

# Critical Success Factors for ICT Interventions in Western Cape Schools

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## ABSTRACT

ICTs are changing education by providing teachers with tools to use in all spheres of their profession. The Western Cape is a leading province in this regard and projects implementing ICTs in schools are spreading rapidly with the hope to alleviate the educational crisis in this country. However, it is still unclear what the underlying factors are to create a high level of adoption of ICTs in Western Cape schools.

This research used the Theory of Planned Behaviour as a framework to identify the critical success factors related to ICT interventions in Western Cape schools. A qualitative research approach was adopted and in-depth interviews were conducted with 20 teachers and the principals of six schools. Seven critical success factors emerged, contained within the following three themes: it is critical that teachers have a positive attitude toward using ICTs in their teaching; that they believe there is a culture and expectation for the use of ICTs in their teaching and that they are equipped with the skills, resources and support to enable them to use ICTs in their teaching.

## 1 INTRODUCTION

Information and Communications Technology (ICT) is changing the way the educational system works. By providing vast capabilities previously unattainable, ICT integration in education is gaining momentum worldwide. Against this backdrop is South Africa, a country still recovering from the gross unequal management of educational resources from the Apartheid (Taylor, 2001) and is desperately trying to address the shortage of qualified teachers (Ecco South Africa, 2005).

Recognising the potential benefits of ICT-enhanced education, the South African Department of Education has been driving ICT interventions in schools nationally. The Western Cape Education Department has taken the initiative by involving itself with many such projects to implement ICTs in schools (Dugmore, 2004).

However, as Cawthera (2000) alludes to above, there is much more to an ICT intervention than the technology. There are the adoption issues: the factors that will facilitate or impede a teacher's effective use of technology for education. For, it is the educator who will ultimately determine the extent that ICT is used to enhance the learning process (Burger et al, 2003). For the purposes of this paper, Rockart (1979)'s definition of critical success factors will be used, succinctly put as "the few key areas where things must go right" for the ICT intervention in the educational process to succeed.

The current underlying problem is that it is not clear what the factors are that will create a high level of adoption of ICTs in Western Cape schools. Research in this area is vitally important if projects are to continue and to be successful. By creating a set of locally relevant critical success factors and describing the activities that need to be done to fulfil each one, this project will further enhance ICT interventions in schools, and form the basis for their sustainability.

## **2 PRIOR RESEARCH**

### **2.1 IMPACT OF ICT IN EDUCATION**

Proponents of ICT integration into schools argue that ICTs have the potential to improve academic results (Brown, 2004, Jordan, 2005) and whole school functioning (Davis & Venezky, 2002). The basis for this improvement is founded on ICT's four key school enabling factors. It increases the school's ability to prepare learners and teachers for the technology and knowledge-based society; it increases learners' access to education; it supports new pedagogy practices; and it improves school and classroom administration.

#### **2.1.1 Preparation for technology and knowledge-based society**

In preparation for the knowledge-based society, ICTs help prepare learners by developing skills such as "higher order thinking skills, life-long learning habits, and the ability to think critically, communicate and collaborate, access, evaluate and synthesise information" (Castro, 2003). This in turn helps prepare learners for the "real world".

#### **2.1.2 Access to education**

ICTs radically change the physical attendance in classrooms by their inherent ability to connect people separated by geographical boundaries at minimal cost. This is significant in education as resources are now becoming available for learners in remote, hard-to-reach places and the expertise of teachers can be shared globally, particularly where qualified teachers are scarce (Cawthera, 2000).

#### **2.1.3 Pedagogy**

In contrast to traditional education models where learners are recipients of the educator's predefined curriculum, the constructivist models "emphasises the learner's need to organise information and construct meaning" by actively seeking for and engaging in learning material. ICT, particularly computer and Internet access, supports constructivist educational goals by empowering learners with the means to experiment with and explore information resources from around the globe and by providing teachers with better tools to facilitate learner-centred learning (Chapman & Mahlk, 2004). Here the educator's role shifts from instructor to facilitator and mentor nurturing understanding, and creativity within the learner (Bergh, 2002).

