An Exploratory Factorial Analysis of Teachers' Perceptions of Perceived Pedagogical Benefits of Adoption of Information and Communication Technology in Teaching and Learning

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Abstract

In the current information society, the need for teachers to be adequately equipped with information and communication technology (ICT) competency has become essential for teaching in a classroom. This paper investigates factors affecting the perceived pedagogical benefits of adoption of ICT by teachers. The study also sought to establish any variations in terms of age and the established benefits of ICT adoption. The sample comprised 1222 teachers employed in public secondary schools in the greater Durban area in the province of KwaZulu-Natal in South Africa. Descriptive analysis, factor analysis and correlations were used to analyse the data. Through an exploratory procedure six factors – ICT confidence, learning enhancement, work enhancement, work enjoyment, positive attitude towards learning tool, and teaching enhancement – emerged that describe the perceived pedagogical benefits of the use of ICT. It is our recommendation that placing technology at the disposal of educators is not sufficient to ensure use – measures must be in place that will ensure teacher confidence and a positive attitude. Effective implementation of ICT in schools is a multifaceted, complex process that does not just involve providing the technology to schools, but also involves teachers' competencies, schools' readiness, long-term financing, curriculum restructuring, and the Government's willingness to invest in the teaching and learning infrastructure.

Keywords: Teachers, information and communication technology, technology adoption, learning enhancement, work enhancement

1. Introduction

Access and the digital divide have always been an issue for education in many countries, and numerous studies have focused on technology as a means of enhancing learning (Cutrim, 2008; Carle, Jaffee, & Miller, 2009). Moreover, many studies have focused on technology integration, concluding that using technology in educational settings benefits students (Gülbahar, 2007; Kim & Hannifin, 2011; Govender & Govender, 2013). Neyland (2011) and Yilmaz (2011) raised the issue of infrastructure and access to technology as factors affecting integration of information and communication technology (ICT) adoption among teachers. Within classroom settings forces at the micro-and macro-level of the educational systems (educators and learners) may be influential in facilitating or impeding adoption of ICT integration in classrooms (Pelgrum, 2001). Researchers reiterate that technology adoption or diffusion in any context depends on shared negotiation of values and priorities, particularly on how the technology fits into the existing social purposes and practices of the community (Wilson, Sherry, Dobrovolny, Batty & Ryder, 2002; Celik & Yesilyurt, 2013; Kutluca & Ekici, 2010).

Studies have shown that successful implementation of educational technologies depends largely on the attitudes of teachers (Kersaint, Horton, Stohl & Garofalo, 2003; Govender, 2006). For example, Bullock (2004) and Govender (2012) posit that educators' attitudes are a major enabling/disabling factor in the adoption of technology. Development of a positive user attitude towards ICT adoption is essential not only for enhancing computer integration, but also for avoiding educators' resistance to computer use in classrooms. Kutluca and Ekici (2010) add that in order to bring an innovation to scale, an important first step is to understand how the innovations are adopted in local contexts. It is hence

recommended that if any online pedagogical approach is going to be used by students in school, there must be a good fit with the teachers' intentions, perceptions and actions with regard to the classroom culture (Kutluca & Ekici, 2010).

Teachers generally hold their own set of beliefs that determine the precedence for pedagogical knowledge and how students acquire knowledge (Liu, 2011). A commonly used distinction in studies is associated with two pedagogical paradigms, often referred to as teacher-centred or teaching-oriented belief, and learner-centred or learning-oriented belief (Schuh, 2004; Meirink, Meijer, Verloop, & Bergen, 2009).

The teacher-centred belief is based on an assumption of knowledge delivery that resembles traditional teaching methods, and underscores the importance of knowledge reproduction, while the learner-centred belief emphasises student responsibility for learning and is focused on knowledge construction and how students are induced to work and learn together. In terms of acquiring knowledge, teacher beliefs about teaching and learning can be broadly classified into the knowledge transmission or knowledge construction category (Chan & Elliot, 2004; Samuelowicz & Bain, 2001). Thus, teacher beliefs typically encompass teacher-centred and learner-centred pedagogical beliefs (Chai, Hong & Teo, 2009).

