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**E-Learning Expenditure in Gauteng:
Delivering education in the world of
digital technologies, and assessing value
for money**

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PROVINCE: GAUTENG ANALYSIS

EXECUTIVE SUMMARY

Preamble:

In the world of ever-changing ways of doing things, digitalisation and robotics will become the norm and the way to an interconnected future. The simplicity of life, including teaching and learning, can also be viewed from a digitalised prism. The need to use Information Communications Technology (ICT) is viewed as a tool that will enhance teaching and learning. The Gauteng Department of Education (GDE) should invest in ICT for teaching and learning if it is to prepare its pupils for the fourth industrial revolution (4IR).

Purpose:

The Gauteng Provincial Treasury's Public Finance Unit, in collaboration with the Government Technical Advisory Centre (GTAC) conducted this spending review exercise, aimed at the following:

- Highlighting the successes and scrutinise the value for money of the e-Learning programme in Gauteng province,
- Determining how much was spent by the Gauteng Department of Education over a period of seven years (2016/17 to 2022/23), spending patterns and better understand what the core cost drivers are,
- Unpacking all critical issues related to the performance of the programme, procurement modalities and related issues where efficiency gains can be derived,
- Identifying programme role-players and their relative contributions to the programme itself, and the programme delivery environment.

Background:

The review includes identifying the important laws, regulations and policies governing the e-learning programme, programme design, deployment, stakeholders, and role-players involved. The study also examines data and methods, including geographic spread of ICT schools, socio-economic statuses, and type of network infrastructure that all connected public schools are using.

The performance data provided by the GDE revealed that ICT rollout is not random, but to a large extent influenced by the availability of the Gauteng Broadband Network (GBN) infrastructure. Furthermore, the data showed that GDE is making good progress in terms of rolling out the programme across quintiles with quintile one having the highest number of ICT schools when compared to quintiles two to five. This however, changes when comparing ICT rollout across quintiles, where quintile four has the highest number of ICT schools implying that more investment is being made in former model C schools where there is adequate network infrastructure.

Methods:

There were review introduction meetings held between the three key stakeholders to this research, i.e., GPT, GTAC and GDE, followed by numerous follow-up meetings, face to face and virtual - as another form of data collections.

Financial performance and expenditure analysis was conducted using Basic Accounting Systems (BAS) data. Overall, the data shows that spending on e-learning has been on the rise for the period under review. In terms of economic classification, data reveals that the programme is spending more under goods and services which comprises 95% of the total expenditure. To understand what the programme is spending on, the spending review organised the BAS expenditure data into categories or expenditure buckets (classroom technology, learner devices, ICT repairs, e-content, connectivity, project management and distribution fees, and salaries and wages).

The study also provides a comparative pricing analysis of quantities purchased and prices over time. The spending review reveals that prices for Light-Emitting Diode (LED) boards decreased between 2017/18 and 202/23 while prices of laptops and learner devices increased over the same period suggesting that bulk purchases are not fully leveraged by the service provider. The benchmark exercise uncovered that market prices for LED boards and teacher laptops are inflated while learner devices are procured at prices below market average.

Findings:

One of the major findings from the Systems Applications and Products (SAP) data is that the service description field in the SAP module is inconsistently captured, therefore making it unclear as to the items purchased between 2018 to 2023 financial years, with approximately R3.3 billion worth of purchase orders issued to the appointed service provider lacking service description.

We found that there has been increasing investment in terms of ICT resources, however, there is lack of congruency between spending trends and the policy objectives. More benefits are seen mainly in the quintile four schools more than the lower quintiles, there is also more investment in semi-urban and urban based schools. This trend may not be seen as in line with the policy objective of redress and investing in the poor, unprivileged and township communities.

Recommendation:

We recommend;

- That both the GPT and GDE consider the findings and recommendations of this spending review and adopt them for implementation over the 2024 medium-term.
- That the GDE adopt this report and review the whole e-learning programme, re-institute the governance frameworks and implementation structures and protocols, to

improve on accountability, reporting, data management, and alignment with programme's policy objectives.

- Lastly, that GDE considers centralising all the e-learning and related objectives, budget and spending under identifiable e-learning objectives in all its systems to simplify data mining and reporting.

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Acronyms and abbreviations

4IR	Fourth Industrial Revolution
BRL	Bongani Rainmakers Logistics
DBE	Department of Basic Education
EMIS	Education Management Information System
GBN	Gauteng Broadband Network
GDE	Gauteng Department of Education
GIS	Geographic Information System
GPT	Gauteng Provincial Treasury
ICT	Information Communication Technology
LAN	Local Area Network
MGSLG	Mathew Goniwe School of Leadership and Governance
MST	Mathematics, Science and Technology
NSC	National Senior Certificate
PES	Provincial Equitable Share
SABC	South African Broadcasting Corporation
SITA	State Information Technology Agency
SLA	Service Level Agreement
STEM	Science, Technology, Engineering and Mathematics
WAN	Wide Area Network

1 INTRODUCTION

1.1 Overview

In the dynamic landscape of the 21st century, technology has become an integral part of young people's lives, profoundly shaping their experiences, interactions, and development. This generation of youth has grown up in an era where smartphones, social media, and online gaming are not just luxuries but essential elements of their social fabric. The internet has transformed how they learn, communicate, and express themselves, offering unprecedented access to information and global communities.

The concept of e-learning traces its origins back to the 1960s where computer-based learning was introduced into the field of education. However, the concept gained traction in the 1990s with the rapid spread of the internet and shift to personal computing (Nicholson, 2007). Over the years, e-learning has evolved from text-based applications to interactive multimedia that uses a combination of text, videos, animation, and more recently virtual reality.

Gauteng boasts a rich heritage of innovation in education and was among the earliest provinces to design and implement an e-learning programme in South Africa. In 2014, Gauteng consolidated all its ICT projects into the e-learning programme. Following this, the Gauteng Department of Education (GDE) approved the ICT and E-Education Strategy that would guide the rollout of its e-learning programme in February 2015.

1.2 Rationale for this spending review

Over the past few years, the South African fiscus has encountered increasingly challenging times, characterised by deeper budget cuts. Against this background, it is becoming harder to protect social expenditures. Thus, it is important to find ways to get the best value for money from government spending. In 2023, the Gauteng Provincial Treasury (GPT) initiated a series of spending reviews on strategic priority programmes in the province. The e-learning programme was selected for the 2023 spending reviews. Since its inception, the GDE has invested millions of rands in deploying Information Communication Technology (ICT) to schools throughout the province. Considering that most of this expenditure is on goods and services, it prompts an important question into the **value for money** the province receives from its investment in the e-learning programme. This spending review seeks to answer this overarching question by examining how much the GDE has spent on e-learning, on what technology and in which schools.

Definition – Value for Money

In the context of this spending review, Value for Money refers to the efficient, effective and economical use of public funds to achieve desired results.

1.3 Research questions

The spending review is guided by five key research questions:

1. What policies guide the implementation of the e-learning programme in Gauteng?
2. How much progress has been made in implementing the e-learning programme in the province?
3. How much has the GDE spent on the e-learning programme since 2016/17?
4. What technology is the GDE spending on through its e-learning programme?
5. What can be done to deliver better **value for money** in the e-learning programme?

1.4 Structure of this spending review report

- **Section 1** provides the background to this spending review and sets out the rationale.
- **Section 2** describes the policy and legislative framework.
- **Section 3** analyses the logical framework underpinning the e-learning programme explaining how it achieves its intended outcomes and impacts.
- **Section 4** summarises the performance of the e-learning programme to date.
- **Section 5** presents the expenditure analysis.
- **Section 6** concludes the report by distilling the findings and making recommendations.

2 POLICY AND LEGISLATIVE FRAMEWORK

E-learning sits at the intersection of technology and education, meaning that the e-learning programme is regulated by a combination of various ICT policies and strategies, alongside the policy and legislative framework of the education sector.

2.1 ICT policies and legislation

The ICT policy and regulatory framework is complex, governed by several acts that shape the institutional landscape and the rollout of technology in government. A key player in this arena is the State Information Technology Agency (SITA), established by the SITA Act (No 88 of 1998). Its purpose is to enhance public service delivery by providing information technology, information systems, and related services within a secure information systems environment to departments and public bodies. The overarching aim of SITA is to improve government efficiency through the use of information technology. The services and pricing of SITA are governed by the SITA General Regulations (Makoni, et al., 2022). In the context of the e-learning programme, SITA supports e-Government in rolling up the flagship Gauteng Broadband Network (GBN).

Aside from the SITA Act (1998), several other pieces of legislation influence the ICT in education. The table below shows how each policy and legislation relate to the e-learning programme.

Table 1: Implications of the ICT policy and legislative framework on the e-learning programme

Policy/Legislation	Implications on the E-learning programme
White Paper 7 of 2004: The National Information and Communication Technologies (ICT) Policy for South Africa	The primary objective of White Paper 7 of 2004 is to establish a foundation for a comprehensive ICT strategy aimed at transforming South African society through the effective utilization of ICT. The policy identifies ICT as a critical enabler for socio-economic development, poverty eradication, and the creation of a globally competitive economy. Specifically, the White Paper underscores the importance of bridging the digital divide and equipping individuals with ICT skills. The e-learning programme contributes to this objective by equipping learners and their teachers with ICT skills to navigate the 21st century (Department of Education, 2004).

Policy/Legislation	Implications on the E-learning programme
Electronic Communications Act (No. 36 of 2005)	This act ensures the protection of the privacy of users, including learners and teachers, of electronic devices (Republic of South Africa, 2005).
Protection of Personal Information Act (Act 4 of 2013)	This act safeguards the personal information of teachers and learners stored on devices or in cloud servers. (Republic of South Africa, 2013)
South Africa Connect: Creating Opportunities, Ensuring Inclusion South Africa's Broadband Policy, November 2013	This policy provides guidance for the development and implementation of broadband in the country, including how the Government Broadband Network (GBN) is implemented in the Gauteng province. It also prioritizes connecting public facilities such as schools to broadband (Republic of South Africa, 2013).
National Integrated ICT Policy White Paper, 2013	The White Paper adopts a whole-of-government approach to digital transformation, ensuring coordination between government departments, entities, and across all relevant spheres of government. Regarding the e-learning programme, this means that the National Department of Basic Education (DBE) and GDE should coordinate their efforts in e-learning to minimize duplication and promote efficiency (Republic of South Africa, 2016).
Draft National Policy on Data and Cloud, 2021	Although still in draft form, this policy aims to safeguard data privacy, cloud privacy, and promote enhanced cybersecurity in the use of technology. Specifically, it seeks to protect children from exposure to inappropriate content on the internet (Republic of South Africa, 2021).
Corporate Governance of ICT Policy Framework, 2022	The primary objective of the Corporate Governance of ICT Policy Framework, 2021 in South Africa is to promote good corporate governance practices in the information and communications technology (ICT) sector. This policy requires that the governance structures and processes of the GDE also oversee the implementation and execution of the e-learning programme (DPSA, 2022).

Source: Miscellaneous

In addition to these national strategies, the Gauteng government had committed to digitisation of public services through its Growing Gauteng Together – GGT2030 strategy. This strategy is supported by the Gauteng 4IR Growth and Digitalisation Strategy which positions Gauteng as a leading hub for 4IR technologies and activities. Specifically, the strategy prioritises the digital transformation of the education sector to improve educational outcomes (Gauteng Provincial Government, 2021).

2.2 Education policies and legislation

The South African Constitution (Act No 103 of 1996) assures every child's right to basic education. Various court rulings have further defined this right to encompass access to safe and reasonable quality education. Although there have been no legal challenges specifically regarding addressing a child's right to access Information Communication Technology (ICT) as part of their education, it could be convincingly argued that in today's digital world, ICT is as essential to a reasonable quality education as textbooks are.

Relevant laws and policies that influence the use of ICT in education include:

- **National Development Plan (2011)** identifies education as a key component in building an inclusive society that provides equal opportunities for all. It emphasises the need for improvements in the quality of education and proposes a comprehensive approach to address challenges that hinder effective education delivery including through the use of technology (Republic of South Africa, 2011).
- **Draft White Paper on e-Education (2003)** outlines the government's response to the evolving information and communication technology (ICT) environment in education. It describes the scope of education and the approach to integrating technology into education delivery in the South African context (Department of Education, 2003). Although this is a draft, the principles for e-education remain pertinent today.
- **Action Plan to 2024 - Towards the Realisation of Schooling 2030** emphasises several key aspects regarding ICT in education and e-learning. It involves providing internet connectivity and ICT equipment to schools, with particular attention to special schools, and includes training teachers to integrate ICT into teaching. Security measures were also put in place to protect the considerable investment in ICT infrastructure and equipment (Department of Basic Education, 2020).
- **Gauteng ICT and E-Education Strategy (2014)** modernises teaching and learning through ICT. Central to this strategy is the Paperless Classroom initiative, replacing traditional teaching tools with digital technologies like smartboards and tablets. Built on five pillars—teacher development, e-content, connectivity, infrastructure, and new products—the strategy envisages access to digital resources for every learner and teacher (GDE, 2014).
- **Gauteng Policy on the use of ICT e-learning devices supplied to schools (2020)** outlines the roles and responsibilities of schools, teachers, and learners in using and maintaining the devices provided by GDE. The policy aims to put in place measures to minimise loss due to theft, breakage and misuse (GDE, 2020).

