



SUCCESS BY NUMBERS

HOW USING DATA CAN UNLOCK THE POTENTIAL OF
SOUTH AFRICA'S R-12 PUBLIC SCHOOL SYSTEM



Michael & Susan Dell
FOUNDATION

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FOREWORD BY THE MINISTER OF BASIC EDUCATION


Over the past 20 years, the standard of research in education has developed substantially, with an increasing focus on diagnosing and measuring system performance and measuring compliance in the provision of quality education. In an attempt to enrich the research environment, the national and provincial departments of basic education have embarked on research studies and commissioned external studies in order to advance the core business of improving learner performance, skills and opportunities.

The Delivery Agreement, signed by the Minister of Basic Education (DBE) and the President of South Africa in 2012, highlights four key outputs: 1) improve the quality of teaching and learning, 2) undertake regular assessment to track progress, 3) improve early childhood development, and 4) ensure a credible, outcome-focused planning and accountability system. This outcome-based approach has resulted in the development of a well-researched, detailed, output-orientated sector plan, the *Action plan to 2014: Towards the Realisation of Schooling 2025*. Our evidence-based approach is further evident through the numerous programmes that have been initiated, including various school and district monitoring efforts, the Annual National Assessments, and the South African Schools Administrative and Management System that aims to improve management at all levels.

The focus of the sector will now be the meaningful use of data to inform planning, management and operations in order to improve learner performance and feedback to all players in the sector. Clearly, the actions and sense of urgency of all players in the sector are critical in enabling improved responsiveness, effectiveness and accountability in our schooling system.

The research conducted by the Michael and Susan Dell Foundation, *Success by Numbers: How Using Data Can Unlock the Potential of South Africa's R-12 Public School System*, assists our sectoral drive to improve the quality of education, reduce systematic inefficiencies and ultimately strengthen learner performance and, in this instance, meaningful use of data.

I would like to thank the Michael and Susan Dell Foundation for their positive contribution to research in the basic education sector and their overall interest in improving the quality of education. I trust that this report will receive consideration from the DBE and other stakeholders in order to improve the basic education sector as a whole.



Mrs. AM Motshekga, MP
Minister

29 May 2013



basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA





EXECUTIVE SUMMARY

This report highlights one of the most critical enablers of education performance for South Africa: the use of data to track and accelerate the achievement of improvement goals across the school system.

The report is the product of a study undertaken by the Michael & Susan Dell Foundation in partnership with South Africa's National Department of Basic Education (DBE), with research and analytical support provided by McKinsey & Company. The study's purpose was to create a robust database of the successes and challenges of South African's school system in using data to drive performance. It also sets out to identify the most promising opportunities to harness data for better outcomes – across South Africa's highly diverse schools, districts and provinces.

To obtain the findings set out in this report, a research team spent several months visiting schools across the country; interviewing education officials at school, district, provincial and national levels; assessing the challenges and opportunities; and distilling the lessons learnt from successful education improvement efforts around the world.

These findings make it clear that South African schools already invest huge effort in data collection, and that many principals and officials appreciate the value of data and want to use them better. However, schools currently derive much less benefit from data than they could – they typically invest many precious hours each year in providing data in response to requests from education officials, but rarely see that data translated into outputs that guide or support action. The same experience is repeated at each successive tier of the system: data flow upwards, but rarely back down for use by those who collect it.

There are grounds for optimism, though. With a few targeted interventions, the huge effort already invested in data collection could generate much more useful outputs. Some quite simple steps could make performance significantly more visible across the system, and enable teachers, principals and officials to use data much more effectively to drive improvement.

The report explores the findings of the study – as well as their context and implications – in seven chapters.

1. Tackling the challenges facing South Africa's public schools

Since 1994, South Africa has had considerable success in increasing student access. For example, access to school for six-year-olds improved from 49.1% in 1996 to 96.1% in 2011. But this has not been matched by sufficient advances in learner achievement and progression. Based on current progression rates, as few as 10% of today's six-year-olds will pass grade 12 at a level that qualifies them to enter university. South Africa's investment in schooling has likewise failed to translate into improved student performance, with the country lagging behind its global and African peers in maths, science and reading.

The problem is made all the more urgent because success and performance in South Africa's school system are tightly correlated with learners' socio-economic background. Rather than narrowing South Africa's socio-economic divide, our education system appears to be maintaining it.

To build on the progress South Africa has made in public schooling and find a solution to the many serious problems that remain, the National Department of Basic Education (DBE) has set out a series of bold improvement goals in its "Action Plan 2014 Towards the Realisation of Schooling 2025". These include:

- Increasing the number of learners who have mastered primary literacy and numeracy, and improving the volume and levels of secondary school achievement, particularly in maths and science.
- Improving school enrolment and grade promotion, and improving access to Further Education and Training (FET).
- Improving teachers' skills, motivation, and optimising teaching time and practice in the classroom; ensuring access to textbooks and workbooks; and improving schools' physical infrastructure and environment.

With a clear action plan in place, South Africa has reason to be optimistic. It can also look to successes in other parts of the world, where the leaders of diverse school systems have grappled with similarly difficult challenges.

2. Harnessing data to drive performance: Global lessons

School systems in other countries – despite great variation in resourcing and technology – have put data to work as a key component of initiatives that have significantly improved education outcomes in a short time. These include:

- **Punjab, Pakistan.** This vast province – with 25 million school-aged children and 60,000 schools – faced severe access, quality and infrastructure challenges, particularly in rural areas. In early 2011, the government launched an improvement programme, underpinned by a simple yet robust approach to using data. The programme has had dramatic results in just 18 months: one million additional primary-age children are now enrolled in school, and teacher absenteeism has fallen by 35%. The keys to success have been clear targets and detailed, context-specific implementation plans – as well as low-tech but highly innovative approaches to data collection.
- **Minas Gerais, Brazil.** This largely urban system of 18,000 schools faced a challenge with reading levels: in 2006, only 49% of eight-year-olds were reading at the recommended level, and 31% were reading poorly. A targeted strategy – including continuous monitoring based on robust gathering and use of data, scripted literacy instruction materials, standardised teaching techniques, and teacher training and coaching – led to an impressive turn-around. By 2010, 86% of eight-year-olds were reading at the recommended proficiency level, and the proportion of those reading poorly had been reduced to 6%.
- **Ontario, Canada.** In the early 2000s, Ontario's comparatively high-performing and well-resourced school system – covering 5,000 schools – was in decline. A data-driven turn-around strategy was launched in 2003 in collaboration with schools, educators, unions and parents. Its main goals were to improve literacy and numeracy in primary schools, and to improve the rate of completion of secondary schooling and progression into higher education or employment. Significant progress has been made. For example, primary school learners' proficiency in reading, writing and maths increased from around 50% to around 70% in the first seven years of the programme.