#### **2.1.4 Administration**

ICTs provide effective tools to administer school and classroom information by providing a means for central data storage and easy data transfer and sharing. Using ICTs, teachers are able to track and analyse learner performance on an ongoing basis, while reducing the time spent on class administration by using templates and automated assessments and reporting facilities. From the class to the school, information is reliable and timely, enabling decision-makers to plan with greater confidence, at a heightened level of accountability (Cawthera, 2000).

### **2.2 ICT EDUCATION IN SOUTH AFRICA**

#### **2.2.1 ICT in Education in South Africa**

In 2002, 39% of schools in South Africa had computers. Of these, 26.5% used computers for teaching and learning (Government Gazette, 2004). This is a significant increase from 2000, where only 13% of schools in South Africa had computers (Howell & Lundall, 2000). The majority of schools with computers rely on parents for financial support. The use of ICTs in

South African schools is primarily focused on developing basic literacy skills with limited integration into overall curricula activities. Internet usage is limited due to high telecommunications costs, though email is becoming more widespread amongst teachers as an administrative and management tool (Government Gazette, 2004).

### **2.2.2 ICT in Education in Western Cape**

It is the goal of the Western Cape Department of Education (WCED) that by the end of 2005, all schools will be equipped with a computer lab, satellite dish and television and VCR set (Dugmore, 2004). Currently, 82% of Western Cape schools are equipped with computers (Government Gazette, 2004). The WCED is involved with many projects to implement ICTs in schools, one of the foremost of these projects currently running is the Khanya project.

This initiative is a pilot project geared towards implementing technology in under-resourced schools for curriculum development and delivery. By 2012, this project aims to have reached every educator in the Western Cape, and empowered them with skills and knowledge to integrate technology into their curricula (Khanya, 2005).

## **2.3 ADOPTION FACTORS AND THE THEORY OF PLANNED BEHAVIOUR**

Jones (2004) structured adoption factors along two levels: school and educator. School-level factors relate to external factors that contribute to the success or failure of a project, such as leadership, infrastructure and cost. Educator-level factors pertain to the educator's understanding, skill and perception of ICT in the school system. Training is determined to be critical in managing educator-level adoption issues.

The Theory of Planned Behaviour (TPB) offers a model to explain the relationship between the adoption factors identified above and how they influence an educator's decision to use ICTs for teaching. The mapping of the factors onto this model will create a holistic understanding of the context within which teachers' concerns lie and how they may be inhibited or facilitated.

TPB attempts to describe elements of the decision making process a person undergoes when deciding to perform a behaviour, in this case the use of ICTs in teaching. According to the model, having the intention to use ICTs in teaching indicates a person's "readiness" to do it. This intention is determined by three main factors:

- attitude towards the behaviour: what the educator requires to develop a positive attitude about the expected outcome of the behaviour
- subjective norm: what the educator requires to experience the correct social pressure to perform the behaviour
- perceived behavioural control: what the educator requires to believe s/he as the ability to perform the behaviour

This model is significant for policy and decision makers to realise the three levels of requirements an educator has before being ready to perform the behaviour. If all of these are addressed sufficiently, the desired outcome, ICT usage in teaching, can be obtained (Aizen, 2000).

## **3 RESEARCH METHODOLOGY**

The following research propositions were tested:

- Teachers to perceive learning and teaching benefits from using ICTs for teaching
- The school-level factors that will inhibit successful ICT implementation include inappropriate decision making processes, unmet technical requirements, high cost of ICTs, lack of security, ineffective resource allocation and lack of technical support
- The obstacles that exist for teachers inhibiting adoption of ICTs in teaching are: lack of understanding the impact of ICTs, lack of ICT skills, inadequate training and insufficient time for preparation.

This research project used a predominantly qualitative research approach to address its research questions and propositions. The nature of this research is one that requires insight and understanding into the respondents' behaviour (Ritchie & Lewis, 2003).

