INNOVATION FOR INCLUSIVE DEVELOPMENT: MAPPING AND AUDITING THE USE OF ICTS IN THE SOUTH AFRICAN PRIMARY EDUCATION SYSTEM

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ARTICLE INFO	ABSTRACT

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Inclusive education aims to identify and minimise barriers to learning and maximise learner participation in the education system. With a focus on the use of information and communication technologies in the South African primary education system, this study aims 1) to create a framework with which to evaluate the current state of ICT uptake across core functions for a school; 2) to audit the current state of innovation uptake; 3) to use the audit outcomes to identify challenges to the uptake of ICTs; and 4) to identify measures for facilitating an improved uptake of these innovations. The researchers conclude that a need exists for government to ensure consistent ICT uptake and use throughout the education system through a better implementation of standards, policies, and processes that facilitate technology uptake.

OPSOMMING

Inklusiewe onderrig beoog om struikelblokke tot onderrig te identifiseer en te minimeer en om leerderdeelname te maksimeer. Met die fokus op die gebruik van informasie- en kommunikasietegnologieë in die Suid-Afrikaanse basiese onderwysstelsel, is hierdie studie gerig op 1) die skep van 'n raamwerk waarmee die huidige toestand van die opname van informasie- en kommunikasietegnologie, vir die kernfunksies van 'n skool, bepaal kan word; 2) om die huidige toestand van innovasie opname te oudit; 3) om die ouduitkomste te gebruik om uitdagings te identifiseer; en 4) om maatstawwe, wat 'n verbeterde opname van hierdie tegnologieë kan fasiliteer, te identifiseer. Die navorsers het tot die gevolgtrekking gekom dat daar 'n behoefte bestaan wat vereis dat die regering seker moet maak dat konsekwente inligting- en kommunikasietegnologie opname regdeur die onderwysstelsel geskied. Dit is moontlik deur 'n verbeterde implementering van standaarde, beleide, en prosesse wat tegnologie-opname fasiliteer.

1   INTRODUCTION AND PROBLEM STATEMENT

Although some view inclusive education as an approach that includes and serves children with disabilities, it has also been viewed as an approach that increases diversity among learners. In this sense, inclusive education aims to identify and minimise barriers to learning and to maximise learner participation and involvement in the education system [1], [2]. Inclusion, for the purpose of this article, is defined as a process of strengthening the capacity of the education system to reach out to all citizens, with its main goal being to guide education policies and practices based on the belief that education is a basic human right and the foundation of an equal society [2]–[4].

The South African education system has some measures in place to facilitate inclusion in primary education. For instance, The South African Schools Act (SASA) of 1996 aims to ensure that every child has access to education and is not subject to discrimination [4]. Schooling is compulsory for children aged 7 to 15, and any child can enrol at a public school free of charge, which means that poor learners should also have access to education. The South African education policy on religion and culture in public education stipulates that religious, political, and ethnic background should not hinder inclusion in schools [5].

However, the general quality of primary education in South Africa remains poor; in 2015 the Organisation for Economic Co-operation and Development (OECD) found that, among the 76 countries evaluated, South Africa's education system was performing second-worst [6]. And for primary school learners specifically, Spaull found that these learners had not reached standard literacy and numeracy milestones, with a national average of 30-35% on numeracy and literacy tests [7]. The system is also characterised by huge inequalities and inequities: many historically disadvantaged schools suffer poor resourcing, while many historically advantaged schools enjoy good resourcing and management, and are better able to equip learners to do well in exams [7].

Information and communication technologies (ICTs) have long been recognised by the South African Government to have the potential to improve the delivery of quality education for all. The South African education ICT white paper [8] states the following:

"Learning through the use of ICTs is arguably one of the most powerful means of supporting learners to achieve the nationally stated curriculum goals. In particular, the use of ICTs for learning encourages: learner-centred learning; active, exploratory, inquiry-based learning; collaborative work among learners and teachers; and creativity, analytical skills, critical thinking and informed decision-making.

It also states [8]:

"As with other types of organisations, schools and school systems are increasingly using management information systems for planning, monitoring, improvement and accountability purposes. ICTs have the capacity to automate processes and save time, thereby freeing managers to focus on instructional leadership"

ICTs can thus be argued to be the basis for innovations that can be employed in the primary education system [9]. ICTs are not only the backbone of the information society, but are an important catalyst for bringing about educational reforms that can transform learners into productive knowledge users. ICTs can support activities such as reporting systems, the effective management of schools, and teaching activities [10]. If some school management functions can be supported by ICTs, it means that the workload of educators could be reduced, allowing them the opportunity to focus more on learners. ICTs can enable inclusion if they assist in addressing and responding to the different needs of all children through increasing their involvement or participation in education, and by reducing or eliminating exclusions in the education system [12].

The adoption of an innovation can be defined as the integration of new technology into the end-users' daily lives [11]. Adoption begins when a person moves from being unaware of a certain solution to being aware of available or introduced innovations [12]. The literature tells us that innovations can be adopted if they are easy to use, observable, better than existing systems, and compatible with users' norms and values, thereby promoting inclusion [13], [14]. If the innovation is not compatible with current systems, it means that users will be overburdened trying to make use of it, and may need a lot of time to resume their daily work tasks, which, in turn, may inhibit its adoption [11]. One might expect that many schools in South Africa would be likely to have difficulties in adopting ICTs due to, inter alia, a lack of adequate computer literacy, IT management skills, enabling infrastructure, and funding [15].

This research article therefore attempts to achieve the following objective: to develop an innovation for an inclusive development auditing framework for the South African primary education system that supports a better understanding of the state of uptake of ICTs across core functions. This is then intended to be used to inform strategies that will help to improve access to education through the use of ICTs.

In order to achieve this objective, the authors answer the following research questions:

- What is the current state of the adoption of ICTs at the primary school level in South Africa?
- What challenges does the South African Government face in the implementation of ICTs for inclusive innovation in education?
- What measures could be implemented to facilitate improved ICT adoption in the South African primary education system?

2   PROPOSED FRAMEWORK OR CONCEPTUAL METHOD

Everett Rogers [16], the leading scholar in the diffusion-of-innovations paradigm, uses 'diffusion' to refer to the spread of innovations. An innovation is "an idea, practice or object that is perceived as new by an individual or other unit of adoption" [16] and innovation diffusion is the "process by which (1) an *innovation* is (2) *communicated* through certain (3) *channels over time* among the members of (4) a *social system*". Since the development of these ideas in the 1930s by rural sociologists in the United States, a large literature has developed on the process and modelling of the development and diffusion of innovations. In parallel with this, concepts such as 'technology transfer' refer to the transfer of technical know-how, information, and people among technical functions in firms to yield innovative service and products that meet the strategic needs of a business and a customer.

These ideas remain relevant in the area of innovation for inclusive development. However, it is a widely held view that, although innovation is highly correlated with economic growth, the lack of access to innovation may cause inequality. There is a growing body of literature that explores how the innovation process can be adapted to support inclusive development [17]–[20]. This has led to the development of concepts such as 'social innovation', 'inclusive innovation', 'innovation for inclusive growth' [21], and 'innovation for inclusive development' [22]. These alternative innovation models regard marginalised communities not only as potential customers, but also as business partners who could be included in the innovation process so that they could ultimately benefit economically from the resulting innovations [21]. This requires a whole new group of participants in the innovation process [23], [24], which has complex dynamics and is beyond the scope of this article. The aim of this study is not to consider the process and dynamics of the development and diffusion of innovation for inclusive development, but rather to provide a basis to review the state of uptake of ICTs in the primary education system of South Africa. In order to facilitate this process, a framework has had to be developed to map the core functions of a school. For this reason, we do not include core theories of the diffusion of innovations in this study, but rather develop a tool to get a 'snapshot' of the uptake.