It has also been argued that constructivist pedagogical beliefs of teachers about teaching and learning are significant in determining patterns of technology usage in classrooms (Higgins & Moseley, 2001; Inan & Lowther, 2010). Honey and Moeller (1990) demonstrated that teachers who held constructivist pedagogical beliefs successfully integrated technology into instruction. Ertmer (2005) indicated that teachers who have strong constructivist pedagogical beliefs or approaches have a greater propensity to use technology in the classroom than teachers who have traditional pedagogical beliefs, who consider themselves mere transmitters of knowledge to learners.

While South Africa still lags behind in ICT development, the Government has made some attempts to address this (Department of Education (DoE, 2003). The Government has responded in trying to bridge the digital divide by introducing a range of measures, which included the Presidential National Commission on Information Society and Development. The Commission comprised members of both the public and private sector, and its main goal was to act as an advisory group to Government on challenges regarding ICT development in South Africa and how the country could address these in order to be globally competitive. The Electronic and Communications Transaction Act, No. 25 of 2002, was established by the Department of Communications in a bid to lead all ICT initiatives in South Africa and to develop a five-year national e-strategy which would empower all citizens, especially the education sector.

Explaining user acceptance and adoption of a new technology is often described as one of the most mature research areas in the contemporary ICT systems literature (Hu, Chau, Sheng & Tam, 1999). Over the years researchers in this area have developed several theoretical models, with roots in information systems, psychology and sociology that routinely explain over 40% of the variance in individual intention to use technology (Govender, 2006; Davis, Bagozzi & Warshaw, 1989; Taylor & Todd 1995; Venkatesh & Davis, 2000). A brief overview is provided of some of the widely used models in ICT systems literature.

1.1   Underlying Theories in User Acceptance of ICT

Ajzen and Fishbein's (1980) 'Theory of reasoned action' (TRA) was developed in 1967. The main premise of this theory is that a person's intention is the main predictor and influencer of behaviour. If a person intends to do something, then they will more than likely do it. The TRA suggests that there are two main influencers of intention: the attitude toward the behaviour, and subjective norms. TRA posits that individual behaviour is driven by behavioural intentions, where these are a function of an individual's attitude toward the behaviour, and subjective norms surrounding performance of the behaviour. The second area, attitude toward the behaviour, is defined as the individual's positive or negative feelings about performing a particular behaviour; this is determined through assessment of one's beliefs regarding the consequences arising from a particular behaviour, and evaluation of the desirability of these consequences.

The Theory of planned behaviour (TPB) is actually an extension of TRA which posits that individual behaviour is driven by behavioural intentions where these are a function of an individual's attitude toward the behaviour, the subjective norms surrounding the performance of the behaviour, and the individual's perception of the ease with which the behaviour can be performed (behavioural control). Behavioural control is an added dimension in TPB, and is defined as one's perception of the difficulty of performing a particular behaviour. TPB views the control that people have over their behaviour as lying on a continuum from behaviours that are easily performed to those requiring considerable effort and resources.

The Technology acceptance model (TAM) is an information systems theory that models how users come to accept and use a technology. TAM suggests that when users are presented with a new software package or innovation, a number of factors influence their decision about how and when they will use it, notably: perceived usefulness, defined by Davis (1989) as "the degree to which a person believes that using a particular system would enhance his or her job

performance"; and perceived ease of use, defined by Davis (1989) as "the degree to which a person believes that using a particular system would be free from effort".

TAM replaces many of TRA's attitude measures with the two technology acceptance measures 'ease of use' and 'usefulness'. TRA and TAM, both of which have strong behavioural elements, assume that when someone forms an intention to act, they will be free to act without limitations. In the real world, however, there will be many constraints, such as limited ability, time constraints, environmental or organisational limits, or unconscious habits which limit the freedom to act (Govender & Maistry, 2012; Bagozzi, Davis & Warshaw, 1992).

In an attempt to integrate the main competing user acceptance models, Venkatesh, Morris, Davis and Davis (2003) formulated the Unified theory of acceptance and use of technology (UTAUT). This model was found to outperform each of the individual models (Venkatesh, Morris, Davis & Davis, 2003). The theory holds that four key constructs (performance expectancy, effort expectancy, social influence, and facilitating conditions) are direct determinants of usage intention and behaviour (Venkatesh *et al.*, 2003). Gender, age, experience, and voluntariness of use are posited to mediate the impact of the four key constructs on usage intention and behaviour (Venkatesh *et al.*, 2003).