The GDE translates this plethora of policies and legislation into implementation plans through its five-year strategic plans and annual performance plans which outlines what it intends to deliver in terms of its e-learning programme, to whom and when.

3 PROGRAMME DESIGN AND INSTITUTIONAL FRAMEWORK

3.1 What is the problem that needs to be solved?

In an increasingly technology-driven world, the South African education system faces the challenge of preparing the youth for the fourth industrial revolution. The future workforce is expected to be highly reliant on technology, making it important for learners to acquire tech-skills that are needed in the evolving work environment. However, in the current educational landscape there is a large digital divide between learners in Quintile 4 and 5 schools and those from low-income households in Quintile 1 to 3 schools. These learners lack access to technological resources, thus widening the gap between them and their counterparts from more affluent families. This divide not only hinders equitable educational opportunities, but also perpetuates socio-economic inequalities later in life.

Moreover, a substantial number of educators currently lack the computer literacy to use technology as an aid in teaching (GDE, 2023). This effectively impedes the effective implementation of the e-learning programme. This means that for the e-learning programme to achieve its intended outcomes, teachers need to be trained in using the technology in the classroom.

The introduction of e-learning in Gauteng is a strategic response to these challenges. E-learning platforms can bridge the digital divide by providing equitable access to educational resources, thus enabling all learners, regardless of their socio-economic background, to get ready for the world of work. Moreover, e-learning can effectively address structural challenges within the existing education system, such as overcrowding and limited teaching capacity, particularly in STEM subjects. By offering learners access to e-content, it enables them to learn at their own pace and in environments conducive to their individual learning styles. This flexibility not only enhances the learning experience but also alleviates pressure on physical infrastructure and resources, allowing for a more balanced and efficient educational system. Lastly, as the economic powerhouse of South Africa, and in line with its goal of preparing for the Fourth Industrial Revolution (4IR), Gauteng requires a skilled workforce comprising technology-literate and specialist workers, a need that the e-learning programme helps to address.

3.2 How is the Gauteng Government responding to the problem?

3.2.1 E-learning programme design

E-learning, or electronic learning, is the delivery of learning and training through digital resources. It entails the use of Information and Communication Technologies (ICT) to enable access to online learning/teaching resources. Although e-learning is based on formalised learning, it is provided through electronic devices such as computers, tablets and even cellular phones that are connected to the internet. There are numerous benefits of e-learning, key amongst others, is the ability to offer educational curricula in adaptive modern technology and integrate elements such as images, videos, audio and graphics proved to be a more reliable way of keeping learners engaged compared to traditional learning.

The e-learning programme in Gauteng is guided by the Gauteng ICT and E-Education Strategy (2014) which outlines the seven pillars (GDE, 2014). The pillars respond to specific aspects of the problem statement and include:

- **Infrastructure** ensures that minor refurbishments are made to convert classrooms into smart classrooms.
- **Devices** are provided for the classroom, teacher, and learner devices.
- **Connectivity and maintenance** ensure that schools and learners are connected on wide area network (WAN), local area network (LAN) and APN.
- **e-content** ensures that static and non-static content including eBooks and multi-media content based on the curriculum is developed.
- **Professional development** delivers training for educators, learners, and parents' stakeholders.
- **Security** ensures that physical security, electronic security, tracking, recovery, and mobile device management (MDM) is provided to ensure that losses are minimized.
- **Research, knowledge management & innovation** tracks and monitors the outcomes and impacts of the e-learning programme while ensuring that the technology is context-appropriate for the Gauteng province.

3.2.2 Phased implementation

The e-learning programme has been implemented as a phased approach since 2014. The programme began as a pilot in seven schools covering over one hundred classrooms. This was followed by:

- Phase 2 targeting Grade 12 no-fee paying township schools covering 1800 classrooms – **Completed.**
- Phase 3 targeting Grade 11 no-fee paying township schools covering 2300 classrooms – **Completed.**
- Phase 4 – Covering Grade 11 and 12 fee-paying township schools covering 956 classrooms – **Completed.**
- Phase 5 – Grade 10 township schools covering 3100 classrooms – **30% Completed.**
- Phase 6 – Grade 9 township schools covering over three thousand classrooms – **In plans for 2023/2024.**
- Phase 7 – Developing a content platform to facilitate the bring your own device model covering all the schools, especially those that have self-initiated – **Completed** (GDE, 2023).

In addition, as an incentive, any township public school that achieves a 100% pass rate in Grade 12 is automatically included in the project as a full ICT school, getting end-to-end support, from grade 8 to grade 12. The implementation of this policy decision is such that a school is enlisted for ICT implementation, however, implementation of a decision to include a school is driven by availability of funding. Before e-learning can be implemented, there is infrastructure investment that is prioritised first. Infrastructure works are planned and delivered for the school to be ready in the following schooling year. In the main, GDE does strive to

gradually implement this first by commencing ICT implementation at grade 10 and then annually include the higher grade until grade 10-12 are fully covered.

3.2.3 Deployment

Schools are connected to the internet through distinct types of network infrastructure. The two main forms of network infrastructure are:

- **Wide Area Networks (WANs)** are telecommunications networks that extend across large geographical areas. In the context of Gauteng, the WAN infrastructure is carried through the Gauteng Broadband Network (GBN). This network utilises fibre-optic technology, known for its high-speed data transmission capabilities and reliability, to interconnect eight core nodes. The GBN's reach extends across five developmental corridors in Gauteng (e-Government, 2019).
- **Access Network Points (APN)** is a gateway between a mobile network and another computer network, typically the public Internet. When a mobile device connects to a cellular network, it must go through an APN to access the Internet. GDE has used this technology to connect schools in areas without access to GBN. The main benefit of APNs is that learners can use their devices outside the school by connecting to a cellular network.

Other connectivity methods, such as wireless or microwave technology, are sometimes employed in a minority of schools. These alternative methods are often used in cases where the school's location precludes access to the GBN or APN. While these methods are less common, they provide vital internet connectivity in areas where traditional wired or cellular networks are not feasible or available (e.g., farm schools). Wireless and microwave technologies offer a practical solution for ensuring that schools in remote or difficult-to-reach areas can still access e-content and the internet.

Once a school is connected, the e-learning programme deploys a technology package. There are two types of technology deployment possible:

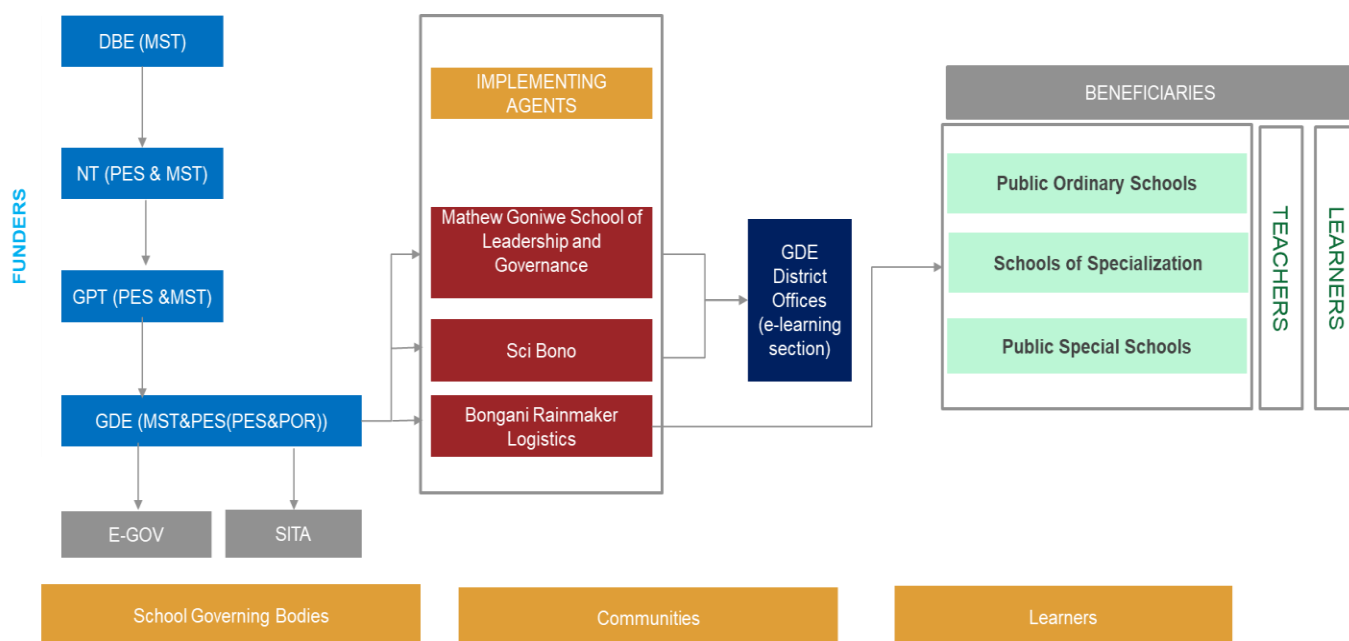
- **Full ICT deployment** - This involves equipping all classrooms with classroom technology such as smart boards, providing tablets to all learners in schools, and supplying laptops to teachers. In other words, every classroom, teacher and learner in the school is provided with appropriate technology.
- **Partial deployment** – This approach is phased in, particularly in secondary schools. It involves converting classrooms into smart classrooms equipped with LED boards. Learners in specific grades (for example, Grades 10-12) are provided with devices. Additionally, the partial deployment includes a "Bring your own device" strategy, where learners in Quintile 4 and 5 schools bring their own devices and can access the GDE's Online Content.

Where teachers and learners are given devices (e.g., laptops and tablets), these devices are preloaded with the digital content including e-Books, multimedia and GDE e-Content (including the Remote Learning Activities Book (RELAB) content).

3.3 Who are the stakeholders and role-players involved?

There are several role-players involved in the e-learning programme. Figure 1 shows the role-players, the funding sources and flows for the e-learning programme.

Figure 1: Role-players in the e-learning programme



Source: Authors' own work

3.3.1 Funders

- The **National Department of Basic Education** is responsible for establishing the policy framework and supporting provincial education departments in executing the concurrent function. With regards to e-learning, the National Department has formulated policies and guidelines for the integration of ICT in basic education. For instance, it is actively engaged in developing specifications for learner devices and is negotiating arrangements for their local production. Furthermore, the Department was in discussions with the National Treasury to establish transversal contracts for the procurement of these devices to obtain better value for money. In addition to its policymaking and support roles, the National Department of Basic Education also administers the Mathematics, Science, and Technology (MST) grant. This grant includes a dedicated component for funding ICT in schools, providing essential resources to enhance digital learning and teaching especially in the STEM subjects (Ragoo, 2021).
- The **National Treasury** oversees the management of public finances, ensuring that government spending is effective, efficient, and transparent. This includes transferring the provincial equitable share and conditional grants to provinces in line with the prescripts of the Division of Revenue Act.
- The **GPT** is responsible for formulating and managing the provincial budget. This involves allocating funds to different provincial departments and ensuring efficient and effective use of resources in line with provincial priorities. In the case of the e-learning programme, the GPT receives and reviews budget submissions for funding. The Provincial Treasury also

oversees the fiscal management of provincial departments and provincial public entities. This includes monitoring spending and ensuring compliance with Public Finance Management Act (PFMA) (No 3 of 2000).

- The **GDE** manages and oversees the implementation of the e-learning programme. Within the province, e-learning is funded from a combination of Provincial Equitable Share (PES) and conditional grant funding through the MST grant. Its responsibilities include developing the provincial policy and strategy, allocating resources for the programme's execution, selecting the implementing agency, and monitoring the overall rollout and performance of the e-learning programme. The GDE also manages the transfer to its entities to implement certain aspects of the e-learning programme.

3.3.2 Partners

The GDE works closely with Department of e-Government (e-Gov) in the Gauteng Province. E-Gov is responsible for the rollout of the GBN. The GBN is intended to connect all public facilities (including schools) to the high-speed optimal fibre network. In rolling out the GBN, e-Gov works with the SITA to ensure that the project is correctly specified and managed in line with the SA Connect Policy Framework, SITA Act and Regulations and the public sector's ICT governance framework.¹

3.3.3 Implementing agents

3.3.3.1 Mathew Goniwe School of Leadership

The Mathew Goniwe School of Leadership and Governance (MGSLG) plays a pivotal role in the educational landscape of Gauteng, South Africa. Named after the anti-apartheid activist Mathew Goniwe, the institution is dedicated to enhancing the skills and competencies of educators and school leaders. It provides targeted training and development programmes aimed at improving leadership, management, and teaching practices in schools.

In relation to the e-learning programme, the MGSLG trains teachers on foundational computer literacy to ensure that they can use their devices. The teacher training also covers the use of the technology (e.g., smart boards and the GDE online platform) for in-classroom uses as well as out-of-school learning.