The value chain model, originally developed by Porter [25], has in previous studies provided a useful framework for analysing potential application areas and adoption options for ICTs in the education value chain [26], [27]. A value chain is a framework that describes a full range of activities that firms and workers perform to bring a product from its design to end-use and beyond [28]. In the education sector, the value chain framework has been applied in a wide range of higher education contexts [26], [29].

In the primary education area, we adopt the value chain framework from Perumal [28] to include primary activities and supporting activities for a primary school. The framework model depicts activities such as teacher recruitment, learner enrolment, and the management of schools, which are typical primary school activities. Figure 1**Error! Reference source not found.** shows the primary school activities mapped on to the familiar value chain framework. The framework looks at primary support services such as technology, teacher support and development, administration and management, and procurement. The secondary support services identified are human resources and school infrastructure.

Referring back to the original value chain framework, *inbound logistics* in the education framework refers to funds, teacher recruitment, and learner enrolments. *Operations* refers to school activities such as teaching, learning, and assessment, as well as school administration and management. *Outbound logistics* can be linked to having literate learners in schools and better skilled and empowered educators. *Marketing and sales* refers to the way the schools will be making the services on offer known to communities. For example, school websites can contain information about activities and results. The schools can also use their website and social media to advertise for enrolment and to communicate extramural activities. *Services* includes reporting and managing school funds and assets.
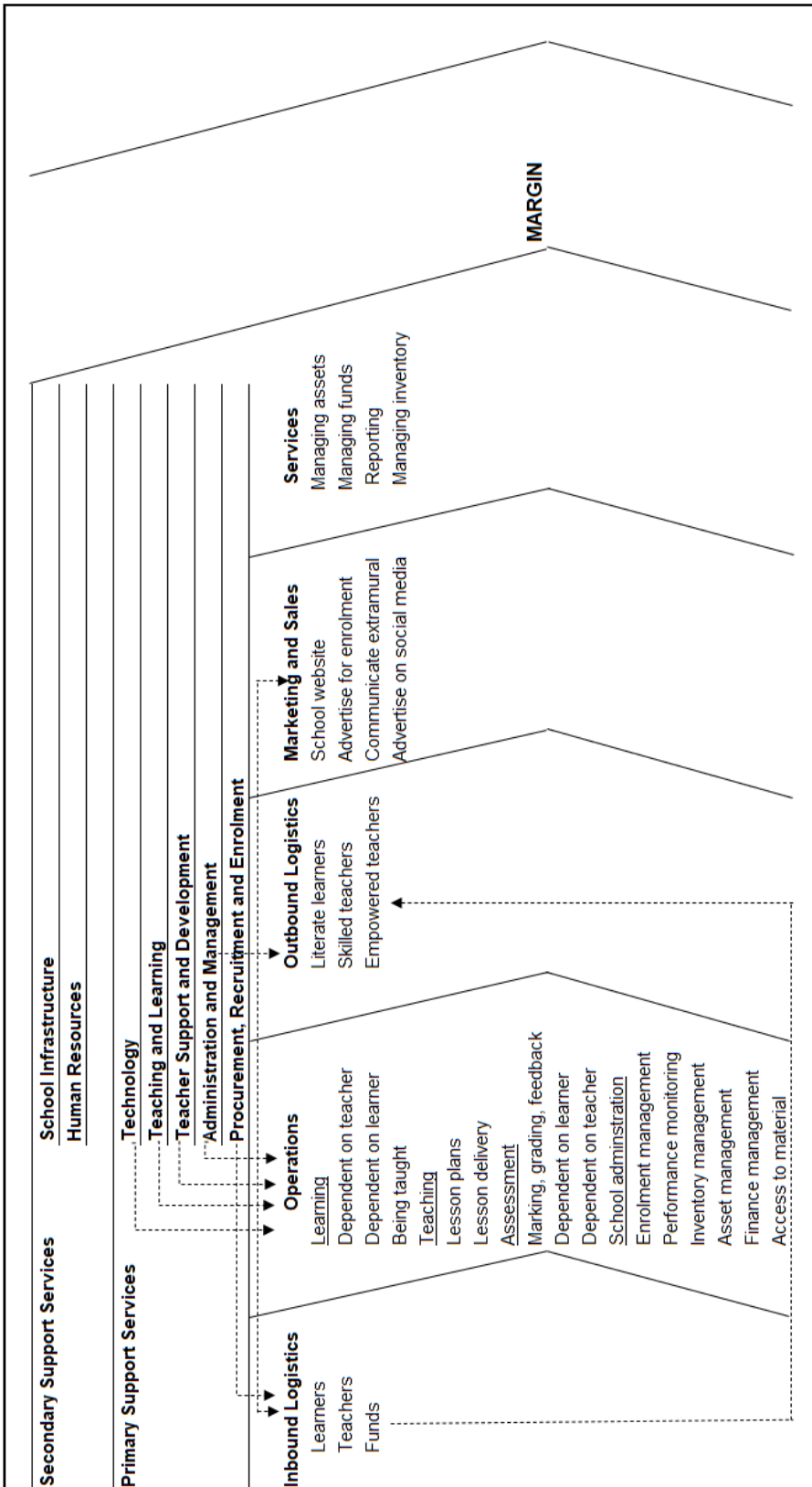
Secondary Support Services
School Infrastructure
Human Resources

Primary Support Services
Technology
Teaching and Learning
Teacher Support and Development
Administration and Management
Procurement, Recruitment and Enrolment

Inbound Logistics
Learners
Teachers
Funds

Operations
Learning
Dependent on teacher
Dependent on learner
Being taught
Teaching
Lesson plans
Lesson delivery
Assessment
Marking, grading, feedback
Dependent on learner
Dependent on teacher
School adminstration
Enrolment management
Performance monitoring
Inventory management
Asset management
Finance management
Access to material

Outbound Logistics
Literate learners
Skilled teachers
Empowered teachers

Marketing and Sales
School website
Advertise for enrolment
Communicate extramural
Advertise on social media

Services
Managing assets
Managing funds
Reporting
Managing inventory

MARGIN

Figure 1: The primary education value chain framework

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In order to apply the above framework to the use of ICTs in education, the authors identified some school-level programmes that can be supported by ICTs in primary school administration (see Table 1) [28]. The authors therefore identified the systems that can be used to support different administration activities:

- A *learner enrolment management system* provides a platform for learner registration and updated details for reporting purpose. A *performance monitoring system* provides the management and responsible authorities with the basis on which to monitor and evaluate learner performance based on the cumulative results in the system. Whenever learner performance is monitored, it helps the decision-makers to decide whether remedial classes or extra lessons need to be conducted, thereby improving the learning process. Knowledge gaps in the educators can also be identified, which can help the education system to develop its educators through in-service training [31].
- The *inventory/asset management system* can be used to keep records of school resources such as textbooks, school nutrition programme data, furniture, and all other assets. This system can help to provide information about the available resources compared with the available users to benchmark across schools, and to ensure that they are optimally applied. It can also support school management in their procurement function.
- *A school management system* can help management and the responsible authorities to keep track of all school-related functions, thus promoting teaching and learning in schools. It can also help to automate some of the schools' activities and so improve the ways in which schools are managed. This will further increase time for teaching and learning, since educators will be free from many administrative duties if they are automated.

