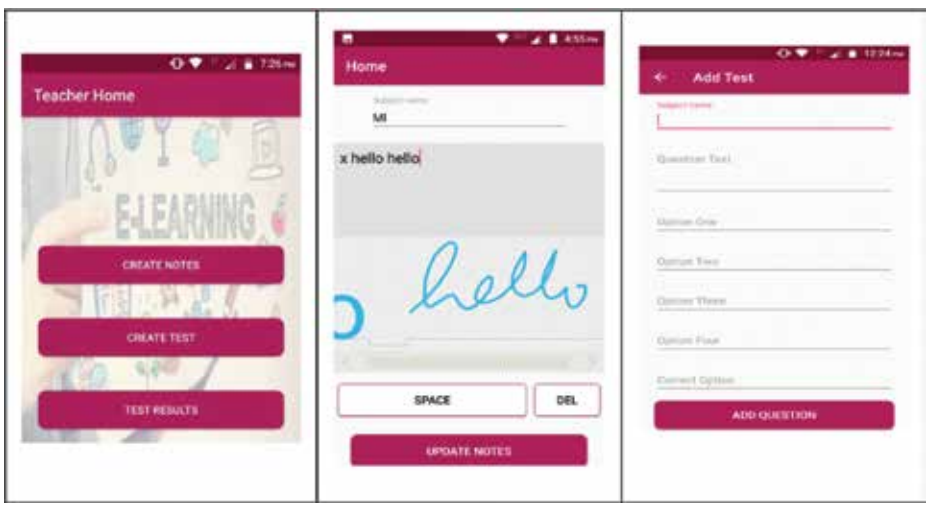

Figure 10. e-Learning application for notes sharing from smart campus.

MCQ question added in MySQL Database and communications between entity connected using the Raspberry Pi device (**Figures 9** and **10**).

Smart e-learning application implemented and deployed within a campus location to visualize wisdom of i-campus in academic institutes. This application part of data sharing medium to bridge communication learners and trainers. Admin users can able to add new question sets for conducting assessment exam in online from the mobile application, allows users to download and use subject notes from the teacher's contribution notes material resources. The application provides a scribble screen to generate teacher's notes while teaching and allow them to upload it in the application for sharing among learners as its.

7. Conclusion

This chapter signifies the importance to an i-campus of an educational institution and the gamification learning mode of teaching and learning must be a part of the IoT-enabled campus. Research work given findings related two dimensions of educational fields, 1st perceptive about the need of IoT in campus, for enhanced technology availability for i-campus, which is realistic in the future and 2nd perceptive about better of engaging the student's effective learning using gamification. So many features are discussed, including smart classroom and gamification, notes sharing for knowledge transfer, online assessments using e-learning application; gamily helps to be competing among every learner. Hence it implies the importance of both methodologies for i-campus platform to makes learners for highly skilled oriented and efficient with smart learning environments.

Author details

Veeramanickam Murugappan[1], Debnath Bhattacharyya[2] and Tai-hoon Kim[3]*

*Address all correspondence to: taihoonn@daum.net

1 Department of Computer Science and Engineering, Karpagam Academy of Higher Education, Coimbatore, India

2 Department of Computer Science and Engineering, Vignan's Institute of Information Technology (Autonomous), Visakhapatnam, India

3 Department of Convergence Security, Sungshin W. University, Seongbuk-gu, Seoul, South Korea

References

[1] Are you ready for billions? https://www.hpe.com/in/en/solutions/internet-of-things.html

[2] GSMA: The impact of the internet of things the connected home. https://www.gsma.com/newsroom/wp-content/uploads/15625-Connected-Living-Report.pdf

[3] Raising engagement in e-learning through gamification Cristina Ioana Muntean Cybernetics and Statistics, Babes-Bolyai University, Romania Strada Mihail Kogălniceanu, Nr. Cluj-Napoca, Ro

[4] C-H. Sumac-H. Cheng. A mobile gamification learning system for improving the learning motivation and achievements. JCAL on 6 Nov. 2014, DOI: 10.1111/jcal.1208

[5] Toward Personalized Gamification for Learning Environments Baptiste Monterrat, Élise Lavoué1, Sébastien George, France

[6] Simõesa J, DíazRedondo R, Vilas AF. A social gamification framework for a K-6 learning platform. Computers in Human Behavior. March 2013;**29**(2):345-353. https://doi.org/10.1016/j.chb.2012.06.007

[7] "An empirical study comparing gamification and social networking on e-learning", Joseba Saenz-de-Navarrete, Carmen Pagés. Computers & Education, Volume 75, June 2014, Pages 82-91. https://doi.org/10.1016/j.compedu.2014.01.012

[8] Connolly TM, Stansfield M, Hainey T. An application of games-based learning within software engineering. 25 April 2007. DOI: 10.1111/j.1467-8535.2007.00706.x

[9] Gamification in education: Top 10 gamification case studies that will change our future, http://yukaichou.com/gamification-examples/top-10-education-gamification-examples/

[10] Amazing examples of gamification in education http://www.edsys.in/amazing-examples-of-gamification-in-education/

[11] Chou Y-K. Gamification & Behavioral Design. http://yukaichou.com/

[12] Preparing for the connected campus: How and why institutions are using IOT. http://www.centerdigitaled.com/paper/Preparing-for-the-Connected-Campus-How-and-Why-Institutions-Are-Using-IOT-92405.html

[13] Lueth KL. The 10 most popular internet of things applications right now, February 2, 2015, https://iot-analytics.com/10-internet-of-things-applications/

[14] Faga N. Internet of things promises smart future for campus infrastructure, utilities, building management and transportation fleets can reap benefits of connected systems, https://edtechmagazine.com/higher/article/2017/03/internet-things-promises-smart-future-campus-infrastructure

[15] Beyond data in the Smart City: Repurposing existing campus IoT, by Oliver Bates and Adrian Friday, IEEE Pervasive Computing, Volume: 16, Issue: 2, April-June 2017

[16] Holloway S. 4 ways to bring gamification of education to your classroom. https://tophat.com/blog/gamification-education-class/

[17] 12 examples of gamification in the classroom. https://www.teachthought.com/the-future-of-learning/12-examples-of-gamification-in-the-classroom/

[18] Veeramanickam MRM, Mohanapriya M, Pandey BK, et al. Map-reduce framework based cluster architecture for academic student's performance prediction using cumulative dragonfly based neural network. Cluster Computing. 2018. https://doi.org/10.1007/s10586-017-1553-5

[19] Dlodlo N, Foko T, Mvelase P, Mathaba S. The state of affairs in Internet of things research. The Electronic Journal Information Systems Evaluation. 2012;**15**(3):244-258

[20] Veeramanickam MRM, Mohanapriya M. IOT enabled futurus smart campus with effective E-learning: I-campus. GSTF Journal of Engineering Technology (JET). April 2016;**3**(4)

[21] Kavitha V, Lohani R. A critical study on the use of artificial intelligence, e-learning technology and tools to enhance the learner's experience. Cluster Computing. 2018. https://doi.org/10.1007/s10586-018-2017-2

Chapter 7

Analysis Learners' Preference in E-Learning System Using Kansei Approach

Ana Hadiana

Additional information is available at the end of the chapter

http://dx.doi.org/10.5772/intechopen.75620

Abstract

Academic institutions have opportunity to provide better learning environment over the Internet using open source web-based e-Learning systems. One of the important issues is how to choose a suitable e-Learning system that can meet what learners need implicitly. It lacks guide to support academic institutions in determining a proper e-Learning system based on learners' needs; it becomes the reason of the implementation of e-Learning that cannot work for long time. This chapter gives an information of result observation regarding learners' psychological aspects toward e-Learning system using Kansei Engineering and its correlation with the e-Learning interface design. Analyzing learner's preference related to e-Learning system, it can provide the kind of desired e-Learning system to enhance learners' experience; finally, it can help the academic institutions to implement e-Learning system continually for a long time.

Keywords: e-Learning, learners' preference, emotion, design elements, Kansei engineering, multivariate analysis

1. Introduction

E-Learning is a kind of web-based system to support learning using computer network as one of learning media via the intranet/Internet. Many web developers compete to develop different kinds of e-Learning systems. Almost all these systems are generally developed based on ambiguous specification of interface's design, mostly ignored the importance of providing desired e-Learning system that can match with learners' implicit needs or desires. Existing open source e-Learning systems are generally developed not for specific learners; it is important to revise the system for specific learners based on specific academic institution.

There are little e-Learning system design guides to observe a system that can maximally meet learners' expectations.

Usability is one factor to be considered in designing e-Learning system interface [1]. Besides its usability, it is also important to pay attention on aspect of usefulness and functionality [2]. A knowhow to design more persuasive learning interface is one of the critical points. E-Learning system developments are lacking consideration of psychological factors, which includes expressing learners' emotions. This study focuses on observing learners' psychological factors because most of users of e-Learning system are learners.

Kansei engineering has been widely referred to explore the emotions in many kinds of product design including software. This study uses Kansei engineering approach in its investigation of learners' emotion due to its ability to translate user's psychological feeling into a concept of emotion, which the research proposed to be incorporated into web-based e-Learning system design.

Many studies have been performed adopting Kansei engineering in many fields for product development including software or computer applications. For example, it includes emotion and entertainment in [3, 4], emotion and wheel chair in [5], emotion and e-commerce in [6, 7], emotion and textile in [8, 9], and emotion and fashion design in [10]. However, there are only few studies that report about learners' emotion in the education domain.

Figure 1 describes the basic idea of Kansei engineering which explains recommendations of solution as product design based on what user's feeling. The founder of Kansei Engineering, Mitsuo Nagamachi, Professor Emeritus of Hiroshima University, defines Kansei as a state of mind, that is, psychological feeling and needs in mind [11]. Kansei is referred to the state of mind where knowledge, emotion, and passion are harmonized [12]. Kansei engineering is established as a discipline that successfully assimilates Kansei, psychology, engineering, and statistics [13]. Kansei engineering is intended to improve product development to win users' heart and mind. It has in its methodology a systematic process to discover users' insight responses toward product display via several physiological and psychological assessment methods. This knowledge will then be translated into product design specifications, which formulate a new product design based on user's implicit emotional feelings and

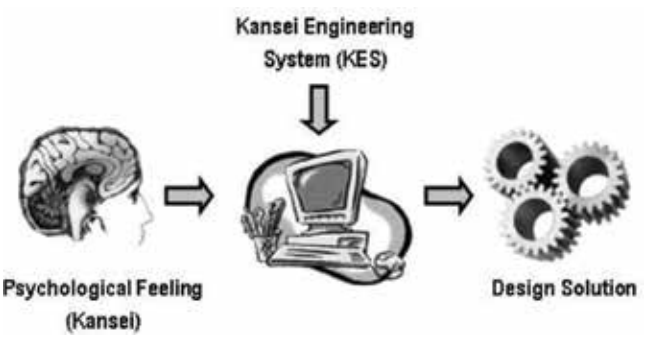

Figure 1. Principle of Kansei engineering [11].

desires. In the case of e-Learning system, this methodology can be used to enable inclusion of learners' emotion, as positive emotion has been found to positively associate with learning activities [14, 15].

Figure 2 shows the diversity of users' expressions that can be used as psychological measurement in Kansei Engineering in Kansei Engineering. Eye movement, face expression, word, etc., can be used as gateway of users' emotions to be analyzed. There are many alternative choices to be used to gain users' emotions related to a product. In many studies of Kansei engineering, Kansei words are used as variable in evaluation and analysis to represent user's emotion related to product. A sample of product used in Kansei engineering is named as specimen.

Implementation of Kansei engineering in education's domain started to appear in the end of the 2000s. In e-Learning system almost all the users are students or learners. Kansei research in this kind of domain mainly focused on learners. Study in [16] explains the element of colors on e-Learning web interface, in the effort to enhance experience. Study in [17] reports the aspect of emotion in interactive e-Learning system with the use of biometric signal and Kansei engineering, by analyzing knowledge and emotion level. Study in [18] proposes a conceptual model for e-Learning using a software agent to recognize and respond to the learners' emotional state during learning phase. Other studies of Kansei engineering in e-Learning can be found in [19] which reports about Kansei semantic space in online database courseware systems and [20] which reports a theoretical framework of playful interaction in mobile learning system. Chen [21], Hussin and Lokman [22], and Lokman [23] are other studies of Kansei engineering to design an interface of web-based system development.

The aim of this study is to observe the relationships between learners' emotional factors (psychological feeling) and the interface design of web-based e-Learning system. The result of this research could be used as guide in ensuring that a selected e-Learning system has a desired interface and function that suit to learners' psychological requirement. This study especially puts its focus of investigation to open source learning management system to be used as

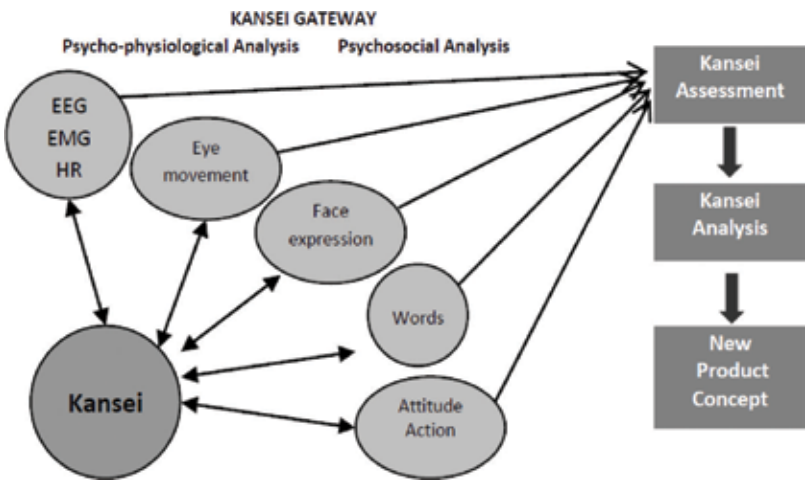

Figure 2. Kansei gateway [6].

platform of e-Learning system in higher educational institution. This study mainly analyzes learners' experience on the e-Learning and translation of emotion to e-Learning interface.