The data collection technique was semi-structured face-to-face interviews with a balance between open and close-ended questions. Two separate interviews were developed: one for the principals and one for the teachers, both with open and close-ended questions.

The sample selected was designed to be purposeful and not representative, to gather the richest data within a convenient location. The sample comprised twenty teachers and six principals from six schools located in the Western Cape Central Educational Management Development Centre (EMDC). Khanya schools were selected to minimise the variability and create a constant factor between schools. The school principal and three to four teachers within each school were interviewed. The subject and grade were not specified, except no technology-related subject teachers were interviewed.

The data was analysed by recording interviewee responses and researcher observations on charts arranged in categories and themes (Ritchie & Lewis, 2003). Patterns were identified by comparing results between respondents, and in particular between and within the emergent segmentation of high and non-high adopters.

## 4 DATA ANALYSIS

Interview codes were developed for each respondent in a system that linked principals and teachers from the same school together. The schools were coded SX where X is a number ranging from 1 to 6. The principal at school SX was coded PX.1, and the teachers from this school were coded TX.Y where Y is a consecutive number assigned to each teacher in the school.

### 4.1 SAMPLE

Overall, six schools were visited and principals were interviewed from each. Within each school, three to four teachers were interviewed making a total of twenty. In two schools, the principals also were teaching and were given both the "teacher" and "principal" interview".

#### 4.1.1 Schools

All schools have at least 1 TV, overhead projector and computer room (the latter of which was supported by Khanya. Three have at least one data projectors and one school has an interactive whiteboard. The computer rooms were all networked internally and had access to the Internet, though S1's had been down for months. No school owned a laptop, PDA or tablet PC. Some schools had access to the DSTV Learning Channel or are waiting for the WCED and Multichoice to install it at their school. The educational software used was mainly *Master Maths* (part of the Khanya project), though mention was made of *Encarta* and *Cami Maths*. Excel is used extensively for teachers' administration, and at S3 *EduMan* is being used for school administration.

### 4.1.2 Principals

Most principals are male between 41-50 years old with 4 – 6 or 8 - 10 years experience as principal. All principals saw value in using ICTs for teaching. Most principals recognised the administrative benefits for teachers, mainly with reference to a reduction in time. Benefits for learners include a better understanding of curriculum and the importance of being exposed to technology.

### 4.1.3 Teachers

There is an almost 50% split between males and females in the sample. Most are between the ages of 31 – 40. All are experienced teachers with a median teaching experience of 14.5 years and all but two teachers having 7 or more years experience. All respondents indicated (to varying degrees) that they would like to and are planning to use ICTs in their teaching. Most teachers have received some level of formal training in the use of ICTs.

Figure 1 is a frequency table of the types of ICTs used for teaching by the respondents. The most commonly used are computers, overhead projectors and TV. The laptop used by one respondent is self-owned. These ICTs are used in four distinctive areas of teaching:

- Administration: record keeping, reports, letters
- Planning: includes preparatory research and any materials that will be given to learners such as tests and worksheets
- Lesson delivery: using ICTs to deliver an educational message to learners
- ICT Assignments: giving tasks that require learners to use ICTs to complete them, includes periods using subject-specific software and research investigations