The common thread in such school improvement efforts is a strong commitment to using data to candidly assess current performance and to focus effort and resources on the areas prioritised for improvement. These characteristics can be mapped onto a simple framework – the “data-driven decision-making cycle” – to help guide school system improvement across three phases:

- **Phase 1: Assessment.** The systems and schools create a shared focus on a prioritised set of measurable goals and capture the key data needed to measure progress against those goals.
- **Phase 2: Analysis.** Data are entered into a shareable system and aggregated and analysed for use.
- **Phase 3: Action.** Routines and capabilities are built to ensure that data are reviewed and acted upon in a regular, timely manner, and actionable, tailored outputs are created for key users at system, district and school levels.

This framework forms the basis for both the findings and the recommendations of this report.

3. Insight at home: The use, impact and potential of data in South African schools

How could better data use improve South Africa’s schooling system? To help answer that question, the team researched the current data landscape, conducting 300 interviews across the National DBE and all nine provinces, covering 18 districts and 48 schools. The research spanned every level of the system, from teachers and school administrative clerks to provincial and national departmental leaders.

This process showed that most of the school system’s educators and officials are already putting enormous effort into data collection. There is a wide range of data measurement tools already in use, covering everything from learner demographics to educator and learner attendance, learner performance, and school finances, inventories, facilities and management.

Thus the raw material for data-driven performance, though imperfect, does exist. In addition, South Africa has a very strong national focus on one key data point: the National Senior Certificate (“matric”) pass rate. This suggests that it is entirely possible to unite stakeholders around other common performance goals and metrics.

However, for all this effort, the South African school system is currently deriving far too little benefit from data. Across the country, the research team’s visits and interviews revealed enormous frustration – firstly because inefficiencies and duplication mean that much of the time and effort involved in data collection is wasted, and secondly because the data collected generally does not translate into useful insight or meaningful action. Data collection is driven more by a policy compliance imperative, which results in data being passed “upwards” in the system, than by a performance imperative, which would result in data being shared “downwards” and “sideways” into the hands of those who can use it most directly to act on student learning and school improvement.

To complicate the data picture further, South Africa’s schools and school districts operate in very different contexts. School accessibility varies widely. Urban schools, whether in richer or poorer neighborhoods, typically receive considerably more visits, attention and support from district and circuit officials than rural schools do. There is also extreme disparity in resourcing. For example, districts visited in some provinces had one individual responsible for overseeing and supporting all 20 to 30 schools in a circuit single-handedly, often over a large geographic area, while other provinces had up to 10 staff per circuit responsible for these tasks. And the technology environment varies too. Technology-enabled schools are at an advantage, while those without computer access must collect data on paper – and must often enter the same data manually into multiple forms and templates.

The research findings are detailed in three sections, focusing on each of the three phases of the data-driven decision-making cycle – Assessment, Analysis and Action. In each of these sections throughout the full report, the findings are supported by case studies, examples and quotes from interviews.

4: Research findings: Assessment

It is in the **Assessment** phase of the data-driven decision-making cycle that South Africa is currently most active. There is widespread awareness of the challenges that must be met, and much effort is already being made to capture data. However, much of this effort is wasted because South Africa has not prioritised a few clearly focused improvement goals. Moreover, existing financial and bureaucratic incentives often promote a “box-ticking” approach to compliance, rather than

With a few targeted interventions, the huge effort that South African schools already invest in data collection could generate much more useful outputs.

aiding the generation of reliable and useful data.

Key research findings include:

- Intense national focus on the matric pass rate has been achieved – but this metric is not an entirely accurate marker of success, and it does not measure performance in previous grades.
- Although this is not intentional, the focus on learner numbers and matric pass rates has led some stakeholders in the system to take perverse action – reporting false information for financial and reputational benefits.
- Data collection currently places an unnecessary – and in many cases overwhelming – burden on educators. There are significant opportunities to reduce this burden by up to 50% through standardisation, data-sharing, assigning collection responsibility to other staff, eliminating other duplication and/or through technology advances.

5. Research findings: Analysis

Although South Africa has developed a robust data management software tool in the South African School Administration and Management System (SA-SAMS), on the whole the country does a poor job of inputting and aggregating data in a systematic way. Unfortunately, most users and managers of SA-SAMS lack the standardised processes or requisite capabilities to combine or analyse data in such a way that actionable insights are generated for school improvement. Huge benefits could flow from investment in developing standardised processes, technical support and management capabilities to aggregate and analyse a few common, prioritised databases.

Key research findings include:

- Processes for inputting and aggregating data are not well defined across the school system – most often, data are kept locally, kept on paper, and/or collected by multiple entities. Most users lack access to aggregated data.
- Virtually all data collected are self-reported and many are unverified. This fuels duplication, as much existing data are not trusted. The opportunity exists to make collected data more reliable and trustworthy through relatively simple methods of data verification, such as cross-referencing reported student numbers with test mark data, or checking reported test scores against random samples of actual marked tests.

- Because of the proliferation of data systems, there is no “single truth” on many key metrics. However, rather than investing in building the processes and capabilities to make a few existing data sourcing “pipes” more reliable and robust, the tendency is to repeatedly develop new pipes.
- Standard analyses are defined and undertaken for the matric pass rate – but other metrics are rarely analysed. In part this is because the large volume of data collected, much of them on paper, means that there is insufficient time or management capacity for either aggregation or analysis. Ironically, in the one case where the research team encountered systematic school-level analysis of common test data, this was done in such breadth and detail that it overwhelmed the educators involved – and obscured any actionable insight they might have derived from analysing their students’ tests.
- The lack of data outputs means that schools and districts are unable to gauge accurately the impact of many of their improvement interventions. As a result, action plans are often generic and non-specific, follow-up on whether plans have been implemented is lacking, and unsuccessful plans are often repeated in subsequent years.

7. The way forward

South Africa’s school system faces significant challenges in translating data into better performance and enhanced educational equity – but there are tremendous opportunities too, no matter the starting point or environmental context of a particular school, district or province. In particular, there is a major opportunity to translate data, that are mostly already collected, into actionable insights that can be shared across the system to drive improvement – in learners’ access, attendance, retention, progression and performance.

How can leaders shift the practice of what happens in school and classrooms – and do so systematically across the whole school system? This report argues that part of the solution lies in using data more effectively to focus efforts that support learning, solve problems for schools and manage performance. We argue further that districts and circuits are a logical starting point for such efforts, as these entities provide both the scale and the granularity to drive meaningful change – they are the fulcrum that can leverage system-wide school improvement. On the basis of the research findings, we propose seven practical steps that leaders at national, provincial and district levels can take to ensure that districts become effective drivers of data collection, analysis and use:

6. Research findings: Action

This is the phase where South Africa’s data performance is most lacking. For all the effort that stakeholders invest in data collection, they typically see little output in the form of information, insight or guidance to support school improvement. This is also the phase where there is likely to be the greatest opportunity for impact: creating a focused set of clear, action-oriented outputs could galvanise change across the school system.