2. E-Learning system

E-Learning is a learning model that involves information and communication technology into learning activities. Better learning process will be gained without changing conventional learning model. E-Learning plays important role in learning, because it provides learning tools to support learning process optimally, but it is not to replace totally the conventional learning.

Nowadays, according to the growth of information technology, many education institutions such as high education try to implement e-Learning to provide better learning environment based on information technology, to give better service of learning activities. E-Learning will support conventional learning by applying information technology, in order to improve learners' learning performance and learning experiences to get more valuable knowledge.

Another name of e-Learning is virtual learning, and in general it can be divided into two types as follows:

- Synchronous system. All learners are required to participate on learning process in the same time and are provided by tool to collaborate with other learners simultaneously. It will impact on improvement of knowledge achievement during learning.
- Asynchronous system. In this case all learners are given flexible time to access the system due to each phase or condition of learning. Learners are provided to be able to communicate with each other using collaboration tools such as bulletin board system.

Most of e-Learning systems either open source or proprietary are generally web-based system and have similar functions or have standard functions to support learning process effectively and efficiently through the Internet. It is possible for education institution to analyze and select the best one to be implemented in their institution. In e-Learning system, the important thing is not only learning functions; learning environment is also an important thing such as interface which acts as link between learners and system. Interface plays a key role in making learners' motivation of using e-Learning for a long time with pleasure and without depression.

The interface's body of web-based e-Learning system commonly is similar to common web-based information system. Basically, it should consist of many design elements as follows:

- Header and footer
- Background (logo and color)
- Font (type, size, and color)
- Menu (position, type, and style)

This study attempts to observe the relationship between design elements and learners' emotion. In other words, using Kansei engineering it will translate the learners' emotion into e-Learning system design elements; then learner-oriented interface can be proposed.

3. KEPack

This study adopts method of Kansei Engineering Type I (KEPack) due to its simplicity and wide use in many product developments [2, 6, 10, 19, 20, 22, 23]. **Figure 3** shows the systematic processes of KEPack. This study uses KEPack as methodology to process the inputted data from learners about what they emotionally feel after exploring each the interface of e-Learning system.

At least five open source e-Learning systems [24–28] can be selected as specimens based on its suitability to be adopted in the academic institution's environment, to be used as specimen in the Kansei evaluation session. The specimens are selected based on their visible differences in design characteristics such as background color and page layout. The selected five specimens in this study are Moodle, Efront, Opigno, Chamilo, and ATutor. Ten Kansei words representing psychological feeling are selected to represent psychological responses learners have with the specimens. The Kansei words are as shown in **Table 1**. This study constructs each Kansei words to five-point semantic differential (SD) scale to be used as measurement instrument in the Kansei evaluation session. In this study one hundred learners are involved as participants. Participants consist of first-grade university students. For further analysis data collection can be categorized according to gender, age, and so on. Learners are required to give responses

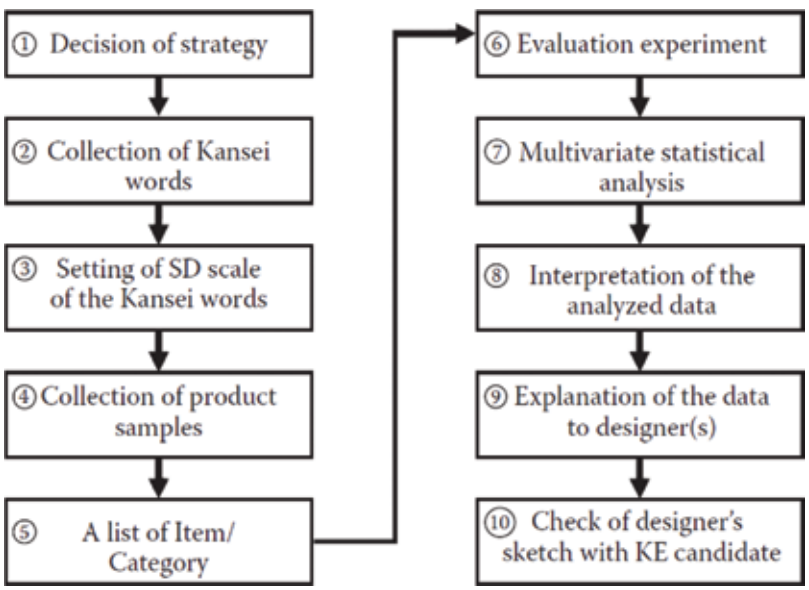

Figure 3. KEPack methodology [11].

No.	Kansei words	Specimens				
		Moodle	Efront	Opigno	Chamilo	ATutor
1	Dynamic					
2	Informative					
3	Simple					
4	Bright					
5	Harmony					
6	Comfort					
7	Rigid					
8	Unique					
9	Passion					
10	Formal					

Table 1. Questionnaire using Kansei words and five-point scale semantic differential.

toward the specimens of e-Learning system. Each specimen is shown for a limited time one by one in an experimental room; all participants rate their Kansei responses to fill the score (from 1 to 5) of every Kansei word into the Kansei checklist.

Multivariate analysis is performed to analyze the average data obtained from the evaluation session. Existing software statistic such as XLStat or SPSS can be used for calculating questionnaire data. Finally, this study provides a recommendation of the desired open source e-Learning system to be used in supporting learning process.

3.1. Data collection

In this study, questionnaire data from all participants are collected and then calculated its average as shown in **Table 2**.

The data is analyzed by two kinds of multivariate analysis: principal component analysis for analyzing distribution of Kansei words and specimens and factor analysis for exploring the biggest emotion.

3.2. Coefficient correlation analysis

The relationship between emotions represented by Kansei words is shown in **Table 3**. According to this result, Kansei word relationship can be divided into six categories such as very strong, strong, enough, weak, very weak, and no relationship. For example, the emotion of bright has strong relationship with the emotion of dynamic, but has no relationship with simple.

3.3. Principal component analysis

Table 4 and **Figure 4** show the result of principal component analysis. According to data collection, there are many factors that have significant impact to the specimens. It provides evidence

No.	Kansei words	Specimens				
		1	2	3	4	5
1	Dynamic	3.02	2.85	3.04	3.09	3.15
2	Informative	3.1	3.3	3.4	3.29	2.9
3	Simple	2.98	3.14	3.05	2.96	3.01
4	Bright	2.96	2.84	3.02	3.02	3.14
5	Harmony	2.91	2.83	2.9	3.01	3.27
6	Comfort	3.14	2.74	3.06	3.17	3.03
7	Rigid	3.21	3.03	3.0	2.79	2.9
8	Unique	3.13	3.2	2.81	2.85	3.08
9	Passion	3.13	2.93	2.92	2.73	3.01
10	Formal	3.03	3.0	3.03	2.98	2.91

Table 2. Average data from all participants.

Kansei words	Dynamic	Informative	Bright	Harmony	Comfort	Rigid	Simple	Unique	Passion	Formal
Dynamic	1	−0.510	0.967	0.819	0.778	−0.456	−0.802	−0.493	−0.068	−0.539
Informative		1	−0.557	−0.790	−0.158	−0.057	0.348	−0.494	−0.549	0.714
Bright			1	0.885	0.609	−0.464	−0.626	−0.429	−0.011	−0.639
Harmony				1	0.320	−0.502	−0.458	−0.046	0.037	−0.909
Comfort					1	−0.141	−0.958	−0.592	−0.062	0.038
Rigid						1	0.210	0.530	0.840	0.606
Simple							1	0.419	0.056	0.156
Unique								1	0.623	−0.154
Passion									1	0.111
Formal										1

Table 3. Kansei word relationship.

of the variability for each D1 to D4. The level of variability of D1 is 47.771%; D2 is 29.407%, respectively. The total cumulative value of D1 and D2 is 77.178% more than threshold value of 70%. It means that these two factors of D1 and D2 can be used for further analysis because these factors have enough influence for representing learners' emotions toward the five open source e-Learning systems.

Figure 5 shows the result of analysis using principal component vector (PCV) analysis. PCV is used to visualize direction and strength of emotion over the structure of emotion, to determine Kansei area [6]. It shows the distribution of e-Learning systems according to learners'

	D1	D2	D3	D4
Variability (%)	47.771	29.407	18.679	4.143
Cumulative (%)	47.771	77.178	95.857	100.000

Table 4. Percentage of variance.

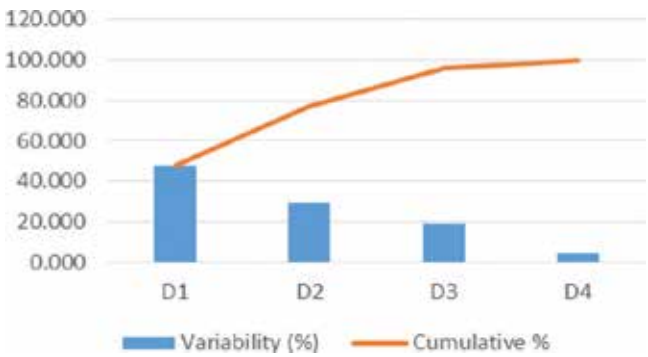

Figure 4. Factors from principal component analysis.

emotions. Evidence showed in **Figure 5** that specimen ATutor, which is found residing in the positive x and y axes, is nearest to emotion of harmony. On the other hand, Chamilo is somewhat near to emotion of comfort, Opigno is near to emotion of informative, Efront is near to emotion of simple, and Moodle is mostly near to rigid.

3.4. Factor analysis

This analysis is to refine the result of principal component analysis. Varimax rotation is used in this analysis to generate more accurate result. **Table 5** shows the result of this analysis. There are two factors with contribution level, respectively, with Factor 1 of 46.838% and Factor 2 of 29.050%. This means that Factor 1 has the highest score of contribution. In cumulative percentage, Factor 1 and Factor 2 have represented 75.889% of total contribution. Analysis using these two factors is conducted to determine the coefficient of emotion and generate variability scores for each 10 Kansei words, as shown in **Tables 6** and **7**.

The factor scores shown in **Tables 6** and **7** are sorted in ascending order to determine the influence of emotion in e-Learning system. The research set the reference threshold to 0.8. Based on Factor 1, the emotions that have score of more than 0.8 are bright, dynamic, and harmony. Based on Factor 2, there is only the emotion of unique. Factor 1 and Factor 2 are represented by the emotion of harmony and the emotion of unique, respectively. The emotion that has biggest impact is harmony. Other emotions shown in **Tables 6** and **7** have value lower than 0.8, and thus it can be ignored because they have less influence to emotion in the selected open source e-Learning systems.

According to this result, it can be concluded that the emotion has influence to preferred system. The emotion or psychological aspect should be considered in selecting the open source

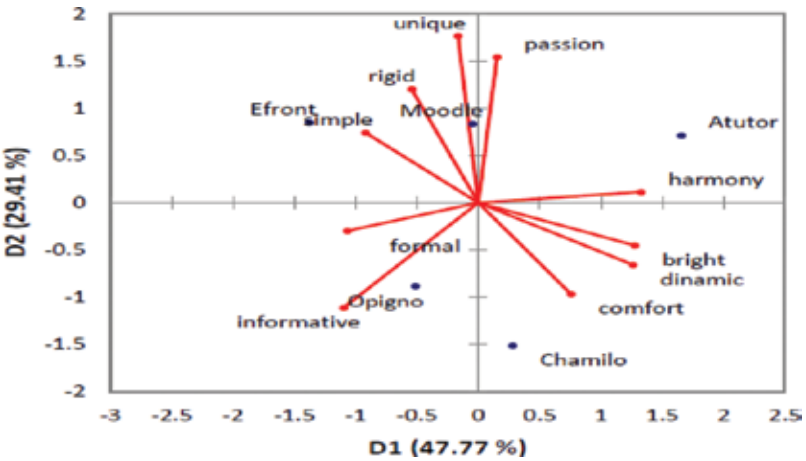

Figure 5. Principal component vector.

	Factor 1	Factor 2
Variability (%)	46.838	29.050
Cumulative (%)	46.838	75.889

Table 5. Factor analysis.

Kansei words	Factor 1
Informative	−0.819
Formal	−0.787
Simple	−0.628
Rigid	−0.376
Unique	−0.093
Passion	0.128
Comfort	0.527
Bright	0.896
Dynamic	0.903
Harmony	0.968

Table 6. Emotion impact priority based on Factor 1.

e-Learning system which is harmony and as alternative emotions which are unique, dynamic, and bright. Academic institution should recommend developer to give full attention to these emotions when designing interface of e-Learning system.

Kansei words	Factor 2
Informative	−0.570
Comfort	−0.540
Dynamic	−0.385
Bright	−0.270
Formal	−0.136
Harmony	0.028
Simple	0.402
Rigid	0.658
Passion	0.795
Unique	0.907

Table 7. Emotion impact priority based on Factor 2.

3.5. Partial least square

The evaluation using partial least square needs two kinds of data such as average data of questionnaire and all specimens' design elements. As shown in **Table 8**, data of design elements consists of each specimen's design elements in a form of table with value of 0 and 1; if a specimen has the element, it will be set as 1; if a specimen has no element, it will be set 0.

