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ICT curriculum integration in modern-day classroom

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Information and communication technology (ICT) curriculum integration is a complex task, and it proves to be a challenge to many organisations and institutions of higher learning. However, ICT serves many purposes including simplifying complex tasks. Many higher education institutions use ICT for innovative teaching and learning. Although ICT has been considered as an educational initiative for the future, it is still not universally understood. This paper presents the role of the ICT curriculum in modern-day classroom and how it should be implemented at a university of technology to enhance teaching and learning. In this study quantitative techniques were used to collect data. Responses from 53 participants in the Department of Office Management and Technology at the Cape Peninsula University of Technology showed the participants' strong views on the significance of the ICT curriculum on the strategies for teaching and learning. Furthermore, the results showed that ICT improves the strategies for teaching and learning. Its integration in modern-day classroom could lead to the transformation of education at the universities of technologies (UoTs). It has been recommended that more research on education technology should be undertaken to develop the strategies for teaching and learning at UoTs to advance transformation in other fields of social science. There is still a challenge on how best education technology could be employed without resistance and without being too costly.

Introduction

Information and communication technology (ICT) is a catalyst for future innovation in teaching and learning practices. ICT transforms the method of delivering the content between the teacher and the learner and also creates an easy access to information. During the 19th century the use of ICT in both public and private sectors was minimal. The production chain relied mostly on the use of human labour. However, in the 20th century it became obvious that more developments emerged in ICT. There were a number of people interacting with the rest of the global community through modern technology systems. Most of the students at academic institutions (i.e. primary schools, high schools, further education and training colleges, and universities) performed multitasks, and others worked from home by accessing material through web-based tools such as Blackboard. These tools and new gadgets enabled the students to create, communicate and access information and solve problems. Aviram (2000:332) asserts that in 1994, 35% of the public schools in the USA had access to the Internet and the number grew to 65% in 1996; the European schools had a slower progress when compared with the USA. The difference in percentage showed the significant role ICT played in education in those countries. However, in developing countries, such as Kenya, there has been a very low access to technology which resulted in less or poor innovations. Bunyi (2013:678) attributed the low access to technology, amongst others, to the lack of strategic implementation of technology and lack of support and training for educators. Therefore, successful improvement in the access to technology must positively impact the socio-economy, and, as Aviram (op.cit.) wrote further, it should include the development and rapid spread of the personal computer, the fax, multimedia, the laptop, the palm point, cellular communication, satellite communications, fibre optics, the Internet, artificial intelligence, mobile connectivity to the Internet, continuous exponential growth in the capacity of computers, smart agents and virtual reality, which would enable people to establish businesses anywhere in the world.

More innovations on technology are introduced at a fast pace and allow people to share information and communicate instantly. The social media such as Twitter, Facebook and Instagram have an increased interaction and information sharing. Globally, governments, stakeholders, staff, students and the community exert pressure on higher education (HE) institutions to introduce modern-day teaching technology in the classrooms. Tabuk District of Education, Saudi Arabia (Alhawiti 2013:177), determined the integration of technology in the classroom as a necessary measure for professional practice. A modern way of delivering

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knowledge is important and necessary, especially for the universities of technologies (UoTs) in South Africa. The expectation is that ICT integration in the classroom should bring about the solution to skills shortage, especially in the areas of technology, education, engineering and medicine. It is also necessary for bridging the gap between the disadvantaged and advantaged groups in a multiracial classroom environment. However, there is an opposing view, on ICT curriculum integration, that it would not make any impact because most of the students are from disadvantaged communities and do not have access to computers after school hours. The argument goes further to say that ICT integration does not guarantee an effective learning process and students' success. The view is that students can still acquire knowledge without the use of education technology and that naturally people will inevitably resist a change. However, it will be the responsibility of the policy-makers and administrators to ensure that ICT is integrated, and the issues of change are being addressed.