Key research findings include:

- The outputs produced from school data are generally intended for provincial, national and even international audiences – with very few data outputs produced for the purpose of informing, enabling and guiding the districts and schools that can act most directly on school performance.
 - Outputs are typically very hard to interpret, most often taking the form of vast tables of raw data. Ironically, by listing everything, these data tables often make it extremely difficult to analyse any item in depth.
 - Because schools and districts typically lack access to data outputs, they lack the “fuel” for effective management meetings. Managers must therefore drive performance largely on the basis of gut feel and anecdote, rather than on data – or else not drive performance at all.
1. **Limit the number of goals a district is expected to prioritise and use as criteria to guide management.** Ideally there should be no more than three to five critical goals per district – and in all cases with the leading goal being learner achievement.
 2. **Reduce data collected from schools to the minimum amount necessary to make decisions.** This step is essential to eliminate duplication and reduce frustration at the school level. To accomplish it will require explicit national and provincial support, elimination of duplicative reporting, avoiding collecting data that can be sourced alternatively (e.g., from Statistics South

Africa), and ceasing to collect data that is used only for reference rather than for insight and action.

3. **Create a central function and local database, to store, manage and share information.** In each district, a capable and empowered central function – logically, a strengthened education management information system (EMIS) – should be given responsibility for storing and interpreting data in a central database, and for sharing data outputs with all district and school stakeholders.
4. **Devise methods to verify that the data collected are accurate.** To ensure data are accurate, a three-stage procedure is recommended. First, systems should introduce basic data validity checks. Second, all self-reported data must be backed up by systems of checks and balances, including cross-referencing of data with other data points. Third, sampling should be undertaken for verification purposes – e.g., random requests for actual exam papers to verify test marks.
5. **Design and deliver easy-to-use, automatic analyses for province, district, circuit and school personnel.** The essence of this recommendation is simple: start showing data to stakeholders. It is also critical to ensure that outputs are easy to interpret, relevant to users' managerial tasks, and easily actionable.
6. **Use new outputs as guides for performance dialogues and accountability meetings between districts and circuits, and circuits and schools.** Regular, prescriptive management sessions must be established between district managers and circuit managers, circuit managers and principals, and principals and HoDs and teachers. These performance-focused conversations should be built into every stakeholder's work schedule and must ultimately guide support and instructional practices.
7. **Shift the mindset of district staff, so they see themselves as agents of change, not inspectors or compliance-driven data conveyors.** Perhaps most challenging of all, people must be won over. District staff need support and ongoing reinforcement to help them understand that success consists of achieving results against agreed performance indicators, not just completing required tasks.

These practical steps represent a range of opportunities for data-driven school improvement across South Africa's highly diverse school districts. Resource-constrained rural districts have an opportunity to gather data with very little technology or investment and to use it to achieve much greater operational efficiency with their limited resources. Districts that already have well-established data-collection routines have a major opportunity to extract greater knowledge and insight from the effort they are already making. And districts that are already technology-enabled and data-savvy have the opportunity to extract deeper insights from data, with higher specificity about the steps schools can take to improve performance and that districts can take to support them.

Chapter 1 Tackling the challenges facing South Africa's public schools

This report has been developed with one very clear purpose: to assist South Africa's educators and education leaders in achieving their aspirations for improving public schooling. The focus is on the use of education data as one effective enabler of systemic improvement.

South Africa's leaders know that in order to achieve sustained improvement in the schooling system, fundamental challenges must be addressed. This chapter outlines those challenges, as essential context for the report's findings and recommendations, and summarises the government's action plan for remediation.

Challenges facing South Africa's schools

Since 1994, South Africa's public school system has been grappling with four core challenges that are common to national public school systems around the world:

- Increasing student access to school.
- Ensuring student retention and progression through the school system.
- Improving student performance.
- Enhancing educational equity across socio-economic brackets.

South Africa has had considerable success in meeting the first challenge – getting more children to class.¹ In 1996, at the start of a massive transition in the national educational landscape, almost one in every five 20-year-olds (19.1%) reported having received no formal education at all. By 2011, only 15 years later, that number had fallen by more than half, with 8.6% of 20-year-olds reporting the same status. Similarly, access to school for six-year-olds improved from 49.1% in 1996 to 96.1% in 2011.

Despite this significant increase in access, however, South Africa has not achieved similar success in learner retention and progression. Current progression rates show that as few as 10% of students who enter Grade R (the first year of schooling) will complete and pass Grade 12 at a level that qualifies them to enter university.²

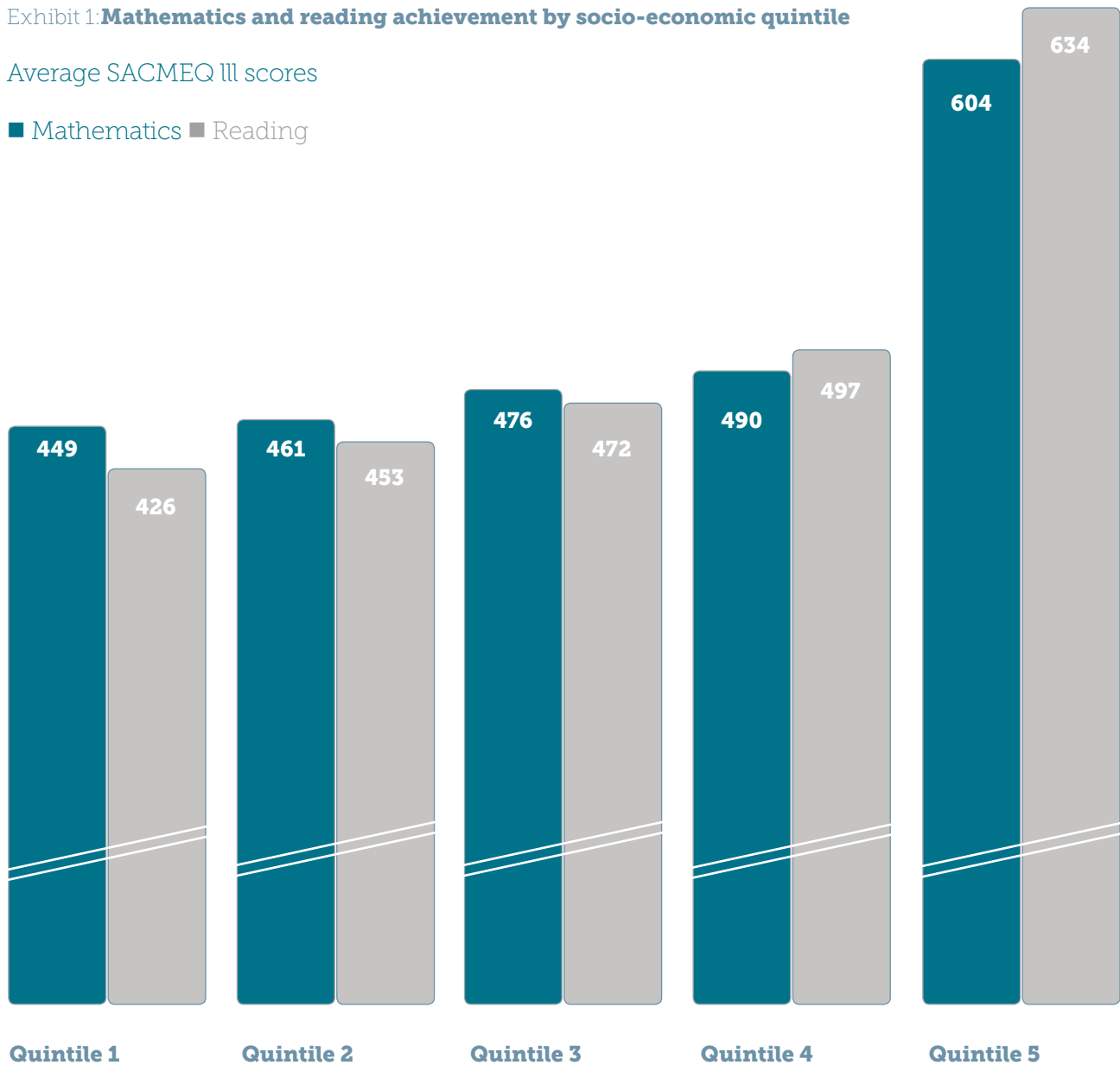
These statistics call into question the effectiveness of South Africa's spending on basic education. The sums spent are enormous: South Africa's education spending is equal to about 7% of GDP, or 20% of the national budget – matching the spending rates of developed countries like the UK and the US. When this expenditure is seen in conjunction with South Africa's low progression rates, however, the picture is even starker – one recent study estimated that South Africa spends R442,900 for each learner who passes Grade 12.³

