

# The Reality of ICT Integration in Schools of Specialisation- Gauteng Province (South Africa)

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**ABSTRACT :** Gauteng Department of Education in collaboration with Matthew Goniwe School of Leadership and Governance (MGSLG) embarked on a journey of implementing Information and Communication Technology (ICT) integration in 114 Gauteng province schools. Of these, 17 are Schools of Specialisation. This paper analysed the challenges and successes of ICT integration in 15 Schools of Specialisation that were purposively sampled for this research. Technology Acceptance Model2 (TAM2) model was used to understand the factors affecting the Perceived Use and Ease of Use of ICT tools in teaching and learning. It was observed that there was a correlation between the number of teachers who attended training workshops organised by the ICT Facilitators and the number of teachers who went on to use ICTs in teaching and learning. This is an indication that teachers are now adopting ICTs. What can be debated further is whether ICTs are being used effectively to assist teaching and learning processes. The major handicap is the provision of ICT resources in schools. Gauteng Department of Education (GDE) should make it a priority that schools get the required resources in time. However, (School Governing Bodies (SGBs) can be encouraged to purchase ICT devices for their schools to cover the gap left by GDE.

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## 1. Introduction

The paper outlines teachers' pedagogical practices and how they have successfully adopted ICTs. Challenges in integrating ICT into teaching and learning are highlighted for future redress. To fully comprehend the challenges and successes of ICT integration in pedagogical practices, Gauteng Department of Education identified 114 schools across Gauteng and assigned Matthew Goniwe School of Leadership and Governance (MGSLG) to offer ICT integration training and on-site support to teachers. Among the 114 schools are the Schools of Specialisation which have been studied for this research.

### Problem Statement

ICT use in education has increased in the past years within the South African education system with the adoption of the e-White Paper on Education in 2003. Guided by this national policy, Gauteng Department of Education (GDE) has come up with a 2015-2020 Strategic Plan on ICT Integration. From the inception of the ICT project, it has been faced with challenges and successes that are not yet well documented. This paper seeks to identify the internal and external factors imparting positively and negatively on ICT integration initiatives in Schools of Specialization in Gauteng province.

**Objectives:**

- To identify successes of school-based ICT training initiatives in Schools of Specialisation in Gauteng Province.
- To identify challenges of the school-based ICT training initiatives.
- Find out how the challenges can be resolved to improve ICT integration in schools.

**Research Questions**

- What are the successes that have been noted in the ICT program?
- What are the challenges that hinder the successful implementation of the ICT program?
- How can the challenges of ICT integration be resolved?

**Anticipated Contribution of the Study to the Discipline of ICT in Education**

Gauteng Department of Education (GDE) has invested huge amounts of funds in its attempt to turn classrooms into paperless environments where ICTs are used effectively to improve teaching pedagogy and student outcomes. This study highlights challenges that are slowing down the pace of ICT uptake, with the hope that if the challenges are resolved, then teachers will successfully integrate ICTs into teaching and learning. Apart from highlighting the challenges, the paper makes suggestions on how to improve the implementation of the project. Successes have been identified and highlighted to showcase good practices that can be emulated by other schools.

## 2. Literature Review and Theoretical Framework

**Conceptual Framework**

To assist in understanding better adoption of ICTs in schools, conceptual frameworks are used in this study. Technology Acceptance Model2 (TAM2) developed by Venkatesh & Davis (2000, p188) was used to discuss managerial perspectives in technology planning in schools. This is an extension of TAM model, which is based on Fishbein & Ajzen's Theory of Reasoned Action (TRA) (Fishbein & Ajzen, 2010). TAM model shows that an individual's behavioural intention to use technology is determined by two main constructs, that is, *perceived usefulness (PU)*, which refers to the extent to which one believes that using the technology enhances one's job performance, and *perceived ease of use (PEOU)*, which refers to the extent to which one believes that using the technology will be free of effort (Venkatesh & Davis, 2000). Of these constructs that determine the uptake of technology by people, Venkatesh & Davis (2000:187) stress that, "Across the many empirical tests of TAM, perceived usefulness has consistently been a strong determinant of usage intentions, with standardized regression coefficients typically around 0.6". This suggests that if teachers perceive that technology is highly likely to improve their teaching strategies or to make their workload lighter, they are likely to adopt the use of technology in class teaching and administrative work. The other two constructs are; *intention to use* and *usage behaviour*. When a teacher perceives that technology is *easy to use* and that it is useful for one's work, then the teacher expresses an intention to use it, which can ultimately lead to *usage behaviour* as the teacher attempts to use ICTs in teaching. However, although TAM proved useful in predicting behaviour intent, it has been criticized for not incorporating social factors that may also have some influence on one's behavioural intent. Behavioural intent implies the strength of a potential technology user's intention to employ a certain behaviour (Zaremohzzabieh, 2015). So, TAM was further developed to TAM2 to cover that gap.