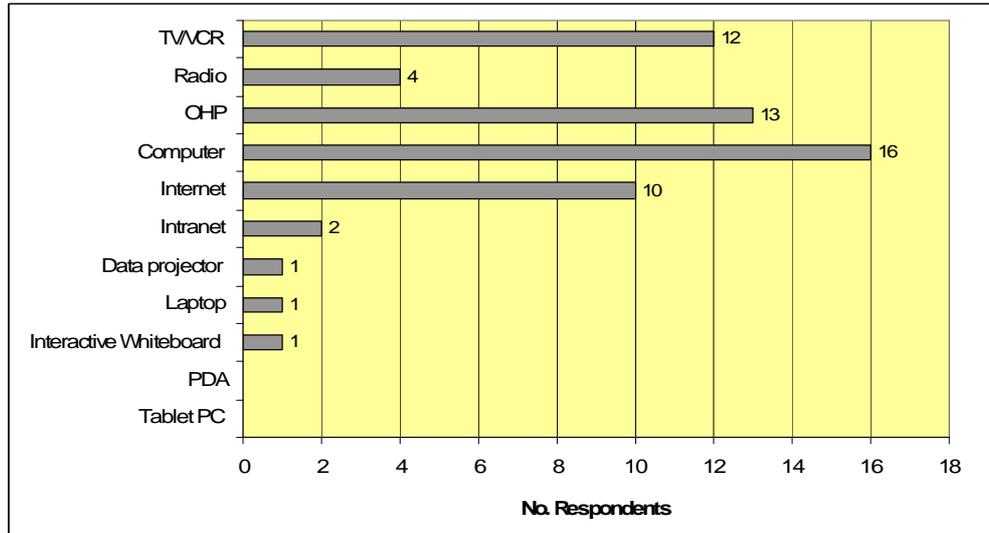


Figure1: ICTs being used by teachers

It became apparent that there is a distinct group of teachers that have incorporated ICTs into all four aspects of their teaching. Thus, a criterion emerged that allowed the researchers to objectively distinguish between “high adopters” and “non-high adopters”, where the former are those teachers that have recognised the different uses of ICTs in teaching, and are actively using technology for all these purposes. There is an even division between gender and language and a wide range of subjects taught, including mathematics, history, geography, biology, English and Afrikaans. Most high adopters are between the ages of 31 – 40, and

have proportionally more years of teaching experience (9-19 years) than non-high adopters (up to 9 years).

## **4.2 ADVANTAGES OF USING ICTS IN TEACHING**

### **4.2.1 Better tools for learning**

Teachers believe that ICTs can contribute to more and better learning by allowing for greater access to the subject and improve the quality of education. Several respondents suggested that this could be attributed to more interactivity and the ability to use multimedia such as sound, pictures and colour to help learners imagine or visualise the subject at hand and further stimulate their creativity.

### **4.2.2 More access to information**

More access to information was a recurrent theme, where respondents felt that this was significant as they were able to use different sources to further students understanding with different explanations or for consolidation.

For teachers, more access to information means that they can better plan for their lessons and improve their understanding by being able to find ideas and information with greater ease.

### **4.2.3 Learner response more conducive to learning**

Increased concentration and attention is an important contribution that ICTs make to the learning process. A widespread perception from respondents is that students are more interested as a result of using ICTs for teaching, and find them to be more willing to participate in class and more motivated to engage with the subject as they are doing something they enjoy.

### **4.2.4 Skills development**

Learners using ICTs for their learning has had a positive impact on the types of skills they have been developing. For example, a number of teachers recognised problem-solving, self-discovery and self-evaluation as key skills developed in learners, which are in line with the goals of the National Education Department's Outcomes-Based Education.

Self-discovery and self-evaluation are developed through learners' having to do their own research or investigations and correct their own mistakes, becoming less dependent on the teacher and rather helping each other.

### **4.2.5 Learners' opportunities**

A dominant theme from both teachers and principals is the importance of computer literacy and giving learners exposure to technology. This is believed to be important mainly for learners' future careers so that they are "marketable" in the workplace.

### **4.2.6 Teaching more interesting**

ICTs give teachers the opportunity to be more creative and vary their methods, moving away from the traditional approach.

Using ICTs for planning gives teachers more time for actual learning in the class by saving the time that teachers and learners normally spend on writing notes.

### **4.2.7 Better class management**

A few teachers identified managing the class and maintaining discipline as an advantage of using ICTs for teaching. For example, making eye-contact and facing the class allows for better control especially when dealing with large class sizes.

#### **4.2.8 Improved administration**

All aspects of administration have been positively affected by ICTs, in particular the computer, according to both teachers and principals. Time is saved doing administration, for example calculating totals and averages for learners' marks. Neater and better organisation of administration is a further positive outcome of using ICTs.

