

Exploring Teachers' Propensity for Technology Adoption in Business Education

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ABSTRACT In many developing nations of the world, competence in information and communication technology (ICT) is seen as a key enabling factor for both personal and national advancement and progress. A major challenge facing such countries is the need to overcome overt and hidden obstacles to technology adoption. School teachers are regarded as the essential drivers of ICT. This article reports on a quantitative study that investigated Business Education teachers' propensities for technology adoption among a random sample of 204 Business Education teachers in the Ethekwini region of KwaZulu-Natal, South Africa. Questionnaires were issued to these teachers to ascertain their responses to statements that linked closely to the constructs used in the study, which were extracted from technology adoption theories/models. The findings indicated that the teachers were quite positive towards the perceived usefulness and relative advantages of computers, were motivated and felt that they could use computers with ease. However, they were not confident that the necessary conditions existed to facilitate their use of computers in teaching and learning. Unless the Department of Education takes cognizance of teachers' propensity for technology adoption and the factors that seem to be hindering ICT integration, the vision and goals of the *White Paper on E-Education* may not become a reality in schools in KwaZulu-Natal.

INTRODUCTION

The successful implementation of educational technologies depends largely on the perceptions of educators, who eventually determine how and when technology will be used in the classroom (Lawless and Pellegrino 2007). Other studies (Rogers 1995; Knezek and Christensen 2002; Li 2002; Nicolle and Lou 2008) have pointed to a wide range of factors affecting perceptions toward ICT.

The researchers set out to determine what are some of the factors affecting technology adoption in Business Management. We achieved this by determining teachers' perceptions towards different constructs extracted from technology adoption models and theories.

While the dawn of democracy in South Africa held much promise for communities that were previously disadvantaged, the promise of better provision especially with regard to education is yet to be realized. One strategy to ad-

vance the national education project is to integrate information and communication technology (ICT) in education. To its credit, the National Department of Education (DoE) in South Africa unveiled its policy on e-education (DoE 2004). The e-education policy intention is that every South African learner be competent in ICT use, so as to be successful in the global economy.

The argument is that the integration of ICT in the school curriculum will facilitate teaching and learning, especially in school subjects that lend themselves to the use of ICT in the pedagogic endeavour. Business Education is one such subject grouping. The nature of the discipline-specific content in Business Education subjects like Accounting, Business Studies and Economics readily lends itself to sophisticated ways of teaching using ICT. The new national curriculum policy for Accounting, for example, suggests pedagogy that should embrace the use of technology. This challenge is already being taken up by some schools that have started to introduce elementary Accounting software packages (Pastel Accounting) to their learners. Teachers of Economics in particular use Microsoft Excel to present statistical data and to generate various graphs and economic models currently taught in the curriculum. Unfortunately, this practice appears to be confined to a

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very small fraction of elite schools in the country.

Given South Africa's complex and uneven education provisioning, the integration of ICT in the school Business Education curriculum poses several challenges. Arguably the most difficult challenge lies in creating the circumstances or conditions for meaningful and effective technology adoption by teachers of Business Education. It is common knowledge that teachers have varied experiences with ICT and respond to it differently. There is little doubt that there is immense potential for ICT to be integrated into Business Education curricula across schools in SA. However, for effective ICT integration it is crucial to establish where Business Education teachers actually are on the ICT learning curve. This article reports on a study that set out to investigate Business Education teachers' propensities for technology adoption.

Literature Review

Education provision in South Africa (SA) occurs in vastly diverse socio-economic contexts. An indication of the polarity between the affluent and the economically disadvantaged is evidenced in the Gini coefficient for SA, which stood at 0.66 in 2008 (The Presidency 2009), among the highest in the world. According to the country's Constitution, education is to be provided free to all South Africans of school-going age. However, the nature of such provision is distinctly unequal. Schools in affluent communities charge high school fees and are able to attract the most competent teachers. Such schools are also able to afford resources that are comparable to those of schools in the world's richest nations. At the same time, South Africa also has schools at the poorest end of the spectrum, where basics such as running water, electricity, libraries, and ICT are non-existent. According to the International Telecommunication Union (2009), South Africa ranks eighty-third in the world in terms of the ICT Development Index, well behind countries like Kazakhstan, Moldova, and Mauritius.