South Africa's national investment in schooling has likewise failed to translate into improved student performance. International standard measurements clearly demonstrate South African students' struggles in maths, science and reading – with surveys showing them lagging behind their peers in the rest of the world, including across much of Africa. These include the Trends in International Mathematics and Science Study (TIMSS),⁴ the Progress in International Reading Literacy Study (PIRLS),⁵ and studies by the Southern and Eastern Africa Consortium for Monitoring Educational Quality (SACMEQ).⁶

Exhibit 1: **Mathematics and reading achievement by socio-economic quintile**

Average SACMEQ III scores

■ Mathematics ■ Reading



SOURCE: SACMEQ, 2007

1 Cited from 2011 SA Census data: http://www.southafrica.info/about/education/census-education-301012.htm#_UMYEr-S5Na9

2 Research by the Sasol Inzalo Foundation.

3 "SA's matrics cost taxpayer R442,900 each", Media24 Investigations, 18 May 2012. <http://www.m24i.co.za/2012/05/18/sas-matrics-cost-taxpayer-r442900/>

4 Trends in International Mathematics and Science Study (TIMSS) results from 2003 show South Africa's achievement in Grade 4 and Grade 8 mathematics to be below those of all other participating countries, including the Palestinian National Authority, Botswana and Ghana. Findings from a Developmental Project. Mullis, I.V.S., Martin, M.O., & Foy, P. (2005), Chestnut Hill, MA: TIMSS & PIRLS International Study Center, Boston College.

5 Progress in International Reading Literacy Study (PIRLS) results from 2006 show South Africa's achievement in Grade 4 and Grade 5 in literacy to be below those of all participating countries including Iran, Kuwait and Morocco. PIRLS 2006 Summary Report; South African Children's Reading Literacy Achievement. Howie, S., Venter, E., van Staden, S., Zimmerman, L., Long, C., du Toit, C., Scherman, V., Archer, E. (2008) Pretoria: Centre for Evaluation and Assessment, University of Pretoria.

6 Southern and Eastern Africa Consortium for Monitoring Educational Quality (SACMEQ) results from 2007 show South Africa's achievement in Grade 6 reading and mathematics to be below a number of peer countries such as Botswana, Kenya, Tanzania, Swaziland, Zimbabwe, Mauritius and Seychelles despite better average socioeconomic status for its learners. SACMEQ III Project Results: Levels and Trends in School Resources among SACMEQ School Systems. Hungi, N., Makuwa, D., Ross, K., Saito, M., Dolata, S., van Capelle, F., Paviot, L., Vellien, J., (2011) SACMEQ.

Perhaps the greatest cause for concern, however, is that success and performance in South Africa's school system are highly correlated with learners' socio-economic background. Among the relatively few students who progress through the education system (and the even smaller numbers who attain high levels) success rates are dramatically skewed towards Quintile 5 schools – typically the wealthiest public schools, mostly in urban areas (Exhibit 1). In South Africa's 2012 Annual National Assessments, which tested all students in Grades 1 to 6 and in Grade 9 on reading and mathematics, Quintiles 1 to 4 all performed at very similar levels to each other. Performance levels at Quintile 5 schools, however, showed a considerable jump up – a pattern that remained consistent across almost every grade and subject.⁷

Even more telling is that the higher the grade level, the larger the gap was between Quintile 5 students and other students – indicating that the school system acts to widen the gap between socio-economic groups. Both success and failure are compounded with each additional year in school. Rather than helping to bridge the socio-economic divide, the country's education system appears to be widening it.

The Government's Action Plan for 2025

To deal with the serious problems in South Africa's public schooling system, the National DBE has set out a series of bold improvement goals in its *Action plan to 2014: Towards the Realisation of Schooling 2025*. The plan is broken down into 13 output goals for student performance and progression in Grades 3, 6, 8, 9 and 12, and 14 "enablers" or input goals to help achieve the output goals. (See the appendix for a full list of these 27 goals.)

Although the National DBE's action plan does not detail specific steps or intervention approaches for schools, districts or provinces to follow, it does set ambitious targets for addressing the fundamental problems in the educational system. The goals can be grouped into five major categories:

1. **Student achievement:** Increasing the number of learners who have mastered primary literacy and numeracy; improving the volume and levels of secondary school achievement, particularly in maths and science; and increasing the number of matriculants eligible for university entry. Specific goals include achieving a 90% Annual National Assessments pass rate for Grade 3, 6 and 9 learners in reading and mathematics by 2024; and increasing the number of Grade 12 learners passing mathematics and physical science to reach 350,000 and 320,000 respectively.
2. **Student participation and progress:** Improving school enrollment and grade promotion, and improving access to Further Education and Training (FET) beyond Grade 9. Specific goals include increasing access to early childhood enrolment to 100% of potential learners; ensuring that all learners remain effectively enrolled in school until age 15; and improving promotion of learners through Grades 1 to 9 to 85% by 2024.
3. **School resourcing and provisioning:** Improving teachers' skills, motivation and optimising teaching time and practice in the classroom; ensuring access to textbooks and workbooks; improving schools' physical infrastructure and environment; and using schools as vehicles for promoting learners' access to public services such as health, poverty alleviation, psycho-social support, sport and culture.
4. **Professional development and oversight:** Improving teachers' professionalism, skills, knowledge, satisfaction and health.
5. **Management and community support:** Strengthening management processes, use of funding, and monitoring and support services; and strengthening parent and community participation in school governance.

⁷ SACMEQ Policy Brief: Inertia in South African Education Quality: Evidence from SAQMEQ II and III. Van der Berg, S., Moses, E., (2011) SAQMEQ.



South Africa's investment in schooling has failed to translate into improved student performance. International standard

Although South Africa's school system is facing some daunting challenges, the country has reason to be optimistic. It already has a clear action plan in place and it can also look to successes in other parts of the world, where the leaders of diverse school systems have faced similar challenges and set ambitious goals for improvement.