### **4.3 DISADVANTAGES OF USING ICTS IN TEACHING**

#### **4.3.1 Time**

In certain circumstances, using ICTs resulted in time inefficiencies for teachers. More time needed for preparation was raised the most.

A couple of teachers acknowledged that this preparation time may be "once-off", if they are able to reuse or recall material for future lessons.

In class, learner computer illiteracy could prevent lesson progression as the learners may show disinterest and "fiddle around because they don't know what to do". Slow Internet connections could result in further time wastage.

#### **4.3.2 Inappropriate use**

The rare respondents who expressed inappropriate use of technologies by teachers were concerned that teachers could "sit back" and not direct the class sufficiently to achieve their desired outcomes, or they could use ICTs to avoid teaching if they were feeling "lazy". Inappropriate use could also stem from learners by accessing inappropriate content on the Internet or resorting to taking "shortcuts" on assignments through plagiarism.

#### **4.3.3 Learners' literacy**

T3.3 and T2.2 discussed how learners' not reading novels, or the lack of a reading culture, is a negative effect of ICTs. According to T3.3, language problems have resulted, as learners have started to write essays like they would a text message via the short message service (SMS).

#### **4.3.4 Attention only for technology**

T5.2 described one effect of exposure to ICTs is that when learners are in a class when he is not using technology, he feels he has to "win the crowd" as they no longer want to concentrate when technology is not being used.

#### **4.3.5 Inflexibility of software**

T3.4, a maths teacher, expressed frustration at the inflexibility of the maths software she is using, because the class cannot skip through repetitive examples if she wishes.

### **4.4 CRITICAL ADOPTION FACTORS**

The critical adoption factors are those aspects of an ICT intervention that have been identified by respondents as the most influential and important determinants of their ICT usage. The following section explains how the researchers identified these critical factors from the interviewees' responses. Grouped as "school-level" or "educator-level", the factors are described based on how teachers experience them, using both the qualitative and quantitative responses. Particular attention is given to the differences between the experiences of high and non-high adopters.

#### **4.4.1 Selection Criteria**

The correct identification of the critical adoption factors is pivotal in this paper, for they form the basis of the critical success factors. A factor was considered critical if it was mentioned spontaneously i.e. not part of a prompted question, was rated as important to respondents and mentioned by teachers from at least 3 different schools. Four school-level critical adoption factors and three educator-level critical adoption factors were identified.

#### **4.4.2 School-Level Critical Adoption Factors**

##### **Accessibility of ICTs**

Access to the computer rooms for the whole class is often managed using a formal timetable system. The rest of the ICTs in the school are usually allocated according to a booking system or on a first come first serve basis. Access is relatively easier for those teachers whose subjects were given priority for ICT usage, such as mathematics or English, or when teachers own their own computer.

##### **Lack of resources**

Teachers and principals alike expressed the need for more resources such as computers, interactive whiteboards, better Internet access, and access to more educational software for different subjects. With class sizes reaching up to sixty learners, and averaging in the upper forties, teachers felt learners could not experience the true benefit of ICTs, for example by not being able to see the television or by fighting over computers.

In some schools equipment had been purchased, but due to absence of parts or materials needed to use the equipment (such as transparencies, blinds to block out the light, materials for television), they were not being used. Lack of financial resources is the underlying factor that contributes to these equipment resource problems. Specific cost burdens mentioned were printing, software and the Internet connection.

##### **Technical Support**

A dominant theme expressed by both teachers and principals was dissatisfaction with technical support and the indefinite time it could take for external technicians to fix the problem. At the time of the interviews, two schools were involved with technical problems that had been ongoing for months – one had not had Internet access “since last year” and the other was having problems contacting their service providers to deal with the issues.

##### **Influence of Educational Leaders**

The educational leaders that have influence over teachers are the WCED and subject advisors, the principal and the head of department, and the Khanya project facilitators. The vast majority of teachers felt that there was some form of expectation for them to use ICTs in their teaching, communicated directly or implicitly by the educational leaders. Direct communications include signing an agreement with Khanya or come teachers perceiving that the WCED requires teachers to type assessment reports at year-end. Implicit communications were experienced when the principal encouraged use of ICTs by making the facilities available in the school, or through WCED workshops that use ICTs for demonstrations.