There is growing support for teachers at both primary school and high school level to make use of computers and other forms of technology to teach Economics (Nelson 1997). Morgan (1991) contends that technology-based teaching of Economics concepts can be effective even

at primary school level. In the teaching of the economic issues related to globalisation, for instance, Rissinger (2001) advances a bibliography of useful websites that contain useful supporting material that can be used by teachers. Similarly, Van Fossen (1998) supports the use of economic education materials generated by the Council for Economic Education that are available on CD-ROM. Robinson and Davis (1999) assert that Economics teaching at college level has shifted significantly; this was evident in that more instructors were beginning to use statistical models and computer-based simulations in their teaching. They argue that this pedagogical shift needs to occur at secondary school level as well, and suggest that traditional "chalk and talk" teaching approaches to teaching Economics must be limited to a maximum of 25% of all classroom instruction time.

Research into the successful implementation of educational technologies indicates that educators' attitudes are a significant factor in determining how educational technologies will be used in classrooms (Kersaint et al. 2003; Lee et al. 2005), and that the development of positive attitudes towards technology is essential for this to happen (Woodrow 1992). Positive attitudes towards technology are also likely to reduce educators' resistance to technology (Watson 1998), and to facilitate easier technology diffusion in education (Rogers 1995). Several models or theories have been developed over time to explain user acceptance and adoption of new technology. In the discussion that follows, we draw on five prominent theories or models, constructs from which were used in determining teacher propensity for technology adoption.

The Theory of Reasoned Action (TRA) as proposed by Fishbein and Ajzen (1975) draws from social psychology and is one of the most influential theories of human behaviour. It has been used to predict a wide range of human behaviours. Davis et al. (1989) in their study of the application of TRA to individual acceptance of technology found that the variance explained was largely consistent with studies that had employed TRA in the context of other behaviours. TRA offers two key constructs, namely "attitude toward behaviour", which is defined as "an individual's positive or negative feelings (evaluative effect) about performing the target behaviour" (Fishbein and Ajzen 1975: 216), and the "subjective norm", which refers to "the

person's perception that most people who are important to him think he should perform the behaviour in question" (Fishbein and Ajzen 1975: 302).

The Theory of Planned Behaviour (TPB) extended TRA, adding the construct "perceived behavioural control" as an additional determinant of intention and behaviour. TPB has been successfully applied to the understanding of individual acceptance and usage of many different technologies (Harrison et al. 1997; Mathieson 1991; Taylor and Todd 1995b). The construct "perceived behavioural control" is "the perceived ease or difficulty of performing the behaviour" (Ajzen 1991: 188).

The Technology Acceptance Model (TAM) was designed to predict information technology acceptance and usage on the job. Key constructs presented include "perceived usefulness", which is "the degree to which a person believes that using a particular system will enhance his or her job performance" (Davis 1989: 320). "Perceived ease of use" refers to "the degree to which a person believes that using a particular system will be free of effort" (Davis 1989: 320).

A later theory, the Unified Theory of Acceptance and Use of Technology (UTAUT), aims to explain user intentions and user behaviour. The theory offers four key constructs which are regarded as direct determinants of usage intention and behaviour (Venkatesh et al. 2003). Firstly, "performance expectancy" refers to "the degree to which an individual believes that using the system will help him or her to attain gains in job performance" (Venkatesh et al. 2003: 447), while "effort expectancy" alludes to "the degree of ease associated with the use of the system" (Venkatesh et al. 2003: 450). "Social influence" considers "the degree to which an individual perceives that important others believe he or she should use the new system" (Venkatesh et al. 2003: 451), and "facilitating conditions" refer to "the degree to which an individual believes that an organizational and technical infrastructure exists to support use of the system" (Venkatesh et al. 2003: 453). The impact of these four constructs on usage and intention are mediated by issues such as gender, age, experience, and voluntariness of use.