The theory was developed through review and consolidation of the constructs of eight models that earlier research had employed to explain information systems usage behaviour (TRA, TAM, and motivational model, TPB, a combined theory of planned behaviour/technology acceptance model, model of PC utilisation, innovation diffusion theory, and social cognitive theory). Subsequent validation of UTAUT in a longitudinal study found it to account for 70% of the variance in usage intention (Venkatesh *et al.*, 2003).

A number of researchers (Govender & Govender, 2009; Voogt, 2010; Ward & Parr, 2010; Friedman & Friedman, 2011) view computers as having an influential effect on teaching and learning processes. They posit that with the use of computers in the classroom, schools would become more learner-centred, and that more individualised learning would take place than ever before. In learner-centred classrooms, with the aid of computers, learners are able to collaborate, to use critical thinking and find alternative solutions to problems (Jaber, 1997; Govender, 2010).

However, the shift from educator-centred delivery to a learner-centred model potentially leads to resistance to change. Learner-centred teaching has challenged teachers to review their teaching and learner learning methods and the outcomes (Jaber, 1997). Research undertaken by Dwyer, Ringstaff and Sandholtz (1991) suggests that computers can be used in collaboration for all subject areas, but that educators have to take into account the different styles of teaching and the learners involved in a learning environment. This type of teaching requires a change in both the educator's method of teaching and the methods of learning, the amount of time needed to learn how to use the technology, and the location of models that work in synergy with technology (Koo, 2008).

Hence, the purpose of this study was to ascertain the factors that influence teachers' perceptions of perceived benefits of the adoption of ICT in teaching and learning.

2. Methodology

This research used a survey approach to investigate various aspects of teachers' perceptions towards the adoption of ICT in the classroom. The survey questionnaire was created with items validated in previous research (Davis, 1989; Davis *et al.*, 1989; Venkatesh & Davis, 2000; Vannatta & O'Bannan, 2002; Abdulkifi Albirini, 2006 Venkatesh *et al.*, 2003) and adapted for this study. Development of the questionnaire was guided by an extensive review of the literature.

The questionnaire consisted of 17 elements, comprising demographic and perceptual data. The instrument was also evaluated by the DoE's Research, Strategy and Policy Development Unit and the University of KwaZulu-Natal's ethical clearance committee. Feedback was mainly used to ensure that the scales measure the content areas under investigation, and are culturally and technically appropriate for the context of the study.

Correlations and factor analysis was used in analysis of the data. According to Tabachnick and Fidell (2001) it is quite common to use principal component analysis as a preliminary extraction technique, followed by other technique(s) with varying numbers of factors, communality estimates, and rotational methods with each run. Analysis ends when the researcher decides on the preferred solutions (Tabachnick & Fidel, 2001, p. 611). Hence, the exploratory factor analysis with principal component extraction and varimax rotation method was first conducted.

2.1 Sample and Data Collection

The sample comprised teachers in public secondary schools located in the greater Durban region in the province of KwaZulu-Natal in South Africa. Questionnaires were distributed to 191 schools. Some schools received their questionnaires via the circuit office and others received them via post. Most Circuit Managers were cooperative in

assisting in the distribution and collection of these questionnaires. However, there were a few who emphatically did not want to assist with this study, and this made collection of questionnaires from these schools very difficult.

We received returns from 93 schools, a 55.4% rate of return. In total we received 1237 questionnaires back from schools. There were 15 questionnaires that we considered to be spoilt because they were partially completed, illegible, or had contradictory entries. Data from 1222 questionnaires have been used. This sample size adequately satisfies Leedy and Ormrod's (2005) requirements (as stated below), since the total number of secondary educators in the region stood at 8026 as per the DoE's Education Management and Information Systems (EMIS) database. The 1222 responses that we used represent a total of 15.23% of our sampling frame.

Gay and Airasian (as cited in Leedy & Ormrod, 2005:25) offer the following guidelines for selecting a sample size:

➤ For small populations (fewer than 100 people) there is little point sampling, therefore one should survey the entire population.
➤ If the population size is around 500, one should sample at least 50% of the population.
➤ If the population size is around 1500, then one should sample at least 20% of the population.
➤ Beyond a certain point (about 5000 or more), one should sample at least 400 of the population.

The sample is fairly representative because every alternate school in a district was chosen and this represents 50% of the secondary schools in the Ethekweni region. Secondary schools were chosen because the *Draft White Paper on e-Education* (DoE, 2003:22) has made access to ICT infrastructure a priority in secondary schools: "Every educator and learner in General and Further Education and Training (FET) must have access to ICT infrastructure".