TAM2 model examines both the external and internal factors that contribute to the successful implementation of ICT tools in teaching and learning. The model explains perceived usefulness and usage intentions in terms of *social influence* and *cognitive instrumental processes* (Venkatesh & Davis, 2000), which makes it an improvement on TAM. Venkatesh & Davis (2000, p186) clarify that, "Both social influence processes (subjective norm, voluntariness, and image) and cognitive instrumental processes (job relevance, output quality, result demonstrability, and perceived ease of use) significantly influenced user acceptance". Social

influence can shape a person's behaviour since one might be motivated to achieve a goal just because society believes one's capability (subjective norm). There are cases where potential adopters perceive that the adoption decision is non-mandatory (voluntariness) (Agarwal & Prasad, 1997, Hartwick & Barki, 1994, Moore & Benbasat, 1991, as cited by Venkatesh & Davis, 2000). The third social influence entails maintaining or establishing a favourable image (Kelman, 1958, as cited by Venkatesh & Davis 2000). Apart from these *social influence processes* that have been discussed, Venkatesh & Davis (2000) theorise four *cognitive instrumental processes*. Firstly, whether the suggested system of operation is applicable of matching one's job goals (job relevance). Secondly, how well the new system helps to perform tasks (out-put quality). Thirdly, how clearly the new system demonstrates its efficient and effective attributes (result demonstrability). Lastly, how the system can be used effortlessly (perceived ease of use). So, *social influence processes* and *cognitive instrumental processes* have an influence in determining technology uptake by potential users. The rest of the constructs form the original TAM model and have been discussed earlier on. This is the theoretical framework that has been used to guide this research paper.

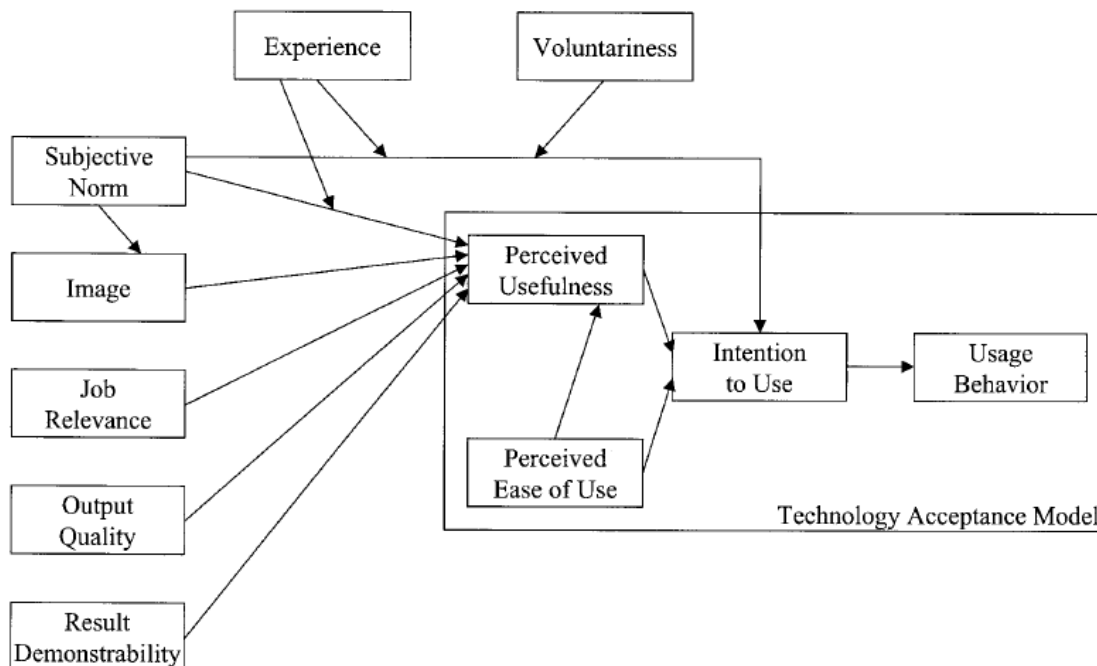
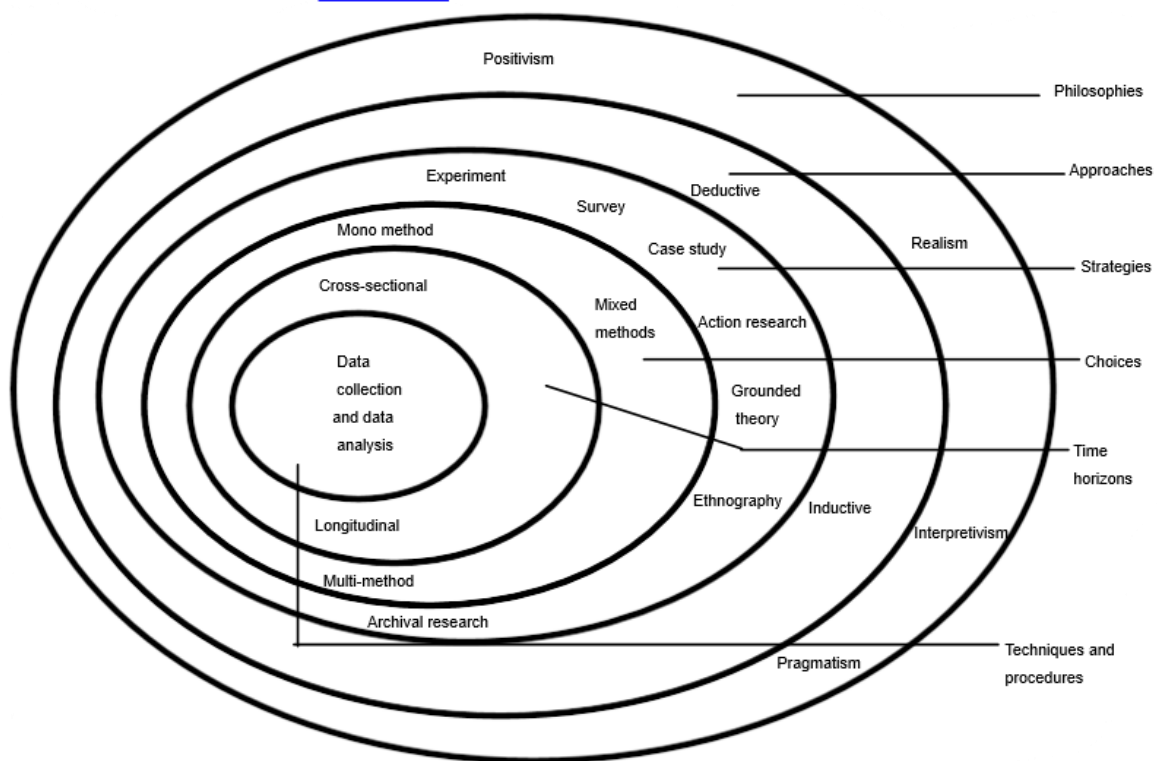