Partial least square combines these two kinds of data to generate data of design elements based on learners' emotion as shown in **Table 9**. Comprehensive investigation can be implemented in order to determine link between emotion and design elements.

The results of this analysis are what kind of design elements should be considered when designing interface of e-Learning based on learners' emotion. The biggest emotion evaluated by factor analysis will be the critical point of design elements to be considered. In this case, factor analysis's result shows that the emotion of harmony has greatest impact in designing an interface of e-Learning.

No.	Kansei words	BGColorWhite	BGColorGray	BodyFont10	BodyFont12	HeaderColorWhite	…
1	Moodle	1	0	0	1	1	…
2	Efront	0	1	0	1	1	…
3	Opigno	0	1	0	1	0	…
4	Chamilo	1	0	1	0	1	…
5	ATutor	1	0	0	1	1	…

Table 8. Design elements of specimens.

Variable	Coefficient	Range	Impact
BGColorWhite	−0.0974		
BGColorGray	0.0974	0.1948	√
BodyFont10	0.0482		
BodyFont12	−0.0482	0.0964	√
BodyFontArial	0.0050		
BodyFontCalibri	−0.0050	0.0100	–
HeaderColorWhite	−0.0050		
HeaderColorGray	0.0349		
HeaderColorGreen	0.0424		
HeaderColorBlack	−0.0712	0.1136	√
HeaderLogoOK	0.0000	0.0000	–
HeaderImgOK	0.0050	0.0050	–
TopMenuBGColGreen	−0.0482		
TopMenuBGColGray	−0.0296		
TopMenuBGColWhite	0.0000		
TopMenuBGColBlack	0.0424	0.0906	–
TopMenuFontSmall	0.0424		
TopMenuFontMedium	−0.0689	0.1113	√
TopMenuAboveHeader	0.0424		
TopMenuBelowHeader	−0.0689	0.1113	√
BodyMenuRight	−0.0238		
BodyMenuLeft	−0.0628		
BodyMenuCenter	0.0349	0.0977	√
BodyMenuText	−0.0974		
BodyMenuIcon	0.0974	0.1948	√
BodyMenuTextSmall	−0.0349		
BodyMenuTextMedium	0.0349	0.0698	–
SearchBarAsLink	−0.0235		
SearchBarAsTextbox	0.0628	0.0863	–
SearchBarAtTopCenter	−0.0712		
SearchBarAtTopRight	0.0974	0.1686	√
Average of range		0.0964	

Table 9. The impact of design elements.

3.6. Recommendation of design elements

For further analysis to support interface design, it needs to calculate the importance of each design element, using procedure as follows [12]:

i. Calculate the range of each category of elements

ii. Calculate the average of all ranges

iii. Compare the average with each range of category; if range of category is bigger than the average, it means that the element of this category has high impacts on interface design. Otherwise, the category has low impact.

According to the result shown in **Table 9**, the emotion of harmony-based design elements of interface of e-Learning is focused on element that has high impact. E-Learning's interface is recommended as follows:

i. Background color: gray

ii. Font type: Arial

iii. Font size: 10px

iv. Header background color: green

v. Header has an image

vi. Top menu font: small

vii. Top menu position: above header

viii. Body menu position: center

ix. Body menu type: icon

x. Search bar position: top right

Other elements which have low impact are still considered as alternative design element; it can be changed with different values.

4. Conclusion

This chapter explores the potential of Kansei engineering implementation in e-Learning analysis and design. E-Learning development is lacking in terms of defining the emotional aspects for design. Thus, this chapter has attempted to engineer emotion in e-Learning system design to fill in the gap of design requirements geared to learners' emotional responses.

Kansei engineering has been adopted to analyze learners' psychological needs and desire in an e-Learning system. In this study, psychological factors are represented by Kansei words to classify them into the concept of emotion in e-Learning systems. Using principal component analysis, factor analysis, and partial least square, this study finds that harmony is the emotion that has the highest influence to the design concept of interface of e-Learning systems.

The proposed method in this study can be used for more specific object, for example, the content of learning material, in order to provide the proper learning material based on learners' psychological aspects.

Further study is proposed to investigate e-Learning system using Kansei engineering based on wider population and demography, to investigate e-Learning interface design elements in more detail. It is critical to explore design element more detail in order to enhance open source platform of e-Learning system based on learners' emotion.

Acknowledgements

The author would like to thank to STMIK LIKMI Bandung, Malaysia Association of Kansei Engineering (MAKE), UiTM, and P2I-LIPI for their great supporting in Kansei Research.

Author details

Ana Hadiana

Address all correspondence to: anahadiana68@gmail.com

Research Center for Informatics (P2I)-LIPI, STMIK-LIKMI, Bandung, Indonesia

References

[1] Lorenzo M, Emanuele B. Abduction and web interface design. In: Ghaoui C, editor. Encyclopedia of Human Computer Interaction. Hershey: Ide Group Reference; 2006

[2] Lokman AM, Ishak KK, Razak FHA, Aziz AA. The feasibility of PrEmo in cross-cultural Kansei measurement. In: IEEE Symposium on Humanities, Science and Engineering Research; 2012. pp. 1033-1038

[3] Sato N, Anse M, Tabe T. A method for constructing a movie-selection support system based on Kansei engineering. In: The 12th International Conference on Human-Computer Interaction (HCII); Beijing; 2007

[4] Kodai T, Onisawa T. Generation of scene frame of Manga from narrative text. In: International Conference on Kansei Engineering and Emotion Research (KEER); Paris; 2010

[5] Ismail MN, Lokman AM, Abdullah NAS. Formulating Kansei concepts of assistive device for people with physical disabilities. In: 3rd International Conference on User Science and Engineering (i-USEr); Shah Alam; 2014

[6] Lokman AM. Emotional user experience in web design: The Kansei engineering approach (A PhD Thesis); 2009. Retrieved 20 January 2015 from: http://www.anitawati.uitm.edu.my

[7] Wang K, Wang T. Applying Kansei engineering on the e-commerce web of 3C product. In: Kansei Engineering and Emotion Research International Conference (KEER); Paris; 2010

[8] Shaari N, Terauchi F, Kubo M, Aoki H. Recognizing female's sensibility in assessing traditional clothes. In: The 6th Asian Design Conference; 2003

[9] Ogawa T, Nagai Y, Ikeda M. An ontological approach to designers' idea explanation style: Towards supporting the sharing of kansei-ideas in textile design. Advanced Engineering Informatics. 2009;**23**:157-164

[10] Lokman AM, Aziz AA. A Kansei system to support children's clothing design in Malaysia. In: IEEE International Conference on Systems Man and Cybernetics (SMC); Istanbul; 2010

[11] Lokman AM, Nagamachi M. Kansei Engineering–A Beginner Perspective. 1st ed. UPENA: Shah Alam; 2010

[12] Nagamachi M, Lokman AM. Innovations of Kansei Engineering. Adedeji B. Badiru, editor. Industrial Innovation Series. Florida: Taylor & Francis Group. 2011

[13] Nagamachi M, Lokman AM. Kansei Innovation: Practical Design Applications for Product and Service Development. Florida: Taylor & Francis Group; 2015

[14] Redzuan F, Lokman AM, Othman ZA, Abdullah S. Kansei design model for e-learning: A preliminary finding. In: Proceedings of the 10th European Conference on e-Learning (ECEL-2011); Brighton; 2011

[15] Liu F. Personalized learning using adapted content modality design for science students. In: Paper Read at ECCE Conference; London; August 2007

[16] Tharangie KGD, Irfan CMA, Marasinghe CA, Yamada K. Kansei engineering assessing system to enhance the usability in e-learning web interfaces: Color basis. In: Workshop Proceedings of 16th International Conference on Computers in Education (ICCE), Workshop on Testing and Assessment; Taipei; 2008

[17] Chaminda HT, Basnayake A, Madurapperuma A, Osano M. An interactive e-learning system using Kansei engineering. In: International Conference on Biometrics and Kansei Engineering; 2009. pp. 157-162

[18] Sandanayake TC, Madurapperuma AP. Conceptual model for e-learning systems using kansei engineering techniques. In: International Conference on Biometrics and Kansei Engineering; 2009. pp. 148-152

[19] Redzuan F, Lokman AM, Othman ZA. Kansei semantic space for emotion in online learning. In: 3rd International Conference on User Science and Engineering (i-USEr); Shah Alam; 2014

[20] Taharim NF, Lokman AM, Isa WARWM, Noor NLM. A theoretical framework of playful interaction in mobile learning. In: Eighth International Conference on Next Generation Mobile Apps, Services and Technologies (NGMAST); Oxford; 2014

[21] Chen Y. Research on optimized design of Kansei engineering-based web interface. In: International Conference on Computational and Information Science; 2013

[22] Hussin SN, Lokman AM. Kansei website interface design: Practicality and accuracy of Kansei web design guidelines. In: International Conference on User Science and Engineering (i-USEr); Shah Alam; 2011. pp. 30-35

[23] Lokman AM, Haron MBC, Abidin SZZ, Khalid NEA, Ishihara S. Prelude to Natphoric Kansei engineering framework. Journal of Software Engineering and Applications. 2013;**6**:638-644

[24] A Tutor Learning Management System [Internet]. 2014. Available from: http://www.atutor.ca [Accessed: October 1, 2015]

[25] Moodle Learning Management System [Internet]. 2014. Available from: http://www.moodle.org [Accessed: October 1, 2015]

[26] Efront Learning Management System [Internet]. 2014. Available from: http://www.efrontlearning.net [Accessed: October 1, 2015]

[27] Opigno Learning Management System [Internet]. 2014. Available from: http://www.opigno.org [Accessed: October 1, 2015]

[28] Chamilo Learning Management System [Internet]. 2014. Available from: http://www.chamilo.org/chamilo-lms. [Accessed: October 1, 2015]

Chapter 8

The Challenges of *E-learning* in South Africa

Moeketsi Letseka, Matsephe Martha Letseka and Victor Pitsoe

Additional information is available at the end of the chapter

http://dx.doi.org/10.5772/intechopen.74843

Abstract

The University of South Africa (UNISA) is the largest open distance *e-learning* (ODeL) university in the continent of Africa, with a student headcount more than 300,000. Over two decades after the transition from apartheid to democracy, vast inequalities across race, class, gender and socio-economic status persist in South Africa, with the majority of the African people being the most affected. Demographically, the African people constitute about 80.8% of the country's total population, compared to whites, who constitute a meagre 8.8%, yet African households carry the highest burden of poverty, living way below the official poverty line of $1.90/day as determined by the World Bank and other international agencies. This chapter explores these inequalities and ponders on the role of *e-learning* for this poorest section of society in a country where modern technological devises in the form of information and communication technologies (ICTs) and access to the Internet are perceived to be ubiquitous. South Africa's Department of Higher Education and Training (DHET) commits to "an expansion of open and distance education and the establishment of more 'satellite' premises where universities or colleges provide classes at places and times convenient to students (including in rural areas)". This chapter also explores the role of UNISA in the provision of distance learning through structured and sustainable *e-learning*.

Keywords: South Africa, inequalities, UNISA, open distance *e-learning*

1. Introduction

The University of South Africa (UNISA) is the largest open distance *e-learning* (ODeL) institution in the continent of Africa, with a massive student headcount more than 300,000 [1–4]. According to UNISA [5], in 2011, 91% of its students were South Africans, 6.6% came from the Southern African Development Community (SADC) region, 1.3% came from the other African countries, 0.5% came from the rest of the world, while there was no information about the

outstanding 0.1%. UNISA has been described as a *mega* university, and the only dedicated distance education provider in the African continent [3, 6–10]. Van Broekhuizen [11] argued that UNISA is South Africa's foremost distance learning institution that accounts for roughly half of all enrolments in the initial teacher education programmes. He noted that, by 2013, UNISA accounted for 36% of South Africa's higher education enrolments. To that end, it is his contention that "trends in South African HE enrolments and graduations will, to a large extent, be a reflection of the underlying trends in enrolments and graduations at UNISA" ([11], p. 18).

In this chapter, we explore UNISA's provision of distance education through *e-learning* in a country that is marked by vast socio-economic inequalities and extreme levels of poverty. We shall differentiate between distance education and *e-learning* [12]. On the one hand, "distance education" is "a set of methods or processes for teaching a diverse range of students located at different places and physically separated from the learning institution, their tutors/teachers as well as other students" ([13], p. 1). On the other hand, *e-learning* "encompasses any form of telecommunications and computer-based learning" ([14], p. 8). We ponder on the potential empowering role of *e-learning*, especially for the poorest of the poor African people who were previously excluded from opportunities by apartheid policies and legislation. South Africa's Department of Higher Education and Training (DHET) [15] is committed to "an expansion of open and distance education and the establishment of more 'satellite' premises where universities or colleges provide classes at places and times convenient to students (including in rural areas)". The reason for this is that just over two decades after the transition from apartheid to democracy, South Africa remains a vastly unequal society, by race, class, gender and socio-economic status. The country's Gini coefficient[1] is estimated to be approximately 0.65 based on expenditure data (per capita excluding taxes) and 0.69 based on income data [17]. The previously privileged white minority populations continue to enjoy living standards comparable to those of the *First World*, while the previously marginalised majority of the African people continue to live in abject poverty, way below the official poverty line as determined by the World Bank and other international agencies. Drawing on Sir Benjamin Disraeli's 1845 novel *Sybil, or Two Nations*, Mbeki [18] described South Africa as "Two Nations".