For the teachers who did not feel there was expectation, this non-expectation could have been communicated through not being included or prioritised in the timetable for ICT usage, or just that a direct message had not been given.

#### **4.4.3 Educator-Level Critical Adoption Factors**

##### **Internal belief and motivation**

Numerous teachers both high and non-high adopters, recognised the existence of a prevailing personal belief in ICT's positive impact or a general interest in technology as a key motivator for their use of ICTs in teaching. The relevance of ICTs in these teachers' personal and teaching lives was widespread amongst them.

The positive impact is not restricted to learning, but also to the learners' response. Some expressed their interest in technology by being part of a "computer club" or by educating themselves to further expand their own knowledge and skill as a teacher.

### **Adequate Knowledge**

Having the skills to use ICTs was a dominant theme voiced by both teachers and principals. Principals commented that they felt the teachers were not competent enough or were not computer literate. The teachers themselves did not always agree with the principals' assessments of their abilities. In fact, it was from the two schools (S4 and S6) where the principals did not mention ICT skills problems, that the most teachers discussed how they felt ill-equipped and unskilled.

Having a good understanding of how a technology works and how it can be incorporated was repeatedly expressed. Other teachers choose not to use OHPs and the interactive whiteboard because it would result in "more passive learning" and would require the teacher to turn his/her back to the learners, respectively.

P4.1 and P5.1 are both aware that teachers may feel fear from using technology, by feeling threatened that their learners may know more or that their ignorance will be discovered.

A time when ignorance is most at risk of being revealed is when a technology malfunctions, an occurrence that was rarely mentioned, but, as was stated, could result in embarrassment. The solutions offered by teachers to deal with this vulnerability are to either improvise for the rest of the lesson that has been disrupted by technical failure, or perform comprehensive checks of the equipment prior to the lesson.

The training teachers have received focuses mostly on basic computer literacy (through Khanya), with some teachers receiving subject-specific training at WCED workshops or the Universities of Cape Town or Stellenbosch.

The response to this training is generally positive. Teachers feel that training has empowered them to use technology, making their jobs much easier. The teachers that disagreed with this statement felt that training needs to be ongoing as technology changes, and to equip teachers to cope with changing syllabi, for example the new Geographic Information System (GIS) component in the geography syllabus.

The ICDL certification is currently being offered to teachers, sponsored by the WCED, in an attempt to increase computer literacy among teachers.

### **Time**

The time-consuming nature of moving equipment around the school or moving the class to the equipment was discussed as a factor that dissuaded teachers from using ICTs in their classes, given the time constraints of each period. This was particularly prominent in schools that either did not have the resources to supply each class with a TV or OHP, or where teachers did not have their own classrooms and safety of the equipment prohibited it from being left in the classroom.

In terms of time needed for preparation of teaching using ICTs, most respondents felt that they were generally under time pressure, and preparing lessons using ICTs did not add to this. Factors impacting teachers' time pressure include WCED meetings, extra-mural

activities to coordinate or personal responsibilities, often preventing teachers from spending time after school using the computer rooms.

## **5 IMPLICATIONS**

In this section, the seemingly disparate critical adoption factors identified above are integrated into the Theory of Planned Behaviour and evolve into the Critical Success Factors for ICT interventions in Western Cape Schools.

### **5.1 ATTITUDE TOWARD USING ICTS IN TEACHING**

#### **5.1.1 Ensure that all teachers have developed strong beliefs in the positive impact of ICTs for teaching**

The key determinant of the Attitude construct is “behavioural beliefs”: those beliefs that teachers have about the outcome of teaching using ICTs. The range of advantages that teachers in Western Cape schools identified for using ICTs is very similar to that which was found in the literature. Finding relevance of ICTs in personal and professional capacities appears to be important for teachers to feel internally motivated to use and extend their ICT abilities.