Fig1:TAM2 Model- Extension of Technology Acceptance Model (TAM) by Venkatesh & Davis 2000

External factors that we examined are *training* conducted by ICT Facilitators, since this is likely to determine *output quality and result demonstrability*, school environment, which includes School Management Team (SMT) support, the policies surrounding the ICT implementation (which highlight the *job relevance* of technology adoption) and availability of ICT *infrastructure* and devices such as laptops, data projectors, SMART Boards, as this has an impact on *perceived ease of use* of technology due to exposure. Internal factors which are teacher centred involve *teacher confidence, attitude* (as shown by the teacher's willingness to attend training workshops) and *computer literacy*. So, external and internal factors can either affect positively or negatively on how a teacher perceives the Ease of Use (PEOU) and perceived usefulness (PU) of the ICT tools. Depending on how the teacher perceives the ICT tools as an aid or disrupter to teaching and learning, the teacher either adopts the ICT tools for teaching and learning or disregard them. A research design has been adopted to test this model in Schools of Specialisation (SoS).

## Research Design



The research 'onion': Source: Mark Saunders, Philip Lewis & Adrian Thornhill 2019

Saunders et al (2019) developed the concept of the 'onion' to assist in highlighting important aspects of a research design. They view a research process like peeling an onion, whereby a researcher starts by working on the outer layer that represents the choice of the research philosophy, followed by the choice of research approach, then strategies, research choices, time horizon and lastly, techniques and procedures, in that order. The research philosophy that was adopted for this study is epistemology as opposed to ontology. According to Saunders et al (2019), epistemology refers to what constitutes acceptable knowledge in a study. It has important aspects worth noting; that is, positivism and interpretivism, realism and pragmatism, whereas ontology highlights the nature of reality through objective (referred to as objectivism) or subjective (referred to as subjectivism) lenses. Remenyi et al (1998) as cited by Saunders et al (2019) assert that if one's research reflects a philosophy of positivism, (like this research in question), that implies one prefers to work with observable social reality resulting in law-like generalisations like those produced by physical and natural scientists. An approach to handle this positivist philosophical stance was adopted.

The next inner layer after peeling off the first layer 'philosophy' deals with approaches to be employed in research. A choice between two is given, that is, deductive and inductive approaches. According to Saunders et al (2019), a deductive approach entails developing a hypothesis or theory then designing a strategy to test the theory. Efforts are made to deduce causal relationships among variables under study. Inductive approach entails collecting data to develop a theory. In this research study, the deductive approach was used to test TAM2 model in a new context (African specialised schools, for example, SoS) with prospects of engineering development of a new ICT framework. Suitable strategies were adopted in order to support this deductive approach.

The strategy that was used for this research study was the survey strategy. Other strategies that are at the disposal of the researcher are; experiment, case-study, action research, grounded theory and ethnography. Surveys measure some aspect of social phenomenon or trend and facts are collected to test a theory or hypothesis (Denscombe, 2010). The goal of survey research is to collect data representative of a population.

The researcher uses information collected from the survey to generalize findings from a given sample, within the limits of random error (Bartlett, Kotrlik & Higgins, 2001). The survey strategy was preferred because, as Saunders et al (2019) put it, enables the researcher to collect quantitative data, which can be analysed quantitatively with the aid of descriptive and inferential statistics in order to assist in getting possible reasons for relationships between variables.

The choice of a mono-method was made after peeling off the third layer of research strategies as opposed to mixed methods or multi-method. The methods to be used can be quantitative or qualitative. Quantitative methods are concerned with objectivity and involve gathering and analysis of quantitative data, whereas qualitative methods refer to data gathering techniques (such as questionnaire) and data analysis procedures (such as categorising data) that generate non-numeric data (Saunders, 2019), (Queiros, Faria & Almeida, 2017). The method that was used to collect data in this research paper was qualitative, since the researchers used document analysis tools. This type of research did not take long because of financial and time constraints. So, a suitable time horizon was chosen.

A suitable time horizon was selected based on the resources available. Time horizon can either be longitudinal or cross-sectional. According to Saunders et al (2019), "The 'snapshot' time horizon is what we call here cross-sectional while the 'diary' perspective we call longitudinal". So, cross-sectional research is undertaken to study phenomena at a given time period or for a short duration unlike longitudinal research that stretches for a long period of time. The cross-sectional time horizon was ideal for this research due to time and resources constraints. Techniques and procedures are at the heart of the onion.