The primary objective of this paper is to discuss the significant role of the ICT curriculum in modern-day classroom at the UoTs in South Africa and how it should be integrated into daily learning modes to allow and encourage active learning (Aviram 2000). The paper also reviews the literature on the ICT pedagogical method for knowledge transformation and discusses the general framework for transformation of education, which was adopted after extensive literature review and data analysis. The paper also highlights the significance of the rationale behind the strategies for incorporating technology in the classroom.

Literature review

The significance of ICT curriculum integration

The integrated ICT curriculum pedagogy allows students to use computers to access information and form collaborative groups to solve complex tasks in various learning areas. Alhawiti (2013) believed that the success of ICT integration is based on evidence-based policy formulation. This policy formulation should guide the strategic implementation of such a technology within the universities. Jaffer, Ng'ambi and Czerniewicz (2007:131) argued that the central role of educational technology is to provide additional strategies that can be used to address the seriousness of environmental and educational challenges in UoTs in South Africa. Therefore, the formulation of evidence-based policy should speak directly to these challenges and proposes the solutions needed. This will enable students to acquire more knowledge and to adapt to evolving technology innovations by doing things differently. The role of technology in education is vital in globalising challenges faced by HE institutions. It has the ability to change and shape the educational system to conform to current practices. For example, South African education is faced with the general lack of academic preparedness, multilingual needs in English-medium settings, large class sizes and inadequate curriculum design (Jaffer *et al.* 2007). These and many other challenges

could be seen as the most common trend in teaching in HE institutions, and they have tremendous possibility to affect the new developments around the educational sphere. Moreover, since the new dispensation in South Africa, HE institutions have to deal with large classes, which are becoming difficult to manage and prepare for, putting more strain on effective interactions between the students and the teachers. However, ICT integration is significant because of its prevalence in the 'modern era' and its potential to change education environment, and it is also an effective tool for classroom management for teachers (Aldossari 2013). It should be employed as a tool for the development of relevant and locally produced content (Unwin 2004:2).

Teaching and learning models

The ICT teaching and learning models (TLMs) should assist students to be able to draw a comparison from more than one variable. These learning resources are very crucial for developing innovation and creativity. Ogbonnaya (2010:51) believed that the TLMs motivate students and could instil the learning curiosity if employed correctly, enabling students to want to learn further. Furthermore, Ogbonnaya (2010:50) stated that these models enable students to be creative in examining changing relationships, which in return are able to answer 'what if' questions. Different business organisations make use of different technologies to add value to the existing business dynamics, etc. and often drive the integration of IS/information technology (IT) strategy with business strategy, establishing the business requirements for information systems (Edward *et al.* 1991). For example, a small- or medium-sized enterprise in the developing world could be a significant model of technology adoption (Uwizeyemungu & Raymond 2011:141). Companies and firms need to be capacitated to be able to use IT (Uwizeyemungu & Raymond 2011). Basole (2006) believed that the role of mobile technology was significant in the transformation of business. Luo, Warkentin and Li (2013:65) argued that organisations using mobile technologies should devise strategies to remain competitive and relevant in the market and should cater to all customers' needs. The ICT should play a significant role in making sure that the environment within which these technologies operate allows such advantages. Uwizeyemungu and Raymond (2011:14) asserted that businesses should be able to adapt to the environments within which these models are adopted in order to thrive. However, the provision of quality service and competition remains a challenge to these small organisations, which experience skills and capacity challenge and are unable to attract world-class resources as well as the required workforce.

Conceptual framework

As shown in Figure 1 it is necessary to develop a conceptual framework that seeks to assist in the data collection and analysis of the results. The purpose of the framework is to give meaning and understanding to the role of technology education for the transformation of education. The literature indicates that there is still a gap in the TAM for the transformation of education.

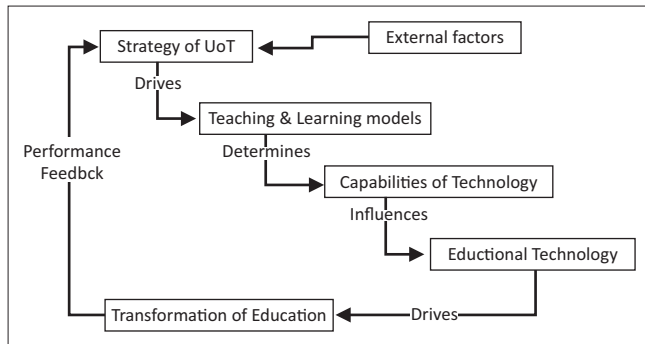


FIGURE 1: Problem conceptualisation.