The data suggested that this sense of relevance may also be affected by the career phase within which the teacher is found. For teachers that are nearing the end of their teaching careers, they appear to find minimal personal or professional benefit in ICTs. This relationship between career phase and relevance was not addressed in the literature.

Interestingly, some potentially negative aspects emerged. For example, the emphasis on the technology-based society has led to deterioration in learners’ language and is not developing a culture of reading books amongst youth. Additionally, the full benefit of using technology in lessons may not be realised due to computer illiterate learners losing interest or slow Internet connections. Further, a balance of learners’ interest needs to be found that will ensure that they are not interested only in ICT-enhanced lessons – particularly poignant in schools where resources are scarce and their use could be infrequent. Access to ICTs can also have a negative effect on the teacher who could exploit their use to avoid teaching, or their use can diminish the learning process by the difficulty of adapting technologies for appropriate lessons.

According to the Theory of Planned Behaviour, the overwhelmingly strong positive attitude has led all teachers interviewed to use ICTs in their teaching to some extent. However, the data analysis did not reveal a significant distinction between the types of beliefs held by high and non-high adopters. Thus, this CSF is a requirement to enable any level of usage by teachers in Western Cape schools.

### **5.2 SUBJECTIVE NORM**

#### **5.2.1 All educational leaders must give a strong, clear and measurable message that encourages and requires the use of ICTs**

The influence of educational leaders was not adequately emphasised in the literature to fully support the primary data. The respondents appear to be greatly influenced by the demands and expectations made on them not just from the principal, but also from the WCED and Khanya. It is these demands and expectations that are critical in forming the Subjective Norm construct.

For educational leaders, this means that the messages they communication play a large role in the adoption of ICTs in schools. Perhaps more important to note is that the lack of communication also plays a significant role impacting on teachers' usage. In an environment where teachers are not aware of facilities and there are no perceived expectations, they may not have the internal motivation to take ownership of their usage. This phenomenon was demonstrated in the data analysis with non-high adopters experiencing less expectation than high adopters. According to the Theory of Planned Behaviour, this is indicative of the importance of the subjective norm in influencing a teacher to "highly adopt" ICTs for teaching.

### **5.3 PERCEIVED BEHAVIOURAL CONTROL**

The most significant factors impacting the interviewees' perception of their ability to teach using ICTs are access, resources, skills and understanding, technical support and the availability of time. The three factors where high and non-high adopters demonstrated the most significant difference in perception are access, skills and understanding, and technical support. Thus, these three control factors will lead to a high level of adoption.

#### **5.3.1 Ensure all teachers have adequate access to ICT facilities before, during and after school hours**

The literature describes resource allocation as providing teachers with the right equipment at the right time in the right amount, and suggests using a timetable system to allocate ICTs. The data agrees with this suggestion and further adds that the school needs more than one person supervising the ICTs in such a way that teachers and learners can easily find this person and access ICTs when they desire. It is not surprising that significantly more high adopters find it easier to access ICTs, indicative that less adoption is a direct consequence of the perception that ICTs are not within reach.

#### **5.3.2 Ensure teachers are trained to be skilled ICT users, confident in their adoption of ICTs in all aspects of teaching**

Inadequate training or a lack of understanding of how to use or incorporate a particular technology has shown to result in non-utilisation of ICTs both in the primary and secondary data. It is interesting to note that high adopters gained confidence through actual usage whereas non-high adopters gained it through training. This shows a direct relationship between the level of confidence and usage, alluded to in the literature.

The fundamental role of education department training was not emphasised in the literature, but for the teachers interviewed there exists an expectation that WCED should provide more regular training on changing curriculum, given within an appropriate timeframe at a convenient location. The DoE ostensibly has the right aims for training programs, but the primary data suggests that these aims are not being realised in the Western Cape, particularly since *the Educators' Network* and *Intel Teach to the Future* training programs were not mentioned.