The techniques and procedures of conducting research involve data gathering and analysis. The data collection technique that was used by the researchers were examination of documents (in the form of ICT training weekly and monthly reports, close-out reports, trainee workshop evaluation forms) and unstructured interviews with ICT Facilitators. School based ICT Facilitators were interviewed to get their perspective on ICT integration. Since the research took a deductive approach, data was analysed with reference to the theory that was being tested, that is, TAM2 model. The research design was also influenced by information from literature on ICT that was reviewed.

## **Related Literature**

### **Variables that Determine ICT Integration in Education**

Several variables are at play when it comes to ICT integration and these variables help determine the success and failure of ICT programmes. Jamieson-Proctor, et al. (2006) identify the following as determinants of teacher engagement with ICT: (1) Confidence, time and access to quality resources; (2) Technical faults affecting teachers' confidence in technology; (3) Resistance to Change. Some teachers usually resist any type of change because it deskills them. Roblyer (1993, as cited by Lim & Khine, 2006) notes that a teacher's vision of the use of technology to improve his/her classroom practices determines the extent and effectiveness of ICT integration in the classroom. (4) The quality of training availed to the teachers will affect ICT uptake by the teachers. Finally, the other determinant that is important to note is the attitude and involvement of the school leadership, usually referred to as the School Management Team (SMT). These aspects may determine the success or failure of ICT integration efforts in schools.

### **Benefits/Successes of ICT Integration**

ICTs have benefits that are worth taking note of as enunciated in the e-Education White Paper in which it proposes the use of ICTs in education not only to teach students how to use technological devices, but ICTs being used as important tools for teaching and learning, that is ICT/ subject integration in class. Habib, Al-Mamun & Clement (2012) note that ICT provides opportunities for teachers and students to operate, store, manipulate and apply higher order thinking. They further postulate that ICT teaching and learning, motivate teachers and students to continue learning even beyond and outside school hours, when teachers plan and prepare lessons, design materials and facilitate sharing of resources, expertise and advice.

The use of ICT as a medium for teaching and learning; focuses on the use of ICT for the enhancement of the teaching and learning process. Kennwell (2014, p8) asserts that the use of computers can help students to become knowledgeable, reduce the amount of direct instruction given to them, and give teachers an opportunity to help those students with special needs. It can help the teachers enhance their pedagogical practice and equip them with the knowledge and skills to use different computer technologies to access, analyse, interpret process and disseminate information to learners. For administration, computers have cut down on paper expenditure in both the schools and the Department of Basic Education (DBE) since communication is now done via e-mail, thus alleviating pressure on teachers and administrative staff (Karsenti, Collin & Harper-Merrett, 2012). Paperwork is also saved when teachers reduce photocopying and printing of class tasks and tests and replacing them with e-tests or assessments and e-tasks that can be marked instantly by the computer, thereby giving learners immediate feedback.

### **Challenges of ICT Integration**

Information and Communication Technology (ICT) in education faces some challenges in ICT integration just like other developing countries. Kennwell (2014, p4) points out some of the challenges related especially to the use of the Interactive White Board (IWB) by saying "However, some negative factors emerged, including lack of adequate training and support, and practical difficulties with equipment and its use in settings not designed for the purpose." If the ICT devices malfunction most of the time, the teacher and students become frustrated, thereby viewing the devices as difficult to use and not fit for purpose. Bingimlas (2009), highlights other challenges by saying, "Since confidence, competency and accessibility have been found to be critical components of technology integration in schools, ICT resources including software and hardware, effective professional development, sufficient time, and technical support need to be provided to teachers". Data collected (in their South African study) suggests that schools understudy perceived the main challenge as lack of adequate finance to ensure that learners and educators have sufficient exposure to computers to afford them the effectiveness they need to integrate ICT into teaching or learning (Karsenti, Collin & Harper-Merrett (2012). Pelgram (2001, p173) listed the following as barriers: Insufficient number of computers, teachers' lack of knowledge/skills, insufficient teacher time, lack of technical staff, not enough training opportunities and outdated local school network, among other barriers.

These barriers to ICT integration have been categorised by authors like Etmer (1999, as cited by Bingimlas, 2009) into two, that is, extrinsic and intrinsic barriers. Extrinsic barriers refer to barriers such as resources, teacher support, time and training, whereas intrinsic barriers include attitudes, practices, beliefs and resistance (Etmer, 1999, as cited by Bingimlas 2009). So, as a result of these challenges, little change has taken place regarding the way teachers teach in ICT-mediated classrooms as compared to traditional ones (Lima & Khine, 2006). So, for ICT integration to take place, extrinsic and intrinsic barriers should be addressed otherwise ICT programmes remain pipe dreams.

### **MGSLG/GDE ICT Intervention Program**

When GDE initiated the ICT integration programme, it was guided by the White Paper on e-Education (2003) and its aim is to accelerate the use of ICT in schools as a resource for teaching, learning and school management. The goals of South Africa's e-Education White paper were for every school learner in the country to be ICT capable by 2013 and for teachers to use information and communication technology (ICT) to enhance teaching and learning. There was indeed a need to depart from the traditional teaching practices of chalk and talk. Teachers whose schools received ICT devices and infrastructure were expected to carryout ICT integration in teaching.