Furthermore, in the context of adopting change on educational landscape, Hramiak and Boulton (2013:91) argued that rapid technological development across Europe required teachers to be aware of the latest technology to improve their skills. However, Wallace (2012:1) was of the view that the resultant increase in the pace of change added complexity to business and social environment. He further stated that managers, academics and professionals had shown a great deal of interest in ICT innovation in organisations. As mentioned earlier in this paper, change is essential in secondary schools in Europe, and it can be applied to many UoTs in South Africa for the development of skills and knowledge in the educational sector. A further significant issue pointed out by Hramiak and Boulton (2013) is that teachers need to be familiar with the latest technology. This familiarity will help them to enhance their teaching and learning as well as innovation skills. There is a need to align the successful integration of technology in the classroom with a teacher's performance. Hramiak and Boulton (2013) further asserted that the literature had shown that this is possible with appropriate pedagogy to improve their critical skills necessary for the adoption of modern technology in classrooms.

Research methodology

Introduction

Research philosophy centres around two distinctive schools of thought: qualitative and quantitative techniques. Numerous studies have drawn distinctions between these two methodologies. For example, Sale, Lohfeld and Brazil (2002:43) argued that the two paradigms did not study the same phenomena; quantitative and qualitative methods cannot be combined for cross-validation or triangulation purposes. However, these methods can be combined for complementary purposes. These methods do so to emphasise the different underlying philosophies as well as to arrive at the intended outcomes of the research. There was no qualitative data collected; therefore, it is not discussed. The aim of selecting the quantitative research was to describe a particular phenomenon through the numerical sample of data collected and analysed. Mathematical or statistical software such as Statistical Package for Social Sciences was used to convert the data into numerical format. Data were collected from a randomly selected sample and

therefore used to address key questions from the research. Quantitative methods can also be used in instances whereby data to be collected are not quantifiable by nature, but instruments such as questionnaires are designed for such purposes. The participants were offered an opportunity to respond to a number of statements. Jamieson (2004:1217) alluded that the response categories have a rank order; for example, 1 represents strongly agree, 2 agree, 3 disagree, etc. Amaratunga *et al.* (2002) suggested that this approach placed considerable trust on numbers that represent opinions or concepts. Moreover, the quantitative method was preferred for this research because it gave the respondents an opportunity to select a statement, which best suited their preference. Over the years, social researchers have favoured quantitative rather than qualitative approaches because of the freedom to choose from a list of options, the one that best describes your views about the variable. As Blanche, Durrheim and Painter (eds. 2006:132) argued, most researchers preferred to measure issues such as malnutrition, life expectancy and depression as opposed to interviewing people about such matters.

Quantitative method

The quantitative research concentrates on the numbers that resemble a certain opinion. Will, Bertrand & Fransoo (2002:241) believed that a quantitative approach has been the basis of most of the initial research on operations. On the other hand, Stansfield (1995:36) suggested that quantitative research had been applied to a wide variety of property research topics such as measurement of property research portfolio performance. In essence, quantitative research methods explain a particular phenomenon or particular question and also collect numerical data. It is also an effective research method employed to collect data in a numerical format based on a number of statements. For example, 1 represents strongly agree and 5 represents strongly disagree by using instruments such as questionnaires. Structured interviews and questionnaires are often employed. Researchers have always viewed quantitative research as equivalent to positivism. Bhattacharjee (2012) stated that positivism was used in quantitative research, whereby experiments and surveys are being conducted. Amaratunga *et al.* (2002:18) argued that logical positivism used quantitative and experimental methods to test hypothetical-deductive generalisation. Therefore, quantitative methods include the following techniques:

1. Questionnaires
2. Observations and
3. Primary investigations

Results and discussion

This section presents the analysis of data collected for the study. The Department of Office Management and Technology at the Cape Peninsula University of Technology (CPUT) was the unit of analysis. The conceptual framework that was developed for the study is reintroduced and briefly discussed in this section.