> *We therefore make bold to say that South Africa is a country of two nations. One of these nations is white, relatively prosperous, regardless of gender or geographic dispersal. It has ready access to a developed economy, physical, educational, communication and other infrastructure. This enables it to argue that, except for the persistence of gender discrimination against women; all members of this nation have the possibility to exercise their right to equal opportunity, the development opportunities to which the constitution of 1993 committed our country.*
>
> *The second and larger nation of South Africa is black and poor, with the worst affected being women in the rural areas, the black rural population in general and the disabled. This nation lives under conditions of a grossly underdeveloped economic, physical, educational, communication and other infrastructure. It has virtually no possibility to exercise what in reality amounts to a theoretical right to equal opportunity, with that right being equal within this black nation only to the extent that it is equally incapable of realisation.*

[1]The Gini coefficient or index is a prominent measure of income inequality. It leverages a scale of 0–1 to derive deviation from perfect income equality. A Gini index of 0 would imply perfect income equality, while an index of 1 would imply complete income disparity (see [16]).

This chapter is divided into four sections. First, we sketch South Africa's political landscape, which is marked by instability, uncertainty and unpredictability. These features are a causal effect of the country's ailing and shrinking economy. South Africa's economic growth rate is estimated at a dismal 0.7%, while unemployment is rising. Second, we touch on UNISA as a *mega* university given its size, and the aggregated resources and capacities at its disposal. During the period 2013–2016, UNISA's student headcount enrolments were more than 300,000, drawn from South Africa, the rest of the African continent and worldwide. Third, we explore UNISA's role in the delivery of distance learning through *e-learning*. We differentiate between distance learning and *e-learning*. While we take distance learning to refer to an aggregate of methods for teaching diverse students that are located at different places and therefore physically separated from the learning institution, lecturers and fellow students, we take *e-learning* to refer to "the delivery of content via all electronic media, including the Internet, intranets, extranets, satellite broadcast, audio/video tape, interactive TV and CD-ROM" [19]. In the fourth and final sections, we offer some concluding remarks.

2. South Africa's political landscape

South Africa's political landscape is uncertain, unstable and unpredictable. The president of the country is embroiled in scandals and faces 783 charges of corruption [20]. As a result, the country's economy is in a state of disarray and shrinking. In his maiden mid-term budget speech, finance minister Malusi Gigaba proposed a downward revision of the country's economic growth from 1.3 to 0.7% for 2017. He estimated the deficit at 4.7%, and projected the country's economic growth "to increase slowly reaching 1.9 per cent in 2020" ([21], p. 15). It is therefore no wonder that South Africa's adult unemployment rates, especially among the African people, who were previously excluded from socio-economic opportunities and privileges, were at a record high of 27.7% in 2017 (see **Figure 1**).

Figure 1. South Africa's unemployment rates. Source: Statistics South Africa [22, 23]. *Quarterly Labour Force Survey.*

Figure 2. SA's youth unemployment rates (15–34 years). Sources: [24, 25].

South Africa's youth (15–34 years) unemployment rates are even worse than adult (35–64 years) unemployment rates. For instance, during the period 2012–2016, youth unemployment was above 35%, peaking at 38.8% in 2016 (see **Figure 2**). These high unemployment rates are a manifestation of flawed economic policies that do not augur well for investor confidence in the country.

It therefore came as no surprise that in April 2017 international credit rating agencies Fitch, and Standard & Poors (S&P) decided to downgrade South Africa's economy to non-investment grade, commonly known as *junk* status. As Hlongoane [26] observes,

> *The real task for South Africa is to get its political house in order, which will be the foundation for an economic turnaround. The uncertainty around the country's ability to pay its debts stems in part from the perception that there is no political will to stem the ballooning debt problems, and no will to institute the kind of reforms that can drastically improve education and the management of public assets such as Eskom.*

What does the downgrade of the country's economy to *junk* status mean to ordinary South Africans? Our immediate response would be: mammoth socio-economic challenges and devastating hardships, especially for the majority of previously disadvantaged African people who are in the margins of the country's economic opportunities and live below the poverty line[2]. South Africa will not be able to attract foreign direct investments, which are essential for injecting the much needed capital to fund projects in agriculture, mining, manufacturing, utilities, construction, trade, transport and finance, which create jobs. Second, the country will fall into recession. The price of consumables such as food as well as basic necessities

[2]The World Bank's international poverty line of $1.90/day is based on a collection of national poverty lines, which were originally used to set the international poverty line of $1.25/day at 2005 purchasing power parity (see [27, 28]).

such as electricity, illuminating paraffin, and petrol and/or diesel will rise exponentially. The value of the local currency (the South Africa Rand) will diminish. People's buying power will be eroded. Interest rates will rise as the banking sector scampers to protect its lending practices with a view to ensuring return on investment. Ordinary people's eligibility for loans will be lost. Those that have mortgaged properties or own vehicles on higher purchase (HP) will be forced to consider downgrading or selling (see **Figure 3**).

Demographically, the African people constitute about 80.8% of the country's total population [22, 23], while whites constitute a meagre 8.8%, yet whites constitute over 80% of the university professoriate [30, 31]. During the period 2012–2016, whites dominated top management positions in the South Africa labour market (see **Figure 4**). Statistics South Africa [17] reported that "In terms of the poverty share, black African households made up the vast majority of poor households. In 2006, they accounted for 93. 2% of all poor households - a proportion that marginally grew to 93. 7% in 2009 and to 93.9% in 2011". Statistics South Africa ([22, 23], p. 81) stated that "Given the high incidence of poverty … black Africans continue to carry the highest burden of poverty in the country". For Statistics South Africa ([22, 23], p. 21), "South Africa would not likely achieve the target of reducing inequality to 0.6 by 2030".

In the following sections, we examine the different ways in which UNISA can intervene in the above-sketched scenario through its provision of distance learning through *e-learning*.

Figure 3. The meaning of South Africa's junk economy status. Source: Adapted from Republic of South Africa, National Treasury [29].

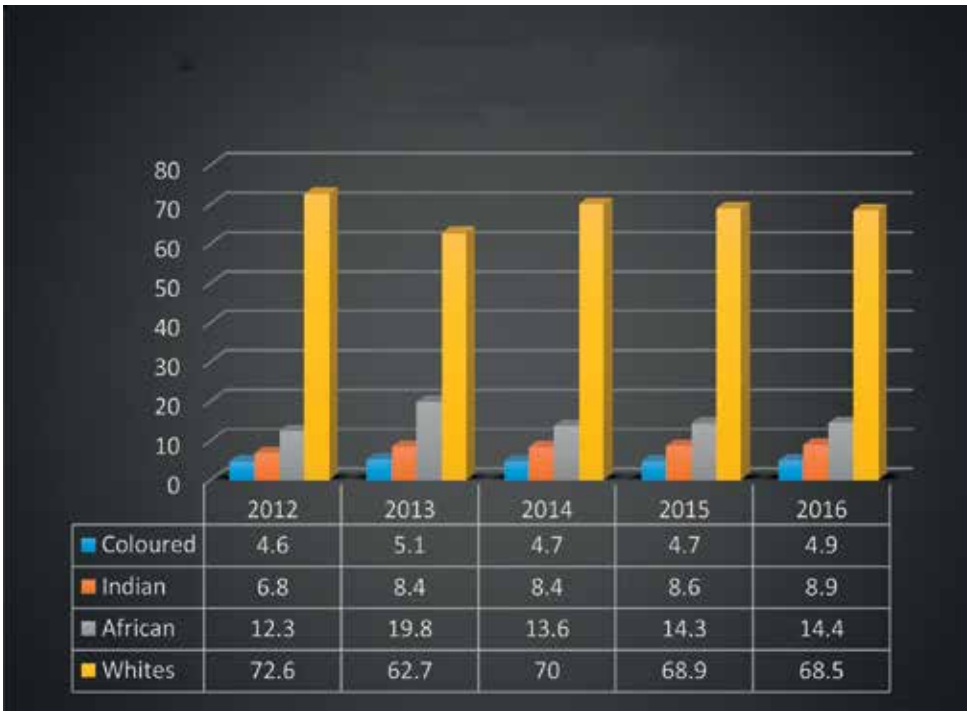

Figure 4. SA population distribution for top management. Source: Commission employment equity reports [32–36].

3. UNISA as a mega university

UNISA has been described as a *mega* university, and the only dedicated distance education provider in the African continent [3, 6, 7, 9–11]. In his book, *Mega Universities & Knowledge Media: Technology Strategies for Higher Education*, Professor John S. Daniel [6] of the Open University, United Kingdom (OU UK) described UNISA as the oldest *mega university* which began as the University of the Cape of Good Hope in 1873 when it was an examining body for affiliated university colleges. In 2018, UNISA will celebrate 144 years of existence. Letseka and Pitsoe [4] described UNISA as "the largest university on the African continent". Daniel [6] noted that, by 2010, UNISA had a projected student headcount of 290,000. At the time of writing, in 2017, UNISA's student headcount enrolments stood at 350,641, confirming its status as one of the world's *mega universities* (see **Figure 4**).

Daniel noted that as far back as the mid-1990s, UNISA has been regarded as (**Figure 5**):

> *A vita academia which centres round the adult learner and creates an environment of lifelong learning through systems of adult basic education, student support and interactive means of teaching technologies. Furthermore, this vision of vita academia acknowledges the existence of all other institutions of higher learning and foresees a very broad co-operation with them to bring about living systems of dual-mode teaching.*

UNISA's ([37], p. 8) *Strategic Plan 2016–2030* articulates the university's vision as "*The* African University shaping futures in the service of humanity". In the same vein, UNISA [13] commits

Figure 5. UNISA enrolments, 2013–2017. Source: UNISA's institutional information and analysis portal.

"to advancing social justice with an emphasis on redress, equity and empowerment of the previously disadvantaged groups in South Africa such as blacks, women, people with disabilities, the rural and urban poor and adults generally who have missed out on opportunities to access higher education". It seeks to position itself "as a leading provider of higher education opportunities through open distance learning (ODL) nationally, on the African continent and internationally". In its *Strategic Plan 2015*, UNISA [38] noted that the institution "is unique in the sense that it is the only dedicated distance education institution, and justly claims to be the only truly national university. Its size, and the aggregated resources and capacities at its disposal, place it in a position to make a vital contribution to development in Southern Africa". The *Strategic Plan* further stated that UNISA's "geographical reach enables it to support high-level capacity development beyond the borders of South Africa, especially on the continent".

The above-mentioned commitments are consistent with the commitments made by South Africa's Department of Higher Education and Training (DHET). For instance, the DHET ([15], p. 8) is committed to "an expansion of open and distance education and the establishment of more 'satellite' premises where universities or colleges provide classes at places and times convenient to students (including in rural areas)". The DHET ([15], p. 22) further committed to "establishing dedicated distance education capacity at one or more of the community colleges, with the requisite resources and capacity to provide education and training opportunities to eligible youth and adults who are unable to attend face-to-face institutions". In its *Draft Policy Framework for the Provision of Open Learning and Distance Education in South African Post-school Education and Training*, the DHET ([39], p. 1) adopted "open learning as a strategy to increase access to education and training opportunities for all and to construct quality learning environments which take account of learners' context and use the most appropriate

and cost-effective methods and technologies". It is the DHET's ([39], p. 55) stance that "like distance education, open learning focuses directly on making access to learning a primary goal, and may use the benefits of online and *e-learning* to achieve this end".

The DHET ([39], p. 34) advocated distance education and specifically *e-learning* to provide increased access to post-secondary education and training opportunities for those who cannot or choose not to enrol for traditional campus-based provision; and second, to lower costs per student by collaborating in curriculum design and materials development, by spreading some teaching and support costs across larger number of learners and by obviating the need for continuing investment in physical infrastructure. It envisions a new post-school education and training system (PSET), that is, responsive to the social, economic and transformative needs of the country, and that will increase "access to, and success in learning through open learning in PSET Institutions" ([39], p. 6).

4. UNISA's role in *e-learning* in South Africa

In this penultimate section, we broach UNISA's provision of *e-learning* in these challenging times. In our introductory remarks earlier, we highlighted the fact that South Africa's socio-economic and political landscape is marked by instability, uncertainty and unpredictability. In Section 2, we touched on South Africa's enduring and vast inequalities, which are by race, class and gender. We showed that while the African people constitute the vast majority of the country's population, the whites, who are a minority, continue to enjoy living standards comparable only to those of *First World* countries. The opposite is the case with the majority of the African people, who continue to live in abject poverty, way below the official poverty line of $1.90/day as determined by the World Bank and other international agencies. It therefore comes as no surprise that Statistics South Africa ([22, 23], p. 21) is convinced that "South Africa would not likely achieve the target of reducing inequality to 0.6 by 2030".

There has been a bourgeoning interest in *e-learning* among South African academics ([40–44]; Swanepoel, de Beer & Muller, 2009]). For instance, Venter et al. [41] explored "the antecedents of *e-learning* use among advanced business students at UNISA". Mbatha and Naidoo [42] examined "*e-learning* as a transformational educational tool in collapsing the transactional distance among communication science students at UNISA".

Meier [44] draws on the multi-institutional study between School-Net South Africa, the University of Jyväskylä in Finland and the University of South Africa's School of Education to inquire "whether intercultural understanding can be achieved through *e-learning*". It is her view that "terms such as '*e-learning*', 'online learning', 'virtual learning', 'web-based learning', 'internet-based learning' and 'resource-based learning', all refer to the use of Internet technologies to provide education" ([44], p. 661).