2.2 Instrumentation

The survey questionnaire was adapted from Vannatta and O'Bannon (2002) and Albirini (2006. The first section of the questionnaire solicited information on gender, ethnicity, age, subjects taught in schools, educational qualifications and general use of computers and the Internet. The second part of the questionnaire comprised questions relating to teachers' perceived readiness and attitudes towards adoption of information technology anchored on five-point Likert scales ranging from 1= strongly disagree to 5= strongly agree.

2.3 Ethical Considerations

Ethical clearance was sought from the DoE in KwaZulu-Natal to conduct the research, and permission was granted by the school principals to conduct the research. To ensure their safety and rights, the participants were informed about the prevailing ethical considerations, for instance, informed consent, voluntary participation (and rights of the participants to withdraw from the survey), anonymity and confidentiality. Informed consent was obtained from each participant. Further, the researchers ensured that the participants received full disclosure of the nature of the study, benefits and alternatives, with an extended opportunity to ask questions.

3. Results and Discussion

The results are reported in the following sequence: first the composition of the sample and general profile of teachers; thereafter, correlation analysis and exploratory factor analysis to establish underlying factors relating to perceived benefits of adoption of ICT in teaching and learning.

3.1 Sample Composition

The target population in this study is secondary school educators in the greater Durban area of KwaZulu-Natal. The list of educators is based on the DoE's EMIS list, which is maintained and updated on an annual basis by the Provincial DoE. The total number of secondary schools in the region on the DoE's EMIS list was 403. Of these schools, 382 have staff ranging from 2 to 60, and the balance of 21 schools show 0 staff members. We chose, at random, every alternate school and had a sample of 191 schools. The region is made up of three districts, viz. Ilembe, Pinetown and Umlazi. Once the sample had been chosen, the number of schools per district was as shown in Table 1.

Table 1: Distribution of Schools

District	Number of schools
Ilembe	57
Pinetown	68
Umlazi	66
Total	191

3.2 Reliability and Validity

Reliability coefficients for each perceived benefit's sub-scales are reported in Table 2, together with descriptive statistics for each scale and example items. Reliability of the instruments was examined using Cronbach's alpha. According to Nunnally and Bernstein (1994), a value of 0.70 is sufficient for early stages of research in order to establish internal consistency. The six sub-scales met this requirement, as the reliability values ranged from 0.701 to 0.798.

Construct validity was established through factor analysis. The instrument met the requirements of construct as each variable loaded on one factor only, with no evidence of cross-loading. Convergent validity was established through the computation of correlation analysis. These results are reported in Table 2. The six perceived sub-scales showed moderate to strong correlations among the latent constructs, with *r* values ranging from 0.252 to 0.555, which was significant at a level of $P < 0.01$, thus providing evidence of convergence among the latent constructs.

Table 2: Correlations – Latent Constructs Relating to Perceived Benefits in ICT Adoption

Factors	F1	F2	F3	F4	F5	F6
ICT competence (F1)	1.000	0.427**	0.333**	0.404**	0.342**	0.312**
Learning enhancement (F2)	0.427**	1.000	0.502**	0.517**	0.444**	0.406**
Work enhancement (F3)	0.333**	0.502**	1.000	0.555**	0.359**	0.434**
Enjoyment (F4)	0.404**	0.517**	0.555**	1.000	0.407**	0.456**
Learning tool (F5)	0.342**	0.444**	0.359**	0.407**	1.000	0.252**
Teaching enhancement (F6)	0.312**	0.406**	0.434**	0.456**	0.252**	1.000
** Correlation is significant at the 0.01 level (two-tailed).						

3.3 Factor Structure

Factor analysis with the principal components method and varimax rotation was used to summarise the variables into underlying sets of factors. Through factors analysis variables can be reduced into factors, each reflecting an underlying property which is commonly shared by a group of variables (De Vaus, 2002). In order to determine the number of factors to be extracted, several rotation solutions were compared, taking into account the percentage of explained variance, the scree plot and the eigenvalue criterion. Finally, a six-factor solution was developed as the items were logically associated with the underlying factors. The six factors accounted for approximately 60% of the variance, with eigenvalues ranging from 6.37 to 1.05. The final factor structure is shown in Table 3.