Finally, Moore and Benbasat (1991) adapted Rogers and Shoemaker's (1971) model of Diffusion of Innovation (DOI), and presented a refined set of constructs that could be used to

study technology acceptance. "Relative advantage" as a construct is "the degree to which an innovation is perceived as being better than its precursor", "ease of use" is "the degree to which an innovation is perceived as being difficult to use", "image" looks at the "degree to which use of an innovation is perceived to enhance one's image or status in one's social system" (Moore and Benbasat 1991: 195), and "visibility" can be described as the degree to which one can see others using the innovation in the organization. "Compatibility" indicates the "degree to which an innovation is perceived to be consistent with the existing values, needs and past experiences of potential adopters", "results demonstrability" is "the tangibility of the results of using the innovation, including observability and communicability", and "voluntariness of use" indicates the "degree to which use of the innovation is perceived as being voluntary, or of free will" (Moore and Benbasat 1991: 195). The predictive value of these innovation constructs has found substantive support (Agarwal and Prasad 1998; Plouffe et al. 2001).

Other researchers in the field of technology adoption have found that the introductory step for computers in schools is using them in administrative tasks and not as part of the teaching and learning process (McCannon and Crews 2000). Educators adopt ICT in stages (Demetriadis 2003), initially focusing on their own interaction with the new medium, becoming comfortable with its use and then proceeding to deliberate on its potential use in pedagogy (Myhre 1998).

Moseley and Higgins (cited in Mumtaz 2000) suggest that an important factor determining educators' behaviours is the notion of "pedagogical content knowledge", the kind of knowledge that develops at the interface of content and pedagogy that facilitates understanding of the organization, representation and adaptation of topics, problems and issues related to disciplinary knowledge to suit the particular contextual challenges prevalent in a teaching and learning moment. How ICT is likely to be viewed by the educator depends on whether he/she sees ICT as changing the nature of their subject and the way that it is understood. The challenge then is to create conditions that will enable teachers of Business Education to develop this new pedagogical content knowledge that ICT use is likely to produce.

METHODOLOGY

This research study was descriptive and exploratory in nature. Creswell (2003: 30) suggests that exploratory studies are most advantageous when “not much has been written about the topic or the population being studied”. The target population in this study was Accounting, Economics and Business Studies secondary school teachers in the Ethekwini Region of KwaZulu-Natal. The list of educators was extracted from the DoE’s Education Management and Information Systems (EMIS) list, which is maintained and updated on an annual basis by the Provincial Education Management and Information Systems Department. The total number of secondary schools in the Ethekwini Region on the DoE’s EMIS list was 403. Of these schools, 382 have staff ranging in number from 2 to 60, with the balance of 21 schools showing 0 staff members. Gay and Airasian (as cited in Leedy and Ormrod 2005) suggest that if the population size is around 500, one should sample at least 50% of the population. From the population of 382 schools, a random selection of every alternate school was made, giving a sample of 191 schools. The sample is a representative sample because every alternate school in a district had been chosen, and this represented 50% of the secondary schools in the Ethekweni region. Secondary schools have been chosen because the *White Paper on E-Education* (DoE 2003: 22) has declared ICT infrastructure as a priority in secondary schools: “Every educator and learner in General and Further Education and Training (FET) must have access to ICT infrastructure”.

Questionnaires were distributed to the above 191 schools. A letter of recruitment and a letter indicating that permission had been granted by the DoE (KwaZulu-Natal) accompanied the questionnaires to schools. An average of 20 questionnaires was sent to each school. 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, which made collection of questionnaires from the affected schools very difficult.