To assist teachers to carry out this pedagogical shift from the norm, MGSLG deployed school-based ICT Facilitators to provide the necessary training and support. The facilitators are expected to use the 10-20-70 model approach to the training and support initiatives. Ten percent of the time is spent on theory, 20 percent comprises practice sessions on the theory learnt, and then 70 percent of the time is classroom practice, whereby the theory and skills learnt are put into practice in a class situation. The research study assessed how

far this intervention assisted in the adoption of the new technology, by using a number of data gathering techniques.

### **3. Research Methodology**

#### **Data Collection Techniques:**

This study was aimed at identifying the challenges and successes of the ICT programme in Gauteng province's Schools of Specialisation. Data was collected using secondary data collection techniques. It involves summary, collation and synthesis of available data. This type of research is classified as historical research. ICT Facilitators have collected a lot of data in the field on this topic. They recorded the data on weekly training feedback reports, participant training evaluation reports and self-evaluation reports. Data for Quarter 2 Week 12 to 22 was used for the research. In addition to this data source, school-based ICT Facilitators were interviewed to get their opinions on ICT integration in the schools they supported.

#### **Sampling Techniques**

Purposive sampling was used to select the schools to be studied. The population comprised 112 ICT schools and 4 858 teachers located in 15 districts of the province. Of these schools, only Schools of Specialization (SoS) were targeted. The total number of SoS is 17; however, 15 schools were purposefully selected for this study. The areas of specialization were: a) Engineering (Aviation, Maritime, Agriculture) b) Creative and Performing Arts c) Mathematics, Science and ICT d) Sports e) Commerce, Hospitality and entrepreneurship.

#### **Data Presentation and Interpretation**

For data presentation, frequency distribution tables and histograms were used to display quantitative data. Both quantitative and qualitative research techniques were used to analyze data. Quantitative research involves measuring quantities of amounts. It is suitable for phenomena that can be counted, where's qualitative techniques deal with phenomena that has a quality value.

#### **Data Analysis Tools**

Both descriptive and inferential statistical methods were used to analyze data to get answers for the research questions. Inferential statistics such as Pearson Correlation Coefficient test was used to analyze the relationship between teacher attendance in group training workshops and ICT usage in class. A measure of dispersion – Standard Deviation was used to check the variance on the number of training workshops undertaken by various ICT Facilitators.

#### **Workshop Attendance Vs ICT Usage in Class**

- Were teachers able to apply the new skills and knowledge in a class teaching learning situation?

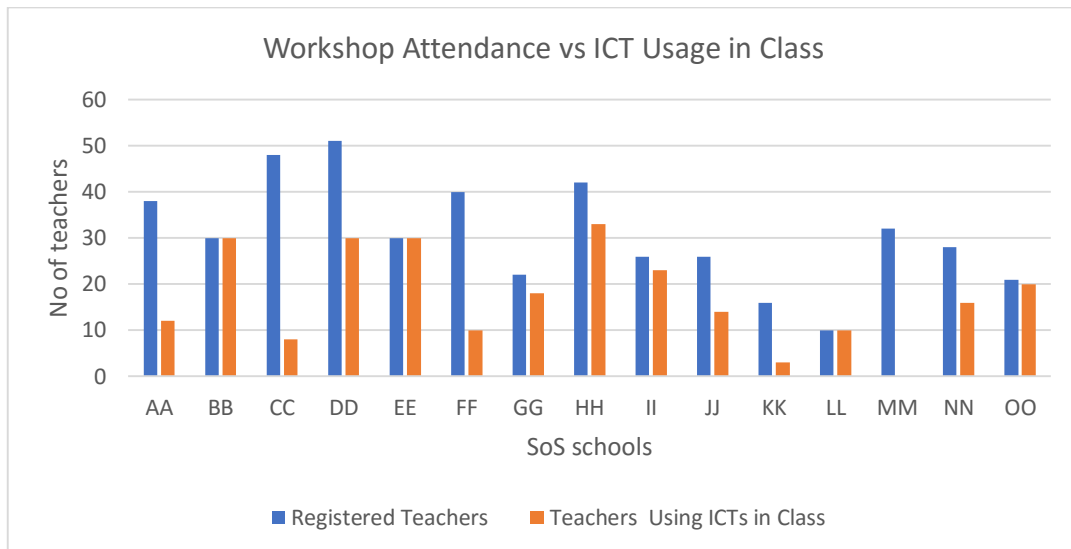


Figure 1: Workshop Attendance vs ICT Usage in Class

The comparison (Figure1) gives a positive outlook on the willingness by teachers to adopt ICT in teaching. Clearly, 10 out of the 15 of the schools indicate that where teachers registered and attended ICT teacher development training, the same teachers or slightly less proceeded to use ICTs in class. This positive attitude can be attributed to both external and internal factors to ICT usage as highlighted by TAM2 theoretical framework. The schools that show a comparatively low ICT usage after training were; AA, CC, FF, KK and MM. Possible reasons for this scenario are clear from Table1 below and will be analysed in this report.