In general, ICTs enable communication in organisations through the use of e-mail and social media, the internet, SMSs, and phone calls [32]. They also provide an important tool for bringing about educational reforms [33]. In order for an innovation to be adopted, users tend to compare the benefits of a new system with their current system. Even though the benefits of ICT in primary education may lead to reduced time to access information, reduced costs due to reduced paper work, ease of information access and retrieval, and quick communication, the way users will experience the system and the change management required to shift to electronic systems may prove to inhibit its adoption.

3   RESEARCH METHOD OR APPROACH

In order to test and apply the developed auditing framework and tool, this research project surveyed 20 primary schools, selecting them through a stratified random sampling technique from both urban and rural areas of Gauteng Province. The definition of 'urban' and 'rural' rests on the StatsSA definition, which draws on various indicators, mostly depending on population density [34]. According to the School Act of South Africa [35], two categories of schools are recognised: public and independent. All private schools fall into the 'independent' category, while public schools are state-controlled. Given the difference in resourcing that schools often experience, and the digital divide that exists between them, this study aims to take these into account in our interpretation of the findings by distinguishing between rural and urban and private and public schools. Respondents targeted in the survey were schools' principals, deputy principals, and school managers, since they are involved in the day-to-day management of schools. This enhances validity and reliability, which are critical measures to determine the credibility, truthfulness, and believability of research findings [36].

The surveys were structured so that, in some cases, open-ended questions were used to acquire more detailed information. The questionnaires were sent to the selected respondents to survey whether their school was already making use of ICTs. The survey asked the respondents to identify the different ways in which ICTs were being used in their schools, and also to explore the benefits and challenges associated with the use of ICTs. The respondents were also surveyed to determine what they actually do to enhance the use of ICTs in the activities / functions identified in the value chain. Factors affecting the effective use of ICTs in primary school activities were also identified. Furthermore, barriers to the uptake of ICTs were considered in the survey.

The data collected were analysed using descriptive statistics such as simple percentages, frequency tables, and bar charts.

Table 1: Information systems that can be used in primary school programmes

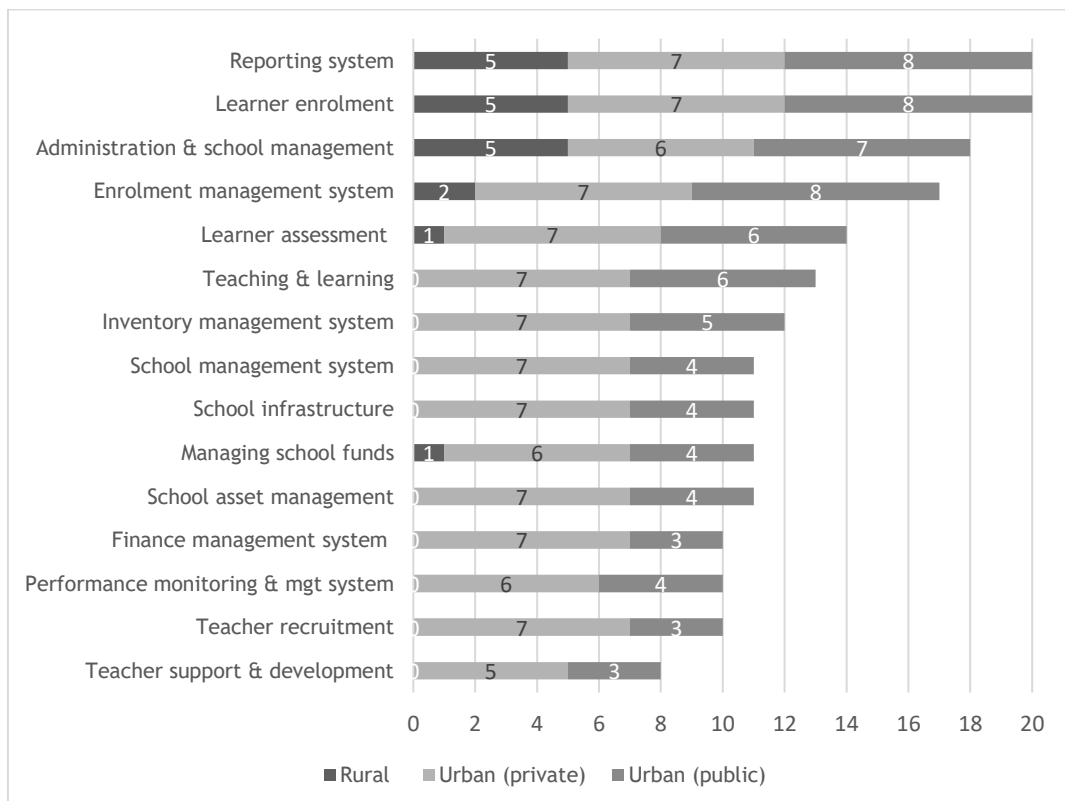| Learner enrolment	Teaching and learning	Teacher support and development	School infrastructure	Administration and management	Access to lessons & materials	Teacher recruitment & vacancies	Managing funds	Assessment
Activities								
Determine number of learners to be enrolled at a given school How to register learners at a school Identify learners who are supposed to be registered Identify the general trend of enrolment on a yearly basis Create a management plan (school) Improve education awareness in communities	Schools to come up with management plans (monitor teaching and learning) Improved access to learning materials Learners being taught Provide systematic review of performance across learning areas Provide better teaching and learning environment Manage and implement curricula in classrooms Use of ICTs	Develop in-service training and support Identify knowledge gaps Reduce workload Promote teamwork Help to understand curriculum Upgrade their knowledge and skills to fulfil their roles	Identify all the necessary infrastructure for effective teaching and learning Procure resources Create a management plan Improve security to protect available resources	Ensure that lessons take place Oversee the curriculum across the school Evaluate learner performance Ensure the availability of appropriate LTSM Ensure that heads of departments (HODs) monitor the work of educators Monitor the work of HODs Create class visits programme and provide feedback to educators Time management	Ensure that teaching and learning materials are available	Ensure that information about teachers needed is readily available Manage teacher recruitment	Keep track of income and expenditure at school level Have an updated list of debtors and creditors	Identify knowledge gaps Provide systematic review of performance across learning areas
ICTs used								
Enrolment management system Reporting system	School management system	Performance monitoring system	Inventory management system	School management system	Inventory management system	School management system	Finance management system	Performance monitoring and management system

4   RESULTS

Of the 20 schools surveyed, five are public and rural based, seven are private schools in urban areas, and eight are public schools in the urban areas of Gauteng Province (Figure 2). All the public schools surveyed in this study are no-fee-charging schools.