Of the 191 schools in the sample, 18 schools indicated that they did not receive the questionnaires, 2 indicated that they had misplaced them

and another 3 declined to participate in the study. Returns from 93 schools were received, giving a 55.4% rate of return. In total 204 questionnaires were received from Business Education teachers in FET schools. Fifteen questionnaires were considered to be spoilt because they were partially completed, were illegible, or had contradictory entries. The questionnaire was created with items validated in previous research (Davis 1989; Davis et al. 1989; Venkatesh and Davis 2000; Vannatta and O’Bannan 2002; Venkatesh et al. 2003; Abdulkafi 2004) and adapted for this study. The TRA scales were adapted from Davis et al. (1989), the TAM scales from Davis (1989) and Venkatesh and Davis (2000), the TPB scales from Taylor and Todd (1995) and the DOI scales from Moore and Benbasat (1991). All other scales were adapted from Venkatesh et al. (2003).

The questionnaire consisted of 52 statements, where each statement was linked to at least one of the different constructs extracted from the technology adoption theories/models. A five-point scale was used for all of the constructs’ measurement, with 1 being the strongly negative end of the scale and 5 being the strongly positive end. Development of the questionnaire was guided by an extensive review of the literature. Data were analyzed using the statistical package SPSS®.

Propensities for Technology Adoption

Variables were computed for each construct extracted from the technology adoption theories/models. A score of 5 was awarded for strongly agree, 4 for agree, 3 for neutral, 2 for disagree and 1 for strongly disagree. The polarity for negative statements was reversed. For each construct the sum of the values was divided by the number of items per construct to give a score out of 5; the frequency analysis is indicated in Table 1.

Overall the respondents’ perceptions were somewhat positive, with a strong average mean of 3.84, average median of 3.90, average mode of 4.10 and average standard deviation of 0.8 (Table 1).

The frequencies for the different constructs were grouped and analysed according to UTAUT’s four main determinants of user acceptance and usage behaviour, namely performance expectancy (Fig. 1), effort expectancy (Fig. 2), social influence (Fig. 3) and facilitating conditions (Fig.4).

Table 1: Educators' perceptions of the constructs of information systems theories/models

	<i>Perceived usefulness</i>	<i>Extrinsic motivation</i>	<i>Relative advantage</i>	<i>Perceived ease of use</i>	<i>Complexity</i>	<i>Subjective norm</i>	<i>Image</i>	<i>Perceived behavioural control</i>	<i>Facilitating conditions</i>	<i>Compatibility</i>
Mean	4.34	4.44	4.26	4.02	4.30	3.89	3.72	2.67	3.01	3.77
Median	4.00	5.00	4.00	4.02	4.00	4.00	4.00	3.00	3.00	4.00
Mode	5.00	5.00	4.00	4.00	4.00	4.00	4.00	2.00	3.00	4.00
Std Dev.	0.69	0.93	0.81	0.82	0.70	0.77	0.88	1.13	0.66	0.61

For the construct 'perceived usefulness', 91% of our respondents were quite positive that using a computer would enhance their job performance (Fig. 1). Educators were most positive about schools being a better place with computers. This should contribute positively towards their intention of using computers in the classroom (Venkatesh and Davis 2000). Perceived usefulness is one of the constructs evident in the TAM model.

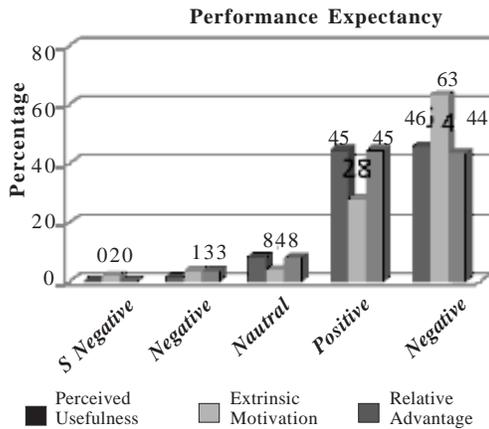


Fig. 1. Performance expectancy

For the construct 'extrinsic motivation', 91% of respondents perceived computers as being instrumental in achieving valued outcomes such as improved job performance. Educators were strongly positive about wanting to learn more about computers. A significant body of research in psychology has supported general motivation theory as an explanation for behaviour or intended behaviour. Several studies (Vallerand 1997; Venkatesh and Speier 1999) have examined motivational theory and adapted it for specific contexts.