Swanepoel et al. ([60], p. 311) explored the use of "satellite classes to optimise access to and participation in first-year business management" at the neighbouring University of Pretoria, while Engelbrecht [43] explored "the reasons why universities are driven to implement *e-learning*". Her aim is "to identify the critical issues in the *e-learning* models that have to be addressed in a strategic planning process for the implementation of *e-learning* or the adjustment of existing

e-learning initiatives". The above-cited literature confirms our expressed view that there is "a bourgeoning interest in *e-learning* among South African academics".

It is our conviction that UNISA is "ideally placed to play a leading role in increasing access to higher education for marginalized communities", and "to support high-level capacity development beyond the borders of South Africa, especially on the continent" ([38], p. 2). As Africa's largest and the only dedicated distance learning institution, UNISA has the necessary capabilities to mount structured and sustainable *e-learning*, understood as "a wide set of applications and processes, including computer-based learning, Web-based learning, virtual classrooms, and digital collaboration" ([19], p. 15). Bates [14] noted that governments "see *e-learning* as a new knowledge-based industry, able to lever the advantage of advanced educational systems to create educational products and services that can be marketed internationally". In the same vein, South Africa's DHET ([39], p. 3) "views ICTs and *e-learning* as very significant aspects of open leaning approaches", and as "critically important tools in the struggle against poverty, underdevelopment and marginalisation" ([39], p. 26). The DHET ([39], p. 11) categorised *e-learning* as "digitally supported, digitally dependent, internet supported, internet dependent, and fully online" (see **Figure 6**).

There is, therefore, a sense that *e-learning* can potentially create the desired impact in efforts to widen access to higher education with success. For instance, the DHET ([39], p. 55) noted that while, "distance education is well-known for increasing the educational reach of institutions, and for providing learning opportunities to many who would otherwise be deprived of formal learning…open learning may use the benefits of online and *e-learning* to achieve this end". Boddy et al. ([19], p. 17) identified the following advantages of *e-learning*:

- Learning becomes more active and dynamic when compared to traditional in-class learning, allowing it to be cantered on the students and their learning, instead of focusing on the classroom activities.
- Access to a vast quantity of resources is possible and at lower cost.
- Learning can be differentiated pedagogically, it can accommodate different learning styles, allow students to work at their own pace and facilitate learning through a variety of activities.
- New tools and social media encourage collaboration between students and the community, without barrier to space and time.
- Those same tools allow for the development of virtual communities that can persist after the program/course is done.
- IT and the Internet can transform processes and institutions, transforming, in consequence, the ways of teaching and learning and opening the door to innovation and new pedagogical theories.

Figure 6. DHET's categorisation of *e-learning*.

In this section, we briefly sketch UNISA's capacity for *e-learning*. As Prinsloo [45] pointed out, "Through the years Unisa has always embraced a range of technologies to enhance teaching and learning such as audio cassettes, video cassettes, DVDs, satellite broadcasting and video conferencing and increasingly more effective use of *MyUnisa*". UNISA [46] stated that UNISA's "Students have access to a menu of support services ranging from face-to-face tutorials to video conferences, satellite broadcasts and e-tutors". What we shall attempt to do in this penultimate part of the chapter is to demarcate UNISA's *e-learning* initiatives and practices such as the institution's online learning management system (LMS) known as *MyUnisa*, the uses of video conferencing (VC) and Satellite Broadcast (SB) and the role of the UNISA Telecentre Community Outreach (TCO) initiative. We shall close with an exploration of UNISA's Integrated Tutor Model (ITM).

4.1. *MyUnisa*

UNISA's provision of *e-learning* is done through the Learning Management System (LMS) known as *MyUnisa* [41, 42, 47]. Mbatha and Naidoo [42] described *MyUnisa* as "the *e-learning* resource developed by the university to improve communication between lecturers and students, while also improving its services to students to ensure a seamless learning experience". They argued that *MyUnisa* "has been developed to supplement and enhance academic interactions and improve communication between UNISA and its students, as well as provide an opportunity for engagement among students". It is their view that *MyUnisa* is used "to bridge the transactional distance in order to ensure increased engagement among all stakeholders" ([42], p. 170). In the same vein, Venter et al. [41] posited that *MyUnisa* "uses the Sakai platform and offers tuition and administrative functions to develop and enhance academic interaction and improve communication between UNISA and its students". *MyUnisa* features a wide range of *e-learning* enabling functions among which we want to mention the *course administration* and *my students*.

The *course administration* section is a platform for staff to manage course assessment plans; assign and manage assignments, course readings, examination question papers and examination statistics; F1 concessions—supplementary concessions that are granted to students who have one outstanding module to complete a qualification, and to manage Tutor Student Grouping.

The *my student* section provides staff with facilities for storing information on students' admissions; students' assignments, assignment status reports and marking statistics; academic records, examination results and financial details; students' lists and students' mailing lists; capturing and recording of masters and doctoral students' activities, that is, submission of research proposals and progress being made in the research.

Each course portal provides space for announcements, uploading of official study material and additional resources and prescribed books. It also features the *Discussion Forum Portal*, where staff can post important announcements and notices for students; reply to student queries and initiate exchanges among students on course-related issues, or intervene where there is an *impasse* and give direction in ongoing discussions among students. The *Discussion Forum Portal* provides a user-friendly and enabling space for staff-to-students and student-to-student sharing of ideas and experiences online.

Additionally, each course portal features a *Course Site Tools* section, which provides a wide variety of *e-learning* tools from which the lecturers can choose. These include, among others:

- *Welcome Message*: for generating a welcome message to students at the start of the course.
- *Announcements*: for posting current, time-critical information.
- *Blog*: an online collaborative writing tool allowing posts and comments.
- *Calendar*: for showing a summary of scheduled events for the course.
- *Course Contact*: which stores students' e-mails for communicating with the students.
- *SMS Messages*: for sending bulk SMS text messages to students.
- *Discussion Forum*: which enables the students to discuss study-related matters, and for lecturers to mediate and give direction to the discussion.
- *Drop Box*: which provide a private file sharing between the lecturers and the students.
- *Wiki*: for collaborative editing of pages and content.
- *Meetings*: this is a Sakai conferencing tool.
- *Podcast*: for the management of individual podcasts and podcast feed information.
- *Polls*: for initiating and managing anonymous polls or voting.
- *Syllabus*: for staff to post summary outlines and requirements.

In a study of access and usage of *MyUnisa* that involved 22,216 UNISA online students, Liebenberg et al. ([48], p. 257) found that 91% of students who participated online had regular access to the Internet, which meant that 9% of online students did not have regular access to the Internet. Their study found that online students who had access to the Internet mostly accessed it from home (57%) and work (51%). The vast majority (82%) of online respondents owned a mobile device that is capable of accessing the Internet.

4.2. Video conferencing and satellite broadcasting

UNISA makes use of "videoconference technology for the purpose of discussion classes, meetings and tutorials" ([49], p. 2), and "as a way of bridging the time, geographical, economic, social, educational and communication distance between students and the institution, students and academics, students and courseware and students and peers" ([50], p. 4). UNISA ([61], p. 11) defined video conferencing "as an interactive means of communication between two or more locations. The interactivity is accomplished by various means, but the most common include live video and audio feed in both directions". Video conferencing allows lecturers to use computers to display PowerPoint presentations or play music clips for the purpose of promoting discussion and interaction.

On 2 June 2010, the Senate of UNISA approved the use of video conferencing (VC) and Satellite Broadcast (SB) sessions free of charge to all registered students ([51], p. 3). As Prinsloo [45] pointed out, "Although *Adobe Connect* is a licensed software in the same league as *Elluminate* and *Wimba*, there is Open Source Software available such as *BigBlueButton* which is already available in the Unisa context". Swanepoel et al. ([60], pp. 311–312) argued that.

> *One method of increasing student teacher (two way) communication is through interactive satellite classes (real time verbal communication), which have the capacity to re-humanize distance education and are more accessible to the majority of UNISA students who are far removed from the major cities.*

UNISA ([61], p. 8) defined satellite broadcast (SB) as "the distribution of visual images by means of a satellite link. It is less interactive than video conferencing, but more cost-effective. Students can see their lecturer, but their lecturer can't see them". One of the disadvantages of satellite broadcasts is that they encourage passive viewing instead of active participation. Students do not have control over the medium and are unable to stop the flow of information to ask questions and request clarification.

4.3. The Telecentre community outreach (TCO)

In its *Strategic Plan 2016–2030*, UNISA [37] provided for the university to "Upgrade ICT platforms at all student centres and regions to promote ICT accessibility" and to "Sign agreements with, at least, 2 Multi-Purpose Centres in each province to serve as sites for the uploading and downloading of students' assignments" ([37], p. 72). UNISA [52] stated that

> *The identification and contracting of Telecentres across the country is an effort to contribute to a positive student experience by providing tools for students to access ICTs with ease. Telecentres are located within communities (mostly rural) and are usually public organizations that are funded by the government, such as public schools; non-profit organizations (NPOs); agencies.*

UNISA has established collaborative agreements with Telecentres throughout the country under the auspices of the Telecentre Community Outreach (TCO). In its submission to the Council on Higher Education (CHE) with reference to Quality Enhanced Project (QEP), UNISA [53] stated that

- "The institution has video conferencing facilities at the Muckleneuk and Florida campuses and across all regional learning centres to enhance the learning experiences of students".
- "The institution has an initiative wherein it identifies centres with functioning computers (Telecentres), particularly in areas where the regional learning centres are not within easy reach for our students, to facilitate student access to computers".
- "The regional learning centres have well-resourced computer laboratories to enable students to download and upload their study material as well as engage in other teaching and learning activities".

The main objective of the TCO is to reach out to the rural and remote students nationally by providing them with access to the Internet/computer facilities, for academic purposes.

4.4. The integrated tutor model (ITM)

According to the UNISA Tutor Model, tutorials emphasise collaborative learning (group work) among students. They promote social integration particularly at the first-year level. Students who enter higher education are provided with a tutor who will guide them as they grapple with the many challenges that often confront students entering university directly from a school environment ([54], p. 5). Tutorials therefore offer "a facilitative space". Concomitantly, the tutor's

role is facilitative. It entails encouraging dialogue between tutors and students, among students, and between the student and the academic and administrative structures of UNISA [54].

The notion of dialogue was made prominent by, among others, Greek philosopher Plato in his dialogues such as *The Republic, Crito*, *Euthyphro*, *Protagoras,* and the *Meno*, which feature Socrates as the central character. Gonzales [55] described dialogue "as a face-to-face conversation that can answer questions, choose whom it addresses and when". During the interview by Donaldo Macedo, Brazilian philosopher of education Paulo Freire ([56], p. 379) argued that "dialogue characterizes an epistemological relationship…I engage in dialogue because I recognize the social and not merely the individualistic character of the process of knowing. In this sense, dialogue presents itself as an indispensable component of the process of both learning and knowing". In his seminal book, *Pedagogy of the Oppressed*, Freire [57] argued that "problem-posing education sets itself the task of demythologizing. Banking education resists dialogue; problem-posing education regards dialogue as indispensable to the act of cognition which unveils reality".

Commeyras [58] makes a case for the promotion of 'critical thinking through dialogical thinking. Her take on critical thinking draws of Robert Ennis [59], who defined critical thinking as "reasonable reflective thinking that is focused on deciding what to believe or do…Critical thinking involves both dispositions (e.g., open-mindedness, reason seeking, and sensitivity towards other's feelings and knowledge) and abilities (e.g., engagement in argument analysis, question identification, credibility assessment, and inference)". It is Commeyras [58], p. 487) contention that "In a dialogical approach to teaching, students learn to argue for and against each and every important point of view and each basic belief or conclusion that they are to take seriously". Our view is that in an open distance *e-learning* environment such as UNISA where tutoring is offered online, hence *e-tutoring*, an e-tutor is a person who undertakes the role to support and enable students to engage in the above-mentioned forms of dialogical conversations online, thus providing personalised student support.

5. Conclusion

In this chapter, we outlined the way by which UNISA, which is the oldest *mega university* in the continent of Africa with a student enrolment more than 300,000, is ideally placed to play a leading role in the delivery of distance learning through structured and sustainable *e-learning*. We sketched South Africa's socio-economic and political landscape, which we argued, is marked by instability, uncertainty and unpredictability. We showed that because of this landscape, South Africa is the most unequal society. We broached the country's demographics, showing that Africans constitute about 80.8% of the country's total population, while whites constitute a meagre 8.8%, yet in terms of top management positions in the labour market whites dominate, and they also constitute over 80% of the entire university professoriate.

We sketched the country's high rates of youth unemployment, which peaked at 38.8% in 2016 as well as adult unemployment rates, which peaked at 27.7% in 2016. We showed that in terms of the poverty share, black African households accounted for over 90% of all poor

households, and that this proportion grew to 93.9% in 2011, making black Africans to carry the highest burden of poverty in the country. We argued that this constitutes the imperative for UNISA to intervene through its expanded provision of distance learning through *e-learning.* We demarcated numerous ways by which UNISA can potentially achieve this imperative. We sketched UNISA's online learning management system (LMS) known as *MyUnisa,* the uses of video conferencing (VC) and Satellite Broadcast (SB) and the role of the UNISA Telecentre Community Outreach (TCO) initiative and the Integrated Tutor Model (ITM). We argued that collectively, these initiatives place UNISA in an ideal position to play a leading role in increasing access to higher education for marginalised communities in South Africa and in the African continent through its provision of *e-learning*. We should point out that because UNISA offers opportunities and access to mature adult working students to further their studies, the students are not required to be at institution in person in order to study. UNISA's e-learning systems are ideally suited to offer essential support to such students to further their studies and acquire higher education qualifications.