3.3.3.2 Sci Bono Discovery Centre

The Sci-Bono Discovery Centre is a science centre established by the Gauteng Provincial Government. It serves as an interactive platform for learning about science and technology, aiming to improve science education quality and boost public engagement with these subjects. Sci-Bono offers a diverse range of hands-on exhibits, educational programmes, and activities designed to stimulate curiosity and learning in learners of all ages. The centre plays a critical role in promoting STEM education amongst school children, providing them with the

¹ Note: The spending review on e-Gov provides more detail on the GBN and the role of SITA in the project.

opportunity to explore and understand the world of science in an engaging and accessible manner.

With regards to the e-learning programme, Sci Bono is responsible for developing broadcast content in partnership with South African Broadcasting Cooperation (SABC), so learners are able to access e-content on television.

3.3.3.3 Bongani Rainmakers Logistics (BRL)

Bongani Rainmakers Logistics is a private company that specialises in providing logistics and supply chain management services. The company's focus is on delivering customised logistics solutions that meet the specific needs of their clients, ensuring timely and cost-effective delivery. Bongani Rainmakers Logistics manages and streamlines logistics processes, from warehousing and inventory management to transportation and delivery.

In line with its Service Level Agreement (SLA), BRL is responsible for:

- Identification of needs from schools targeted by the e-learning programme
- Aggregation of orders from schools
- Procurement of devices and e-content from suppliers
- Pre-loading and loading of all content on devices
- Distribution and delivery of devices and technology to schools
- Retrieval of devices
- Management, monitoring and reporting on distribution and delivery

3.3.4 Beneficiaries

3.3.4.1 Institutional beneficiaries

The e-learning programme benefits public ordinary schools in Gauteng. In particular, schools of specialisation derive a specific benefit when they receive the full ICT deployment. This is done to ensure that these schools are better equipped to deliver specialised curriculum or priority subjects such as STEM.

When schools are connected to the GBN or APN, School Governing Bodies (SGBs) stand to benefit significantly. This connectivity means that SGBs are relieved from the financial responsibility of funding internet access from their budgets, allowing them to allocate these funds to other educational needs.

3.3.4.2 Individual beneficiaries

Teachers benefit from the e-learning programme in three ways. Firstly, they are equipped with laptops and tools (e.g., Smart Boards) that assist in enhancing their pedagogy. This allows them to integrate digital resources into their lessons, making the learning process more dynamic and interactive. Secondly, the e-learning programme facilitates the automation of assessments and marking in certain cases, significantly reducing the teacher's workload. The time saved allows teachers to focus more on instruction. Lastly, the monitoring tools enable teachers to track learners' progress more effectively. They can track individual student

performance, identify areas where students are struggling, and implement targeted corrective measures.

For the learner, access to devices and e-content facilitates a more engaging and interactive learning experience. With a wide range of multimedia available on the GDE online platform, the programme also caters to the different learning styles.

3.3.4.3 Communities

The e-learning programme generates beneficial spillover effects within communities, particularly in historically disadvantaged areas. When learners from these communities are more motivated and perform well in school, it often leads to increased engagement and positive support from parents and the broader community.

4 HOW DOES THE E-LEARNING PROGRAMME IMPROVE EDUCATIONAL OUTCOMES?

4.1 Theory of Change

The theory of change presented for the e-learning programme outlines a systematic approach from the initial inputs to the long-term impacts on society (see Figure 2).

4.1.1 Inputs and Activities

The foundation of the theory rests on two main inputs: personnel and funding. Personnel refers to the trained educators, technicians, and administrative staff necessary to implement and sustain the programme. Funding is the resources required to support all facets of the e-learning programme. These inputs drive a series of activities which include the planning stages, procurement of technology and devices, distribution and delivery of these devices, the design and installation of LAN (Local Area Network), installation of smart classrooms, teacher development programmes, and the development and procurement of digital content.

4.1.2 Outputs and Outcomes

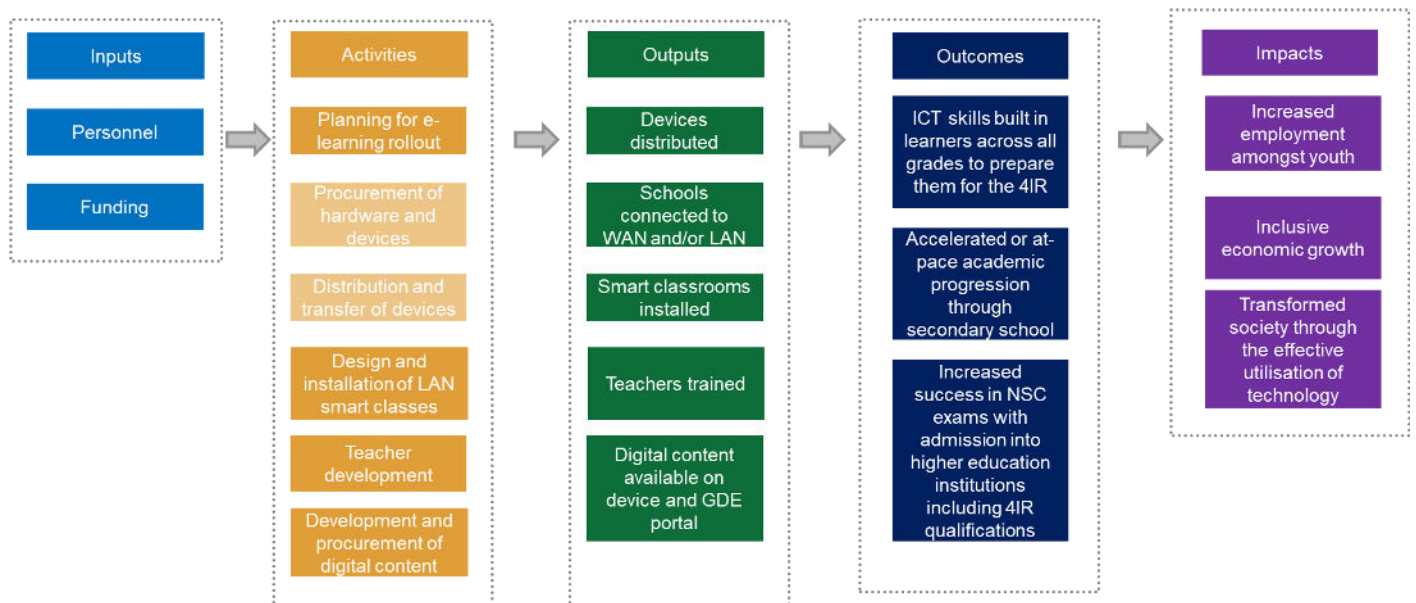
The activities lead to tangible outputs such as the distribution of devices to learners, connecting schools to WAN and/or LAN, smart classrooms, trained teachers, and e-content on the GDE portal. The successful delivery of these outputs is expected to yield several outcomes. These include the development of ICT skills in learners across all grades, accelerated or on-pace academic progression through secondary school, and increased success in National Senior Certificate (NSC) examinations, which potentially leads to greater admission rates into higher education institutions.

4.1.3 Impacts

The ultimate impacts anticipated from the e-learning programme are broad and societal in nature. There is an expectation of increased employment among the youth, as improved education and technological skills enhance employability. Additionally, the programme aims to contribute to inclusive economic growth, which suggests that the benefits of economic expansion will be more evenly distributed across diverse groups within society, reducing

inequality and fostering a more equitable economic landscape. These impacts are the long-term goals that the programme seeks to achieve, reflecting its success not just in educational terms but also in socio-economic development.

Figure 2: Theory of Change for e-learning programme



5 PERFORMANCE ANALYSIS

5.1 Data and methods

The performance analysis reviews the e-learning programme's implementation across various schools in the province. It analyses the deployment of the programme according to the geographical location of schools, their quintile categorisations, which is a measure of the socio-economic status of the school communities, and the types of schools, whether they are primary, secondary, or schools of specialisation.

This spending review uses two datasets: the programme data on the e-learning rollout as provided by the e-learning Directorate within the GDE, and data from the Education Management Information System (EMIS). The EMIS data, which undergoes annual verification and audit, is regarded as an exceptionally reliable source of information that includes variables such as school enrolment, quintile categorisation, staffing and Geographic Information System (GIS) coordinates. While EMIS data provides a solid foundation for the analysis, the e-learning programme data, though rich, may contain some discrepancies as it is not subject to the same rigorous auditing process.

For the purpose of the performance analysis, these datasets were combined using Microsoft Excel to align and correlate the programme's rollout information with the EMIS data. This integrated dataset was then utilised to spatially map the schools GIS alongside the extensive fields contained within the EMIS database. The mapping was executed in Power BI, which offers visualisation capabilities. This allowed for the creation of an interactive geographical representation of the programme's implementation, providing clear visual insights into patterns and trends of the e-learning programme's reach.

It is important to note that the GPT received data from GDE that contained 605 ICT schools in Gauteng. Upon further analysis, 22 were Teacher Development Centres which are serviced through the e-learning programme. These Teacher Development Centres were excluded from this analysis. Therefore, the performance analysis is based on 583 ICT schools in the Gauteng province.

5.2 Geographic spread of ICT schools

In terms of a district-wise breakdown of ICT schools, Gauteng North leads the way with 40% of its schools classified as ICT schools, having 19 out of 47 schools equipped with these resources (see Table 2). Following closely are Gauteng West and Tshwane North, with 31% and 30% respectively, indicating a relatively high adoption of ICT in schools within these districts. At the lower end, Johannesburg East and Tshwane South have 22% and 20% of their schools with ICT facilities.

Across the province, over a quarter of the schools (26%) are leveraging ICT for education. However, there is variability in the distribution, with some districts like Johannesburg Central having a lower percentage of ICT schools at 24% despite having the highest number of such schools at 52. A map with the location of the ICT schools can be found in Appendix 1A.

Table 2: District breakdown of ICT deployment in the e-learning programme, 2022

District Name	Number of ICT schools	Total number of schools	% of Total
Gauteng North	19	47	40%
Gauteng West	50	163	31%
Tshwane North	44	147	30%
Sedibeng West	40	135	30%
Tshwane West	46	161	29%
Sedibeng East	22	80	28%
Johannesburg North	43	157	27%
Johannesburg South	30	110	27%
Johannesburg West	35	136	26%
Ekurhuleni South	47	183	26%
Gauteng East	43	169	25%
Ekurhuleni North	42	172	24%
Johannesburg Central	52	215	24%
Johannesburg East	29	132	22%
Tshwane South	41	205	20%
Grand Total	583	2212	26%

Source: Author's own work based on consolidation of programme performance and EMIS data

5.3 ICT Schools by socioeconomic status

The quintiles serve as an indicator of socioeconomic status within the basic education system. Quintile 1 denotes the most marginalised learners, originating from the lowest income households, whereas Quintile 5 signifies the most affluent areas. Table 3 presents the quantity of ICT schools within each quintile, expressed as a percentage of the total number of public schools. The intra-quintile analysis reveals that schools in quintiles 1 and 2 has the highest concentration of ICT schools, accounting for 40 per cent and 39 per cent respectively. When viewed through this lens, the GDE is making satisfactory progress in transforming Quintile 1 and 2 schools into ICT schools.

Table 3: Intra-quintile analysis, 2022

Quintile	Number of ICT Schools	Number of schools	% of total in each quintile
1	109	272	40%
2	102	259	39%
3	124	416	30%
4	152	476	32%
5	69	642	11%
Unclassified	27	147	18%
Total	583	2212	26%

Source: Author's own work based on consolidation of programme performance and EMIS data

However, the inter-quintile analysis tells a different story. When comparing between quintiles, Quintile 4 schools (e.g., former model C schools) have the highest concentration of ICT schools at 26% followed by Quintile 3 at 21%. This means that as a proportion of total schools,

the relatively well-resourced Quintile 4 schools account for the highest proportion of ICT schools. A plausible explanation for this trend could be that numerous schools in Quintile 4 are situated in regions where the GBN has been established. This might make it easier to connect these schools to the WAN which means that the decisions around the choice of schools for ICT deployment are driven by the availability of GBN infrastructure.

Nevertheless, this finding raises questions about whether the implementation of the e-learning programme is consistent with the pro-poor policy direction of the Department which aims to first benefit the public schools in quintiles 1 and 2. Ultimately, if the programme continues to focus on Quintile 4 schools, it will contribute to an expansion of the digital divide between affluent and low-income learners in the Gauteng province.

Table 4: Inter-quintile analysis, 2022

Quintile	Number of ICT Schools	Number of schools	% of total across quintiles
1	109	272	19%
2	102	259	17%
3	124	416	21%
4	152	476	26%
5	69	642	12%
Unclassified	27	147	5%
Total	583	2212	100%

Source: Author's own work based on consolidation of programme performance and EMIS data

5.4 Network infrastructure

Network infrastructure connects schools to the internet allowing them to access information in real time. As previously noted, the GDE employs two primary types of network infrastructure: WAN and APN. The implementation of the WAN is carried out through e-Gov's GBN, while the APN is set up by a private service provider.

Figure 3 shows the network infrastructure across ICT schools, colour coded by type of connectivity.²² A considerable number of schools are integrated into the WAN, as depicted by the pink colour on the map. This integration primarily aligns with the areas where the GBN has been established, particularly along five development corridors. The implication is that the deployment of Information and Communication Technology (ICT) in schools is not random but rather strategically influenced by the availability of the GBN infrastructure.