**Correlation between ICT Training attendance and ICT usage in class.**

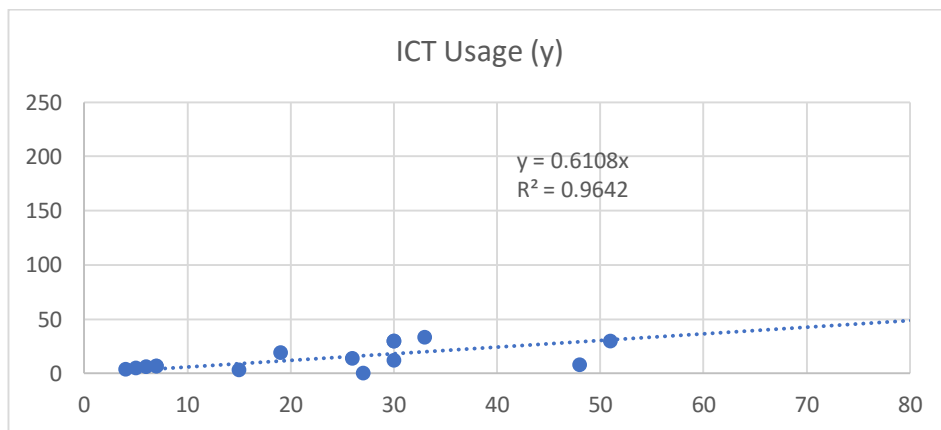


Figure 2: Correlation between ICT Training attendance and ICT usage in class.

The correlation between attendance to training workshops by teachers and ICT usage in class is strong - correlation coefficient <sup>®</sup> of 0.98 and a coefficient of determination value of 0.96. This means that most of the teachers who were trained proceeded to use ICTs in class. However, what can be debated further is the quality of ICT usage, which warrants a different study.



### Availability of ICT Devices

School	SMART Boards #	Teacher Laptops #	Learner Tablets #	Data Projectors #	Computer Lab Devices #
AA Skills School	0	35	0	7	0
BB Sec School	9	18	0	2	20
CC Sec School	0	0	0	0	0
DD Technical School	0	51	0	4	0
EE School of Arts	0	0	0	3	0
FF Sec School	0	14	0	0	0
GG Sec School	11	13	0	0	0
HH Technical	0	42	0	0	0
II SoS	28	18	700	0	0
JJ Sec School	0	0	0	0	0
KK- Sports School	0	0	0	0	0
LL	10	25	1012	0	0
MM Commercial School	0	32	0	1	0
NN College	16	17	0	0	0
OO Academy	0	14	0	0	0
<b>Total</b>	<b>74</b>	<b>279</b>	<b>1712</b>	<b>17</b>	<b>20</b>

Table 1: Availability of ICT Devices

Since ICT devices are a necessity in ICT integration, there was a need to check their availability in the schools under study. Sixty-seven percent of Schools of Specialisation (SoS) do not have ICT infrastructure. SoS are regarded as focussed institutions of learning; therefore, proper ICT infrastructure and devices should be made available. From the above data (Table 1), 33% of the schools have SMART Boards, 73% of the teachers have laptops, 13% learner tablets and 7% data projectors. Only one school has a computer laboratory (lab). Lack of ICT infrastructure and devices hamper efforts to integrate ICTs in teaching and learning and likely to demotivate teachers.

### Teachers Registered for Training Vs Teachers Actually Trained

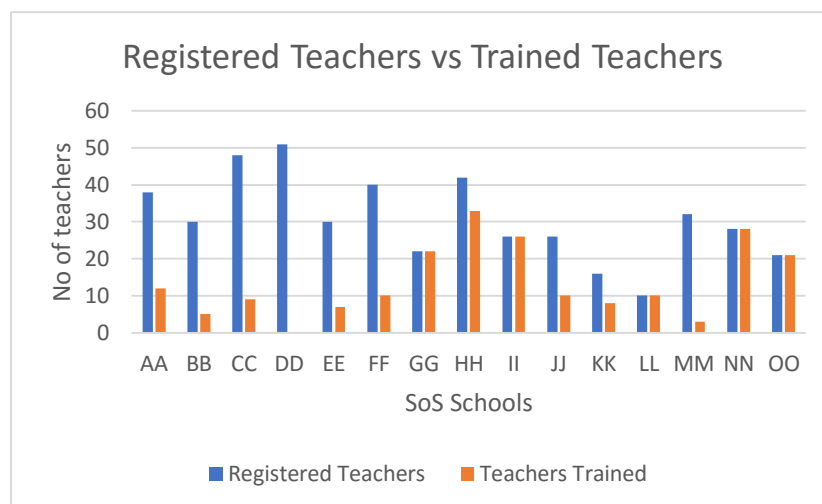


Figure 3: Teachers Registered for Training vs Teachers Actually Trained

It can be noted from the graph that there is not much variance between the teachers that were registered for training and the actual number that was eventually trained, showing positive attitudes of the teachers towards teacher development training sessions. Four schools out of fifteen showed a big variance between the number of teachers that were registered for training and those that actually attended the training workshops (Schools; BB, DD, EE& MM). The possible reasons will be analysed later.

#### 4. DISCUSSION

##### **Successes of ICT Integration**

*Reduction of Teacher Workload:* Creation of class tasks using ICTs has made the teachers' work lighter since the tasks can be reused with several other classes and can be stored in some devices such as memory sticks for future use. When doing lesson preparation using the SMART Board, a teacher can prepare some SMART lessons and store them under my content section for future use. The lesson plan can be prepared at home on a laptop then transferred to the SMART Board the following school day. These aspects are covered during training workshops.