Distribution of schools in the sample

Category	Value
Rural	5
Urban (private)	7
Urban (public)	8
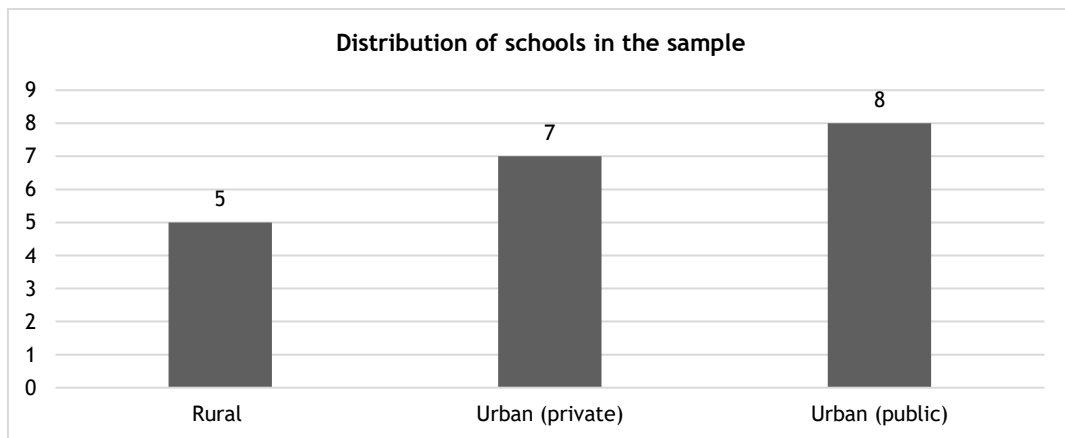
Figure 2: Sample description

The survey showed that there is variation between the rural and urban (private and public) schools in terms of the number of school functions enabled through some forms of ICT. From inspection of the distribution of responses in Figure 3, it can be concluded that private schools tend to apply ICTs in most of the school functions, followed by the public schools in urban areas. Public schools in rural areas seem to be lagging behind in technology use.

| School function	Rural	Urban (private)	Urban (public)
Reporting system	5	7	8
Learner enrolment	5	7	8
Administration & school management	5	6	7
Enrolment management system	2	7	8
Learner assessment	1	7	6
Teaching & learning	0	7	6
Inventory management system	0	7	5
School management system	0	7	4
School infrastructure	0	7	4
Managing school funds	1	6	4
School asset management	0	7	4
Finance management system	0	7	3
Performance monitoring & mgt system	0	6	4
Teacher recruitment	0	7	3
Teacher support & development	0	5	3

Figure 3: The use of ICTs in school functions

Through the audit of core school functions, it was found that the use of ICTs is most often implemented in administration, learner enrolment / registration, and reporting systems in all the surveyed schools. This is probably due to the government requirement that all learners need to be electronically enrolled and registered in the government database. However, when compared with urban schools, the surveyed rural schools are not employing ICTs in school functions such as teaching and learning, inventory management, finance management, and asset management. The urban schools (both public and private) are using ICTs in teaching and learning as well as learner assessment. Urban schools seem to lead in ICT use in teacher support and development, performance management and monitoring, and teacher recruitment. All the private schools surveyed are using finance management systems, possibly because they depend on school fees being paid and need to manage their finances in order for the school to be functional.

The survey revealed that the respondents had different experiences of the implementation and use of ICTs in their schools. Figure 5 shows the respondents' views about the perceived use of ICTs in their schools, expressed in counts of responses; while Figure 5 shows the same data in percentages for each respondent group. Several issues were raised by the respondents, with most of the private schools' respondents stating that they were satisfied with the way they were using ICTs in their schools. One respondent from a private school indicated that there seemed to be resistance by users to changing their routines; this may point to a lack of change management processes, or inadequate solutions hindering the adoption process. This is in stark contrast with rural public schools, with only one out of five respondents holding the view that they were satisfied with the way that ICTs were being implemented. All the rural schools surveyed stated that they did not have adequate resources, thus limiting their chances of being more innovative. Also, all the rural public schools surveyed felt that they were neither trained nor equipped with the necessary resources to enhance ICT use in their schools.
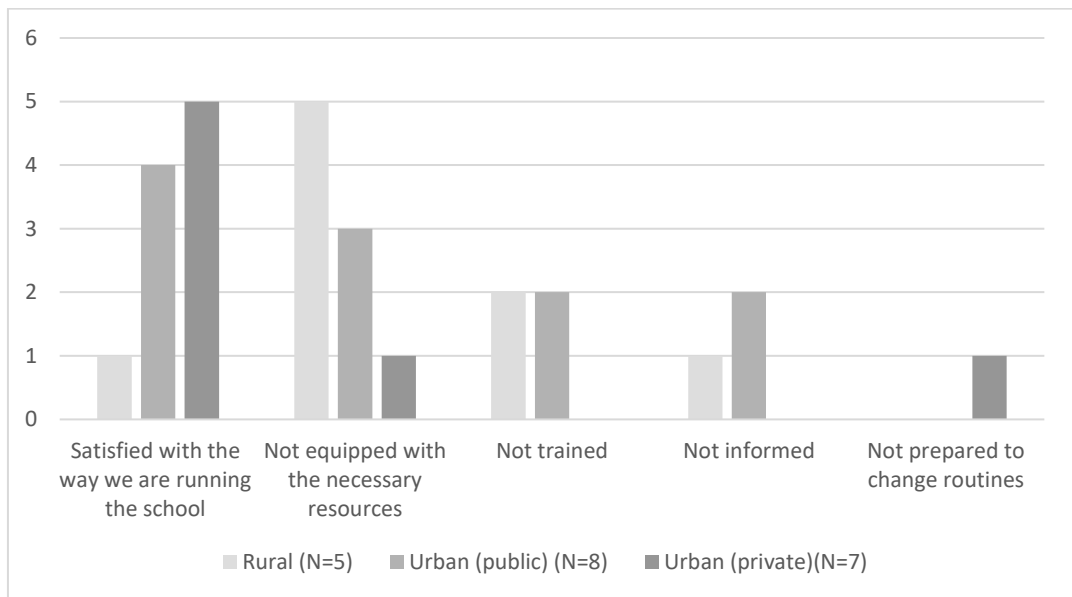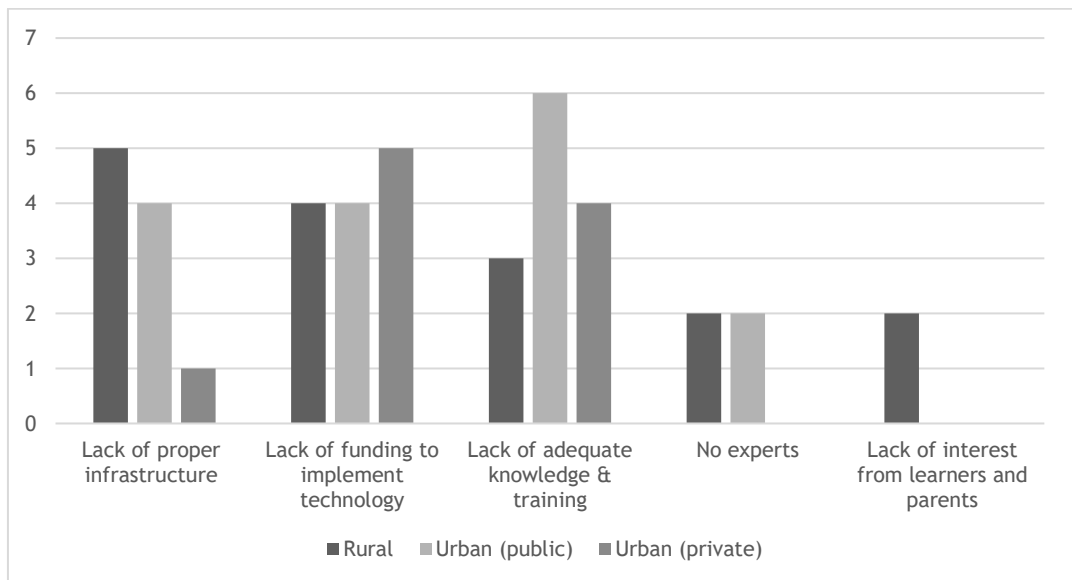