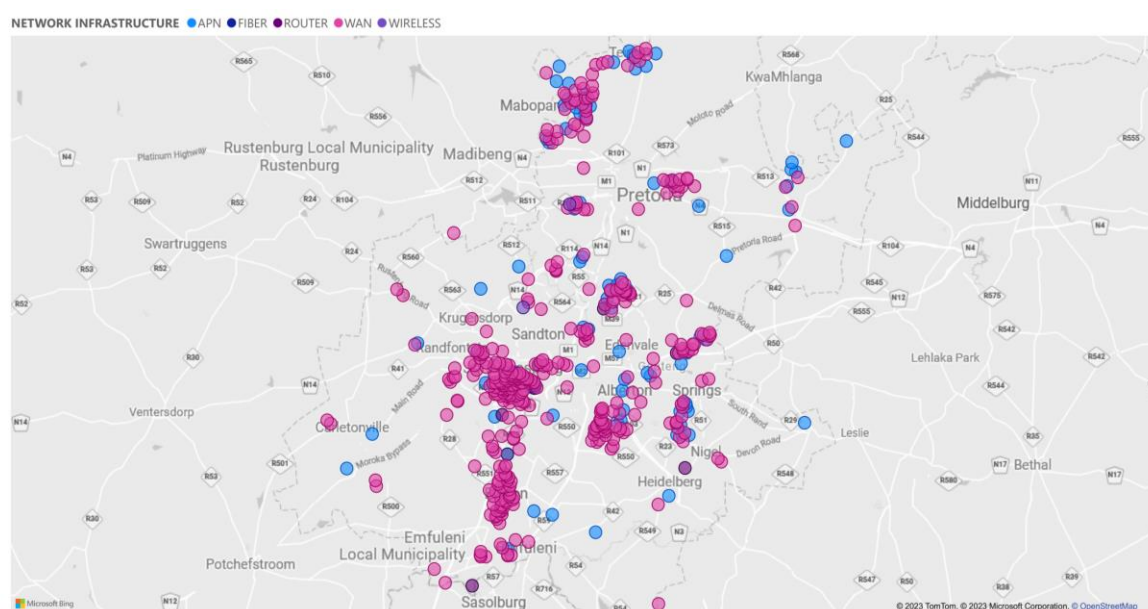
The focus of GBN deployment in densely populated urban areas has broader implications for the e-learning programme. In regions where GBN and consequently WAN are available, schools likely have better access to high-speed internet, facilitating effective e-learning. This access enables a range of online educational resources, virtual classrooms, and interactive learning platforms, which can significantly enhance the educational experience.

²² Refer to the legend in the top left-hand corner of the map.

However, this pattern also suggests a digital divide. Schools in rural or less densely populated areas, where GBN rollout is limited or absent, may not have the same level of access to e-learning opportunities. This disparity can lead to inequalities in educational outcomes, with learners in urban areas having a distinct advantage over their peri-urban or rural counterparts due to greater access to digital resources and online learning environments.

To mitigate this challenge, the GDE has deployed APNs, shown in blue on the map. Though costlier than the WAN, APNs can be used to connect the outlying areas. It also offers the added advantage that learners can access e-content remotely within a certain radius from the access point.

Figure 3: Schools connected by type of network infrastructure, 2022

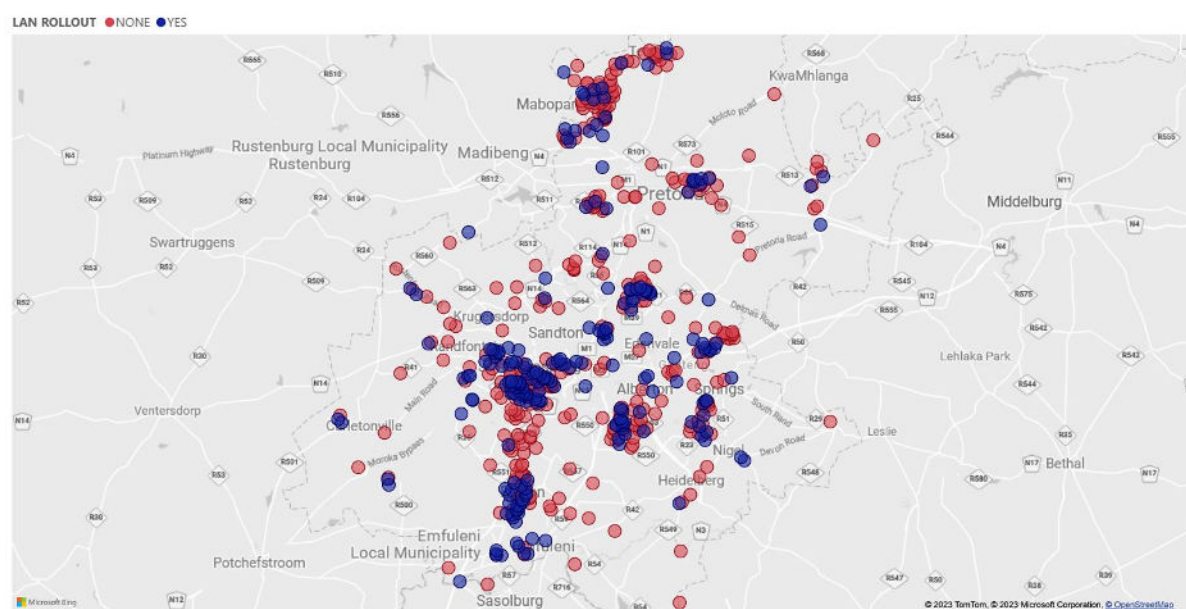


Source: Author's own work based on consolidation of programme performance and EMIS data.

5.5 Local area networks

Once, schools have connectivity with reasonable speeds, they can establish a LAN. The analysis revealed that 46% or 215 of the ICT schools with WAN have established a LAN, colour coded in blue in the Figure 4. The installation of a LAN represents a deepening of the ICT intensity within schools as it requires additional investment from the GDE. The main advantage of LANs is they allow for resource sharing within schools. Quintile 4 schools have the single largest number of LANs. This suggests that not only are these schools benefiting from the e-learning programme but also receiving an elevated level of investment compared to their peers. It is important to note that the rollout of LANs has slowed as GDE considers moving beyond site-based connection towards out-of-classroom learning, through the APN with allows learners to access e-content remotely.

Figure 4: ICT schools with LANs, 2022



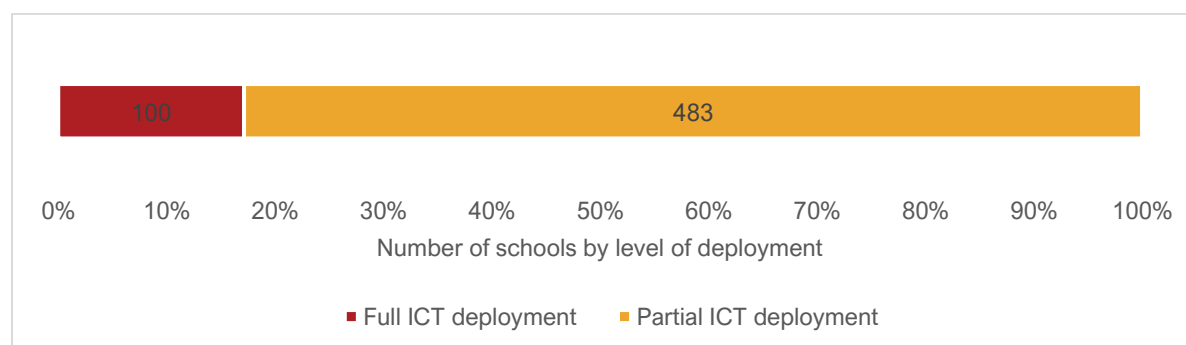
Source: Author's own work based on consolidation of programme performance and EMIS data.

5.6 Level of deployment

5.6.1 Full versus partial deployment

As mentioned before, the province has two approaches to deployment: (i) full deployment and (ii) partial deployment. The province has approximately 100 full ICT public schools out of 583 ICT schools, with the remaining 483 schools having a partial ICT deployment. Full ICT schools are those with a comprehensive ICT package, that is, every classroom is equipped with an LED board, all teachers have laptops and learners across all grades have devices (tablets).

Figure 5: Schools with full versus partial ICT deployment



Source: Author's own work based on consolidation of programme performance and EMIS data.

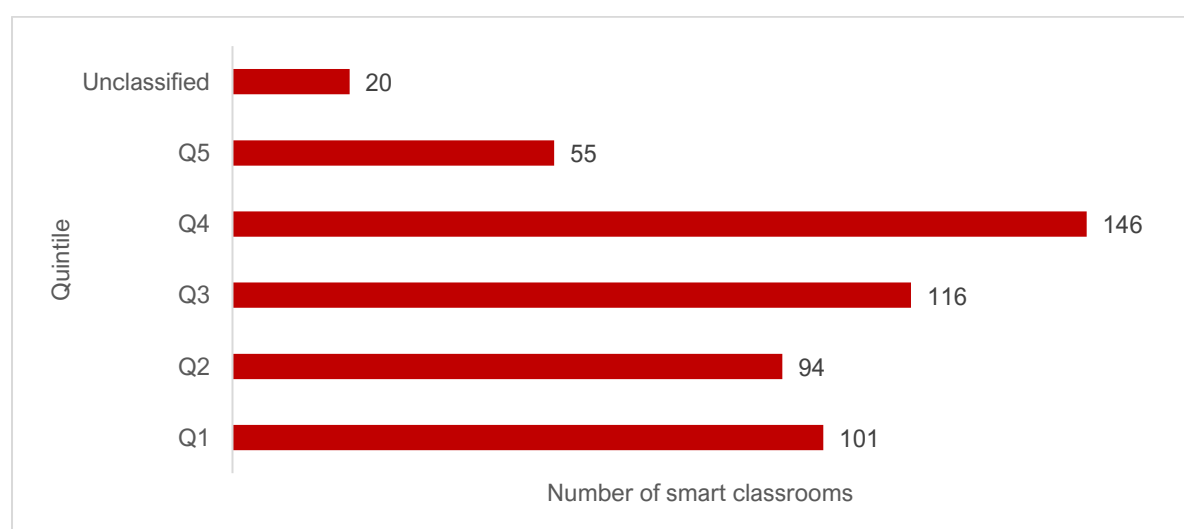
5.6.2 Smart classrooms

Smart classrooms consist of LED board, access to the internet and e-content. For some subjects, classrooms will be retrofitted with specialist equipment such as visualisers in life sciences.

Smart classrooms require a significant investment. Although, the prices of LED boards have declined over the years, it remains a significant monetary investment in equipment. In addition to the cost of the equipment in the classroom, the GDE must invest in security to protect the classroom equipment. Therefore, from a funding perspective, the installation of smart classrooms requires ongoing expenditure to maintain the equipment and provide security.

Based on the data received from the GDE, most of the smart classrooms have been installed in Quintile 4 schools. There are two plausible explanations for this trend. Firstly, higher quintile schools may have more resources and capabilities to secure their equipment and classroom technology, which is why the GDE opted to install smart classrooms in these institutions. Secondly, these schools have access to the GBN, with faster speeds making it easier to connect to the internet through LEDs and visualisers compared to Quintile 1 schools.

Figure 6: Smart classrooms by quintile, 2022

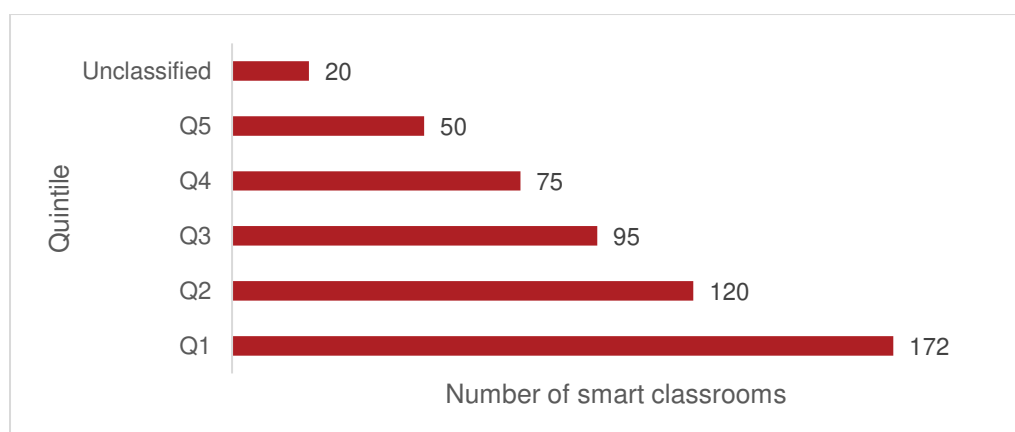


Source: Author's own work based on consolidation of programme performance and EMIS data.