The next chapter explores three such school systems in very different countries. Brazil, Canada and Pakistan have all put data to work to achieve better education outcomes. South Africa now hopes to achieve outcomes on the same scale. There are grounds for optimism, as this country has already laid the foundation to begin to harness the power of data to drive improvement.

measurements show South African students lagging behind their peers in the rest of the world, including across much of Africa.

Chapter 2

Harnessing data to drive performance: Global lessons

To key in on improvement strategies that are relevant for South Africa's many types of school district, this chapter considers the lessons offered by the school improvement efforts of three public school systems, each in a very different environment and with very different resources and challenges. The chapter then uses these global insights to set out a three-phase framework for data-driven decision-making that forms the basis for this report's findings and recommendations.

Lessons from school improvement efforts around the world

Below, we outline the approaches and successes of school improvement efforts in three major public school systems – Punjab in Pakistan, Minas Gerais in Brazil and Ontario in Canada. Each has found contextually relevant ways to use data to help deliver tangible educational improvements in a relatively short time-frame.

Punjab, Pakistan: Data use in a low-tech rural environment

Punjab is Pakistan's most populous province, with some 94 million inhabitants. Its school system, with 60,000 schools (more than double the number in South Africa), faced tough access, quality and infrastructure challenges, particularly in rural areas. In 2010, eight million of Punjab's 25 million school-age children were not enrolled in school, with the low quality of schooling driving high drop-out rates. In early 2011 the government launched an improvement programme, underpinned by a simple yet robust approach to using data. The programme has had dramatic results in just 18 months: one million additional primary-age children are now enrolled in school; teacher absenteeism – a major contributor to low-quality schooling – has fallen by 35%; 180,000 primary school teachers have been retrained; and 35,000 facilities have been repaired, replaced or

expanded.

The data-driven improvement effort in Punjab has taken place in a vast school system, much of it rural, with low technology penetration and modest capabilities. Its approach to data collection and aggregation has therefore been relatively low-tech – but highly innovative.

The keys to success have been clear targets and detailed, context-specific implementation plans. The regional Punjab government worked with every school district to set clear targets, improvement trajectories and delivery plans. It also created standard monthly progress reports for each district, which are used both to recognise achievements and to identify and resolve problems. Punjab has employed an "army" of 800 people on motorbikes, each of whom does a monthly round of schools armed with a simple, standard checklist covering four metrics: teacher presence, student attendance, distribution of texts and the functioning of facilities.

Once the data has been collected, a small, central analyst team rapidly aggregates and synthesises it. The team creates visual reports that clearly communicate progress both at district level and statewide. Further analysis is undertaken for particular challenges revealed by the data, such as enrolment in rural areas, or enrolment of girls.

The data from these reports are used to inform progress reviews held every six to eight weeks at the state

level. These sessions focus on pragmatic problem-solving to drive immediate action and are led personally by the state's chief minister. The data for each school district are then translated into clear, simple reports which are used to support district-level staff so they can act quickly to solve problems.

Training and support has been provided to school districts to enable them to use the reports to identify, prioritise and solve problems – ensuring that the data are not used simply for top-down control, but also to empower people at all levels to take responsibility for driving improvement in their own areas.

Minas Gerais, Brazil: Focus on a few key metrics to drive improvement

Minas Gerais, Brazil's second most populous state, has some 20 million inhabitants, 85% of them in urban areas. Its school system, covering some 18,000 schools, faced a challenge to improve reading levels: in 2006, only 49% of eight-year-olds were reading at the recommended level, and 31% were reading poorly. A targeted strategy – including continuous monitoring based on comprehensive gathering and use of data, scripted literacy instruction materials, standardised teaching techniques, and teacher training and coaching – led to an impressive turn-around. By 2010, 86% of eight-year-olds were reading at the recommended proficiency level and only 6% were reading poorly. As a result, the state rose from fifth place in 2006 to first place in 2010 in Brazil's national reading assessments.

To achieve this result, the government prioritised improving the reading ability of eight-year-olds and created a standard literacy test to measure the state's progress against this clear goal. It also developed measures for a small number of "leading" indicators, such as scores on custom reading examinations. Reducing the complexity of the problem to a small set of common, easy-to-interpret numbers, enabled stakeholders to focus on a specific type of performance and track the effectiveness of local interventions.

The statewide goal was cascaded down to specific reading-improvement goals that were contracted with each individual school. A simple online tool was created to allow external teams to report on school performance quickly and easily – ensuring that data collection did not impinge on teaching time. Analysis of the data was entrusted to a central specialist team of 46 analysts at the state level. The team rapidly

generated standard, easy-to-interpret reports, and used the data to identify which regions and schools were progressing, and which were in need of more targeted support and intervention. This collaborative use of standardised test scores and common metrics on leading indicators (to guide interventions) enabled Minas Gerais to translate data into action.

Ontario, Canada: Data-driven turn-around in a high-tech environment

Ontario is Canada's most populous province, with 11 million inhabitants. In the early 2000s, Ontario's comparatively high-performing and well-resourced school system – covering 5,000 schools – was in decline. A data-driven turn-around strategy was launched in 2003 in collaboration with schools, educators, unions and parents. Its main goals were to improve literacy and numeracy in primary schools, and to improve the rate of completion of secondary schooling. Significant progress has been made. For example, primary school learners' proficiency in reading, writing and mathematics increased from around 50% to around 70% in the first seven years of the programme.

Effective use of data has been at the core of Ontario's successful school improvement programme. Granular (i.e., at the student level) data describing student achievement in each subject have been used to inform regular, action-oriented progress reviews at school, district and province levels. In particular, a provincial Literacy and Numeracy Secretariat uses student and school-level data to drive rigorous performance monitoring and problem-solving, providing "precise but not prescriptive" advice to schools on how to improve their particular learner test scores. The data is also used to populate the "Premier's dashboard", an up-to-date, easy-to-read progress summary used by the provincial premier to drive delivery.

This monitoring system has enabled the education ministry to focus on helping to implement the improvement strategy rather than on policy and compliance, which was its previous main focus. The system also makes it possible to quickly identify schools that are improving, understand which innovations are working in those schools, and share them across the system. For example, the programme "Ontario Statistical Neighbours" has used data to target interventions towards schools with similar characteristics and student populations, encouraging them to learn from each other's efforts and successes.

Data are also used in real and meaningful ways at the school level. In each school, one staff member (the principal, an analyst or a teacher leader) has been given responsibility and training to compile the data from individual classes and translate them into analysis on progress at the grade, subject and school levels. This timely analysis is communicated visibly to educators – for example, it is displayed in many teachers' lounges – as part of a drive to create data-rich school environments.

A three-phase decision-making cycle for data-driven school improvement

These three school improvement efforts had different goals and used different interventions. But the common thread was commitment to using data to candidly assess current performance and expend effort and resources on the areas prioritised for improvement. This is the essence of data-driven decision-making.