The degree to which a computer is perceived as being better than what exists (for example, traditional methods of teaching) was positively supported by 89% of the respondents. This supports Rogers' (1995) innovation diffusion theory, where one of the many constructs is 'relative advantage'. This suggests that Business Education teachers see the benefits of using computers as a tool in teaching their subject.

For the construct 'perceived ease of use' at least 86% of respondents were of the opinion that using a computer would be free of effort (Fig. 2). This is in line with 'perceived ease of use' from TAM as a direct determinant of perceived usefulness (Davis et al. 1989), since all else being equal, the less effortful a system is to use, the more using it can increase job performance. There is extensive empirical evidence that perceived ease of use is significantly linked to intention, both directly and indirectly via its impact on perceived usefulness (see, for example, Davis et al. 1989; Venkatesh 1999).

Closely linked to 'perceived ease of use' is 'Complexity', where 89% of respondents felt that it is not difficult to understand and use a com-

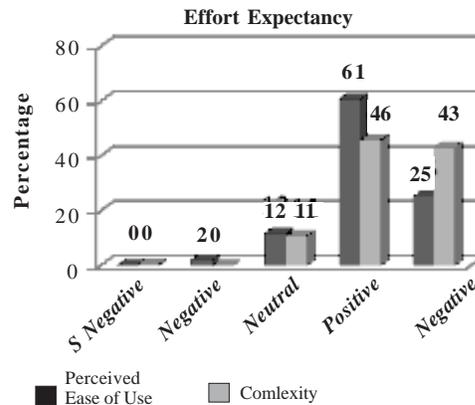


Fig. 2. Effort expectancy

puter. This finding suggests strongly that Business Education teachers viewed the effort required and use of computers in their teaching as manageable. They also indicated that they would not find it difficult to understand and use computers in the Business Education teaching enterprise.

For the construct ‘subjective norm’, 79% of respondents were positive about learners using computers to prepare them for future jobs, and that computers should be a priority in education (Fig.3). ‘Subjective norm’ from TRA as well as ‘image’ (Moore and Benbasat 1991) are represented as ‘social influence’ in UTAUT. While they have different labels, each of these constructs contains the explicit or implicit notion that the individual’s behaviour is influenced by the way in which they believe others will view them as a result of having used technology. Sixty eight per cent felt that using a computer would enhance their image in their social system. It was clear that Business Education teachers in the sample viewed the use of computers as a means to possibly improve their status and image in the eyes of their colleagues.

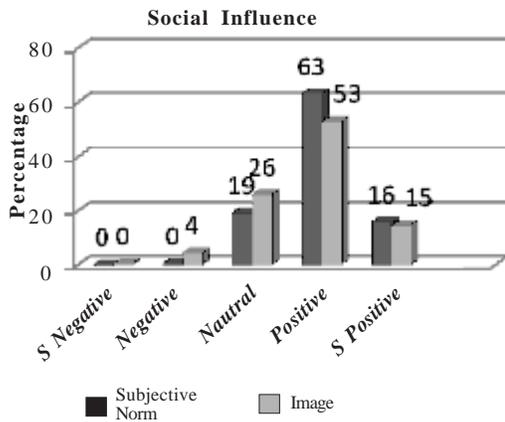


Fig. 3. Social influence

As noted in Figure 4, for the construct ‘perceived behavioural control’ (behavioural control), 45% of respondents were neutral to positive about their perceptions of internal and external constraints on their behaviour, including self-efficacy, resource-facilitating conditions and technology-facilitating conditions. It seems that the majority of educators are not overly confi-

dent with these constructs. This is a cause for concern, as Business Education teachers did not feel that they possessed the necessary competence to be in control of the technology.