Author details

Moeketsi Letseka[1]*, Matsephe Martha Letseka[1] and Victor Pitsoe[2]

*Address all correspondence to: letsem@unisa.ac.za

1 Department of Educational Foundations, College of Education, University of South Africa (UNISA), South Africa

2 Department of Educational and Management, College of Education, University of South Africa (UNISA), South Africa

References

[1] Letseka M, editor. Open Distance Learning (ODL) through the Philosophy of Ubuntu. New York: Nova Publishers; 2016

[2] Letseka M, Koenane M. ODL research and Ubuntu values. In: Letseka M, editor. Open Distance Learning (ODL) through the Philosophy of Ubuntu. New York: Nova Publishers; 2016. pp. 175-184

[3] Letseka M, editor. Open Distance Learning (ODL) in South Africa. New York: Nova Publishers; 2015

[4] Letseka M, Pitsoe V. The challenges and prospects of access to higher education at UNISA. Studies in Higher Education. 2014;**39**(10):1942-1954

[5] UNISA. An Institutional Profile: Unisa Facts & Figures. UNISA, Pretoria: UNISA Press; 2012

[6] Daniel JS. Mega Universities & Knowledge Media: Technology Strategies for Higher Education. Abington, Oxon: Routledge; 2006

[7] Letseka M, Pitsoe V. Reflections on assessment in open distance learning (ODL): The case of the University of South Africa (UNISA). Open Praxis. 2013;**5**(3):197-206

[8] Möller J. Benefits for DACeL in the lessons learned in the deployment of an LMS at UNISA. In: Proceedings of the Defence Academies and Colleges 2009 International Conference "Network Centric Learning: Towards Authentic e-Practices"; 25th-27th March; 2009. pp. 62-68

[9] Prinsloo P. Participation in open distance learning. In: Letseka M, editor. Open Distance Learning (ODL) in South Africa. New York: Nova Publishers; 2015. pp. 21-37

[10] Tlale D, Mahlo D. Inclusive education and Ubuntu in open and distance education. In: Letseka M, editor. Open Distance Learning (ODL) through the Philosophy of Ubuntu. New York: Nova Publishers; 2016. pp. 163-174

[11] Van Broekhuizen H. Teacher supply in South Africa: A focus on initial teacher education graduate production. A Working Paper of the Department of Economics and Bureau for Economic Research, University of Stellenbosch; 2015

[12] Guri-Rosenblit S. Distance education and e-learning: Not the same. Higher Education. 2005;**49**:467-493

[13] UNISA. Open Distance Learning Policy. UNISA, Pretoria: UNISA Press; 2008

[14] Bates AW. Technology, E-Learning and Distance Education. 2nd ed. New York: Routledge; 2005

[15] Department of Higher Education and Training (DHET). White Paper for Post-School Education and Training. Pretoria: DHET; 2013

[16] World Bank. World Development Indicators 2013. Washington, DC: World Bank; 2013

[17] Statistics South Africa. Poverty Trends in South Africa: An Examination of Absolute Poverty between 2006 and 2011. Pretoria: Statistics South Africa; 2014

[18] Mbeki TM. Africa the Time Has Come: Selected Speeches of Thabo Mbeki. Johannesburg: Mafube Publishers; 1998

[19] Boddy C, Detellier C, Duarte S, Duplàa E, Erdma A, Lavasseur D, McKay M, Ofholz L. Report of the E-Learning Working Group. Ontario, Canada: University of Ottawa; 2013

[20] De Vos P. President Zuma loses bid to dodge 783 charges. But will he have the last laugh? Mail & Guardian. 2017. Available from: https://mg.co.za/article/2017-10-16-president-zuma-loses-bid-to-dodge-783-charges-but-will-he-have-the-last-laugh

[21] Republic of South Africa: National Treasury. Medium Term Budget Policy Statement 2017. Pretoria: National Treasury; 2017

[22] Statistics South Africa. Mid-Year Population Estimates 2071. Pretoria: Statistics South Africa; 2017

[23] Statistics South Africa. Poverty Trends in South Africa: An Examination of Absolute Poverty between 2006 and 2015. Pretoria: Statistics South Africa; 2017

[24] Statistics South Africa. Vulnerable Groups Indicator Report 2016. Pretoria: Statistics South Africa; 2016

[25] Statistics South Africa. National and Provincial Labour Market: Youth. Pretoria: Statistics South Africa; 2015

[26] Hlongoane S. How South Africa can turn back from junk status. Huffington Post. 2017

[27] Ferreira FHG, Chen S, Dabalen A, Dikhanov Y, Hamadeh N, Jolliffe D, Narayan A, Prydz EB, Revenga A, Sangraula P, Serajuddin U, Yoshida N. A global count of the extreme poor in 2012: Data issues, methodology and initial results. Journal of Economic Inequality. 2016;**14**:141-172

[28] Jolliffe J, Prydz EB. Estimating international poverty lines from comparable national thresholds. In: Policy Research Working Paper. Poverty and Inequality Team, Development Research Group, World Bank; 2016

[29] Republic of South Africa: National Treasury. Credit Ratings and how they Work. Pretoria: National Treasury; 2016

[30] Govender P. There still aren't enough black professors, despite university transformation attempts. Mail & Guardian. 2017. Available from: https://mg.co.za/article/2016-07-11-there-still-arent-enough-black-professors-despite-university-transformation-attempts

[31] Ramoupi NL. Why are there so few black professors. Mail & Guardian. 2017. Available from: https://mg.co.za/article/2017-06-15-00-why-are-there-so-few-black-professors

[32] Department of Labour. Commission for Employment Equity 2015-2016: Annual Report. Pretoria: DoL; 2016

[33] Department of Labour. Commission for Employment Equity 2014-2015: Annual Report. Pretoria: DoL; 2015

[34] Department of Labour. Commission for Employment Equity 2013-2014: Annual Report. Pretoria: DoL; 2014

[35] Department of Labour. Commission for Employment Equity 2012-2013: Annual Report. Pretoria: DoL; 2013

[36] Department of Labour. Commission for Employment Equity 2011-2012: Annual Report. Pretoria: DoL; 2012

[37] UNISA. Strategic Plan 2016-2030. UNISA, Pretoria: UNISA Press; 2016

[38] UNISA. Strategic Plan 2015. UNISA, Pretoria: UNISA Press; 2015

[39] Department of Higher Education and Training (DHET). Draft Policy Framework for the Provision of Open Learning and Distance Education in South African Post-School Education and Training. Pretoria: DHET; 2017

[40] Bharuthramc S, Kies C. Introducing e-learning in a south African higher education institution: Challenges arising from an intervention and possible response. British Journal of Educational Technology. 2013;**44**(3):410-420

[41] Venter P, van Rensburg MJ, Davis A. Drivers of learning management system use in a south African open and distance learning institution. Australasian Journal of Educational Technology. 2012;**28**(2):183-198

[42] Mbatha BT, Naidoo L. Problems hampering the collapse of distance in ODL. Progressio. 2010;**32**(1):70-184

[43] Engelbrecht E. A look at e-learning models: Investigating their value for developing an e-learning strategy. Progressio. 2003;**25**(2):38-47

[44] Meier C. Enhancing intercultural understanding using e-learning strategies. South African Journal of Education. 2007;**27**(655):671

[45] Prinsloo P. ODL Communiqué 57. Office of the Vice-Principal: Academic & Research, UNISA; April 20, 2011

[46] UNISA. UNISA at your Fingertips. UNISA, Pretoria: UNISA Press; 2016

[47] Abdullah H, Mtsweni J. The role of e-tutors in promoting e-learning using web 2.0 technologies. In: Proceedings of the African Cyber Citizenship Conference 2014 (ACCC2014); 5-6 November; Port Elizabeth. 2014. pp. 67-72

[48] Liebenberg H, Chetty Y, Prinsloo P. Student access to and skills in using technology in an open and distance learning context. International Review of Research in Open and Distance Learning. 2012;**13**(4):250-268

[49] Nematandani AT. Experiences of Videoconference Tutors in Instructional Methodologies Application [Unpublished Masters Dissertation]. College of Education, University of South Africa; 2016

[50] Prinsloo P. ODL Communiqué 4. Office of the Vice-Principal: Academic & Research, UNISA, March 5, 2010

[51] Prinsloo P. ODL Communiqué 25. Office of the Vice-Principal: Academic & Research, UNISA; August 4, 2010

[52] UNISA. Tender Specification Document: Expression of Interest Process to Appoint Telecentres for Community Outreach. Pretoria: UNISA; 2017

[53] UNISA. Quality Enhancement Project Institutional Submissions: Phase 1. Submission to the Council on Higher Education (CHE); September 1, 2014

[54] UNISA. UNISA Tutor Model. UNISA, Pretoria: Directorate, Tuition and Facilitation of Learning; 2012

[55] Gonzales FJ. Dialectic and dialogue in the hermeneutics of Paul Ricoeur and H. G. Gadamer. Continental Philosophy Review. 2006;**39**:313-345

[56] Freire P, Macedo M. A dialogue: Culture, language, and race. Harvard Educational Review. 1995;**65**(3):337-402

[57] Freire P. Pedagogy of the Oppressed. New York: Continuum International Publishing Group; 2005

[58] Commeyras M. Promoting critical thinking through dialogical-thinking reading lessons. The Reading Teacher. 1993;**46**(6):486-494

[59] Ennis RH. A taxonomy of critical thinking dispositions and abilities. In: Baron JB, Sternberg RJ, editors. Teaching for Thinking. New York: Free man; 1987. pp. 9-26

[60] Swanepoel A, De Beer A, Muller H. Using satellite classes to optimise access to and participation in first-year business management: A case at an open and distance-learning university in South Africa. Perspectives in Education. 2009;**27**(3):311-319

[61] UNISA. Task Team 4: Student Support, enabling discussion classes at UNISA through satellite broadcasting and video conferencing. Pretoria: UNISA Press; 2010

Chapter 9

Moodle Platform: A Case of Flexible Corporate Learning in the Financial Sector in Sierra Leone

Emerson Abraham Jackson

Additional information is available at the end of the chapter

http://dx.doi.org/10.5772/intechopen.75617

Abstract

In the current age of technology, which is supported by flexible (hand-held) devices like iPad, the use of learning platforms such as Moodle can support virtual learning through synchronisation with available technologies like effective (fibre-optic) network system. In addition to it being a good platform for academic learning, its use is now becoming widespread in the corporate environment, more so for compliance training in areas like banking and insurance sectors. In developing countries like Sierra Leone where resources are limited, effective corporate governance can be addressed by ensuring that people are conversant with their organisational compliance policies through access to Moodle managed learning environment (MLE). There is a myth concerning Moodle's confined use in the academic environment, but this work will explore its relevance in an environment not so common in the working practices of staff professional engagement and learning in the corporate environment. Discussion is focused in the financial sector where demand on work is preventing employees and even those charged with governance from engaging themselves in activities supposedly meant to enhance their understanding of professional working practices, for example, addressing risks and compliance measures.

Keywords: Moodle, collaboration, e-learning, corporate environment, Sierra Leone

1. Introduction

In the current age of technology, which is supported by flexible (hand-held) devices like iPad, the use of managed learning environments (MLEs)/platforms of various sorts can support virtual learning through synchronisation with available technologies. The advent of modern technology has made it possible for new terminologies to be added in the discourse of professional undertakings. In these cases, the use of words like managed learning environment

(MLE), virtual learning environment (VLE), technology-enhanced learning (TEL) and many more has become the terminologies of everyday language for people engaged in virtual space of work, be it for formal learning or other means of collaboration like video conferencing and blogging.

All around the world, e-learning is becoming widespread, and not only in the academia where its usage is the common ground for enhanced teaching and learning, but corporate organisations such as legal, medical and financial institutions are also embracing it as a way of improving knowledge of people in the dynamic world of technological advances [1, 2]. The pace of MLE is expediting the speedy globalisation of institutions through enhanced virtual collaboration features present. It is now possible for users to improve their learning opportunities without being physically present in a classroom situation. An approach used by most established organisations to gauge performance management of employees without having to watch them all throughout the time as all activities or tasks were performed on MLE platforms like Moodle can be tracked.

Developing countries like Sierra Leone are still treading in the direction of making advances in the global community of technology, but this needs serious strategic planning to make sure institutions of all types (corporate, educational, governmental and non-governmental) harness the chances of keeping pace with countries around the world. With the current high state of non-compliance present in the financial sector, it is but necessary for technological advances like MLEs to be given serious consideration in the breakthrough of ensuring that professional working standards are embraced. Currently, institutions across the world, particularly those in the advanced economies, are embracing the opportunities, given the benefit this sort of technology brings to improved operations and work standard, with the capacity to synchronise management information systems (MIS) where employee details are automatically updated on the system to take full advantage of facilities.

This advanced and digitised technology brings with it the advantage of synchronous or asynchronous means of learning/communication around the world; the former refers to the exchange of ideas and information with one or more participant at the same time; for example, this could involve face-to-face discussion and also online real-time discussion, incorporating feedback from participants. On the other hand, the latter (asynchronous) is a form of self-paced means of communication/learning where participants are engaged in ideas or discussions without the dependence on another participant in a real time (e.g., this may include blogging, emails and discussion board). Both synchronous and asynchronous methods are said to have moved society to a point where individuals can improve their opportunities for collaboration, with knowledge acquisition set at the centre of embracing a variety of learning opportunities the technology has brought to people's lives [3, 4].