Figure 4: Counts of respondents' views about the reasons for and extent of use of ICTs in their schools (N=20)
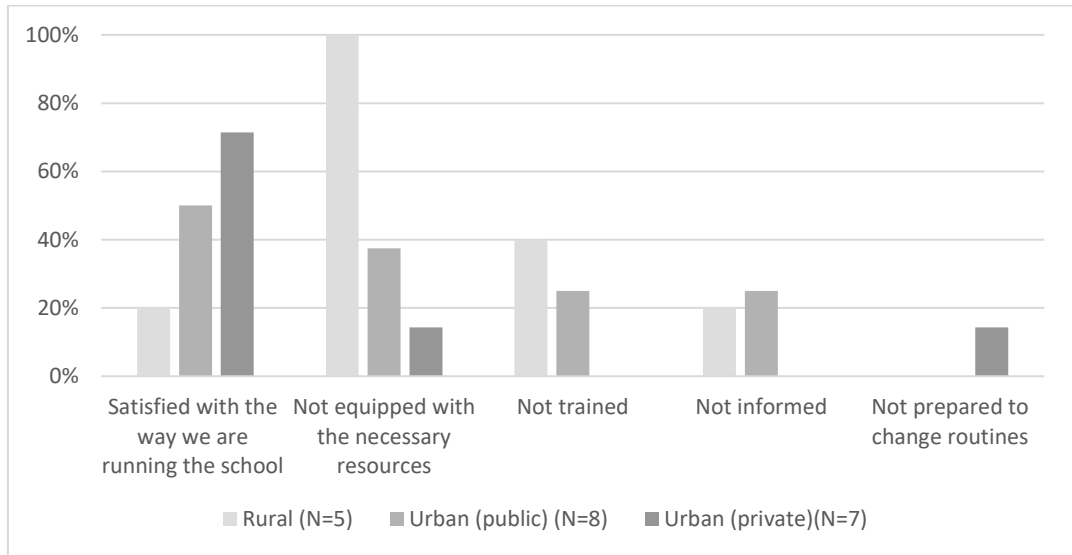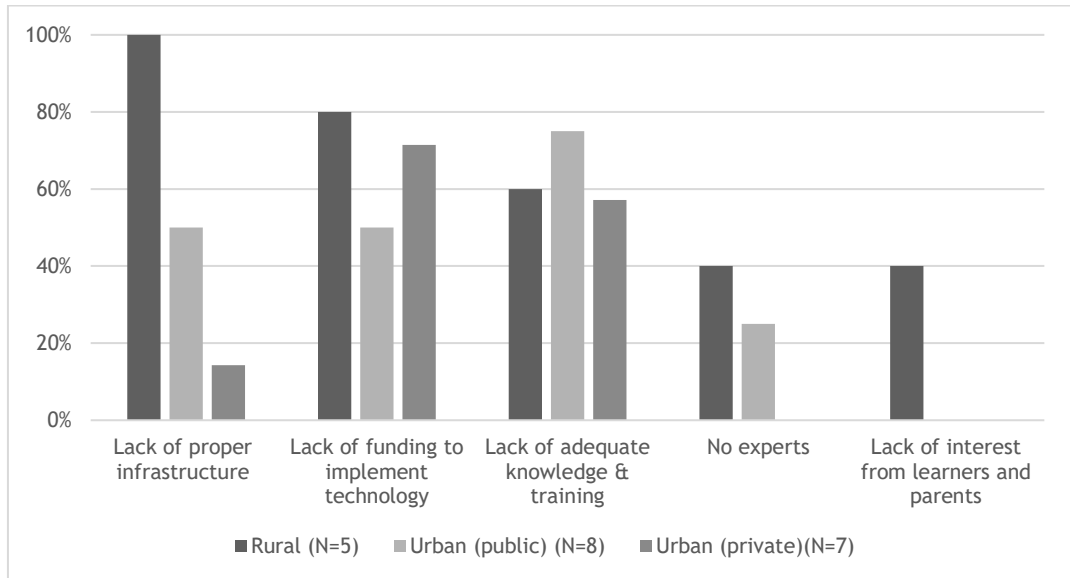
Figure 5: Percentage breakdown (by respondent group) of respondents' views about the reasons for and extent of use of ICTs in their schools (N=20)

Factors affecting the effective use of ICTs — specifically for those programmes for which ICTS were not implemented — were also identified and analysed according to the school type (see Figure 6 for the count and Figure 7 for the percentage breakdown per respondent group). Although all schools were using ICTs in at least one school function, the subjects indicated that the most important barriers to implementing ICTs in their schools were the lack of experts, limited infrastructure, low interest from other stakeholders, inadequate knowledge and training, and lack of funding to implement new technologies properly.

Figure 6: Counts of respondents' views of factors affecting the effective use of ICTs in primary school functions
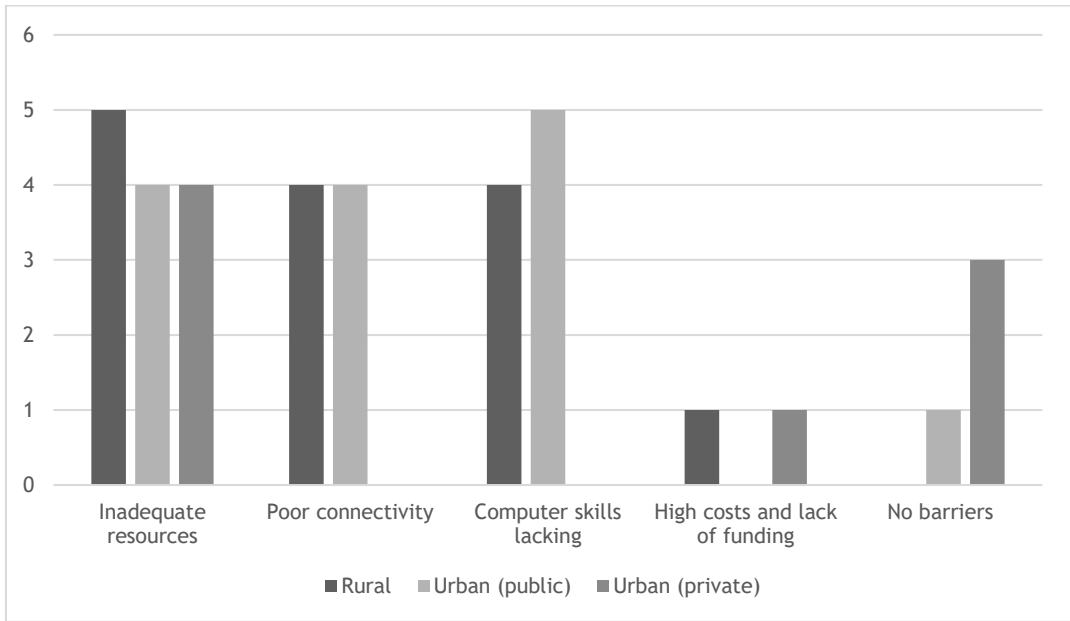
Figure 7: Percentage breakdown (by respondent group) of respondents' views about factors affecting the effective use of ICTs in primary school functions

All the public schools in our sample (all of which are non-fee-paying) are completely dependent on government funding, which seems to hinder the innovative use of technology due to a lack of sufficient resources. Also, in line with the finding that few functions in rural schools are supported by ICTs, these schools are experiencing more barriers to the effective use of ICTs than the schools in urban areas. Rural schools are significantly affected by a lack of proper infrastructure, followed by lack of funding to implement technology, lack of adequate knowledge and training, no access to experts, and lack of interest from learners and parents.