Knowledge of applications

Figure 2 shows the knowledge, which the participants have on different software used by the CPUT. The results show that all respondents have knowledge of MS Office applications. Therefore, MS Office Application is the most used office application at CPUT. Furthermore, the results show that 43 out of 53 respondents have indicated that they have knowledge of Blackboard (LMS). Once again, this shows that the many of students at CPUT use LMS for teaching and learning purposes, and most of them know how to use it. The results agree with Alavi and Leidner (2001:1) when they argued that the web-based courses were very crucial to allow students an opportunity to study from home. They further wrote that in the knowledge economy there was a high demand for highly skilled employees to contribute towards the production of new knowledge. This should be combined with a strong penetration rate at which IT presents, at an extraordinary potential for the transformation of educational and learning processes.

I use learner management system (Blackboard) for my studies

From the graph above it is clear that most students have knowledge on LMS application. The primary objective was to establish whether the respondents use this learning tool and whether it impacts on their level of performance. The results are shown in Table 1.

Table 1 shows that 53 responses were projected as follows: 52.8% of 53 respondents have agreed that they use Blackboard as an educational tool to manage their school work. This percentage indicates that most students rely on LMS to do their school work, which signifies the role of education technology in the transformation of education at CPUT. The results further show that 45.3% of 53 respondents indicated that they strongly agreed that they use LMS for

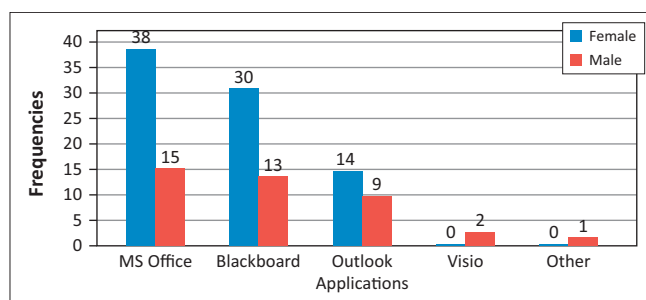


FIGURE 2: Knowledge of applications.

TABLE 1: The use of learner management systems.

Variable	Answer	<i>f</i>	%	Valid %	Cumulative %
Valid	Strongly agree	24	44.4	45.3	45.3
	Agree	28	51.9	52.8	98.1
	Strongly Disagree	1	1.9	1.9	100.0
Total		53	98.1	100.0	-
Missing	System	1	1.9	-	-
Total	-	54	100.0	-	-

f, frequency.

teaching and learning purposes. It seems like many of the students see the need to have this tool for teaching and learning. The highest percentage, as argued by Alavi and Leidner (2001), is attributed to the fact that the application of technology to education and training underscores a fundamental need to understand how these technologies improve the learning process. It further shows the significant impact the increased use of web-based learning tools, such as LMS, could have on the transformation of education at CPUT. However, its usage depended largely on whether the teacher/educator is instructing students to use it by placing reading material on it. Therefore, it is important for educators to communicate to learners the significance of usage of such material.

Education technology is important part of teaching and learning strategies

The CPUT's teaching and learning strategies are very significant in the transformation of education. This section discusses the responses of the above statement. The results are shown in Table 2.

The results given in Table 2 show that 59.6% out of 53 respondents have strongly agreed that education technology is an important part of teaching and learning strategies. This is followed by 36.5% of respondents, who also indicated that they agreed with the statement (8). Both percentages represent the biggest percentage of those who hold positive views on the statement above. Therefore, these results imply that the modern-day class should be equipped with the kind of technology that would enhance teaching and learning to ensure that strategies are implemented. As Su *et al.* (2005:7) pointed out, modern technologies should be the driver of education in modern-day classrooms. This statement affirms the responses as per statistics above. The next section presents a summary of the data analysis and the interpretation of data that has been discussed in this article.