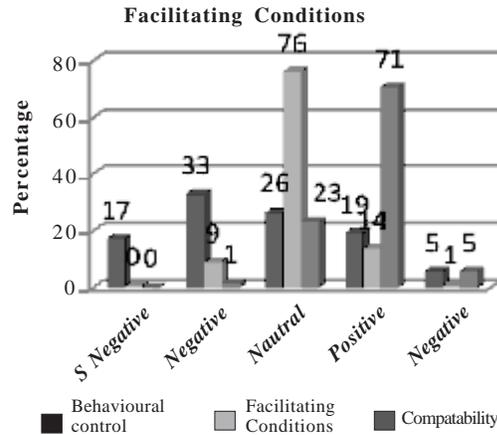


Fig. 4. Facilitating conditions

For the construct ‘facilitating conditions’ (Fig. 4), 90% of respondents were neutral to positive (but mostly neutral) towards factors in the environment that make an act easy to do, for example seeing computers being used as an educational tool. This suggests that Business Education teachers did not feel that the conditions exist for integration of ICT in the teaching and learning of Business Education in schools. This clearly signals the need for continuing professional development in ICT integration in Business Education teaching.

Seventy six per cent of respondents were quite positive towards the degree to which they perceived computers as being consistent with existing values, needs and experiences. The ‘compatibility’ construct from DOI and the ‘perceived behavioural control’ construct from TPB are seen as concepts embodied in ‘facilitating conditions’ of UTAUT. Here it can be observed that Business Education teachers view using computers as quite compatible with their existing curriculum content and practices. This makes sense, since Business Education subjects like Economics, Business Studies and Accounting content knowledge includes wide-ranging opportunities to generate graphs (demand and supply curves, cost curves) and quantitative data

response exercises, as well as numerous Accounting applications.

DISCUSSION

An examination of individual computer attributes showed that respondents were most positive about the relative advantage of computers as an educational tool. A mean of 4.26 and a median of 4.00 supports this analysis (Table 1). Educators' perceptions of the compatibility of ICT with the current teaching practices that they followed were also very positive, with a mean of 3.77 and a median of 4.00 supporting this. However, twenty-five per cent (25%) of participants were neutral/uncertain about whether or not computers fit well into their curricular goals. The disparity between technological demands and the existing curricula has often been a major hindrance for technology integration (Ojo and Awuah 1998). As the responses of the participants indicate, the KwaZulu-Natal educational landscape seems to be no exception. Besides, 45% of the participants considered that the class time was too limited for computer use. This problem has also been emphasized in the literature (Becker 1998). Educators' concerns about the incompatibility of computers with the existing curricula, as well as lack of time for computer use, indicate that educational change cannot simply be attained by placing computers in schools (Hodas 1993). For a change to occur, innovation is required at the structural level, as well as at the pedagogic level. Hence, the introduction of ICT innovations into education requires equal innovativeness in structural, pedagogical and curriculum approaches. As mentioned earlier, new curriculum policy in Business Education strongly supports the use of ICT in the delivery of the curriculum. There is enormous potential for the development of new kinds of pedagogical content knowledge using ICT.

An analysis of the frequencies for the different constructs from the information systems theories/models shows that there is definitely a lack when it comes to 'perceived behavioural control' and 'facilitating conditions' (Fig. 4). This neutral to negative response from educators may result in a reluctance to adopt the use of technology. In information systems terms, it means that there are "perceptions of internal and external constraints on behaviour" (Taylor and Todd

1995: 149). There may be objective factors in the environment that educators believe make technology adoption easier that they have not encountered – for example, "seeing computers being used as an educational tool". Also, "provision of support for users of PCs may be one type of facilitating condition that can influence system utilization" (Thompson et al. 1991: 129). These are areas upon which the DoE must focus so that 'perceived behavioural control' and 'facilitating conditions' can be improved, which could result in a better chance of technology adoption by educators.