All the public schools reported that they were significantly affected by the lack of infrastructure, funding, and knowledge and training, whereas private schools' main challenge was lack of funding, followed by lack of knowledge and training in some cases. A couple of public schools in the urban areas also indicated that they still had a problem with access to expertise in ICT use. In the same vein, although private schools used ICTs more frequently, they still faced a lack of adequate funding and knowledge and training to use new technology effectively.

The literature reveals that innovations may not succeed if teachers and others staff members are not equipped with the proper skills, the right attitude towards the technology, and the necessary knowledge to take up an innovation [10], [37]. Figure 6 summarises the barriers to proper *implementation and use of information and communication technologies* in the schools surveyed. In short, this is a reflection on those programmes that do use ICTs in functions. Respondents from the different school types identified barriers to the proper use of ICTs as poor connectivity, high costs and lack of funding, lack of computer skills, and a shortage of resources.

The rural primary schools used ICTs in fewer activities, and had challenges with resources, connectivity, and skills to implement technology effectively. An equal number of urban schools (both private and public) also found resource shortage to be a major challenge. Only the public schools (rural and urban) seemed to be affected by poor connectivity and lack of skills. Four urban schools (one public and three private) indicated that their schools were not experiencing any barriers to the use of ICT tools and technologies in the identified school functions. In conclusion, the shortage of resources proved to be a major challenge to the use of information and communication technologies in the schools surveyed. These resources varied from human capital to proper technological infrastructure.
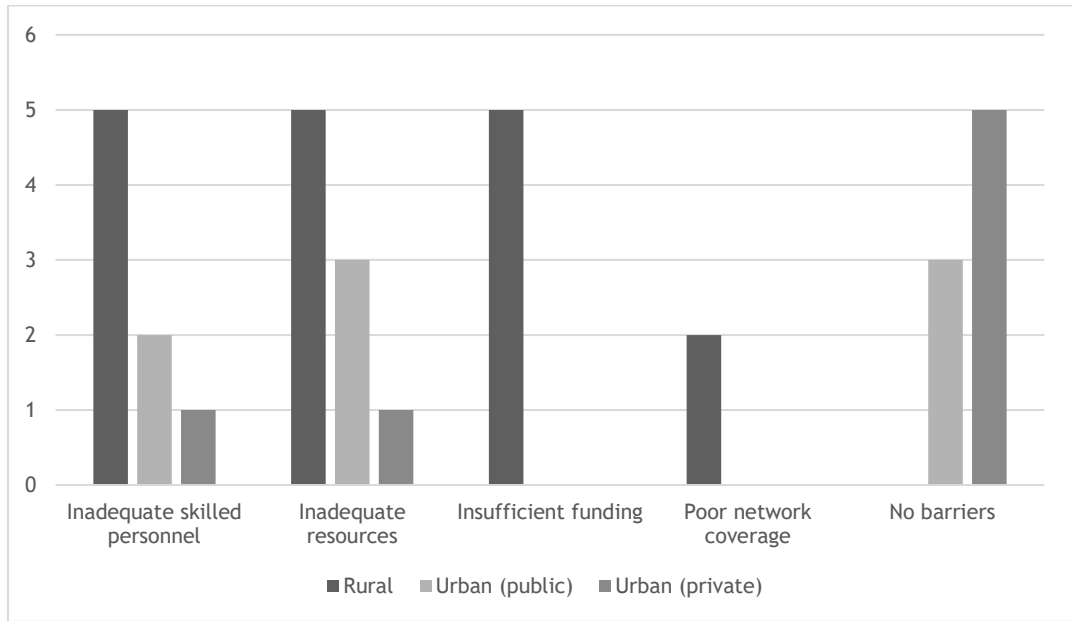
Figure 8: Counts of respondents' views of barriers to the use of ICTs in school management programmes for those in which computer technology is used
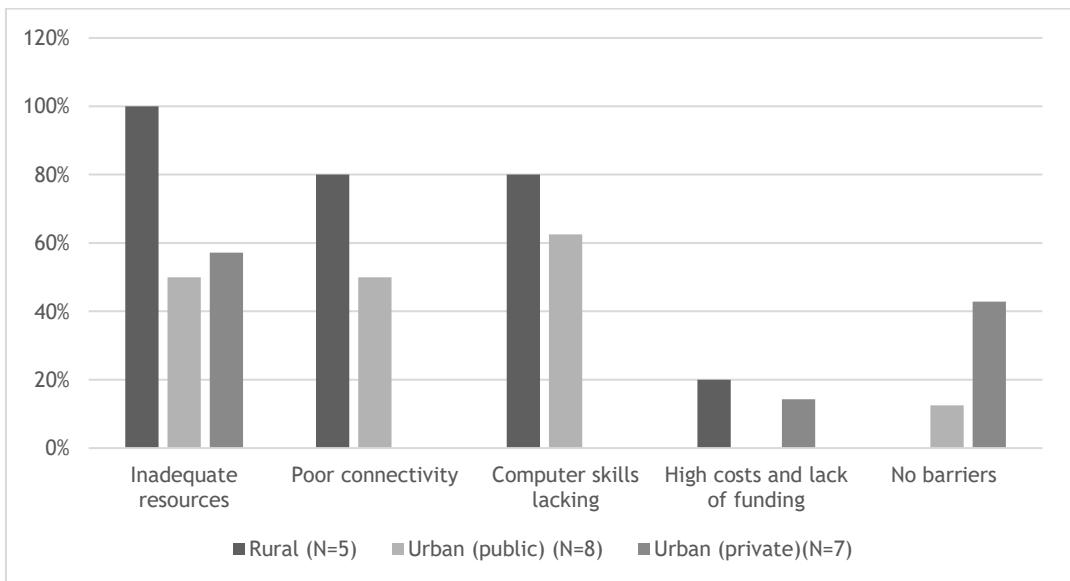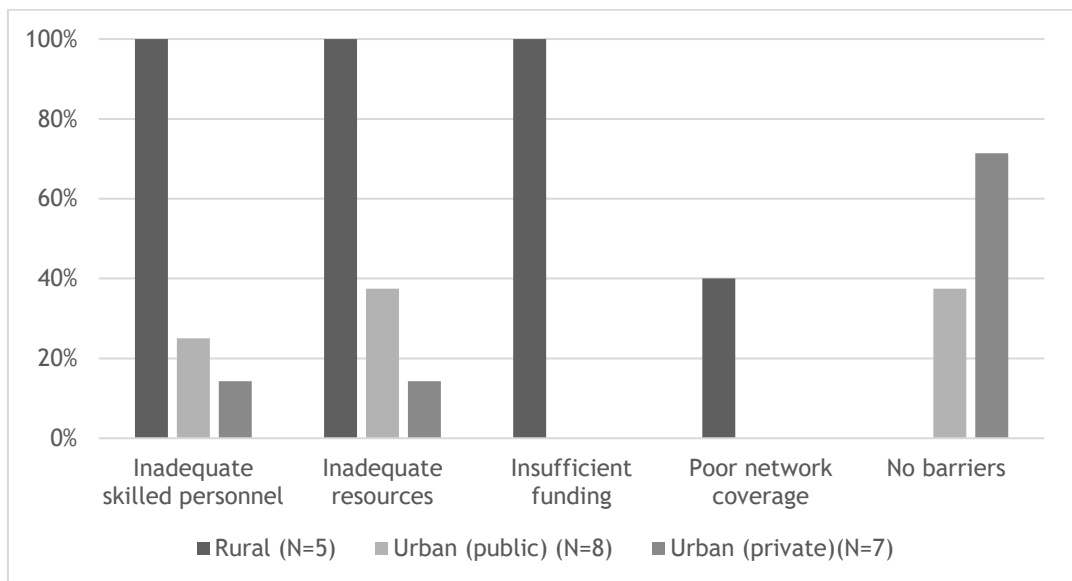