Summary of data analysis and interpretation

The role of education technology in the transformation of education at CPUT is significant and should be seen as a key driver towards quality education. A conceptual framework was used to guide the collection of data. The data reveal that most of students rely on education technology to access and process material. Furthermore, they believe that technology drives transformation. However, there is a need for CPUT to expose students and educators to various tools

TABLE 2: Universities of technologies strategies.

Variable	Answer	<i>f</i>	%	Valid %	Cumulative %
Valid	Strongly agree	31	57.4	59.6	59.6
	Agree	19	35.2	36.5	96.2
	Strongly Disagree	2	3.7	3.8	100.0
Total		52	96.3	100.0	-
Missing	System	2	3.7	-	-
Total	-	54	100.0	-	-

of learning to ensure that transformational objectives are achieved. The advancement of transformation, especially the issues of teaching and learning, requires everyone's contribution. Most importantly, it requires leadership and resources. There is a need to ensure skills development and to encourage classroom interaction to close the knowledge gap and to transform education at CPUT. Therefore, this study recommends and affirms the general framework that it proposes could be applied to similar situations at other UoTs in South Africa.

Conclusion

The global communities are advancing towards technology-centred education. South Africa is also following the same approach on transformation. The HE in South Africa has been pressurised by stakeholders, i.e. government, student organisations, educators, students, unions representing workers, policy administrators to consider integration of ICT in the classrooms. The integration of ICT in modern-day classroom is possible if the strategy for implementing educational technologies is in place and supported by all stakeholders. The general framework has been proposed to be employed to support the transformation of education. The paper further recommends that the management of HE institutions should ensure that students and educators receive continuous training on how to use these tools. The training provided should ensure that they are able to access teaching and learning material on time and submit on time, as well as being able to access important policy documents on transformation. The paper argues that ICT integration is necessary for the transformation and development of education in South Africa and to address the shortage of skills.

Recommendations

Education technology proposed be analysed before and during the process of implementation; students at CPUT should be exposed to various tools of learning. The management of CPUT should ensure that students and educators receive continuous training on how to use these tools. The training provided should ensure that they are able to access teaching and learning material on time and submit on time, as well as being able to access important policy documents on transformation. In Singapore (Chen, Tan & Lim 2009:1) teachers improved the process of adopting technology in education through different stages. The educators must be well informed about the new change that is going to take place and should receive proper training on how to use the new technologies. Furthermore, this study recommends the implementation of the general framework (see Figure 3) developed, based on the conceptual framework and the literature reviewed, as well as the data analysis. The general framework should be used to assist CPUT, especially the Department of Office Management and Technology, to employ the education technologies that support the transformation of education.

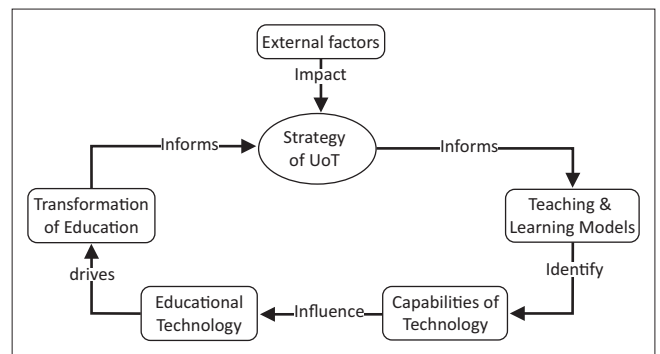


FIGURE 3: The proposed general framework.