The facility of Moodle platform is not so common in the learning environment in many developing economies and in particular Sierra Leone where learning process is still based on the old didactic approach to teaching. Given the current age of technology, it is now a choice for those engaged in learning to decide as to whether they should engage in 100% online learning or part way depending on their commitments to work. The decision to move into a flexible approach to learning by staff in a country like Sierra Leone will certainly change the

landscape of professionalism as staff are mostly engaged in the rote approach to learning and without many opportunities for them to be actively connected with virtual world of learning. The benefit of proposing Moodle as a means of learning for the financial sector is that its flexible feature makes it possible for anyone to be actively engaged in continuous learning, more without the need to worry about distance and location. The learning process is always done electronically with real-time engagement with other participants in the world.

2. Moodle learning environment and its architecture

Moodle is a learning environment whose topology is defined by an easy access for users to select appropriate tool(s) that enhances their access to learning resources. Based on an excerpt from Jackson [5], the term *topology* from its derivative in mathematics and as applied in the context of this chapter refers to the physical description of Moodle features that makes learning for both teachers/instructors and learners more adaptive, with its flexibility of usage in a static/m-learning environment using gadgets like tablets/mobile phones. By definition, 'Moodle is a learning platform designed to provide educators, administrators and learners with a single robust, secure and integrated system to create personalised learning environment (Moodle: online)'. The complex feature of the platform has made it possible for users to take advantage of modern technology through flexible means of engagement, which can take the form of self-paced learning, video conferencing, real-time collaboration with users and many more. **Figure 1** provided an illustrative discourse of the architecture of Moodle with its integrated features for promoting flexible means of learning, while also ensuring details for the achievement of high professional standards are met.

According to Kesse [6] as shown in **Figure 1**, the concept 'Moodle was originally an acronym for Modular Object-Oriented Dynamic Learning Environment', with its main philosophy geared around supporting a style of learning called social constructionist pedagogy, which is simply about interaction. The system has developed a flexible approach to dynamic learning, and regardless of where the user is, learning can still be made as an integral part of the person's professional impetus to aim higher. With the right level of support and internet capability, access to Moodle platform creates a new wave of thought into people's approach to learning.

According to Kesse [6] and more so Moodle (online), the architecture supports collaborative virtual pedagogy with both learner and instructor at the centre of virtual/collaborative engagement. This is the most important feature of Moodle as it creates the means through which users can be actively engaged in their learning process and at a flexible pace.

The assignment tool button in **Figure 2** allows task(s) to be created which can be assessed with constructive feedback and graded by the instructor. Most importantly, there is also a feature for instructor and learner to engage in collaborative virtual 'feedback', thereby creating scope for flexible means of differentiated learning engagement. The benefit ascribed to the pedagogy tool is such that all users will have equal chances of being monitored due to the fact that the platform allows MIS data integration/synchronisation of user records. It matters not

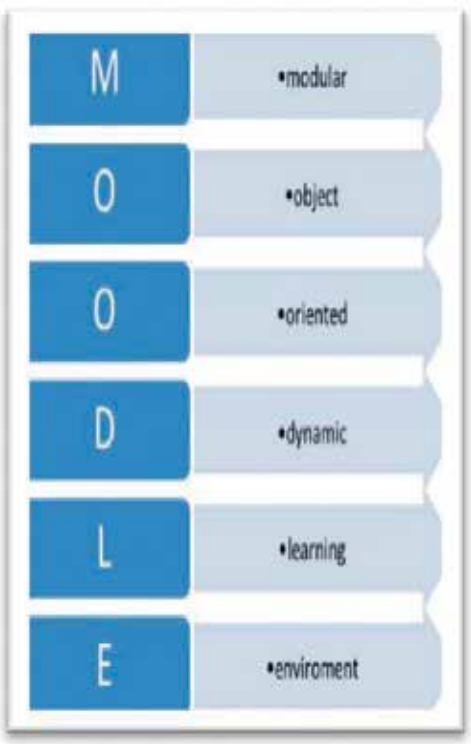

Figure 1. Moodle acronym.

as to whether the environment of work is in formal education or in the corporate world; there is always the capability for Moodle system to develop a comprehensive set of database for users accessing the system. Moodle is quite a dynamic platform, and its open-source feature gives it an advantage for principal users in institutions (whether in the corporate or academic environment) to customise tools to address organisational priorities. As seen in **Figure 2**, the *BigBlueButtonBN* allows access to real-time classroom and also later recording using the *RecordingsBN* resource button [7].

With reference to **Figure 2**, Moodle provides the means for an instructor to add the following five types of readable course (much more so in the lesson tool) materials for users, but not necessarily interactive [6, 8]:

- A text page
- A web page
- A link to anything on the web
- A label that displays any text or image
- A view of 1-year course directories

http://dx.doi.org/10.5772/intechopen.75617

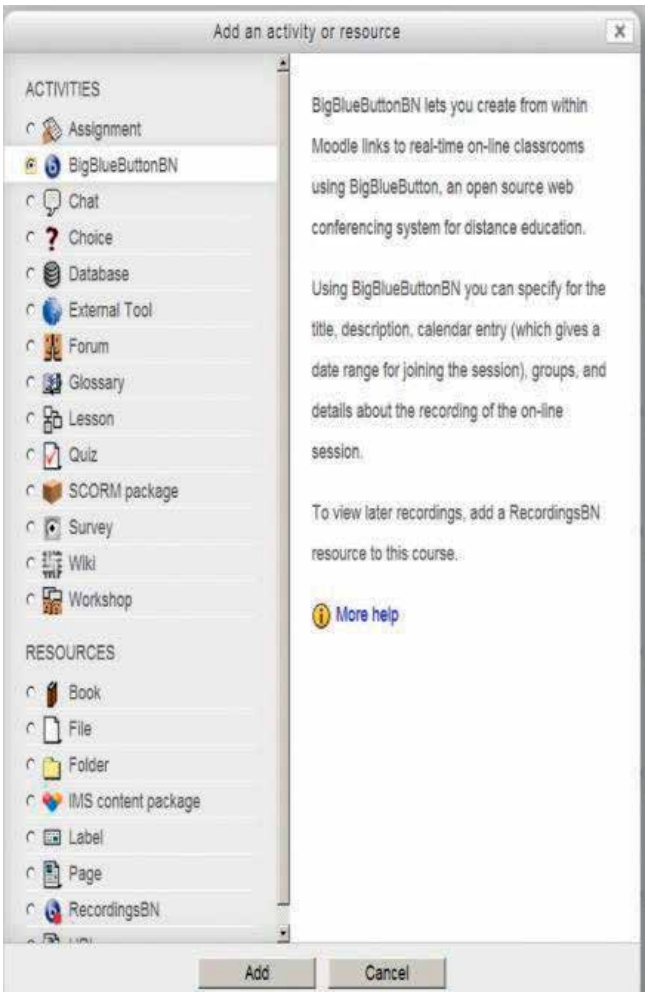

Figure 2. Moodle pedagogy (activities). Source: Fred Dixon [7].

On a more interactive note, the following interactive course materials can be added for learner's use as addressed by Kesse [6]:

- Assignment (everyone can upload files to be reviewed by the instructor or learner)
- Choice
- Journal
- Lesson
- Quiz (online)

The following activity items on the pedagogy widow will also be an easy interaction and collaboration by the student:

- Forum
- Quiz
- Wiki
- Chat
- Glossary

Moodle runs through an operating system (depending on the most preferred choice of an institution/organisation), and its topology can be networked to address the needs/requirements of users or the establishment. **Figure 3** provides a generalised topology system for a typical Moodle infrastructure with connecting hubs, with not only physical cables within establishments, but also wireless cables, to address the institution's size directed at the Moodle server to make sure information are easily shared irrespective of where the user is accessing information.

The network architecture is arranged such that users can be engaged in multi-tasking activities at the same time. This can then provide users the chance(s) of making flexible use of the

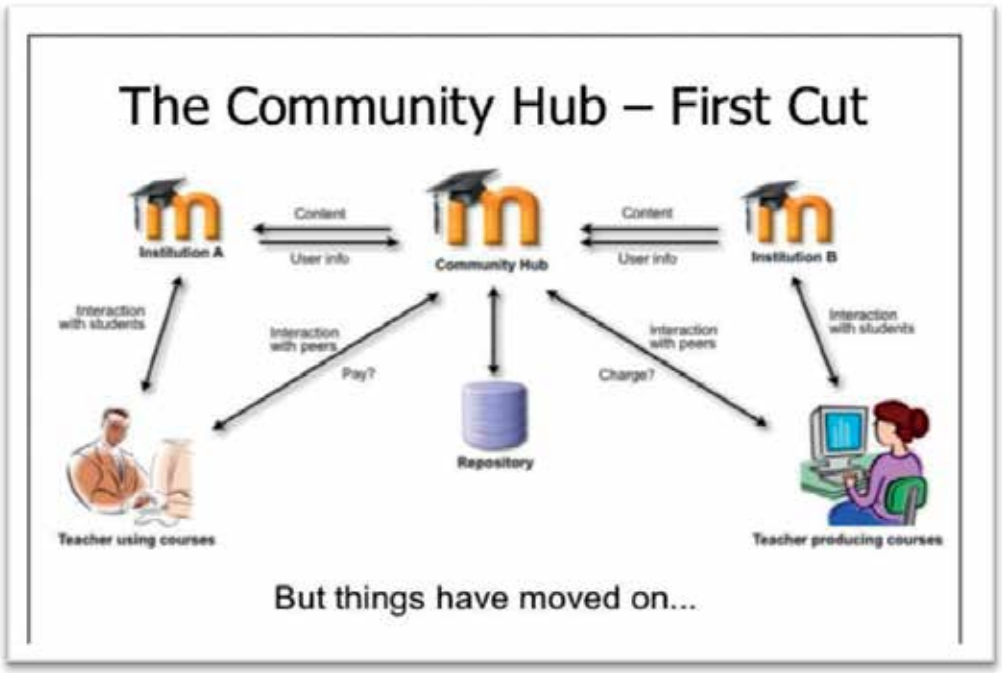

Figure 3. Moodle general topology infrastructure. Source: Sean Keogh [9].

http://dx.doi.org/10.5772/intechopen.75617

topology to collaborate with multiple users, for example, a facilitator setting up an online collaborative 'forum' in the pedagogy architecture to post materials for learners' conversation or answering questions as and when requested by individual or user groups [10]. Enhancement of user security is key to the applicability of Moodle usage; in this regard, users are initially set up with individual account (username and password). This then means that users can access their account(s) from any location, with a given Internet-connected hardware device (desktop PC, laptop, iPad and other portable m-learning devices such as iPhone). Users can access all materials in the same way as if they were in a physical environment of learning.

Amidst the above benefits of using MLEs, there is always the need to raise caution regarding the fact that country like Sierra Leone (at the moment) may not necessarily be capacitated to run a consistent 100% online provision to support high-level operational activities. In this regard, organisations in the financial sector may need to ensure that high percentage of their proceeds in profits is invested in high-level technology to make sure staff are highly capacitated to keep pace with standards in the industry. Advanced collaboration feature in Moodle MLE can create the enabling environment where provision for such facilities is easily accessible by staff in the industry. The topology has made it possible for collaboration to be facilitated through chat rooms where learners can pose questions pertaining to their learning developments. Regardless of the number of branches or locations an institution is operating on, Moodle technology will always provide the opportunity for users to participate in a course and contribute towards the learning process through active participation on questions posed.

3. Link with G.J.J. Biesta's pedagogical theory

According to Jackson [11], the architecture of Moodle has made it possible for learning to be characterised on the basis of what Biesta [12] classified in the pedagogy of three interconnected discourses of good education: *qualification, socialisation and subjectification*.

Figure 4. Biesta's interconnected education. Source: Twenty-first-century learners [13].

Moodle as a learning tool provides the medium through which learners/users can improve their knowledge (qualification discourse) as a result of the active and collaborative support from facilitators in the learning environment. As shown in **Figure 4**, Moodle platform provides the enabling environment for users to collaborate, either through face-to-face or virtual means of socialisation discourse, an area also emphasised by Majumdar [14]. In the event that such learning platform is to be adapted, particularly by corporate establishments in the financial sector, there is an opportunity to increase users' opportunity in their improving skills through knowledge sharing. This can be done through the learning medium environment by engaging in activities like tests, which can be self-administered on a time scale as determined by the facilitator.

This is an opportunity for both facilitators and those charged with oversight/corporate responsibilities, for example, board of directors, to engage themselves in new technology, supposedly meant to improve their chances of acquainting with standards in addressing ongoing concerns like risks and compliance issues in the industry. Through Moodle platform, there is a high tendency for online collaboration to be fostered with colleagues in similar professions around the world. Given the nature of financial institutions like commercial banks and insurance companies, there is the tendency for branches to be located in every region and corner of the country. The use of Moodle as a learning platform will serve the purpose of ensuring that staff are regularly kept up to date about standards and performances in the industry. Courses can be easily accessed, and collaboration feature like chat and even real-time recording (reference to **Figure 2**) can provide the means through which staff enrolled on courses improve their learning skills and possibility of keeping up to date with standards through continuous engagement with the facilities provided. In as much as the Moodle is seen as a tool for supporting academic ventures, the features in it can be explored equally to increase organisational performance and standard, particularly in a situation where core skills are required to be addressed by everyone working in a given industry. The standard requirement for gauging performance in any industry is to make sure staff are able to keep up to date with the core skills, and in this case, competencies can be set up on Moodle for staff to be regularly engaged on while at the same time ensuring their collaboration feature used effectively to keep up to date with standards in the industry.