Despite a high combined percentage share of quintiles 1 to 3, it is important to also assess this by disintegrating the quintiles individually. Ideally, quintiles 1 to 3 should each have been showing investment that is each more than that of quintile 4 and or quintile 5. On the basis that the e-learning Programme is aimed at 'redressing' the inequities of the past, where the privileged communities (i.e., quintiles 4 and 5) had and continues to have access to technology, the trends derived from the investments being made GDE demonstrate a contrary result from strategy implementation. The anomaly that is evidenced by an outlying position of quintile 4 should to a certain extent question where the investment is being made and should also question the E-Learning plans for the coming medium-term expenditure framework. In fact, there resources should be assigned in a balanced manner to give effect to the policy direction, i.e., there should be a stagnation in the investment meant for quintile 4 so that more resources could be directed the lower and poor quintiles instead.

The proposed budget and investment per quintile should to a greater extent be aligned with the graph below.

Figure 7: Proposed smart classrooms investment by quintile, 2022



Source: Author's own work.

5.7 Building teacher capability for e-learning

In its ICT and e-Education Strategy, the GDE recognised the need to build the capability of its teachers to integrate ICT into their pedagogy. To this end, the Department has identified two specific needs. First, there is a need to enhance the computer literacy of teachers (e.g., the use of Microsoft Office). More experienced teachers are more accustomed to paper-based methods and may lack the foundational computer literacy needed to work on laptops and tablets. Second, teachers needed to specific pedagogical knowledge around how to integrate technology into to their lesson plans.

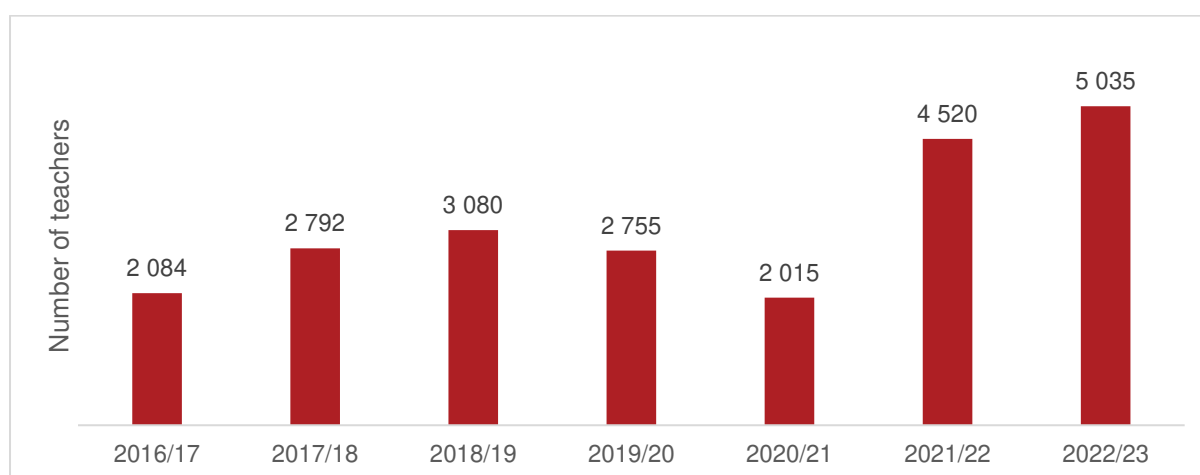
Against this background, the GDE tasked the MGSLG to train teachers to deliver the curriculum in a manner that aligns with the goals of the e-learning programme. The MGSLG offers diverse types of training to teachers. It provides foundational computer literacy to teachers who have limited or no prior experience in working with laptops and Microsoft Office applications. For example, the MGSLG conducts a course called 'Digital Literacy Skills' for teachers. The School of Leadership and Governance also offers courses on the use of technology in curriculum delivery to enhance the pedagogical skills of teachers (e.g., "Integration Course for Teachers"). Lastly, the MGSLG offers hands on support to teachers in ICT schools should they have queries or challenge in using the classroom technology or e-content portal through on-site support.

The spending review team was provided with data on the transfers to MGSLG for e-learning programmes as well as the number of teachers trained by the School of Leadership and Governance. After cleaning the performance data on the number of teachers trained to exclude courses such as Computer Application Technology and Robotics and Coding which are specialist subjects and not part of the e-learning programme, the review team was able to determine the total number of teachers equipped with the skills to use technology in teaching and learning. With this information, this spending review was able to calculate the unit cost of teacher training through the e-learning programme.

5.7.1 Teachers trained for e-learning

There has been an overall increase in the number of teachers trained between 2016/17 and 2022/23 on the various skills and aspects of e-learning. Teacher training accelerated post the COVID-19 due to the shift from physical to online training of teachers. This growth encompasses not only an increase in the number of teachers participating but also an expansion in the variety of courses offered by MGSLG. In 2022, MGSLG reached 5 035 through its various courses. This translates into approximately 7% of educators trained in Gauteng's public schools out of a total of 68 560 employed by the province. MGSLG works together with the GDE's Training and Development Unit to conduct baseline proficiency assessment of teachers' technology capabilities and gaps. Based on the levels of teachers, they are classified into groups and then be taken through training that is tailor-made for each group based on their homogeneous characteristics.

Figure 8: Number of teachers trained for the implementation of e-learning, 2016/17 – 2022/23



Source: Author's own work based on data provided by MGSLG

5.7.2 Unit costs per teacher trained on the implementation of e-learning

As the numbers of teachers trained has increased, the unit cost per teacher trained for e-learning has declined, dropping from a peak of R22 025 in 2016/17 to R9 168 in 2022/23. This downward trend in training unit cost continued despite the variability between years (see Table 5). The adoption of online training methods by the MGSLG has contributed to this reduction in costs with a considerable proportion of training done through the MSG Online portal. As the MGSLG platform was updated to accommodate online teacher development, the number of teachers that could be trained increased significantly, nearly doubling between 2020/21 and 2021/22. This led to a reduction in the training costs per teacher. In total, GDE has spent R238 million between 2016/16 and 2022/23 on building teacher capability for e-learning in the province.

Table 5: Teacher training on e-learning, 2016/17-2022/23

	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23
Total expenditure (Rands)	45 900 802	25 405 751	28 749 018	40 074 943	20 603 444	31 861 695	46 159 684
Number of teachers trained	2084	2792	3080	2755	2015	4520	5035
Training cost per teacher (Rands)	22 025	9 099	9 334	14 546	10 225	7 049	9 168

Source: Author's own work based on data provided by MGSLG

6 EXPENDITURE ANALYSIS

6.1 Data and methods

6.1.1 Analytical approaches

This review uses three types of analysis to understand spending on the e-learning programme. The first is an analysis of accounting data captured in the Basic Accounting System (BAS). The BAS analysis shows how much was spent on e-learning, on what and by whom. The second type of analysis draws on transactional procurement data from the SAP system used by the Gauteng province. The procurement analysis shows the range of suppliers, the categories of goods and services and the quantities purchased. The last and final type of analysis is a price benchmarking study that compares the specifications for classroom technology, teacher, and learner devices (provided by the GDE) to the market prices to establish the economy of provincial government's purchases through the e-learning programme.

6.1.2 Data challenges and limitations

It is important to note that the spending review faced several challenges. The BAS data for 2016/17 to 2022/23, supplied by GTAC, did not match the data from the GDE. This discrepancy was eventually traced back to modifications made by the Vulindlela team at SITA, resulting in incorrect field mappings in the BAS dataset. Consequently, the team had to manually merge seven years of data for this review.

Identifying the spending on the e-learning programme posed additional challenges, partially due to the GDE's unique method of recording this expenditure. Unlike other provinces that use specific tags for e-learning expenditure in the BAS, such as responsibility level or project code, the GDE's e-learning costs are dispersed across various programmes. For example, employee compensation costs are recorded under Programme 1: Administration. To determine the actual expenditure, extensive consultations with the GDE finance team were necessary. Moreover, some expenses, like security costs occurring at the school level, are not reflected in BAS, potentially leading to underestimation of the overall spending on the programme.

The procurement data presented its own set of issues, characterised by inconsistent recording and incomplete fields by officials. These data shortcomings restricted the depth of the analysis that could be conducted. However, evaluating the available data was still useful for gaining insights into potential improvements in data quality for procurement and monitoring.

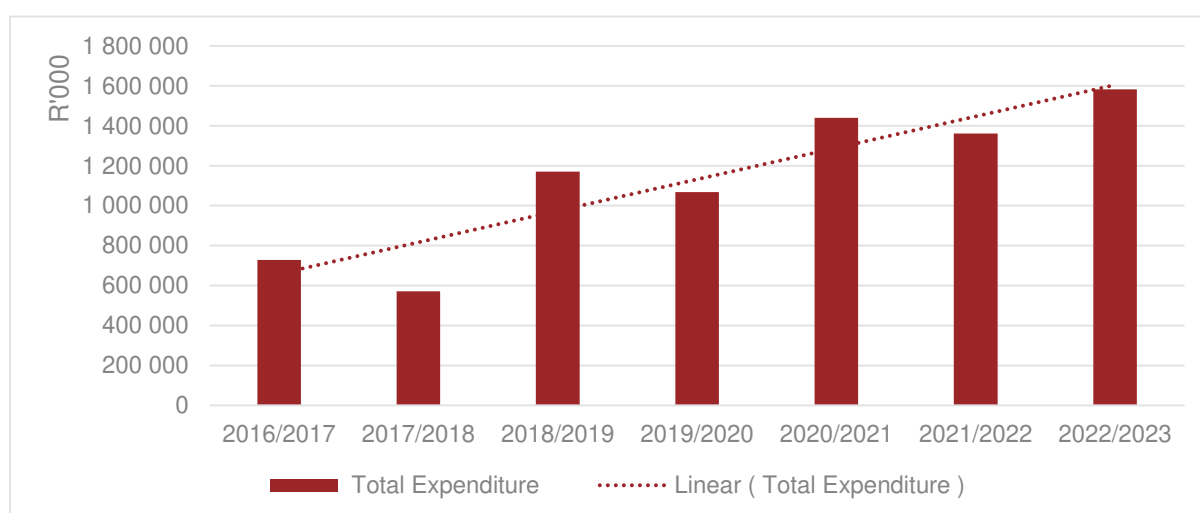
Lastly, the spending review was hindered by not receiving all the requested data, limiting the team's ability to develop a comprehensive costing model. Additionally, important documents, such as the SLA with BRL, were only received late in the project, further complicating the analysis.

6.2 BAS analysis

6.2.1 Aggregate spending on e-learning

Between 2016/17 and 2022/23, the GDE has spent a total of R7.9 billion on the e-learning programme. While there is a general upward trend, as shown in Figure , there have been some fluctuations over the seven-year period. In the 2016/17, the GDE spent considerable resources buying classroom technology and devices, as part of the initial investment in the e-learning programme. The COVID-19 pandemic gave new momentum to the e-learning programme which jumped from R1.1 billion in 2019/20 to R1.4 billion in 2020/21, tantamount to a 34.5% year on year increase. In many respects, the COVID-19 pandemic has established a 'new' spending baseline for the e-learning programme, making it difficult for spending to return to the pre-COVID levels.

Figure 9: Expenditure on the e-learning programme, 2016/17-2022/23

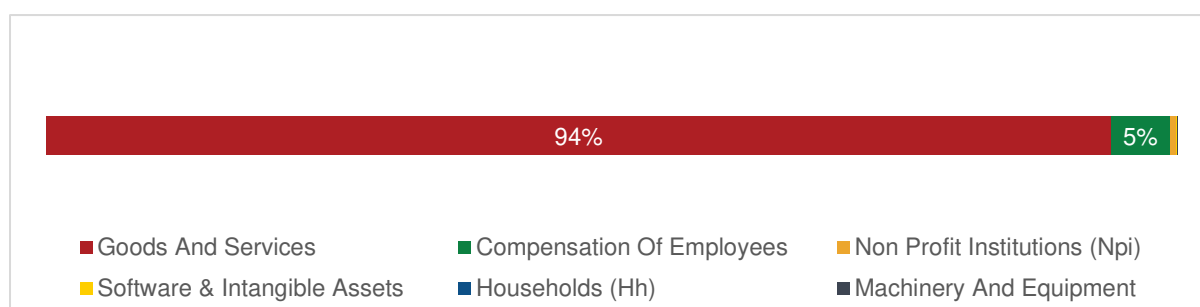


Source: Author's calculations based on BAS

6.2.2 By economic classification

As expected, 94% of the expenditure for the e-learning programme is allocated to goods and services, with an additional 5% dedicated to employee compensation (see Figure 10). A minor portion is directed towards the Sci Bono and Matthew Goniwe School of Leadership for Teacher Training. Regrettably, the BAS transfer aggregates all projects, making it challenging to isolate the transfers specifically intended for the e-learning programme. Given that Goods and Services represent the bulk of the spending, it raises a pertinent question about the value for money being derived from the e-learning programme. Interestingly, salaries and wages for staff employed to support and monitor the e-learning programme sits within Programme 1: Administration. This is surprising because only administrative expenditure is meant to be allocated to Programme 1.