Strategy of university of technology

Institutions of higher learning and business organisation must strive to reposition themselves in the market and craft a sound strategic plan/vision which will make them unique. They must do in conjunction with ICT curriculum support system to strengthen and enhance education. Tosun & Barışusing (2011:223) believed that the strategy should define the skills that educators should possess in ICT. Furthermore, Shuva (2010:495) believed that it was significant for teachers to do more practical training to demonstrate knowledge of ICT application in the classroom to ensure that the investment is not going to be a waste. Therefore, the UoTs should ensure that there are ICT resources in place to strengthen teaching strategies that are more learner-centred and focus on the needs of learners. In Singapore, for example, there have been efforts towards the integration of digital technology into the curriculum, pedagogy and assessment (Yeung *et al.* 2014:136). The aim of this integration was to transform students' competencies in the classroom by integrating the Ministry of Education, which was responsible for developing ICT policies, and the National Institute of Education, which was a 'sole provider of initial teacher education and schools'. Hence, this study argues that it is significant for UoTs in South Africa to consider educational strategies that have the ability to drive TLM for transforming education. And finally, the university must ensure that the implementation of strategies is followed by the monitoring, evaluation and feedback processes for the purpose of quality assurance.

TLM for UoTs

The TLM for UoTs should be directives for strategic transformation and development of education in the classroom. Miller *et al.* (2004:30) recommended that colleges should use the results of their work to improve teaching in their own classroom. It is therefore imperative for TLM to play a significant role in ensuring the effective delivery of curriculum and also allow greater participation from all learners. Prior to the implementation of TLM, the management of UoTs should consider the capabilities of ICT infrastructure in place. According to Rahimnia, Polychronakis and Sharp (2009:246) for the planning and implementation to take place, the decision-makers must play an active role. This is to allow management to better understand the capabilities of

these technologies. Therefore, the adoption of UoT's strategy model shown in Figure 3 should be aimed at assisting the decision-makers to improve the environment of learning.

Capabilities of technology

Another important element for the management of selected UoT is to consider the effectiveness of the technologies employed for the transformation of education. These technologies should enable the institution to carry out its mandate without any challenges. Petrova and Claxton (2005:27) argued that to maintain student skills development as well as ensuring technology capabilities, the universities should consider the industry-related learning models such as cooperative education to keep up with the demanding technology. Alampay (2006:4) believed that ICT has been regarded as an important means for development and for measuring the capabilities of other existing technologies. The necessary training should also be provided to users (educators and students) of education technologies. This will ensure that there is preservation of the necessary skills at the institution. Furthermore, the technology capabilities must influence the education technology in place or that of the future.

Education technology

The integration of teaching and learning technologies is very significant for UoTs and for the transformation of education in South Africa. In Sweden, for example, higher education in engineering was the driving force for economic growth, global competitiveness and the sustainability of welfare state (Hallström, Hultén & Lövheim 2014:121). Therefore, it is necessary for this education technology to be recommended for the selected UoT to advance and improve students' level of competence, and achieve this the education technologies should be influenced by the capabilities of existing technologies as well as the ICT infrastructure in place within the UoTs. It is important for this research to consider Potgieter's (2013:969) argument that the management of UoT should consider 'the instructional strategy for the particular technology education programme to be adapted to include the Education Technology-based learning outcomes' for teaching and learning. If these components are not in place, the implementation of education technology could not be achieved. Therefore, it is important for the management of UoTs to review the capabilities of existing technology and then make decision as to which technologies to employ for teaching and learning.

Transformation of education

The HE sector needs to develop so that the set goals could be achieved. This is important especially in developing economies such as South Africa. The framework previously mentioned shows that transformation is driven by the nature of education technology employed to improve teaching and learning. It should also determine which TLMs are appropriate for the enhancement of education.

Sutherland *et al.* (2004) argued that when ICT was integrated into specific subjects, the teachers could use it to develop themselves and transform their knowledge. However, it is important to note that there are external factors which often impede the transformation of education. Often, these are factors which teachers and management have no control over. All over the world ICT brought about drastic changes in education systems. This change has prompted the HE institutions to be aware of the following external factors, i.e. government policies, migration, new technology, decline in economy, learning environment, etc. Therefore, it is important for the management of UoTs to consider all these factors when developing strategies for educational transformation.

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Competing interests

The authors declare that they have no financial or personal relationship(s) that may have inappropriately influenced them in writing this article.

Authors' contributions

P.M. (Cape Peninsula University of Technology) and M.T-D. (Cape Peninsula University of Technology) contributed equally to the writing of this article.