Figure 9: Percentage breakdown (by respondent group) of barriers to ICT use in school functions that use ICTs

Although all the schools surveyed used ICTs for at least one function, there were still several barriers for the schools, resulting in some functions not being supported by ICTs. The two figures below outline the barriers that were outlined by schools for the functions for which ICTs were being used (See Figure 10 and Figure 11).
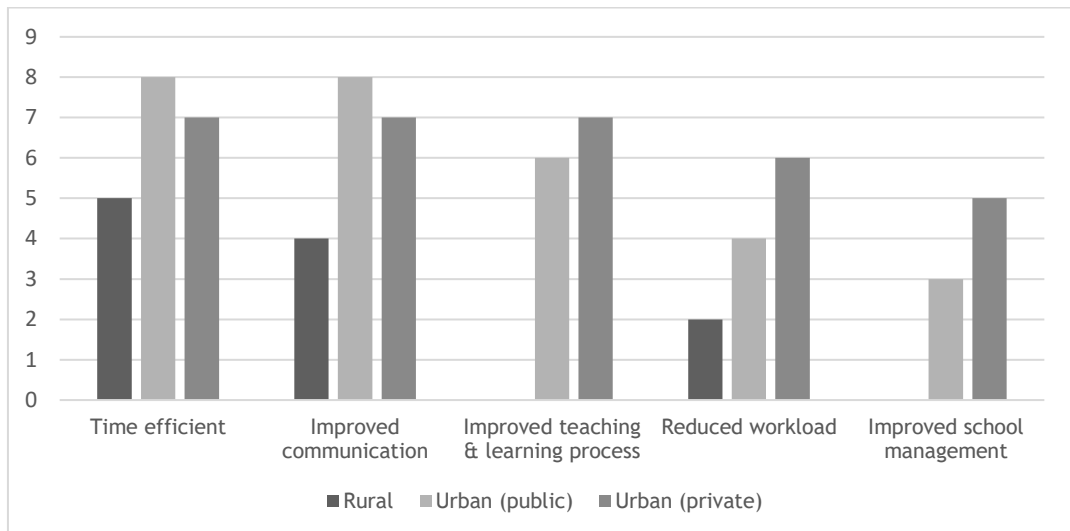
Figure 10: Counts of respondents' views of barriers to ICT use in school functions that do not use ICTs
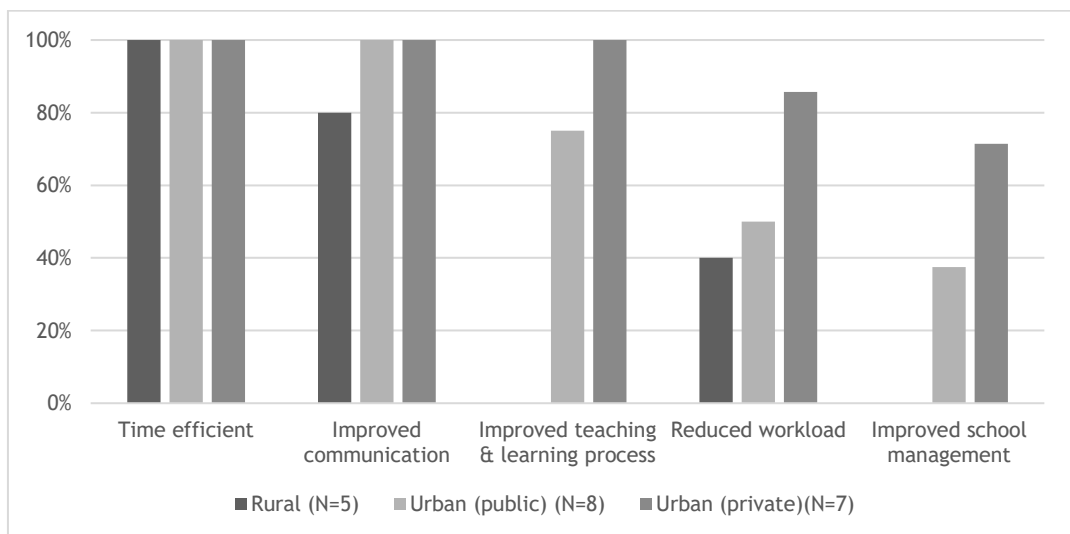

Figure 11: Percentage breakdown (by respondent group) barriers to the programmes that are not using ICTs in their schools

Rural schools that do use ICTs for registration purposes cited barriers most frequently. In a similar way to the previous section, rural schools also identified insufficient funding as a major barrier to the use of ICTs for some school functions. This may be due to lack of government initiatives to employ ICTs, thus not attracting funding from either the government or the private sector. The lack of skilled personnel and the lack of resources, which can be linked to the lack of adequate financial resources, were also considered by the respondents to be major challenges. The barriers identified by the urban schools included inadequately skilled personnel and inadequate resources, while the rural schools experienced insufficient funding and poor network coverage on top of those barriers identified by the urban schools. The rural primary schools' experience of poor network coverage is possibly due to the digital divide between the rural and urban areas of South Africa [38], [39].

Figure 12: Counts of respondents' views of benefits realised through using ICTs in primary schools

Figure 13: Percentage breakdown (by respondent group) of benefits realised through using ICTs in primary schools

Figure 12 illustrates the perceived benefits of using ICT tools by the respondents surveyed. All the respondents from the 20 schools highlighted that the use of ICTs in school functions aided the implementation of functions in being more time-efficient. For example, when ICTs are employed, less effort is needed to generate the progress reports for all learners if all the marks are captured well; and it is also easier to add or remove a learner or a staff member from the school database. When school activities are automated, it becomes easier to retrieve and update information, which helps the decision-makers to decide on better ways to improve their service to learners.