Figure 10: E-learning expenditure by economic classification, 2016/17-2022/23



Source: Author's calculations based on BAS

6.2.3 By category

The spending review effectively streamlined, consolidated, and organised the BAS expenditure into distinct categories. This approach enables the spending review to make sense of what the e-learning programme is spending on. The categories include:

- **Classroom technology** includes LED boards, teacher laptops, projectors, and other technology to aid in the teaching of specialist subjects.
- **Learner devices** refer to the tablets purchased for learners.
- **ICT repairs and maintenance** include expenditure on contractors to repair and maintain the classroom technology and LANs within schools.
- **E-Content** includes spending on the GDE Online Portal, e-books, and licenses.
- **Connectivity** covers spending on the APNs to provide schools with connectivity.
- **Project management and distribution fees** cover all administrative payments made to the service provider for the management, distribution, delivery, loading, and retrieval of learner devices, smart boards, and teacher laptops.
- **Salaries and wages** cover the compensation of employees at both head office and district staff involved in e-learning.

Figure shows how spending priorities have changed over the period whereas Table 6. The patterns reveal that the implementation of the e-learning programme began with a focus on rolling up smart classrooms with a large investment in classroom technology. This item has a total spend of R2.2 billion, accounting for 27% of the total expenditure on the e-learning Programme. That said, as the focus has shifted to providing learners with devices, expenditure on this category has declined.

Learner devices, with a spend of R1.9 billion grew at an average annual rate of 48.6% over the period. These devices are the second largest expenditure item account for 24% of the total spending. This category's growth highlights the increasing focus on making technology accessible to individual learners.

ICT Maintenance and Repairs saw a dramatic increase with an average annual growth rate of 169.8%, amounting to R1.3 billion and constituting 17% of the overall expenditure. This surge indicates the escalating need for maintaining existing technology installed in classrooms and within schools.

Project Management and Distribution cost R962.9 million, forming 12% of the total. This reflects the ongoing operational costs for the execution of the e-learning programme using a procurement and logistical agency as the model of implementation.

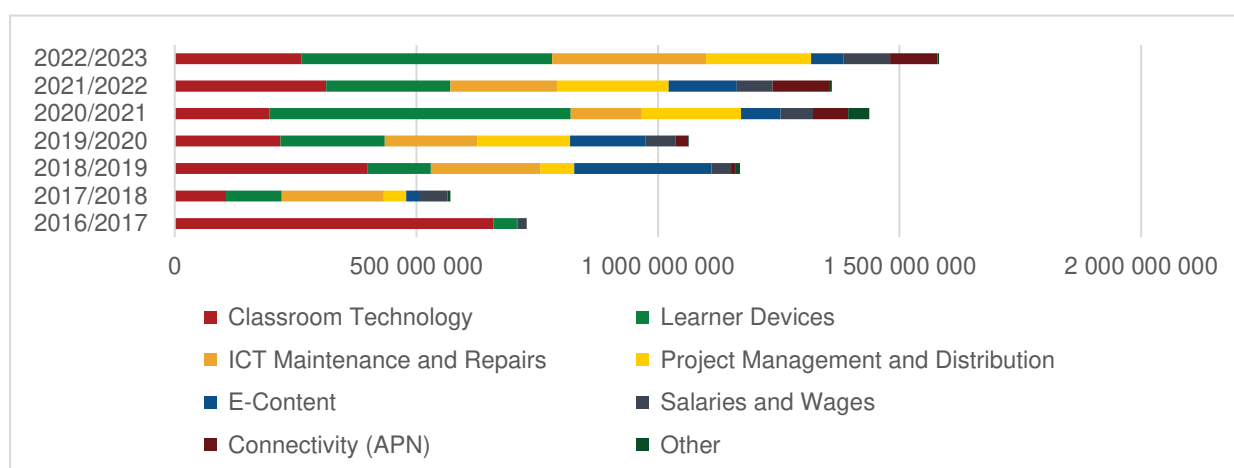
E-Content development, with an expenditure of R757.551 million (10% of total spend), points to the importance of creating engaging and relevant digital learning materials. This spending is also strongly correlated with spending on learner devices which require e-books and licenses.

Salaries and Wages for staff involved in the programme amounted to R416 million, with an average annual growth rate of 31.2%.

Connectivity (APN) costs, crucial for ensuring internet access, grew significantly at a CAGR of 200.4%, totalling R327.678 million and making up 4% of the spending. This rapid increase reflects the increasing importance of the APN as a type of network infrastructure that can not only be installed in schools but enable remote access for learners.

Overall, a total of R7.9 billion spent over these seven years. Expenditure on the e-learning programme grew at an annual average rate of 13.8%, which is higher than inflation, reflecting the continued focus of the department on expanding access to the programme.

Figure 11: e-learning expenditure per category, 2016/17-2022/23



Source: Author's calculations based on BAS

Table 6: Growth rates in categories of e-learning expenditure, 2016/17 to 2022/23

CATEGORY	2016/17-2022/23	CAGR	% TOTAL
Classroom Technology	2 153 088 920	-14.3%	27%
Learner Devices	1 911 370 781	48.6%	24%
ICT Maintenance and Repairs	1 316 205 676	169.8%	17%
Project Management and Distribution	962 885 284		12%
E-Content	757 551 108		10%
Salaries And Wages	416 985 145	31.2%	5%
Connectivity (APN)	327 677 903	200.4%	4%
Other	66 174 096	46.1%	1%
Grand Total	7 922 359 853	13.8%	100%

Source: Author's calculations based on BAS

6.2.4 Comparison of actual to budgeted expenditure

The spending review analysis compared actual to budgeted expenditure by item Level 4 on BAS. The 2020/21 year is excluded from the analysis due to the changes in allocation brought about by the COVID-19 pandemic. Nevertheless, the analysis of actual to budgeted expenditure reveals how challenging it has been to budget for the e-learning programme.

There has been persistent underspending on the Inv: Other Supplies item, which relates to classroom technology. In contrast, there has been consistent overspending on Inv: Learn & Teach Supplies which relates to the expenditure on devices. These factors might imply that the GDE faces difficulties in planning and controlling its expenditure on e-learning within the allocated budget. A contributing factor could be its method of outsourcing procurement. Although this outsourcing strategy offers significant advantages, such as efficiency and prompt delivery, it also involves a trade-off between timely delivery and cost-effectiveness. In other words, although the GDE is able to deliver and deploy ICT quickly to schools, there might be a loss of control over spending, as the procurement agency may purchase items at prices exceeding the budgeted prices.

Table 7: Comparison of actual to budgeted expenditure

Item_Level_4	2016/2017 Variance	2017/2018 Variance	2018/2019 Variance	2019/2020 Variance	2021/2022 Variance	2022/23 Variance
ADMINISTRATIVE FEES: PAYMENTS	-	5 508 494	- 186 919	79 015 592	- 25 872 760	6 048 812
ADVERTISING	-	-	-	-	113	1 560
AGENCY&SUPRT/OUTSOURCED SER	-	-	-	-	-	-
CATERING:DEPARTML ACTIVITIES	- 240	-	- 51 000	- 80 000	-	-
COMMUNICATION	24 638	108 365	- 53 339	- 5 013 211	- 4 067 878	- 38 276 155
COMPUTER SERVICES	-	927	3 129 136	1 789 510	14 091 997	51 882 697
CONS SUPPLIES	- 1 269 828	- 75 699	679 131	935 065	- 7 261 460	- 18 202 286
CONS:STA,PRINT&OFF SUP	- 3 487	- 24 162	- 240 940	- 306 147	- 190 781	- 192 595
CONTRACTORS	-	- 3 788	- 9 025 642	- 236 017	74 740 504	93 183 270
FLEET SERVICES(F/SER)	- 3 390	- 70 220	- 114 219	- 748 619	- 1 082 898	- 1 164 028
H/H:EMPLOYEE SOCIAL BENEFITS	-	- 36 058	- 323 259	- 1 672 523	- 50 929	- 9 031
INV:LEARN&TEACH SUPP MATE	- 3 146 898	- 23 514 555	26 298 776	22 007 493	- 59 698 562	- 101 220 485
INV:OTHER SUPPLIES	529 042	- 162	50 685 100	96 223 865	13 714 685	84 226 000
MINOR ASSETS	- 6	- 17 000	- 35 000	- 510 000	- 600 380	- 645 026
NPI:PUBLIC SCHOOLS	-	-	-	-	-	-
OPERATING LEASES	75 393	- 40 465	18 568	- 3 236 312	- 11 653 742	- 11 757 856
OPERATING PAYMENTS	21 097	- 52 091	- 13 099	- 391 835	- 147 367	- 86 676
OTHER MACHINERY & EQUIPMENT	- 1 629	- 23 711	- 587 895	- 968 123	- 115 968	- 317 401
SALARIES AND WAGES	2 944 070	27 493 895	34 798 541	53 328 303	64 071 460	81 693 238
SOCIAL CONTRIBUTIONS	442 927	3 706 090	2 717 609	8 419 701	10 245 756	13 816 582
SOFTW & OTHER INTANGIBLE ASSET	-	-	-	-	3 133 157	2 427 714
TRAINING & DEVELOPMENT	- 996	- 100 000	-	-	-	-
TRANSPORT PROVIDED DEPT ACTIVI	63 000	-	-	-	-	-
TRAVEL AND SUBSISTENCE	106 180	1 956 799	- 805 051	- 9 254 850	- 3 860 120	- 5 821 453
VENUES AND FACILITIES	-	-	- 40 000	310 700	-	-
Grand Total	- 220 125	14 886 922	107 497 015	239 612 592	65 496 459	51 839 550

Source: Author's calculations based on BAS

6.2.5 ICT Spending per learner

The expenditure on ICT per learner provides a foundational benchmark for ongoing monitoring of the programme. It also enables Gauteng to benchmark its spending on ICT against other provinces.

That said, calculating expenditure per learner is complicated due to the varying ICT deployments across schools. As a result, it is difficult to establish exactly how many learners benefit from the e-learning programme. Therefore, to derive expenditure on ICT per learner, we have made certain assumptions:

- All learners in schools with Full ICT deployment benefit from e-learning.
- Only learners in the FET phase in schools with Partial ICT deployment benefit from the e-learning programme.

Based on the 2.5 million learners in Gauteng, we estimated that the e-learning programme reached about 476 895 learners in 2022. Given that the total expenditure for 2022/23 on the e-learning programme was R1.5 billion in 2022/23, this spending review estimates that the Gauteng Province spent on average of R3 319 thousand per learner per year through the e-learning programme (see Table 8). This expenditure per learner on e-learning is the highest in the country.³

Table 8: Estimated Expenditure per learner on e-learning in Gauteng Province, 2022

Number of Learners			
	Primary school	Secondary school	Total
Full ICT deployment	39 229	92 205	131 434
Partial ICT deployment	29 547	315 914	345 461
Grand total			476 895
Expenditure			
	Rands		
Total expenditure on e-learning	1 582 975 550		
Expenditure on ICT per learner	3 319.34		

Source: Author's calculations based on BAS and EMIS

6.2.6 ICT Security

The GDE's efforts in rolling out the e-learning programme have been hindered by a series of robberies of computing equipment. Shortly after the programme was introduced schools became prime targets, and criminals started setting up syndicates in communities to steal smart boards and other ICT devices. Unfortunately, we could not ascertain the amount spent on security from the data. School level data is not available, and the price of trackers for smart boards is included in the unit price.

6.3 Procurement analysis

The procurement analysis involved an examination of the SLA as well as an analysis of the SAP data.

6.3.1 Procurement contract

GDE has entered into a contract with BRL to procure, warehouse, distribute and retrieve (where applicable) devices to schools. For the GDE, this approach of outsourcing procurement and logistics has several advantages. GDE's agreement with a management and procurement agency significantly reduces the reliance on its internal procurement processes. This approach can potentially ensure that the rollout of the e-learning programme happens on time by

³ See Ragoo (2020) for the estimated expenditure per learner across provinces.

avoiding the delays typically associated with these internal procedures. Furthermore, BRL's provision of integrated services, encompassing procurement, warehousing, and distribution, eliminates the need for GDE to develop and maintain its own infrastructure in these areas. In addition, this arrangement transfers some of the maintenance and repair responsibilities, along with associated risks, to BRL.

On the downside, under the SLA, BRL's remuneration for managing GDE's e-LTSM is calculated as a percentage of the total budget rather than the actual expenditure. This fee structure could lead to excessive management fees, especially in cases where the budget is not fully utilised. Moreover, this arrangement does not incentivise BRL to seek cost-effective options in the procurement of devices and technology, as their fee is not linked to spending efficiency. Additionally, the process for monitoring how BRL passes trade discounts to GDE lacks transparency. Based on our interviews with GDE, there appears to be limited monitoring of the actual purchase price and whether volume or trade discounts are actually passed onto the GDE.

It is unclear whether the fees were compared against industry standards before the contract negotiation. For instance, another province has successfully negotiated a management fee of 11.5% for its e-learning programme, against what BRL charges which ranges from 12.5% to 13.5%.

The department appointed BRL in 2016/17 on a contract that spanned three years. This contract was renegotiated and the most recent contract between BRL and GDE started 2022 and will run for three years. In the most recent iteration, BRL levies fees on the total budget determined by a regressive scale for:

- Management/ administrative fee which covers the management of the contract.
- Aggregation and pre-loading data and content on devices.
- Monitoring, tracking and retrieval of devices.

Whereas the total fee charged depends on the item purchased, the maximum fee for learner devices can go up 25% of the budget. This effectively means that a quarter of the budget for learner devices goes towards the warehousing, preparation and logistical costs. Appendix 2 contains the schedule of fees in the 2022 SLA.