References

- Alampay, E.A., 2006, 'Beyond access to ICTs: Measuring capabilities in the information society', *International Journal of Education and Development using Information and Communication Technology* 2(3), 4–22.
- Alavi, M. & Leidner, D.E., 2001, 'Research commentary: Technology-mediated learning—A call for greater depth and breadth of research', *Journal of Information Systems Research* 12(1), 1–10, viewed 24 April 2015, from <http://www.jstor.org/stable/23011097>
- Aldossari, A., T., 2013, 'Classroom management approaches of primary teachers in the Kingdom of Saudi Arabia: Descriptions and the development of curriculum and instruction with a focus on Islamic education teachers', Doctoral thesis, Durham University, Durham, viewed 18 February 2015, from <http://etheses.dur.ac.uk/6981/>
- Alhawiti, M.M., 2013, 'Strategies and action plans for integrating ICT into Saudi elementary schools curricula: The case of Tabuk District of Education', *International Journal of Information and Education Technology* 3(2), 177–184. <http://dx.doi.org/10.7763/IJNET.2013.V3.259>
- Amaratunga, D., Baldry, D., Sarshar, M. & Newton, R., 2002, 'Quantitative and qualitative research in the built environment: Application of "mixed" research approach', *Work Study* 51(1), 17–31, accessed 20 March 2015, from http://www.adolphus.me.uk/emx/research_design/meth_be_files/p17.htm
- Aviram, A., 2000, 'From "Computers in the classroom" to mindful radical adaptation by education systems to the emerging cyber culture', *Journal of Educational Change* 1, 331–352. <http://dx.doi.org/10.1023/A:1010082722912>
- Basole, R.C., 2006, 'Modeling and analysis of complex technology adoption decisions: an investigation in the domain of mobile ICT', Doctorate Thesis, Georgia Institute of Technology, Atlanta, viewed 20 June 2014, from <http://alturl.com/2trm8>
- Bhattacharjee, A., 2012, *Social science research: Principles, methods and practices*, 2nd edn., Global Text Project, Georgia.
- Blanche, T.M., Durrheim, K. & Painter, D. (eds), 2006, *Research in practice: Applied methods for the social sciences*, 2nd edn., UCT Press, Cape Town.
- Bunyi, G.W., 2013, 'The quest for quality education: The case of curriculum innovations in Kenya', *European Journal of Training and Development* 37(7), 678–691. <http://dx.doi.org/10.1108/EJTD-01-2013-0008>
- Chen, W., Tan, A. & Lim, C., 2009, 'Extrinsic and intrinsic barriers in the use of ICT in teaching: A comparative case study in Singapore', in M. Brown, M. Hartnett, & T. Stewart (eds.), *Future challenges, sustainable futures. In Proceedings Ascilite Wellington*, 191–196
- Edwards, C., Ward, J. & Bytheway, A., 1991, 'Creating an environment for success: The Applications Portfolio, *The Essence of Information Systems*, Prentice Hall, London.