Table 3: Factor Loading Matrix, Descriptive and Psychometric Scale Properties

Variable description	Components						Descriptive and psychometric scale properties		
	F 1	F2	F3	F4	F5	F6	Means	Item-total correlation	Cronbach's alpha
C12 Easy to learn	0.144	0.060	0.272	0.194	**0.554**	0.013	3.90	0.420	
C14 Effective learning tool	0.134	0.134	0.320	0.033	**0.627**	0.227	4.24	0.541	0.706
C15 Educational tool	0.037	0.130	0.027	0.066	**0.795**	0.024	4.10	0.521	
C16 Use for educational purposes	0.021	0.010	0.054	0.010	**0.750**	0.205	3.75	0.495	
C2 More advantages	0.091	0.186	0.210	0.115	0.041	**0.672**	4.09	0.486	
C4 Subject more interesting	0.243	0.223	0.152	0.110	0.157	**0.704**	4.26	0.599	0.709
C6 Fits with curriculum	0.251	0.064	0.117	0.167	0.216	**0.669**	3.98	0.524	
B17 Save time	**0.691**	0.141	.147	0.071	0.008	0.261	3.40	0.569	
B18 Use computers often	**0.779**	0.207	0.025	0.160	0.108	0.114	4.21	0.681	0.798
B19 Learn more with computers	**0.766**	0.166	0.134	0.061	0.035	0.162	4.45	0.636	

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B20 Use in the future	**0.688**	0.320	0.008	0.175	0.105	0.013	4.52	0.577	
B10 Good to learn	0.125	**0.591**	0.006	0.187	0.041	0.005	4.54	0.385	
B12 Good information search	0.054	**0.583**	0.151	0.024	0.033	0.266	4.67	0.420	
B13 Like use in the classroom	0.195	**0.661**	0.091	0.205	0.044	0.087	4.54	0.541	0.720
B14 Enhance learning	0.262	**0.650**	0.155	0.011	0.080	0.157	4.39	0.521	
B15 Do more good than harm	0.180	**0.655**	0.097	0.125	0.152	0.062	4.27	0.495	
D4 Earns respect	0.067	0.040	**0.636**	0.023	0.035	0.183	4.27	0.435	
D6 Improve work	0.108	0.056	**0.699**	0.121	0.099	0.301	3.57	0.585	
D7 Learn about traditions	0.022	0.112	**0.595**	0.144	0.170	0.021	4.04	0.403	0.707
D9 Not only for privileged	0.055	0.159	**0.709**	0.039	0.022	0.043	3.88	0.446	
D12 Make life easier	0.064	0.168	**0.566**	0.021	0.245	0.198	3.83	0.465	
B4 Like to talk about information technology	0.124	0.067	0.067	**0.760**	0.077	0.069	4.17	0.541	
B5 Enjoyable	0.076	0.107	0.106	**0.670**	0.033	0.205	4.02	0.497	0.701
B6 Like using computers	0.024	0.254	0.043	**0.614**	0.034	0.290	4.25	0.474	
B2 Feel comfortable	0.156	0.130	0.014	**0.700**	.079	0.099	4.12	0.443	
Eigenvaues	6.37	2.19	1.57	1.39	1.21	1.05	**Overall Cronbach alpha = 0.870**		
% of variance	30.48	8.87	6.28	5.58	4.80	4.21			
Cum % of variance	30.48	39.35	45.63	51.21	56.01	60.22			
Kaiser-Meyer-Olkin Measure of Sampling Adequacy = 0.898; Bartlett's Test of Sphericity, Approx. Chi-Square=8416.780/d/f=300; significant at 0.000.									

F = Factor; F1 = ICT competence; F2 = Learning enhancement; F3 = Work enhancement; F4 = Work enjoyment;
F5 = Positive attitude towards a learning tool; F6 = Teaching enhancement.

3.3.1 ICT Competence

Factor 1 was labelled 'ICT Competence', which relates closely to 'ease of use' from the Technology acceptance model (TAM). This factor explained 30.48% of the variance and comprised four variables. This factor relates to teachers' confidence in ICT usage. An important determinant of teachers' levels of engagement in ICT is their level of confidence in using these technologies in the classroom or in communicating with learners (Peeraer & Van Petegem, 2011). This factor accounts for the most of the variance, suggesting that teachers place greater prominence on this factor.