Training provided to teachers develops in them skills on how to integrate ICTs into teaching and learning by using ICT tools, thereby making ICTs to be Perceived as Ease of Use. The training effort expectancy depends on the quality of training provided. The quality of training improves teacher attitudes and teacher confidence. When attitudes and confidence are raised, more teachers will be motivated to come for trainings, which results in ICT adoption. This is evidenced by the number of teachers who are using their own devices despite lack of infrastructure. It is worth noting that although the number of teachers who were registered to be trained did not exactly match the number of teachers who were actually trained in most schools (Fig 3), having 6 schools out of 15 with almost hundred percent turn-up is an achievement for a new programme handling relatively new innovation. Furthermore, considering the fact that about 5 of the schools do not have ICT infrastructure and ICT devices (Table1). This is an indication that the teachers saw value in the training provided by the ICT trainers, otherwise the teachers would have disengaged in no time. If teachers see value in ICT training sessions, then with the support of the SMT and ICT committee, adoption of ICTs becomes a reality in schools.

Apart from basic and intermediate SMART Notebook skills, teachers were taught how to create interactive lesson activities for students using the SMART Lab and Lesson Activity Tool kit. Use of Multi-media in teaching was also introduced. They were taught on how to download and edit educational videos to suit their lesson objectives. The teachers realised that the use of videos to support their teaching helps to offer students with alternative explanations to difficult abstract concepts. The teacher will also have the chance to assist the slow learners individually. They were also trained in creating powerful interactive PowerPoint slides that can be shown to the class using data projectors. Interactive PowerPoint slides give students an alternative way of conceptualising new ideas other than the teacher lecturing for hours and hammering on key concepts to no avail. Use of data projectors and SMART Boards appeal to different types of students such as the auditory, the visual and kinaesthetic students. These training sessions were subject specific, meaning that particular subject teachers were targeted at a time in most cases to make the training outcomes more focussed as opposed to training in general ICT usage. This makes ICT integration a reality despite challenges that have been noted.

##### **Challenges Encountered in ICT Integration Programme**

**Teacher Work Overload:** According to the reports collected, most teachers complained of work overload. This is referred to as an extrinsic barrier by Etmer (1999, as cited by Bingimlas, 2009). So, initially, they viewed the introduction of ICTs into the system as some additional work that would finally throttle them. To make matters worse for them, they were expected to attend ICT workshops among other workshops organised by the District Office. However, when the teachers begin to perceive ICTs as ease of use (Venkatesh & Davis, 2000), and that they do help to lessen their workload, they start embracing the training programmes and even

requesting for one-on-one ICT support from school-based ICT Facilitators, despite shortages of ICT infrastructure and ICT devices.

**Unavailability of ICT Infrastructure:** Lack of ICT infrastructure frustrates ICT Facilitators as they struggle to carry out training workshops with minimum ICT resources available. The following report from one of the ICT Facilitators who was covering a School of Specialization that did not have ICT infrastructure sums up the frustration of trainers in such situations;

*As far as lack of resources are concerned, there is nothing I can do any more. I have called the relevant units. I have been reporting on this platform as well (ICT Facilitator online weekly report feedback platform), but every effort I have made thus far seems to be in vain. (ICT Facilitator)*

These external factors do demoralise teachers in attending trainings in high numbers. Fortunately, SMART Boards for this particular school were delivered at the time of finalizing this paper. However, this is the same plight of several other ICT Facilitators who find themselves in a position of training teachers that do not have ICT devices (Table1). Since many of the Schools of Specialization do not have adequate ICT infrastructure, it is appreciated when teachers in several schools show willingness to bring their own ICT devices to class for teaching and class administration. According to ICT Facilitators, some teachers have been using their own ICT devices such as laptops. This gesture is so much appreciated especially when teachers realise that ICT tools enhance teaching and learning. This gesture by some teachers in most SoS schools validates the view that ICT enhances teaching and learning, hence the willingness by teachers to adopt use of ICTs. Teachers at CC, EE, JJ and KK do not have adequate ICT resources to use in class for teaching. However, the teachers use their own laptops for training workshops and class administration like preparing mark-sheets and attempts at content integration. They share the few personal laptops, which is encouraging. Teachers are frustrated when they are expected to share a few ICT resources such as SMART Boards. That is why some schools end up disengaging from ICT training sessions. The situation is made worse by the fact that the department promised them ICT infrastructure, but takes time to deliver. At the initial stage of the programme, teachers are happy to improvise and use their own resources, but when the promises are not fulfilled in time, they are demotivated and lose interest. Jamieson-Proctor, et al. (2006) stress the need for 'quality resources'. The Gauteng Department of Education should step in and assist such schools that are ready for the change into the 21<sup>st</sup> Century. Workshop training follow-ups should be encouraged to ensure sustainability of the programme.

Most ICT Facilitators expressed their frustration when it comes to follow-ups after the training workshops, to monitor the implementation of the newly acquired skills. Only a few teachers would invite them into their classrooms to show-case the newly acquired skills due to lack of confidence. Most ICT Facilitators indicated in their training reports that they were not allowed to observe teachers in session. Most of the feedback on the class implementation of ICTs could be deduced from HoD and School ICT Coordinator's reports. So, detailed information on whether ICT/ Subject integration in class has been effective or not needs some other qualitative study that uses a classroom lesson observation tool that effectively measures ICT uptake in class and levels of ICT integration like the TPACK lesson observation checklist tool (Technology, Pedagogy and Content Knowledge) as suggested by Schmidt-Crawford et al (2017). Otherwise, this study only managed to determine whether ICTs are used in class for teaching purposes and class administration after teachers have attended the training workshops. What still needs to be determined is the level of ICT integration. Some teachers who are still novices in ICT integration are tempted to use SMART Boards just as a replacement for the traditional chalk board, thereby underutilizing the valuable ICT device.