The use of ICTs is widely recognised as allowing quick and more effective communication with the responsible authorities, using emails that can be accessed regardless of the user's geographical location. All the urban schools identified improved communication as a benefit of the use of ICTs. The respondents also recognised that the use of ICTs in school functions may result in a reduction in workload, with six private schools confirming that they were enjoying that benefit; half of the urban public schools and only two rural schools highlighted this benefit.

ICTs can be said to provide a tool for bringing about educational reforms, thus improving teaching and learning. All the private schools recognised that the use of an innovation may allow for improved teaching and learning. However, most of the public schools did not report this benefit. Only eight schools highlighted that the use of ICTs may result in improved school management, with most of them being private schools.

The public schools were still not realising such benefits, with only three urban schools enjoying improved management, and none of the rural schools seeming to experience this benefit. Urban schools that used ICTs revealed that they provided a better way of managing the entire school's record-keeping and quick access to information. Thus the use of ICTs allows for easy access and retrieval of information, reducing the time needed to do so.

5   CONCLUSIONS AND RECOMMENDATIONS

South Africa is considered to have the most advanced ICT infrastructure in Africa; but there remains a divide between urban and rural communities, as well as between the rich and the poor [40], [41]. Through an audit of the uptake of ICTs in core school functions, the primary data-gathering and analysis process revealed that the implementation and use of ICTs as an innovation to enhance development and improved access to education in primary school is still in its infancy. The researchers concluded that, although South Africa is advanced in ICT use in sectors such as higher education and banking, the primary education sector — and, in particular, public and rural primary schools — may be lagging behind in technology uptake.

Many of the challenges encountered by the public schools can be addressed through government intervention. These schools are dependent on government for funding and for a directive to implement management systems. A key finding is that integrating the ICTs with the existing systems at school level is still a major priority in the uptake of ICTs. There is a need for the Department of Basic Education to drive the implementation of ICTs, and to help address the challenges identified by this study. There is also a need for the government to provide adequate infrastructure for the use of ICTs in primary schools.

Once the right policy and governance frameworks are put in place, ICT uptake is likely to be affected by the adoption process, in which stakeholders need to be aware of the need to adopt technology in their schools. According to the literature reviewed, educational innovations may not succeed if users are not equipped with the necessary skills and knowledge to use innovations [24]. In public schools (rural and urban), the major constraints identified are a lack of adequate knowledge and training, a lack of funding to implement ICTs, and inadequate resources and infrastructure.

Table 2 summarises the challenges and the barriers, as well as the benefits of using ICTs as innovations in primary schools. It shows that the rural schools are still lagging behind in ICT adoption and use.

In order to implement ICTs effectively in primary schools, the following need to be implemented:

- Planning and appropriate support should be put in place for the uptake of ICTs in primary schools. The study identified barriers to the adoption and implementation of the new technologies; so for the ICTs to be fully used, these barriers (for example, skills development, availability to experts, and proper funding) must be considered.
- Rural schools are most likely to be left behind technologically due to the digital divide and a lack of access to appropriate skills and funding. Government should aim to put extra measures in place to ensure that these schools receive help to use technology in performing and managing school functions.
- There is still a need for government to ensure that there is consistent ICT use throughout the primary education system by producing standards, policies, procedures, and processes in order to ensure technology adoption within the system. The government should also initiate ICT projects to attract funding from individuals and private organisations, especially for rural schools, so that disadvantaged learners can also benefit from these life-changing innovations.
- Relevant stakeholders, such as the Department of Basic Education, policy-makers, educators, managers, learners, and parents need to be engaged during the planning, design, and implementation process to ensure that the systems meet the needs of all stakeholders.
- A general awareness of how ICTs can benefit the efficient management of the school enterprise must be promoted at a grassroots level. There is therefore a need to showcase the benefits of ICTs in schools via channels such as social media and television.
- There is also a role for the private sector in this process. For example, private companies can leverage their corporate social responsibility funds to donate computers, train users, and provide funding support for maintaining systems. The private sector can also play a role in developing systems and products that schools can use to manage their functions better.

Table 2: Summary of the outcomes of various issues reviewed

	Rural (public)	Urban (public)	Private
Number of schools surveyed	Five rural public schools in the sample	Eight urban public schools in the sample	Seven urban private schools in the sample
Barriers to effective use of ICT tools in schools	Major barriers to implementation faced	Major barriers to implementation faced	Room for improvement
	All five schools did not have proper infrastructure	Four out of eight schools did not have proper infrastructure	Only one out of seven schools did not have proper infrastructure
	Four schools did not have enough funding to implement ICTs	Only four schools did not have sufficient funding to implement ICTs	All the private schools encountered funding problems
	Three schools experienced inadequate knowledge and training	Six schools experienced inadequate knowledge and training	Only three schools had adequate knowledge and training
	Two schools lacked experts	Two schools lacked experts	
			None of the schools lacked experts
	Two schools encountered lack of interest from other stakeholders	None experienced resistance from other stakeholders	None experienced resistance from other stakeholders
Use of ICTs in schools (with respect to respondents' views)	Below standard	Room for improvement	ICTs fairly widely used
	Only one school was satisfied with the way they are doing their things, as indicated by the representative	Four schools were satisfied with the way they are managing their schools	Only five schools were satisfied with the way they are running their school functions
	None of the five schools were equipped with the necessary resources	Three schools were not equipped with the necessary resources	Only one school did not have adequate resources
	Respondents from two schools felt that they were not trained to use ICTs		
	One felt uninformed about ICTs	Two respondents felt that they were not trained to use ICTs for the benefit of their schools	The respondents from all the schools felt that they were well-trained on ICT use
	None of the respondents felt that they could continue with their routines	Two respondents felt that they were not well-informed about the need for ICTs in their schools All eight schools were ready to change their routines so that they could benefit from ICTs	All the schools were aware of the need to implement ICTs Six schools were ready to change routines in order to benefit from ICTs

	Rural (public)	Urban (public)	Private
Barriers to proper implementation and use of ICTs (programmes using ICTs)	Significant room for improvement	Room for improvement	ICTs fairly widely used
	All five schools surveyed encountered some barriers to ICT use	Seven out of eight schools encountered some barriers to ICT use	Four out of seven schools experience some barriers to the use of ICTs
	All five schools experienced resource shortages	Four schools experienced inadequate resources	Four schools experienced inadequate resources
	Four schools were affected by poor connectivity (digital divide)	Four were affected by poor connectivity	None of the schools encountered connection problems
	Four schools were affected by a lack of computer skills	Five were affected by a lack of skills	All the schools had the necessary skills
		None of the schools raised issues about high costs	One school felt that it was too expensive and that there was no funding
Barriers to the use of ICTs (with respect to programmes not using ICTs)	Below standard	ICTs fairly widely used	ICTs fairly widely used
	All the surveyed schools had barriers to ICT use	Five schools had some barriers to ICT use	Five schools had no barriers to ICT use
	None of the rural schools had adequately skilled personnel	Two schools did not have adequately skilled personnel	Only one school experienced the problem of inadequately skilled personnel
	None of the schools had adequate resources	Three did not have adequate resources	Six schools had adequate resources
	All five schools experienced funding problems (insufficient funding)	None of the schools raised issues on funding for this	None of the schools raised issues on funding
	Two schools experienced poor network coverage	None of the schools experienced network problems	None of the schools encountered network problems
Benefits	Reduced workload Improved communication Improved school management Improved teaching and learning processes Time-efficient		

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