The characteristics of the particular environment – the needs of the student population, educator capacity, technological capabilities – can be mapped onto a simple framework to guide data-driven school system improvement. See Exhibit 2 for this framework, the “data-driven decision-making cycle”, comprising three phases of action:

- **Phase 1: Assessment.** In this phase, the systems and schools prioritise a shared set of measurable goals and capture the key data needed to measure progress against those goals.
- **Phase 2: Analysis.** In this phase, data is entered into a shareable system, and is aggregated and analysed for use.
- **Phase 3: Action.** In this phase, actionable, tailored outputs are created for key users at system, district and school levels, and capabilities are built and routines created so data will be reviewed and acted on in a regular, timely manner.

Each of these phases is explored in more depth below.

Phase 1: Assessment

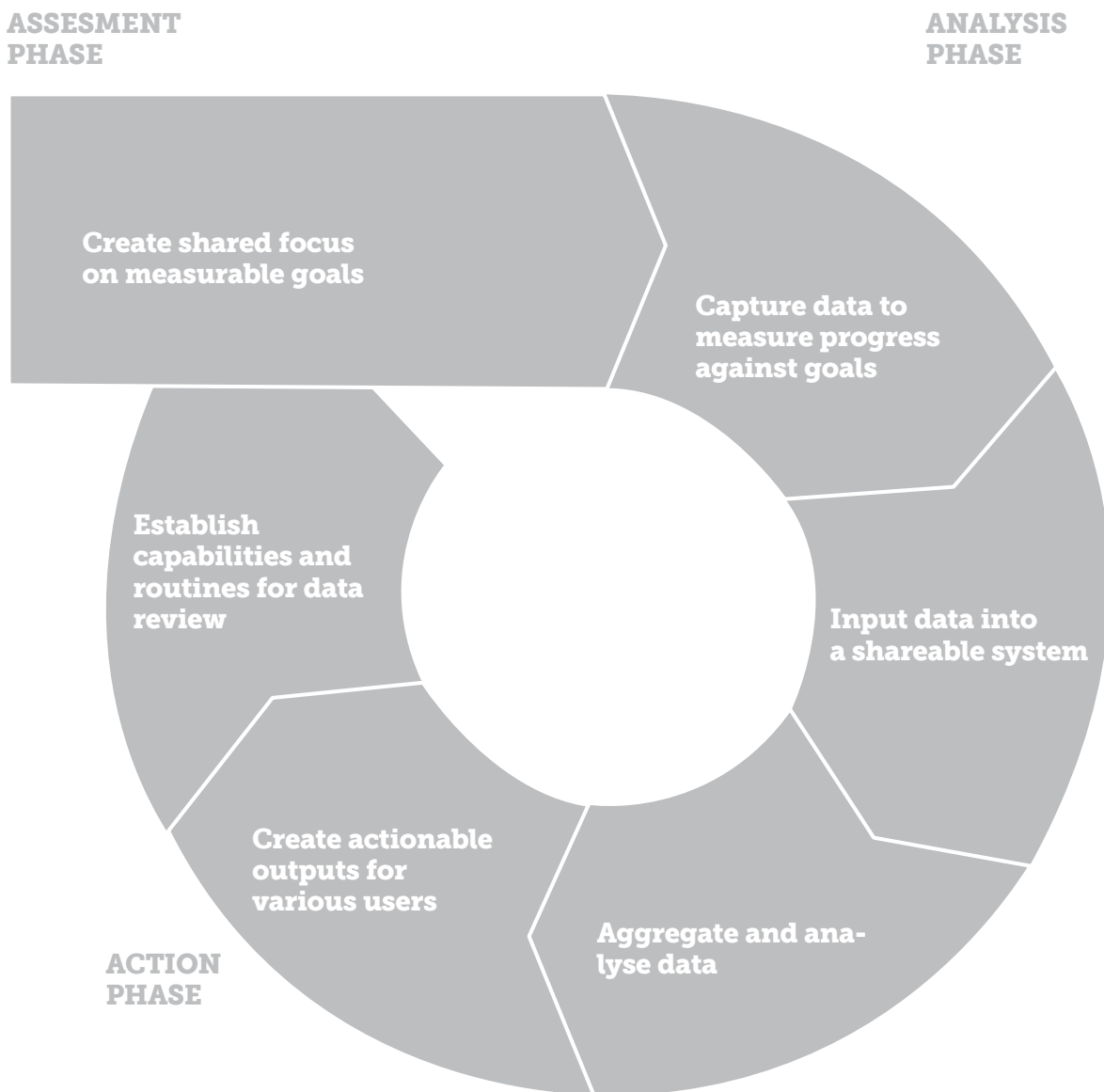
This phase begins by creating a set of measurable goals. Here success is characterised as:

- **Understanding and prioritising the key challenges for the school system.** Leaders of the school system build shared awareness and align the critical challenges for their schools. They ensure there is consensus on which will be tackled first, and stimulate the appetite to tackle them systematically, rather than all at once.
- **Defining representative metrics to understand performance and progress.** Leaders identify a set of data points which will symbolise the system's performance against each of its priority goals.
- **Creating clear communication on objectives, goals and current performance.** Leaders pre-define a set of actions that will follow good or poor performance; and share with stakeholders the rationale behind these actions and the newly prioritised challenges and metrics.

Once a system-wide focus has been established, successful systems spell out a set of clear, common practices for capturing data to measure progress against goals. Here success is characterised as:

- **Setting standard operating procedures and templates for capturing intervention-level data.** Leaders spell out the processes by which data will be collected. Because collection will be done across thousands of sites, these processes must be standardised to minimise variation and confusion.
- **Defining an appropriate cadence for data collection.** A system must determine not only how it will collect data but also when it will collect it. In successful systems, data collection cycles are matched with a timeline for meaningful analysis. They also give stakeholders enough time to act on this analysis and create meaningful change before the next round of data collection.
- **Reducing the data collection burden on educators.** School system leaders find ways to minimise the time teachers and principals spend on data collection, allowing them to spend more time on teaching. They use technology (e.g., barcode scanners to track attendance) and third parties (e.g., administrative clerks) to lessen the burden on educators.

Exhibit 2: Research focused on understanding capabilities across a data-driven decision-making cycle – from collection to output and use



DESCRIPTION

Assessment

A Create shared focus on measurable goals

- Have we defined the goals that we want to track?
- Are these goals understood and shared by stakeholders?

B Capture data to measure progress against goals

- Have we identified the right metric(s) to track?
- Who will capture this metric and how?

Analysis

C Input data into a sharable system

- Where will data be stored? Who will input it? How?
- Are there checks and balances on data?

D Aggregate and analyse data

- What system(s) will aggregate and hold data?
- How is data analysed for use?

Action

E Create actionable outputs for various users

- Which stakeholders will receive outputs? How often?
- How will the collected data be tailored for users?

F Establish capabilities and routines for data review

- Is data used in a regular and timely manner? How?
- What specific actions are taken based on results?