#### **5.3.3 Ensure technical support is available on a timely basis**

The literature discusses the importance of technical support and the urgency of solving problems. This is wholly supported by the data, which discusses this with respect to the computer room facilities. While there are cost implications for hiring or training specialised support, both the primary and secondary data suggests that this is crucial, as the schools that are dependent on a single external service provider are suffering from insufficient technical support which is negatively affecting ICT usage. The apparent miscommunication between

S5's principal and teachers is important to note, as it suggests that effective technical support feedback channels must be in place to fully satisfy the needs for support.

#### **5.3.4 Ensure that all existing resources are able to be used**

The primary data explains a need for more equipment in the school, better management of existing resources to ensure parts and materials are adequately supplied, and the need for curriculum materials. The underlying issue for well-supplied equipment resources is the cost. In the Western Cape, ICT interventions in schools are becoming more regular with projects run from organisations such as Khanya. This existing project infrastructure, with help from the private sector, should be able to respond to this cry for help from schools, as the Department of Education suggests. The e-Rate, if it has been implemented in these schools, does not appear to be making a significant difference in the cost of Internet usage for school.

#### **5.3.5 Ensure all areas where time taken setting up an ICT-enhanced lesson is minimised**

There are two time elements included in the data analysis: one that is considered a disadvantage, and one that is considered a disabler. This distinction is important when determining which one impacts a teacher's utility of ICTs. The literature discussed time for preparation of technology-enhanced lessons as a disabler, whereas the primary data considered this just a disadvantage (and one that may be temporary). There was no indication from the primary data that teachers refrained from using ICTs due to the perceived increased preparation time. The true time disabler for Western Cape teachers was not addressed in the literature at all: the time taken to move equipment to the class or vice versa – often as a result of the need to keep equipment in a centralised storage area for protection.

This indicates that fore-scheduling of ICT-enhanced lessons and easier mobility are enablers for usage. Fore-scheduling will minimise the time taken to move the class to the technology, as they will already know of the venue change. Just as the literature discussed the concept of “computer-on-wheels”, Western Cape schools require TV and OHP's on wheels, such that no setup time is required. To be most effective, each floor of the school building will require its own “Technology-on-Wheels”.

## **6 CONCLUSION & RECOMMENDATIONS FOR FUTURE RESEARCH**

The purpose of this research project was to identify the critical success factors for ICT interventions in Western Cape schools: those few key things that have to be done correctly to create a high level of adoption amongst teachers. The Theory of Planned Behaviour was the model used to understand the different sets of teacher beliefs and perceptions relevant to making the decision to use ICTs in teaching. Significantly the critical success factors identified fully align with this model. Together the model and the CSFs inform a compelling set of critical activities that must be fulfilled in order for the ICT intervention to be successful and result in a high level of adoption.

Teachers need to find the relevance of ICTs in their personal and professional capacities to develop the motivation to use ICTs in their teaching. This relevance is found as their use of ICTs is reinforced by positive outcomes for themselves and from the learners. They need to experience the multitude of benefits cited in this paper.

Teachers need unambiguous communication that supports and encourages their use of ICTs. This communication needs to be in the form of regular direct messages and leadership by example, to envelop the educator in a culture of ICT acceptance and expectation. This

communication must come from the school leadership, the WCED and the ICT intervention project facilitators. The more effective this communication, the higher the level of the adoption will be.

Finally, teachers need to have and perceive they have the skills and resources at their disposal to successfully use ICTs in their teaching. The skills need to be developed from a combination of comprehensive training and experience. The equipment resources must be accessible, easy to set up and relentlessly maintained. The support must be responsive and available.

The analysis also raises some recommendations for future research. While teachers have expressed an expectation that WCED provides them with the training they require, the majority of teachers were not aware of the resources that were available to them. Additionally, many suggestions for training were found in the research. The extent that these are realistic and required needs to be explored to recommend changes and additions to the existing programs. Also, the schools in our research came from urban areas only, but the Western Cape has many schools in the rural regions where similar ICT interventions are being managed. For overall success in project implementations in the entire Western Cape, the CSFs identified in this paper need to be confirmed or changed for the rural schools.

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