6.3.2 Procurement data

6.3.2.1 Supplier analysis

Using the procurement data, this spending review was able to conduct a supplier analysis. The analysis reveals that between 2018 and 2023, there were thirty-three suppliers to the e-learning programme. BRL accounted for 91% of all purchase orders issued by value, followed by e-Gov which is responsible for the installation of the WAN and Altron who connects schools to the APN (see table 9).

Table 9: Supplier Analysis, 2018-2023

Supplier	2018	2019	2020	2021	2022	2023	Grand Total	Share analysis
BONGANI-RAINMAKER LOGISTICS	500 431 901	1 093 196 538	898 651 678	1 203 725 990	1 043 685 147	1 349 626 432	6 089 317 687	91%
E- GOVERNMENT			69 641 593	163 495 534	107 780 664	98 156 980	439 074 771	7%
ALTRON TMT				23 163 797	26 140 203	30 678 386	79 982 386	1%
SCI-BONO DISCOVERY CENTRE				43 000 000			43 000 000	1%
OTHER SUPPLIERS	8 112 744	17 559 824	7 352 730	21 726	1 437 818	1 070 130	35 554 971	1%
GRAND TOTAL	508 544 645	1 110 756 362	975 646 002	1 433 407 047	1 179 043 831	1 479 531 929	6 686 929 815	100%

6.3.2.2 Transaction analysis

One of the worrying observations from the SAP data is that the service description filed in the SAP module is not captured consistently. Approximately R3.3 billion worth of purchase orders issued to BRL lack service description (see Table 10). In other words, it is unclear what was being purchased.

Table 10: Transactional analysis, 2018-2023

Service Text	Sum of invoice value
#	3 385 618 063
General support and maintenance	469 269 783
Resource management fee	184 483 894
Advertisement newspaper to specification	130 930 062
Aggregation and pre-Loading	96 007 010
Outsourced Items Special LTSM	70 712 983
Management fee	66 764 032
License fee	46 912 029
Project management	28 278 876
Advocacy Material & Mediation	20 235 069
E-books 1 year license grade 12	20 081 754
FET Grade 12 subject pack 11	18 756 566
FET Grade 11 subject pack 5	15 970 750

It is also important to note that it is difficult to identify approvals and authorisations from the SAP data, as the GDE uses group codes. This undermines the accountability as it makes it difficult to trace who is responsible for purchase orders approvals. An example of this practice can be seen in Table 11.

Table 11: Critical fields not filled in SAP around purchase name

Purchasing Group2	Invoice Value
054 M L Mkuni	130 585 005
075 T E Kunene	128 852 965
167 F Chitja	40 200 098
GDE COFF Box	3 268 356 577
GDE RFQ BOX	30 385 020
Not assigned	897 309 296

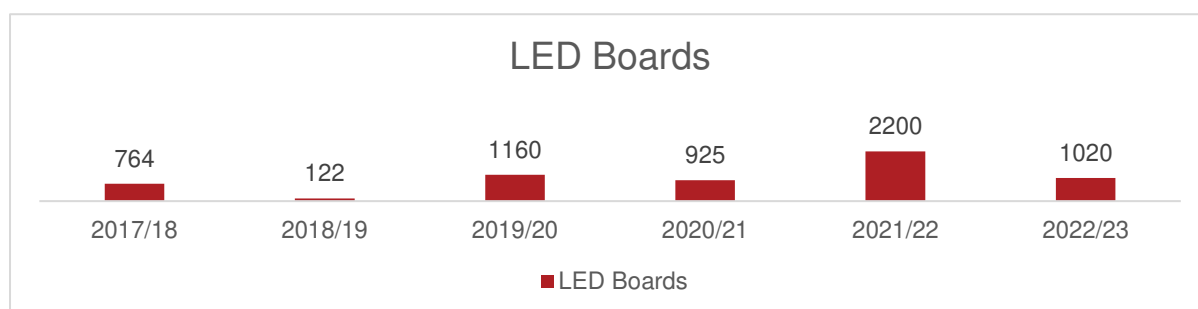
Grand Total	4 495 688 961
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6.4 Comparative pricing analysis

6.4.1 Quantities purchased

The GDE through BRL purchases copious quantities of LED boards, laptops and tablet. It should therefore be able to negotiate bulk discounts and better prices. With regards to LED boards, except for 2018/19, the GDE has purchased over 750 boards annually, peaking at 2200 in 2021/22.

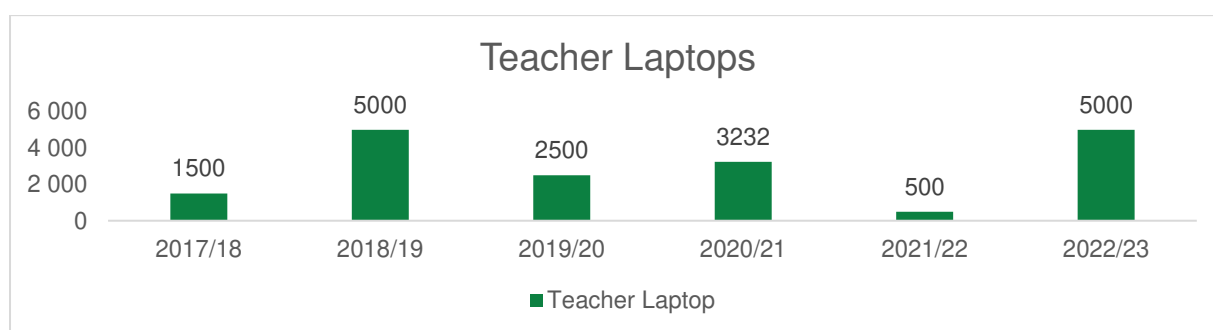
Figure 12: LED boards purchased between 2017/18 and 2022/23



Source: GDE price and quantity data

Except in 2021/22, which could also be a data error, it appears that GDE has purchased at least 1500 laptops every year. This is by industry standards a relatively large order of equipment, meaning that GDE should have considerable power to negotiate on these items.

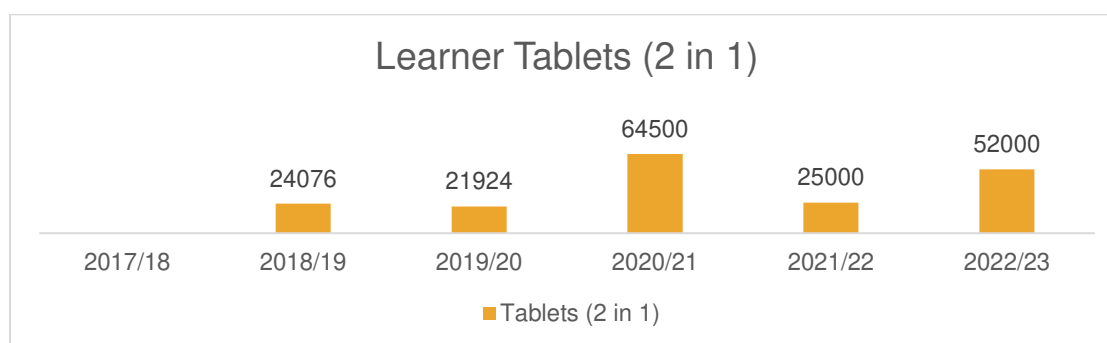
Figure 13: Teacher laptops purchased between 2017/18 and 2022/23



Source: GDE price and quantity data

Tablets are the single largest category of product purchased through the e-learning programme. In 2022/23, the GDE purchased 52 000 tablets for learners across the province. These volumes reinforce the point that the GDE should be paying considerably less than market price for these goods.

Figure 14: Tablets purchased between 2017/18 and 2022/23



Source: GDE price and quantity data

6.4.2 Prices over time

The GDE, based on data received from BRL, provided us with the specification for LED boards, teacher laptops and learner devices as well as the prices for each product across six years.

The analysis reveals that the price LED boards has decreased by 10% between 2017/18 and 2022/23. However, prices of laptops and learner devices have increased by 23% and 17 % respectively over the same period. This is higher than CPI although it is important to note that the price of electronic devices in South Africa is also influenced by a weakening rand as the majority of devices are imported.

Moreover, the price increase for teacher laptops and learner devices has happened even though GDE is purchasing more quantities of these items, therefore suggesting that the procurement agency might not be leveraging sufficient bulk discounts.

Table 12: Price changes for LED boards, laptops and tablets, 2017/18 to 2022/23

Item	Specifications	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	% Change
LED Boards	65-inch, simultaneous touch interaction	137 117	105 169	117 325	115 230	123 477	123 950	-10%
Teacher Laptop	Intel Core i5, 8th generation 32GB RAM	11 000	13 440	15 650	15 583	12 795	13 500	23%
Tablets (2 in 1)	Intel Atom Celeron Chipset, 256 GB SSD		6 308	6 308	6 931	6 976	7 396	17%

Source: GDE price and quantity data

6.4.3 Prices benchmarking

Using this data, we were able to benchmark prices using the Pricecheck Website for 2022/23 prices.⁴ The spending review compared products based on specifications provided by GDE.

On a positive note, the Gauteng Department of Education (GDE) procured tablets at prices below the market average, demonstrating effective use of its purchasing power. Furthermore, a benchmarking exercise revealed that market prices for LED boards and teacher laptops were inflated by 26% and 22% respectively. Had the GDE acquired LED boards at the more competitive rate in 2022, it could have realised savings of approximately R32.6 million. In the case of teacher laptops, potential savings of around R15 million were identified. With these combined savings of R47.9 million, the department could have afforded an additional 6 485 devices for learners, had it consistently secured the lowest prices.

Table 13: Price benchmarking, 2022

Item	Specifications	2022/23	Lowest market price	Variance	Interpretation
LED Boards	65-inch, simultaneous touch interaction	123 950	91 642	26%	Premium over market price
Teacher Laptop	Intel Core i5, 8th generation 32GB RAM	13 500	10 499	22%	Premium over market price
Tablets (2 in 1)	Intel Atom Celeron Chipset, 256 GB SSD	7 396	7 699	-4%	Below market price

Source: Pricecheck

7 CONCLUSIONS AND RECOMMENDATIONS

Conclusion 1: The GDE has made substantial progress in rolling out its e-learning programme. Within seven years of its launch, the e-learning programme covers about a quarter of all schools. That said there is significant variation between districts.

Although the progress to date in deploying ICT in schools is commendable, there is a notable disparity in the distribution of ICT-equipped schools across districts. Gauteng North is at the forefront, with 40% of its schools categorised as ICT schools. Gauteng West and Tshwane North follow closely, with 31% and 30% of their school's embracing ICT, respectively. However, this trend is not uniform across the region, as districts like Johannesburg East and Tshwane South lag behind, with only 22% and 20% of their schools having ICT facilities, highlighting a significant variation in ICT adoption within the province.

Recommendation 1: In its next roll-out plan, the GDE should address how it intends to address the emerging disparity between districts.

⁴ <https://www.pricecheck.co.za/>

Conclusion 2: Schools categorised under Quintile 4 have disproportionately benefited from the e-learning programme, a trend partly attributable to the widespread availability of Wide Area Network (WAN) connections via the Gauteng Broadband Network (GBN) in those areas. Such an imbalance prompts questions regarding the alignment of the e-learning programme with the pro-poor policy direction advocated by the Gauteng Government.

The concentration, displayed by the density of schools that have access to WAN, should be understood within the context of where e-Gov is investing its infrastructure. While there is no direct policy alignment between E-Learning and the Gauteng Broadband Network (WAN investment), the analysis shows a lack of congruency between where both GDE and e-Gov are spending. While the rollout plan of e-Gov is inclusive of all other beneficiaries and communities and government institutions, there should equally be concerted efforts to prioritise public schools in the TISH communities. Therefore, this spending review is putting forward the following questions:

- Is there supposed to be policy or programme congruency between e-learning and GBN?
- Is the implementation of the E-Learning programme aligned with the programme's overall policy objectives, particularly with reference to the spending per quintile?

Recommendation 2: *The GDE should develop a clear policy position detailing the extent of alignment between e-learning and GBN. Moreover, the policy position should demonstrate how the e-learning programme will align with the pro-poor policy implementation of the Gauteng Provincial Government.*

Conclusion 3: There are concerns regarding value for money obtained by GDE, given that 94% of the total expenditure is directed towards goods and services procured mainly through a project management and procurement agency.

The current contract with the implementing agency for the e-learning programme, while advantageous in terms of efficiency and timeliness, exhibits significant shortcomings in two principal areas:

1. **Incentivisation for Value-for-Money Procurement:** The SLA with the service provider lacks incentives to promote value-for-money in procurement processes. This deficiency is highlighted by the excessive costs incurred for LED boards and teacher laptops. Despite purchasing in massive quantities, which typically allows for cost reductions, the premiums paid suggest an inefficiency in the procurement strategy. This situation raises concerns about the service provider's capability or willingness to secure goods economically, which is crucial for government spending. The absence of incentives in the SLA implies a missed opportunity to align the service provider's objectives with the government's value for money goals.