CONCLUSION

While this study revealed that teachers view computers as potentially beneficial for teaching, they are less confident that the conditions exist that will allow them to easily integrate ICTs in the teaching of Business Education. It follows that placing computers in schools is not enough for attaining educational change. The introduction of ICT into education requires equal innovativeness in other aspects of education. Both policy-makers and educators share this responsibility. Other barriers reported in this study were educators' low level of access to computers, which will definitely impact on future computer use. This points to the invariable importance of technology resources for the success of technology initiatives across the world. It also implies that technology initiatives should include measures for preparing educators to use computers in their teaching practices.

One may need to consider seriously the statements made by other authors with respect to a starting step towards ICT integration and that is: that the introductory step for computers in schools is using them in administrative tasks and not as part of the teaching and learning process and that educators adopt ICT in stages initially focusing on their own interaction with the new medium, becoming comfortable with its use and then proceeding to deliberate on its potential use in pedagogy. The DoE has a good basis to start working from, since most teachers were quite positive towards the perceived usefulness and relative advantages of computers. They were also quite motivated and viewed the use of computers as being of ease. However, teachers are not confident that necessary conditions exist that will facilitate their use of com-

puters in teaching and learning. Unless the DoE takes cognizance of teachers' propensity to technology adoption and the factors that seem to be hindering ICT integration, the vision and goal of the *White Paper on E-Education* may not become a reality in schools in KwaZulu-Natal.

If decision-makers want to involve educators in the process of technology integration, they have to find ways to overcome the barriers perceived by the educators.

RECOMMENDATIONS

The introduction of ICT into education requires equal innovativeness in other aspects of education. Both policymakers and educators share this responsibility. Policy-makers should provide additional planning time for educators to experiment with new ICT-based approaches. This may be attained by reducing the teaching load for the educators. To obtain a better result for "facilitating conditions", provision of resources will be necessary, not only in terms of computer equipment, but also providing the necessary infrastructure to support effective operation of these systems. Educators will require support, especially those that have never been exposed to these technologies before.

Educators' preparation necessitates not merely providing additional training opportunities, but also aiding them in experimenting with ICT before being able to use it in their classrooms.

As a recommendation one feels that the Department of Education needs to develop a national framework for competencies for educators, and the use of ICTs must be integrated into pre-service and in-service training. The different stages can be adapted and used to ensure that educators have mastered different competencies at different levels as follows:

- ♦ Entry – must be computer literate, able to use computers and teach learners to use computers for simple tasks.
- ♦ Adoption – must be able to use various technologies, including the computer, to support administration, management, teaching and learning.
- ♦ Adaptation – must be able to use technology to enrich the curriculum, and use integrated systems for management and administration.

- ♦ Appropriation – must be able to integrate technology into teaching and learning activities, and use integrated systems for management and administration in a community context.
- ♦ Invention – must be prepared to develop entirely new learning environments that make use of technology, so that learning becomes collaborative and interactive.

A further recommendation is that the Department of Education will need to build an education and training system that will support ICT integration in teaching and learning. This will require the appointment of dedicated expertise at different levels of the system for the planning, management, support, monitoring and evaluation of ICTs. The system must build educators' and managers' confidence in the use of ICTs. This can be achieved by ensuring that:

- ♦ Every educator and manager has the means to obtain a personal computer, through a government loan scheme, for personal use and administration.
- ♦ Every educator and manager has access to basic training in the use of ICTs.
- ♦ Technology incentives for schools and educators to use ICTs are put in place.
- ♦ A set of case studies, documented research and examples on how to integrate ICTs in management, teaching and learning are available to educators and managers.
- ♦ All pre-service educator-training institutions include basic computer literacy and basic ICT integration into their teaching and learning.
- ♦ Educators have access to in-service training on how to integrate ICTs into teaching and learning.
- ♦ Educators have access to technical support.
- ♦ Subject Advisors are trained in ICT integration so that they can offer support to their schools.

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