Phase 2: Analysis

Once collected, the requisite data must be **entered and aggregated** into a shareable system that combines current data with historical data. Here success is characterised as:

- Defining business processes to **aggregate** and input data from all suppliers. Clear, standard processes are put in place to ensure, manage and combine data submissions, and appropriate training is provided to embed these processes. Specific individuals are made responsible for delivering timely and complete submissions from all stakeholders.
- Installing verification procedures to ensure accuracy of collected data. These include data validation checks at the point where data are entered into a system, data verification steps once data are in the database, or are being updated, and cross-referencing of data points against historical inputs or peer results to identify anomalies. Such checks help ensure broad confidence among schools and managers that the data in central databases are accurate.
- Creating shared access for educational stakeholders interested in the data. System leaders work to ensure that there is widespread access to data, thus promoting accountability, and that solutions are in place to protect the personal and professional privacy of educators and learners.

Once data have been gathered centrally, the next step is to analyse the data. Successful interventions are able to translate data into insights – primarily by taking the volume of required data and analysing it in standard ways to present stakeholders with valuable information. Here success is characterised as:

- **Identifying a standard set of analyses for each school, circuit and district.** Leaders identify trends they expect to see to define success or failure. At the same time, analysts design common yet relevant analyses that are conducted periodically to inform stakeholders about their performance. Stakeholders are involved in the process of designing the analyses, so ensuring widespread agreement that these analyses are important indicators of success.

CREATING FOCUS AND COLLECTING DATA IN PUNJAB

In Punjab, the government prioritised four areas for improvement: (1) student enrolment and attendance, (2) teacher attendance, (3) delivery of textbooks and (4) school infrastructure. A key metric was identified for each goal, respectively: the percentage of students attending school, the percentage of teachers present in school, the percentage of schools that have received teacher guides, and the percentage of schools with appropriate infrastructure. These goals and metrics were communicated across the region, and visibly championed by the Chief Minister to ensure that all stakeholders were aligned on them.

To standardise and reduce the burden of data capture, Punjab's innovative solution was to hire a motorcycle-based "army" of dedicated data collectors who personally fill in standard, paper templates at the schools they visit. This not only reduces the collection burden on school staff but also ensures accurate and consistent data. Schools are visited every eight weeks – a cadence of data collection frequent enough to measure and promote rapid progress, yet not overly intrusive on the teaching process. Although not highly technical, Punjab's solution was well tailored for a rural region with low internet and computer penetration.

USING DATA TO TRACK OUTCOMES AND ROOT CAUSES IN MINAS GERAIS

In Minas Gerais, standardised tests and online entry tools are used to capture data. Data input is verified by the central analyst team and also, where necessary, by school visits. Once entered, data are automatically collected and aggregated online, rapidly analysed and then shared with stakeholders across the system. School staff have access to data for their own school, and for a limited set of comparative and system-wide schools, which is useful for their improvement efforts; while regional and state-level officials have access to a broader set of data.

The central analyst team runs standard analyses across the school system on five key metrics related to reading proficiency, tracking not just outcomes but the root causes of both good and poor performance. The team also trains and supports regional staff to conduct more detailed root-cause analysis for their circuits and schools.

- **Designing cascading analyses to create “root-cause” understanding of performance.** These include macro-level analyses which reflect current performance, and related, but more specific, micro-level analyses, to help stakeholders understand the potential drivers of performance. In successful systems, these two kinds of analysis are linked, to give stakeholders a fuller picture of performance.

Phase 3: Action

Once analysis is completed, data-driven educational systems are quick to create actionable outputs for various users – thus ensuring that data collection is rewarded with rich and actionable insights into performance. Here success is characterised as:

- **Creating outputs tailored to meet the needs of specific stakeholders.** Data analysis can offer insights into performance, but for interventions to succeed the insights must be shared with stakeholders who can affect change. School systems must therefore ensure that the analyses inform all levels of stakeholders with the level of detailed information needed by each – and that outputs are designed to meet the demands of individual users’ roles and responsibilities.
- **Focusing on easy-to-interpret styles of presentation.** Outputs must be designed and displayed with the capacities of the end users in mind, minimising the level of data interpretation required. Successful school systems use a combination of visual, numeric and composite data. They also keep outputs short and focused – to avoid a “data dump” on end users.
- **Ensuring regular production and delivery of outputs.** Successful systems ensure that data collection efforts follow a natural rhythm, giving actors time to act and see their impact. They also ensure that outputs are produced in a timely fashion and delivered regularly to schools and stakeholders.

Producing outputs of targeted analysis can help inform stakeholders, but to drive thoughtful and coordinated action, school systems must establish capabilities and routines for data review: educational stakeholders must meet regularly to discuss insights, review performance and develop intervention plans. Here success is characterised as:

- **Conducting frequent data reviews and performance dialogues involving all stakeholders.** Leaders embed data-review practices into their management calendars, and put in place mandatory data reviews and performance conversations between district officials, circuit teams, school leadership and educators. This helps ensure that all stakeholders understand the current performance of their schools – and that there is growing awareness of results and accountability for them.
- **Establishing a commitment to building analytical skills across stakeholders.** Successful systems ensure that stakeholders across all levels will understand the data outputs and devise solutions and, where there are gaps, commit resources to training and development.
- **Monitoring and evaluating the impact of interventions on performance to guide future decisions.** Beyond tracking performance against targets, results are used to understand the effectiveness of previous actions. A rigorous approach is put in place to identify successful strategies and, just as importantly, unsuccessful ones.

The next chapter uses findings from four months' research across the National DBE and all nine provinces, covering 18 districts and 48 schools and talking to more than 300 interviewees, to offer a picture of South Africa's data landscape today.

CREATING REGULAR, EASY-TO-READ REPORTS TO DRIVE ACTION IN PUNJAB

Punjab created easy-to-read, graphic-based monthly reports that district officials could use to track progress, showing the improvement required to reach targets, in very tangible terms (e.g., 35 more guides must be delivered, 515 students more per day must attend school). It also created a graphic-based report to keep the Chief Minister and other senior decision-makers apprised of progress. This report colour-coded each region in the state green, yellow or red on each key metric, instantly signalling which regions required intervention. Importantly, these reports were prepared regularly and routinely, every six to eight weeks.

Punjabi district officials were required to create concise intervention plans with numerical targets and timelines – which they were held accountable for on a monthly basis. Critically, this accountability was accompanied by empowerment: district officials received monthly training in reading and analysing data. This enabled them to use data to make decisions on a day-to-day basis, identifying which schools required the most support and intervening there first. It also ensured that management meetings at district and state level became increasingly centred on data and analysis – rather than gut feel and anecdote.



Chapter 3 Insight at home – the use, impact and potential of data in South African schools

How could better use of data improve South Africa's schooling system? To answer that question, the research team needed a broad understanding of current data practices. Over four months the team conducted an in-depth study to understand the current state of data collection and use across South Africa's school system. The study included more than 300 interviews across the National DBE and all nine provinces, covering 18 districts and 48 schools in depth. The stakeholders interviewed included national, provincial and district leaders, circuit staff, principals, school management teams (SMTs), teachers and school administrative staff.

Two districts in each province were selected with the help of the National DBE through a random selection process. Participating schools in these districts were selected through a stratified sampling process, ensuring that schools of differing size, performance, composition and socio-economic characteristics were included. This methodology ensured that the provinces, districts and schools covered in the research represented a diverse array of educational environments – a mix of urban and rural schools, across all wealth quintiles and across a range of performance bands, with and without internet and computer access (Exhibit 3).