2. **Contractual Terms and Benchmarking Deficiencies:** Benchmarking of management is a critical process in a contracting process, providing a standard against which the cost-effectiveness and market competitiveness of management fees can be measured. Without this, it becomes challenging to determine whether the GDE is receiving the best possible value for its expenditure on the e-learning programme. Furthermore, the apparent lack of a benchmarking exercise or any substantial analysis for contract renegotiation by the department signifies a potential oversight. Such an oversight could lead to missed opportunities for cost savings and improved contract terms, which are essential for ensuring that public funds are used effectively and that the services procured meet the expected standards of efficiency and cost-effectiveness.

Recommendation 3: *For the next round of contracting, the GDE should consider benchmarking the management and logistical fees against other providers and provinces. This benchmarking exercise should then inform any future negotiations. As an interim measure, the GDE should implement a regular price benchmarking exercise to compare the prices of products (e.g. tablets, LED boards and laptops) provided by the service provider with market prices, identifying potential cost savings opportunities.*

Conclusion 4: There appears that there is limited capacity for contract management and financial oversight specifically related to the procurement and logistical contract within the GDE.

The GDE pays the contractor on an invoice basis without asking for the source invoices showing at what prices the LED boards, tablets and laptops are procured. The GDE assumes that no markup will be added and that the service provider passes on trade discounts but has no mechanism in place to check that this is not happening.

Recommendation 4: *Build capability for contract management and financial oversight dedicated to this specific contract within the GDE. As this particular service provider works across the GDE's units, there is a need for a collaborative approach to contract management. Implement a system of asking for source invoices to accompany all the invoices from the service provider.*

Conclusion 5: The inconsistent and unreliable capture of procurement data in the SAP system makes any analysis of pricing and procurement challenging. It also undermines transparency and accountability in the procurement process.

Analysing the SAP procurement data, it has become apparent that critical fields, such as the service description which indicates what was purchased, are not captured consistently. Approximately R3.3 billion in purchases for the e-learning programme lack a service description in the SAP module. Furthermore, the use of group logins limits the ability to hold individual officials accountable for specific transactions.

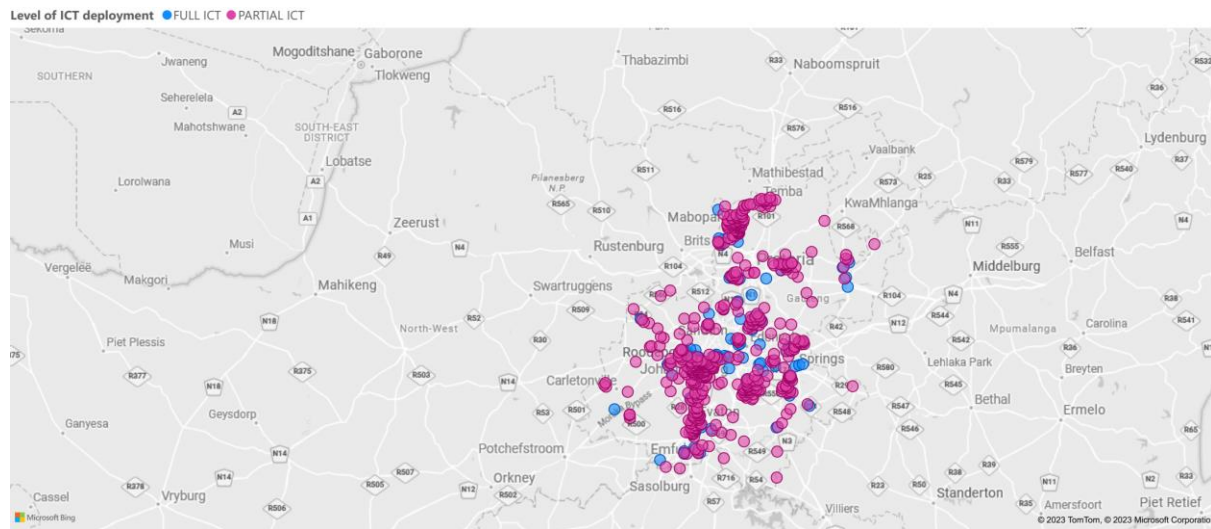
Recommendation 5: *Ensure the consistent and reliable capture of procurement data to facilitate effective analysis and decision-making. Put in place controls so that procurement officers must fill in critical fields in the SAP Module.*

Conclusion 6: E-learning is a strategic priority for the Gauteng Provincial Government and therefore it should be monitored more closely. It is clear that finding e-learning expenditure can be challenging as it sits in different units in BAS.

Recommendation 6: *Promote transparency in reporting expenditures within the e-learning program to build trust and accountability. From 2024/25, GDE should tag all e-learning expenditure using the project code in BAS (e.g., project code level 4).*

APPENDIX 1: SUPPLEMENTARY INFORMATION

1A: ICT Schools in the Gauteng Province

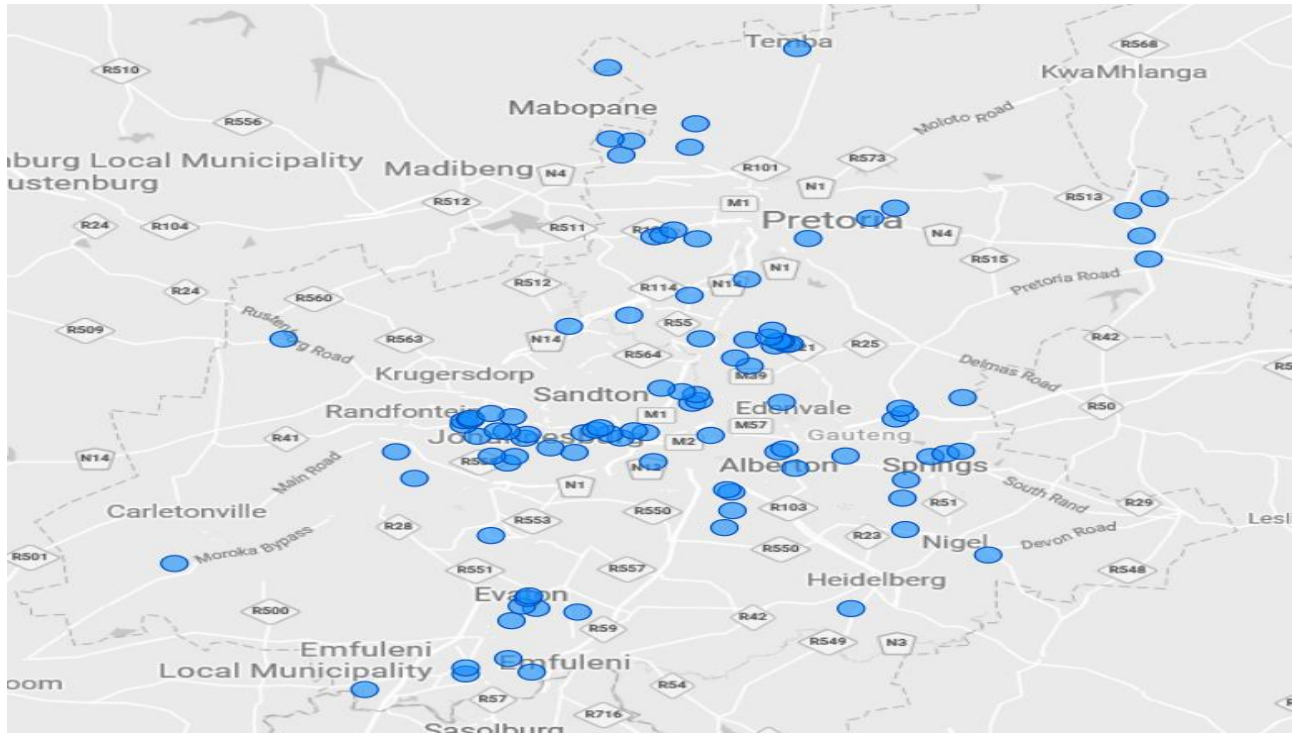


1B: PERFORMANCE ANALYSIS

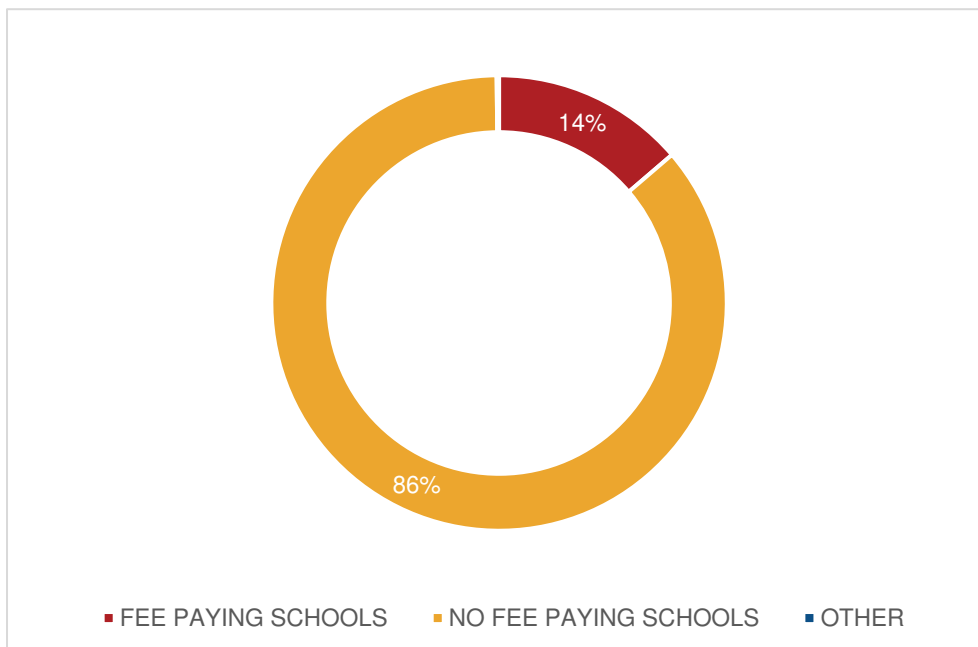
Type of network infrastructure in ICT Schools

NETWORK INFRASTRUCTURE	ICT Schools	Percent
APN	94	16%
FIBER	3	1%
NONE	111	19%
ROUTER	8	1%
WAN	365	63%
WIRELESS	2	0%
Grand Total	583	100%

Full ICT Schools

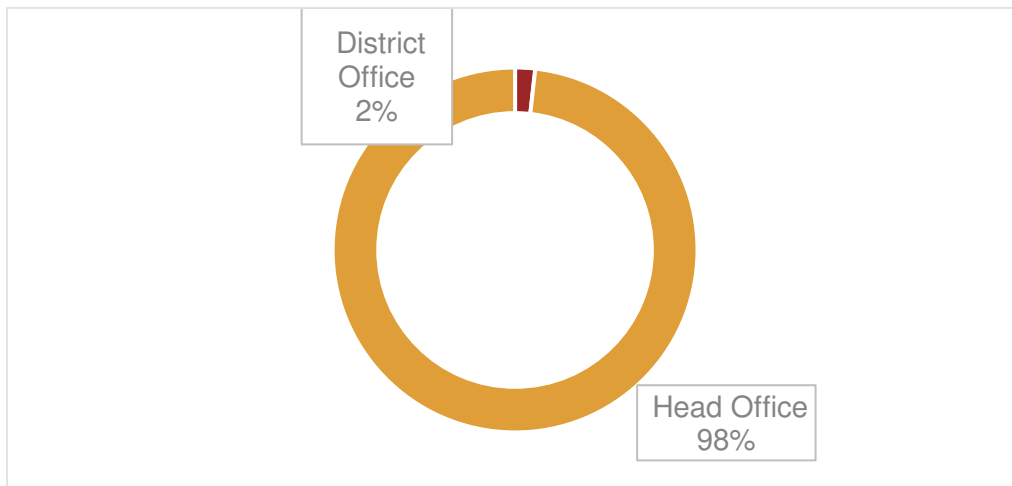


ICT Schools by Payment Status



1C: BAS Analysis

E-learning expenditure by source



APPENDIX 2: BRL SCHEDULE OF FEES

Management Fee/Administration Fee as a percentage of the budget (%)	Estimated range of bid values (Estimated budget amounts) of LTSM to be procured
13.50%	Up to R100 million
13.25%	From R201 million – R 300 million
13.00%	From R301 millin – R400 million
12.75%	From R401 million – R500 million
12.50%	Above R 500 million

Fee for Aggregating e-Content Pre-loading Devices with e-Content (and management thereof) as a percentage of the budget (%)	Estimated range of bid values (Estimated budget amounts) of E-LTSM to be procured
8.00%	Up to R100 million
7.75%	From R201 million – R 300 million
7.50%	From R301 millin – R400 million
7.25%	From R401 million – R500 million
7.00%	Above R 500 million

Tallor Made Resources Management System Fee: Bar-Coding, Profiling, Allocation, Tracking Monitoring of utilisation, Reporting, and Retrieval of Hardware devices and related materials as a percentage of the budget (%)	Estimated range of bid values (Estimated budget amounts) of LTSM and E-LTSM to be procured
3.50%	Up to R100 million
3.25%	From R201 million – R 300 million
3.00%	From R301 millin – R400 million
2.75%	From R401 million – R500 million
2.50%	Above R 500 million