Confidence emerges from competence to handle a wide range of varying computer applications for various purposes (Van Braak, Tondeur & Valcke 2004). According to Berner (2003), Na (1993) and Kutluca and Ekici (2010), teachers' computer competence is a major predictor of integrating ICT in teaching. Evidence suggests that most teachers who reported negative or neutral attitudes towards integration of ICT into teaching and learning processes lacked knowledge and skills that would allow them to make 'informed decisions' resulting primarily from a lack of confidence in using ICT (Koo, 2008). This adds to the growing concern that those teachers who have little or no confidence in using computers in their work will try to avoid them altogether, through avoidance behaviours or by making excuses (Stefl-Mabry, Radlick & Doane, 2010; Liu, 2011). While a lack of personal access or technical problems may lead to a lack of ICT adoption, teacher confidence or a lack thereof may in itself magnify effects of ICT usage among teachers (Jones, 2004).

3.3.2 Learning Enhancement

Factor 2 was labelled 'Learning Enhancement', which relates closely to 'perceived usefulness' from TAM, and explained 8.87% of the variance and comprised five variables. According to Jones (2004) teachers feel reluctant to use computers if they lack confidence. Fear of failure and lack of ICT knowledge have been cited as some of the reasons for teachers' lack of confidence in adopting and integrating ICT into their teaching (Selwyn, 2007).

The use of ICT enhances learning by making teachers less dependent on teaching as a vehicle for the mere transmission of knowledge, instead making learners more responsible for their own learning (self-paced learning). This factor depicts the new kind of learning paradigm which requires learners to be more responsible for their own learning, in line with the recent promotion of a learner-centred pedagogical approach (; Duffy & Cunningham, 1996; Hirumi, 2002), and lifelong learning in education and society due to the advent of ICT and e-learning platforms (Garrison & Anderson, 2003).

The contemporary debate of technology integration focuses on facilitating student development and learning through a conceptual understanding that instructional processes are only a means to an end, and during this process teachers should facilitate learning with the required ICT competence in order to deliver academic content. This calls for varied teaching-learning approaches, such as project-based learning, which is primarily learner-centred (Inan, Lowther, Ross, & Strahl, 2010). Yen and Lee (2011) demonstrated that students who engage in classroom group discussions and report-writing using technology performed better in terms of learning achievement than unengaged students. In keeping with the constructivist learning approach, teachers act as coaches or facilitators rather than teachers who merely teach and disseminate learned knowledge. During learning, learners use in-depth questioning to acquire information, and should interact with classmates in order to find solutions of contextualised problems.

When students work in small groups they can contribute to a common understanding and develop their verbal and social skills, are familiar with sharing personal opinions, and know where to find information and how to identify data through the use ICT (Nussbaum *et al.*, 2009).

3.3.3 Work Enhancement

Factor 3 was labelled 'Work Enhancement', which relates closely to 'performance expectancy' from the UTAUT model. This factor explained 6.28% of the variance and comprised five variables. One key area of teachers' attitudes towards ICT is their understanding of how it will benefit their work and their students' learning (Jones, 2004). Cox (2008) expresses the need to measure, among other factors, teachers' beliefs and understanding of the role of ICT within the subject being taught.

Kirkup and Kirkwood (2005) distinguish innovators, who are enthusiastic for the technology as valuable itself, and later adopters who are less interested in the technology and need evidence that it will improve their lives or work. Not only does ICT enhance the development of learners, it also enhances development of teaching instruction by teachers. According to research conducted in South African secondary schools by Bialobrzeska and Cohen (2005), the use of ICT in schools assisted teachers to administer and manage their work more efficiently; moreover, teachers were able to work faster and communicate more efficiently with other teachers and colleagues in their respective school communities.

3.3.4 Work Enjoyment

Factor four was labelled 'Work Enjoyment', which relates closely to 'effort expectancy' from the UTAUT model. This factor explained 5.58% of the variance and comprised five variables. Enjoyment is defined as the degree to which the activity of using technology is perceived to be enjoyable in its own right, apart from any performance consequences that may be anticipated (Bagozzi *et al.*, 1992). Research has found that enjoyment plays an important role in user acceptance of echnology (Venkatesh & Speier, 1999; Yang & Chen, 2007).

3.3.5 Positive Attitude Towards a Learning Tool

Factor five was labelled 'Positive Attitude Towards a Learning Tool', which relates closely to 'attitude towards behaviour' from the TRA model. This factor explained 4.80% of the variance and comprised four variables. Ether (in Jones, 2004:12) states that "there is little point in providing large quantities of equipment if teachers do not have the attitudes necessary to change their classroom practices".