### **Implications of the Study**

It has been shown that generally teachers are eager to use ICTs in teaching by the percentage attendance in training workshops (Fig1) and secondly by their willingness to use their own ICT devices during training and in the classroom. Therefore, if given the necessary technical support, ICT resources and training, they can fully integrate ICTs in teaching and learning with time. It can be noted in Figure 1 that MM teachers attended ICT

training workshops very well, but none used ICTs in class because of unavailability of ICT resources. So, the training given to those teachers might have been a waste although the teachers were eager.

#### *Did Teacher Attendance in ICT Workshops Translate to ICT Usage in Class?*

The relationship between the number of teachers who attended ICT training workshops and the number that went on to use ICTs in teaching and learning are closely related (Fig 1). This is an indication that most of the teachers who attended training workshops went on to implement the newly acquired skills. The out-layers can be seen in schools such as AA Skills Centre, CC, KK and MM where there is a variance between the number of teachers who attended the workshops and those that went on to implement the newly acquired skills. In cases where ICT usage is low, it can be attributed to the unavailability of infrastructure such as SMART Boards, laptops, data projectors (Table1) and some external factors such as the school environment in fostering the use of ICT. Internal factors such as teacher confidence, attitude and ease use of ICT results in low ICT usage in class. Etmer (1999, as cited by Bingimlas, 2009) refer to this as an intrinsic barrier. However, glaring discrepancy is on MM where 27 teachers were trained but not even one was using ICTs in class because they did not have the devices to use in class. They received laptops at the end of the training period. In such cases, the newly acquired skills are easily lost over time. What could be highlighted at MM, is their attitude towards ICT as evidenced by the high attendance numbers. ICT Committees should play a pivotal role if these challenges are to be addressed.

Out of the 15 schools under study, 14 of them were reported to have active school-based ICT committees. ICT committees are crucial for the successful institutionalisation of ICT in schools. When ICT Facilitators finally leave the schools, these ICT committees are expected to continue spearheading ICT programmes in their schools. So, continual training of these committees from time to time on ICT management is crucial.

#### **How do the challenges affect ICT integration initiatives?**

Lack of ICT infrastructure is the biggest challenge in implementing ICT integration in SoS schools in Gauteng province. It should be noted that availability of infrastructure promotes Perceived Usefulness of ICT tools. Lack of infrastructure in these centres of learning and teaching lowers the performance expectancy, thereby discrediting the effectiveness of ICT tools. Ineffectiveness of ICT tools makes teachers to lack confidence and have a negative attitude towards ICT integration. Once teachers develop negative attitudes towards ICTs, adoption of ICTs in teaching and learning flops. So, lack of infrastructure has a direct effect on workshop attendance numbers. This external factor demoralizes teachers to attend teacher development training sessions.

## **5. CONCLUSION**

Although teachers are showing interest in using ICTs in teaching and learning, they are being frustrated by the shortage of ICT resources. Some teachers, though few, end up boycotting training sessions, maybe to make a point. However, this group is outdone by most of the teachers who are still hopeful that ICT training will succeed as evidenced by their willingness to bring their own ICT devices to class for teaching and class administration. The Department of Education should take advantage of this interest inherent in the teachers and offer resources timeously before the spirit dies. It has been shown that most of the teachers that have been trained are using ICTs in teaching, from the reports that have been studied. However, there is a need to establish the actual level of ICT integration in class, not through self-assessments alone, since these can be subjective/biased and inaccurate, through some skills evaluation exercise using a tool such as a TPACK evaluation form. This checklist helps to gauge Technological, Pedagogical and Content Knowledge of the teacher, which highlights the gaps to be covered in ICT integration.

#### **Recommendations:**

1. Gauteng Department of Education (GDE) should make sure that its work-stream responsible for providing schools with ICT infrastructure delivers on the promises timeously for ICT integration is to be taken seriously in Schools of Specialisation. Lack of ICT infrastructure can easily demotivate

teachers. For example, only 5 out of the 15 schools under study have SMART Boards (33%) and the rest are still waiting in anticipation (See Table1).

2. Since we are now in the 21<sup>st</sup> Century in which ICT is dominating globally in the social and economic lives of people, it is recommended that the national department of education makes ICT education a compulsory subject in the school curriculum.
3. There is a need for teachers' unions to allow ICT Facilitators to visit teachers in action in their classrooms as a follow-up on training given. ICT Facilitators cannot be viewed as education inspectors, but as coaches or mentors of teachers. After a training workshop, it is important for teachers to implement the newly acquired skills to improve lesson delivery, otherwise the training would be visionless and meaningless.

The study found out that most teachers who have ICT devices such as SMART Boards and laptops are using the ICTs in teaching and learning (Fig 1 & 2). However, there is still a need to gauge the level of ICT integration since some may be underutilizing the devices. Not all ICT Facilitators have access to teachers' classes, so it is a challenge to make follow-ups on training goals. For ICT integration to succeed, all the relevant stakeholders are expected to play their parts religiously.

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