- Hallström, J., Hultén, M. & Lövheim, D., 2014, 'The study of technology as a field of knowledge in general education: Historical insights and methodological considerations from a Swedish case study, 1842–2010', *International Journal of Technology and Design Education* 24(2), 121–139. <http://dx.doi.org/10.1007/s10798-013-9252-x>
- Hramiak, A. & Boulton, H., 2013, 'Escalating the use of Web 2.0 Technology in secondary schools in the United Kingdom: Barriers and enablers beyond teacher training', *The Electronic Journal of e-Learning* 11(2), 91–100.
- Jaffer, S., Ng'ambi, D. & Czerniewicz, L., 2007, 'The role of ICTs in higher education in South Africa: One strategy for addressing teaching and learning challenges', *International Journal of Education and Development using Information and Communication Technology (IJEDICT)* 3(4), 131–142.
- Jamieson, S., 2004, 'Likert scales: How to (ab)use them', *Journal of Medical Education* 38, 1212–1218. <http://dx.doi.org/10.1111/j.1365-2929.2004.02012.x>
- Luo, X.R., Warkentin, M. & Li, H., 2013, 'Understanding technology adoption trade-offs: A conjoint analysis approach', *The Journal of Computer Information Systems* 53(3), 65.
- Miller, S.K., Rodrigo, S., Pantoja, V. & Roen, D., 2004, 'Institutional models for engaging faculty in the scholarship of teaching and learning, teaching English in the two year college', *Education Journal*, 32(1), 30.
- Ogbonnay, U.I., 2010, 'Improving the teaching and learning of parabolic functions by the use of information and communication technology (ICT)', *African Journal of Research in MST Education* 14(1), 49–60. <http://dx.doi.org/10.1080/10288457.2010.10740672>
- Petrova, K. & Claxton, G., 2005, 'Building student skills and capabilities in information technology and eBusiness: A moving target', *Journal of Information Systems Education* 16(1), 27–41.
- Potgieter, C., 2013, 'Linking learning activities and assessment activities to learning outcomes and assessment standard when teaching technology: A case study', *International Journal of Technology Design Education* 23(4), 969–986. <http://dx.doi.org/10.1007/s10798-012-9226-4>
- Rahimnia, F., Polychronakis, Y. & Sharp, J.M., 2009, 'A conceptual framework of impeders to strategy implementation from an exploratory case study in an Iranian university', *Education, Business and Society: Contemporary Middle Eastern Issues* 2(4), 246–261. <http://dx.doi.org/10.1108/17537980911001080>
- Sale, J.E.M., Lohfeld, L.H. & Brazil, K., 2002, 'Revisiting the quantitative-qualitative debate: Implications for mixed-methods research', *Journal of Quality & Quantity* 36(1), 43–53. <http://dx.doi.org/10.1023/A:1014301607592>
- Shuva, N.Z., 2010, 'Integrating ICT into University curriculum: A proposal for the Faculty of Arts, University of Dhaka, Bangladesh benefits of ICT in Education', *Proceedings of Informing Science & IT Technology*, 487–501.
- Stansfield, F.R., 1995, 'Enabling property professionals to overcome the limitations of quantitative research', *Journal of Property Management* 13(4), 36–43. <http://dx.doi.org/10.1108/02637479510099305>
- Su, B., Bonk, C. J., Magjuka, R. J., Liu, X. & Lee, S.H. 2005, 'The Importance of Interaction in Web-Based Education: A Program-level Case Study of Online MBA Courses', *Journal of Interactive Online Learning* 4(1), Summer, 1541–4914.
- Sutherland, R., Armstrong, V., Barnes, S., Brawn, R., Breeze, N., Gall, M. et al., 2004, 'Transforming teaching and learning: Embedding ICT into everyday classroom practices', *Journal of Computer Assisted Learning*, 20, 413–425.
- Tosun, N. & Barışusing, M.F., 2011, 'Information and communication technologies in school improvement', *The Turkish Online Journal of Educational Technology* 10(1), 223–230.
- Unwin, T., 2004, 'Towards a framework for the use of ICT in teacher training in Africa', *Open Learning Journal* 20(2), 1–26. <http://dx.doi.org/10.1080/02680510500094124>
- Uwizeyemungu, S. & Raymond, L., 2011, 'Information technology adoption and assimilation: Towards a research framework for service sector SMEs', *Journal of Service Science and Management* 4, 141–157. <http://dx.doi.org/10.4236/jssm.2011.42018>
- Wallace, B.K., 2012, 'Information technology innovation adoption models within the petrochemical industry, University of Phoenix, Phoenix.
- Will, J., Bertrand, M. & Fransoo, J.C., 2002, 'Operations management research methodologies using quantitative modeling', *International Journal of Operations & Production Management*, 22(2), 241–264. <http://dx.doi.org/10.1108/01443570210414338>
- Yeung, A.S., Lin, J.H., Tay, E.G., Hui, C. & Low, E-L., 2014, 'Pre-service teachers' motivation in using digital technology', *Australian Journal of Teacher Education* 39(3), 135–153. <http://dx.doi.org/10.14221/ajte.2014v39n3.1>