Based on shifts in the learning paradigm, technology can help teachers develop constructivist-based teaching activities. Constructivist use of technology during instruction can facilitate high-order thinking on the part of students (Baylor & Ritchie, 2002). To successfully initiate and implement educational technology in a classroom largely depends upon teachers' positive attitude towards ICT as a learning tool. When teachers believe that ICT is neither fulfilling their needs nor their students' needs, it is likely that they will not integrate the technology into their teaching and learning.

Among the factors that influence successful integration of ICT into teaching are teachers' attitudes and beliefs towards technology (Hew & Brush, 2007; Keengwe & Onchwari, 2008). If teachers' attitudes are positive toward the use of educational technology, then they can easily provide useful insights about their experiences on adoption and integration of ICT into teaching and learning processes. Previous research has affirmed that teachers' computer experience relates positively to their attitudes towards (Buabeng-Andoh, 2012). The more experience teachers have with computers, the more likely that they will show positive attitudes towards computers (Rozell & Gardner, 1999). Positive computer attitudes are expected to foster computer integration in the classroom (Van Braak *et al.*, 2004). According to Woodrow (1992), for successful transformation in educational practice users need to develop positive attitudes toward the

innovation.

3.3.6 Teaching Enhancement

Factor six was labelled 'Teaching Enhancement', which relates closely to 'perceived usefulness' from TAM. This factor explained 4.21% of the variance and comprised three variables. Tinio (2003) affirms that the introduction of ICT in education is a powerful tool for educational change and reform, which becomes a catalyst to promote and drive the acquisition of knowledge of learners whereby learners become empowered for lifelong learning and promote new ways of learning. e-Learning Africa Report (2012) revealed, *inter alia*, the following benefits that accrue to learners and teachers: motivation to learn, learning becomes fun, promotion of independent learning with proper guidance from teachers, creation of new knowledge by learners, and access to quality learning material.

4. Limitations

One of the limitations of the study is the representation of the teachers, who were chosen from public schools in a certain geographical part of the province. Therefore these findings cannot be generalised to the entire teacher population in one or more provinces or the country.

ICT can also improve the efficiency of school administration functions (Mueller, Wood, Willoughby, Ross & Specht, 2008); however, this perspective was not studied, as the main aim was approached from a pedagogic viewpoint. Future research can include such a perspective in order to establish a comprehensive appreciation of the use of ICT in schools. Further research can be conducted to identify a more comprehensive model to explain teachers' perceived usefulness and adoption of ICT in schools.

5. Conclusion

The adoption of technology is similar to the adoption of any other educational innovations – however, it is even more time-consuming, labour-intensive and expensive. The risks of not using technology are too great when the rapid pace at which knowledge is expanding is considered together with the need to communicate and compete globally in an information technology community of practice. Research shows that adopting and using ICT in schools leads to significant expansion of education and pedagogical outcomes which are beneficial to both teachers and students.

When used appropriately, ICT can help to strengthen the importance of education to an increasingly networked society, raising the quality of education by making learning and teaching an active process connected to real life (Govender, 2013). However, studies suggest that benefits of adopting and using ICT in schools are not always automatic, as the effective implementation of ICT in schools is a multifaceted, complex process that does not just involve providing the technology to schools but also involves teachers' competencies, schools' readiness, long-term financing, curriculum restructuring and the Government's willingness to invest in the teaching and learning infrastructure (Govender, 2006).

In practice, the usual teaching and curricula approaches remain basically unchanged in many schools, often being skewed more towards the traditional ways of teaching, which makes it difficult to move towards a constructivist approach to teaching and learning (Yilmaz, 2011). Across Africa many countries have started investing considerable amounts of money and designing new policies aimed at making teachers adopt ICT in schools. Perhaps it is time for the Government's education policy makers to earnestly invest in ICT in schools.

However, there are many challenges – some of which could be attributed to teachers' skills in using ICTs (Govender, 2006). For ICT to be effectively implemented in schools, teachers should be prepared to face challenges that accompany its implementation. The use of ICT supports constructivist pedagogy, wherein students use technology to explore and reach an understanding of concepts and content. This approach [constructivism] promotes higher-order thinking and better problem-solving strategies. However, in order to take effective advantage of the benefits of the integration of ICT within the curriculum and within the different subject areas, there has to be a shift from the traditional methods of teaching. New, innovative forms of teaching have to be embraced in order to effectively maximise integration of the technology (Abuhmaih, 2011).

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