In application to Biesta's pedagogic theory of learning (reference to **Figure 4**), there is potential benefits that can be gained through engagement in formal qualifications pertaining to meeting industry standard requirements. Similarly, there is an opportunity of engaging in the best practice of ensuring continuous and flexible assessments that are set for staff while working at the same time. Biesta's third pedagogic theory is *subjectification*. This relate more to choice, which allows people to decide on which area of their work emphasis can be concentrated in a bid to either gain recognised qualification or credit in improving working practices and recognition in their professional engagement. Given the experience of the recent global crisis, the advent of technology like Moodle can serve the purpose of ensuring that staff competencies are enhanced through engagement on specialist virtual courses. Where the requirement is based on risk and compliance in industry like financial and insurance sector, employees can be actively engaged in studies, and continuous assessment exercises can be set up to make sure core skills are assessed regularly through the test activity platform.

http://dx.doi.org/10.5772/intechopen.75617

This means that specialist skills can be addressed and with the necessary support provided to make sure staff are competent enough to meet the standard required in the industry.

One area of relevance in the practice of this interconnected learning pedagogy is the fact that learning process can be differentiated on the basis of pace to meet users'/learners' needs, more so in ensuring standards that are achieved through application in their work environment. Apart from being an essential technology for improved collaboration, it also comes with the benefit of flexibility to the learner, and also those that are engaged in the facilitation process can adapt resources flexibly to address specific learning needs, with easy accessibility regardless of location and the type of device the user may decide to use in accessing materials, for example, laptop, desktop or tablets. Through such dedicated approach to learning opportunities created, it is certain that staff will be able to produce tangible evidence in the form of *qualifications* as addressed in Biesta's interconnected learning pedagogy. The *socialisation* facility provided in Moodle platform makes users improve their learning opportunities on a regular basis without recourse to finding alternative means of support. Given the heavy demand on staff working in the finance/insurance industry, it can be very difficult for them to be actively engaged in learning that will improve their core competencies, but with the availability of flexible learning medium like Moodle, users can be assured of improving their skills regularly by ensuring the features are used effectively and on a regular basis.

4. Corporate governance and risk compliance in Moodle technology (financial sector environment in Sierra Leone as a case study)

In order to keep pace with the dynamic world of digital technology and also improve high standard in work practices, it is vital that senior leadership takes cognisance of how the best facilities in MLE technology can support high-level corporate governance issues, in a bid to ensuring risks and compliance responsibilities that are addressed on a regular basis. In developed economies like the UK, there are tremendous efforts being made to address concerns around risks and compliance, particularly so on the account of the better experience from the 2007/2009 financial meltdown which witnessed billions wiped out of share value. This also witnessed the collapse of financial institutions and simply on the account of relaxed measures in keeping pace with macro-prudential guidelines that were essential in combatting risks to the financial system.

In addition to mitigating issues around risks and compliance measures, financial and also insurance industries in the developing countries are actually making tremendous efforts to capacitate staff in meeting with the demands from customers through product introduction in the market. As emphasised by Majumdar [14], 'increasing competition, newer regulatory bodies and the tremendous impact of information technology have changed the way the industry conducts businesses'. In this vein, there is high priority given to adapting the topology of MLE to suit mobile devices, such that business operations can serve the needs of customers, more so in a flexible manner. This meant that such topology can be customised to incorporate the integration of video−/audio-based learning solutions that enhance employees' confidence in performing their roles. In addition, they can also be integrated with required facilities for frequent

update on mandatory skill requirements to ascertain minimum compliance standards in the industry. This, for example, could ensure regular assessment on core skills that are addressed through industry standard courses to improve confidence for those engaged in the industry.

The use of Moodle platform can also carry with it the benefit of serving as a medium for institutions, particularly those in the finance/industry to launch new products while at the same time serve its purpose within the human resource (HR) department of monitoring core assessment of skills/professional standards from employees and also a platform for making the best recruitment of experienced staff. It can be a very appropriate medium for the assessment of core skills needed by employers, which is needed in the current age of technology to reduce unnecessary costs incurred by employers. The collaborative feature makes it possible for easy means of initial assessment, while the end goal is to make sure potential staff are suitably assessed to meet the requirements of organisational objectives.

In this way forward, the use of MLE or appropriate learning platform environment like Moodle can support this through its dedicated use by institutions, particularly in developing countries like Sierra Leone, to increase staff skills and equally those charged with oversight responsibilities of governances. As presented in the above diagrams, particularly that of **Figure 1**, the availability of Moodle will allow scope for staff to increase their learning opportunities, more flexibly in their scope to improve performances. The preference for this is based on its ease of cost to the user and easy means of online learning support provided by the creator.

5. Conclusion

In the current age of technology, organisations must endeavour to make it part of their organisational and corporate objectives in ensuring that technology has made an integral part of enhancing human resource capacity. The discussion has provided some snapshot of Moodle platform in advancing human resource potential, particularly in coming to terms with compliance and risk issues corporate organisations face in the digital world of technology.

For those already working in the pathway of moving their organisations in the direction of embracing modern technology, efforts must be addressed, whereby research has made an integral part of the strategic leadership to ensure that the most cost-effective MLE is used to drive standards to their highest level, particularly in areas where risk is of critical concern to an organisation's potential for development and sustainable growth in a competitive market.

The use of Moodle as an 'open source' e-learning platform is more appropriate for a country like Sierra Leone where the cost of managing commercialised MLEs can be proven challenging; this has the opportunity of managing staff potential in areas concerned with standard of operations deemed relevant for organisational survival in a competitive market. By definition, open source refers to free access, and in this case, e-learning resources like Moodle can be easily accessed by users around the world without additional cost to the host institution and users. It has additional provisioning for users to seek virtual professional support/training from the parent Moodle institution, particularly in situations where now features are to be added.

http://dx.doi.org/10.5772/intechopen.75617

Moodle is not only an academic medium for learning but also very relevant in the corporate environment as a way of improving collaboration in work standards, while also ensuring technology is reached out to every individual, regardless of place or distance. This technology will make it possible for people's progress to be monitored without the need to be constantly watching them. It brings an entire system under single operation while at the same time making sure collaboration amongst participants is of high concern. In this case, the effectiveness of such a system will need the support of both strategic leaders and those participating in courses to make sure value for money is set as the centrepiece of an institution's goal.

5.1. Outcome indicators of facilitation and learning impact

Moodle as a type of flexible learning platform has provided the means through which learners/users can independently develop their (learning) skills to improve overall corporate responsibilities, particularly in an industry like financial/banking where the dynamism of things happening is very rapid. In this section, effort has been made to address the impact to users into two categories, namely, 'soft and hard' as summarised below:

5.1.1. Soft indicator impacts

These are more generic outcomes for the benefit of both learners and facilitators in enabling a more flexible approach to learning to be realised:

1. Improve collaboration between learners/users and facilitators which can be done through activity links provided, for example, 'forum or feedback' activity link sections where users, in this case, both facilitators and learners, can engage in virtual collaboration in improving knowledge. This form of collaboration can be moderated by the facilitator in a bid to avoiding indecent or more instructive discussions in the way of improving knowledge.

2. There is also a possibility of adding value to knowledge by developing bespoke CPD sessions, particularly for the benefit of facilitators who will need to be on top of how learning is steered on a regular basis. This is also a way of improving skills in interactive differentiation on how course items are to be delivered in meeting the needs of learners' learning styles.

3. This can also be an opportunity for targeting means of high quality of assessment and feedback provided throughout to learners. This in itself is a way of improving timely feedback to the learning community, particularly those who may be enrolled on specific summative assessment courses required for performance management.

5.1.2. Hard indicator outcomes

This is the strategic level of outcomes which needs the support of strategic leadership to improve learning outcomes of users:

1. Given the flexibility of the online learning platform, this is an opportunity for strategic leaders to support 'add-on' features like link buttons for learners to quickly access constructive feedback and support guides to improve learning outcomes by users. In this case, progress of those

engaged in the process of using Moodle to improving their outcomes will be monitored, more so as a way of determining performance management like pay progression and promotion.

2. As a way of going forward, the HR department in individual institutions must endeavour to create Information and Learning Technology (ILT) position(s) to make sure specific duties and responsibilities connected with flexible learning using the platform are managed. This may include additional role of ensuring course materials for users' needs that are uploaded regularly, with improved interactivity.

3. A dedicated time is also essential for strategic leaders to consider as a way of ensuring users/learners that are conversant with the topology of the learning platform. This will serve as a way of marketing the corporate social responsibility role of management in improving capacity building for staff.

Acknowledgements

At this juncture, I want to take this opportunity of expressing my appreciation to my children (*Sona*, *Hannah* and *Emerson [Jnr]*) who have been very receptive to my emotions, particularly time spent away from them to make ends meet. They have helped in enthusing my epistemological journey towards this book chapter. I am also grateful to my brothers (in Sierra Leone and the UK); colleagues in the Research Department, Bank of Sierra Leone; and the academia who have been instrumental in making my mind very focused in thinking constructively throughout the journey of this project.

Author's Biography

Emerson Abraham Jackson is also a Doctoral Research Scholar [distance learning] at the University of Birmingham, researching on *Sustainable Livelihood and Development* in the Goderich Community. He has over two decades of experience in research and teaching both in Sierra Leone and the UK, with evidence of scholarly publication in reputable international journals like the Journal of Mixed Methods Research, Education and Information Technologies Journal, etc. In addition to his academic pursuance, Emerson is a Senior Research Economist, heading the Model Building and Analysis Section, Research Department at the Bank of Sierra Leone, and also, with strategic *oversight* responsibility to the Sierra Leone Commercial Bank.

Author details

Emerson Abraham Jackson[1,2]*

*Address all correspondence to: emersonjackson69@gmail.com; eaJ392@bham.ac.uk; ejackson@bsl.gov.sl

1 Centre of West African Studies, University of Birmingham, UK

2 Bank of Sierra Leone, Sierra Leone

References

[1] Clayton J. E-Learning in Industry: Case Studies from New Zealand [Internet]. 2009. Available from: https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=8&ved=0ahUKEwiu2e2wxuXWAhWGKMAKHdKlAncQFghLMAc&url=http%3A%2F%2Fwww.ascilite.org%2Fconferences%2Fauckland09%2Fprocs%2Fclayton.pdf&usg=AOvVaw28DWSmIM3bztadgw8f6KaB [Accessed: October 10, 2017]

[2] Jackson EA. Ontological and epistemological discourse(s) on sustainable development: Perspective on Sierra Leone in the aftermath of a decade of civil unrest. Journal of Management and Sustainable Development. 2016;**8**(1):35-43. DOI: 10.1515/msd-2016- 0005(Jackson)

[3] Jackson EA. M-learning devices and their impact on postgraduate researchers scope for improved integration in the research community. The Online Journal of New Horizon in Education. 2016b;**6**(3):104-113

[4] Jackson EA. Integration of learning technology in Sierra Leone's higher education system: Implications and challenges. Information Technologist (The). 2016c;**13**(1):39-50

[5] Jackson EA. Proposal for virtual ICT use in Sierra Leone education system: A case of Moodle. Journal of Applied Thought. 2016a;**5**(1):79-94

[6] Kesse MA. Planning the Implementation of Moodle eLearning System in Some African Institutions [Dissertation]. SAVONIA: Savonia University of Applied Science; 2009

[7] Dixon F. BigBlueButtonBN Activity Module Now Supports Moodle 2.3 [Internet]. 10th July, 2012. Available from: https://moodle.org/mod/forum/discuss.php?d=206605 [Accessed: October 9, 2017]

[8] The Moodle Network and Community Hub: Further Communication and Collaboration Possibilities with Moodle [Internet]. 2007. Available from: http://www.immagic.com/eLibrary/SOURCE/MOODLE/M070216A/Building_Learning_Communities_with_the_Moodle_Community_Hub.pdf [Accessed: October 7, 2017]

[9] Keogh S. The Moodle Network and Community Hub: Further Communication and Collaboration Possibilities with Moodle [Internet]. 2017. Available from: (Keogh, 2007) [Accessed: October 7, 2017]

[10] Attwell G, Hughes J. Pedagogic Approaches to Using Technology for Learning: Literature Review [Internet]. 2010. Available from: http://webarchive.nationalarchives.gov.uk/20110414152025/http:/www.lluk.org/wpcontent/uploads/2011/01/Pedagogical-appraches-for-using-technology-literature-review-january-11FINAL.pdf [Accessed:October 2, 2017]

[11] Jackson EA. Impact of MOODLE platform on the pedagogy of students and staff: Cross-curricular comparison. Education and Information Technologies Journal. 2017;**22**(1):177-193. DOI: 10.1007/s10639-015-9438

[12] Biesta, G.J.J. Good Education in an Age of Measurement: Ethics, Politics, and Democracy (Interventions: Education, Philosophy, and Culture). 2011

[13] 21st Century Learners. Biesta, the Trivium and the Unavoidable Responsibility of Teaching [Internet]. (n/d). Available from: http://21stcenturylearners.org.uk/?p=492 [Accessed: September 30, 2017]

[14] Majumdar A. Mobile Learning Provides a Lot of Advantage for the Banking and Financial Services Industry: An Insight [Internet]. 2nd June 2015. Available from: http://www.elearninglearning.com/industry/platform/?open-article-id=3630896&article-title=mobile-learning-provides-a-lot-of-advantage-for-the-banking-and-financial-services-industry--an-insight&blog-domain=gc-solutions.net&blog-title=g-cube [Accessed: October 1, 2017]

Edited by Mahmut Sinecen

This book presents a collection of different researches and results on “e-learning”. The chapters cover the deficiencies, requirements, advantages and disadvantages of e-learning and distance learning. So, the authors reported their research and analysis results on “e-learning” according to their areas of expertise.

Published in London, UK

IntechOpen

ISBN 978-1-83881-532-5