Overview of research findings

What did this study reveal about data use in South Africa's schools?

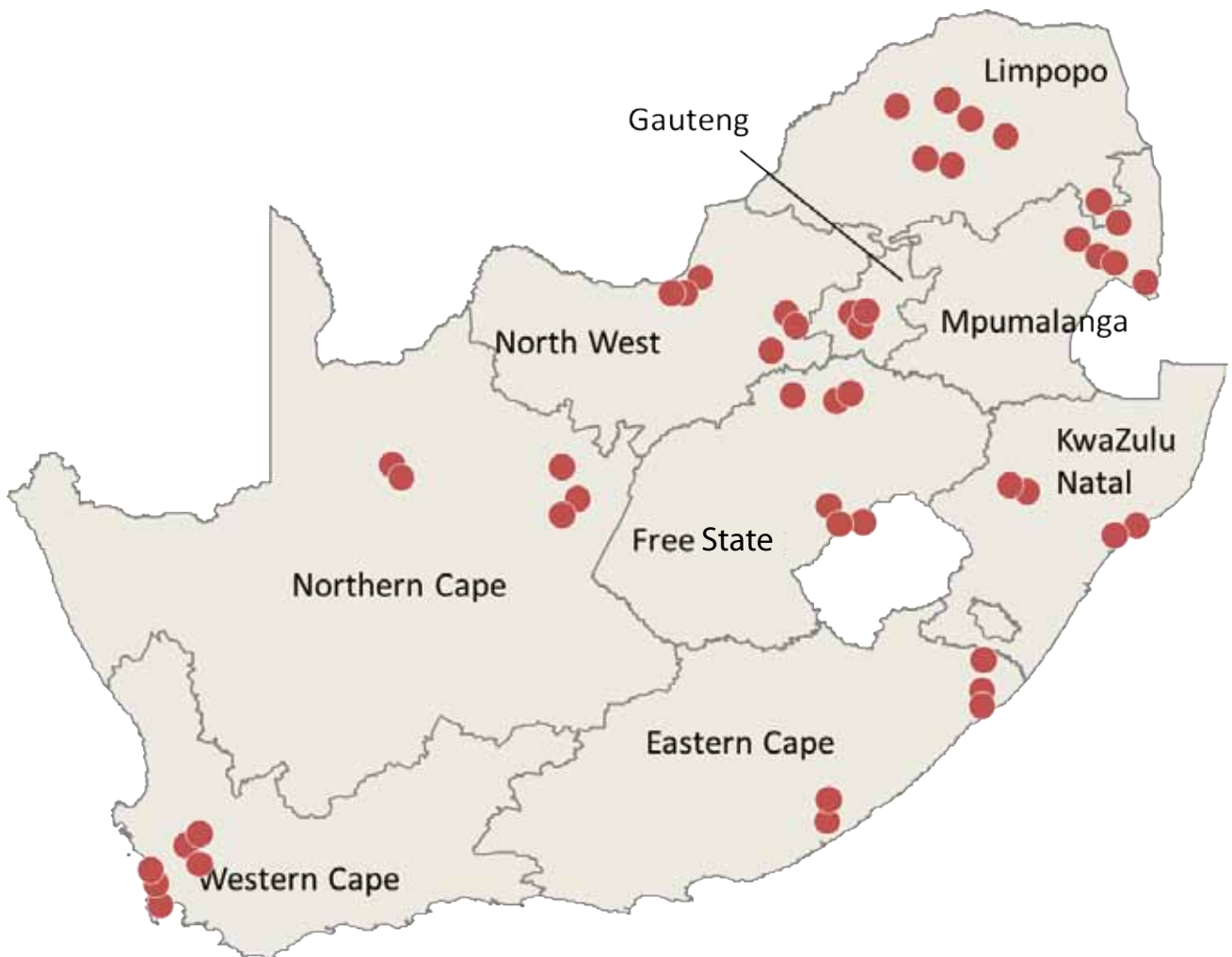
First, it showed that across most of the school system, educators and officials already put enormous effort into data collection. At national, provincial, district, and school levels, the research identified a wide range of data measurement tools already in use, covering everything from learner demographics to educator and learner attendance, learner performance, and school finances, facilities and management. Stakeholders invest considerable time and effort in gathering this data.

In some schools and districts, leaders are exerting additional effort – either compiling, analysing and acting on data of their own, or using data and analysis from elsewhere in the system – to improve their performance or resourcing.

South Africa can therefore be confident that the raw material for data-driven performance exists, with a wide range of operational and assessment data already available across much of the system. At all levels, remarkable individuals are championing the use of data to improve school performance, drawing insights from it, and guiding action with existing resources. (The next three chapters profile several such success stories.)

Second, it showed that South Africa focuses very strongly on one key data point: the National Senior Certificate ("matric") pass rate. Educators, officials and leaders across the system are universally conscious of, and concerned about, the way their school, district or province performs on this metric. This finding suggests that it is entirely possible to unite stakeholders around other common performance goals and metrics.

Exhibit 3: Findings are sourced from over 300 interviews – touching all nine provinces, visiting 18 districts and nearly 50 schools



Third, it showed clearly that, for all this effort, the South African school system is currently deriving far too little benefit from data. Across the country, the research team's visits and interviews revealed enormous frustration – because inefficiencies and duplication mean that much of the time and effort involved in data collection is wasted, and because the data collected generally do not translate into useful insight or meaningful action. Many interviewees complained that most of the data requested are not verified, trusted or even looked at, and that this wasted effort takes a significant amount of time away from teaching and learning activities.

As an example, in one district the research team found that the data requests created at the district level and distributed to principals amounted to 572 questions per quarter – but that more than two-thirds of these questions were duplicative (Exhibit 4), existing in other filed documents or in SA-SAMS, a computer-based school management and administration system (see sidebar).

Exhibit 5 illustrates the research findings, based on interviewees' views of South Africa's effectiveness in harnessing data for school improvement. The exhibit plots 25 key data metrics against the three phases and six steps of the data-driven decision-making cycle – a green bar indicates a positive rating, a red bar negative. According to interviewees, South Africa has been moderately successful across most metrics, in the Assessment phase – that is, pointing stakeholders towards a set of metrics and goals, and capturing relevant data. But they rated South Africa poor in the Analysis phase, across most of these metrics – reporting that data are rarely shared, aggregated or analysed in a meaningful way. In the Action phase, they considered South Africa to be extremely ineffective, both at creating outputs of any sort and at establishing institutional skills and routines.

The more demanding challenges

Underlying these problems – and the widespread sense of frustration across the system – are several more serious shortcomings in the way data are currently designed, collected and analysed. From the school perspective, most stakeholders state that institutional efforts are aimed more at collecting data than on analysing or using it. The breadth of reporting requirements and the persistent duplication of collection and input efforts equate to a significant amount of

SOUTH AFRICAN SCHOOL ADMINISTRATION AND MANAGEMENT SYSTEM (SA-SAMS)

The National DBE developed the SA-SAMS software as a “school administration and management system” available at no charge to all schools in South Africa to help them manage their data and information needs. The system's core modules allow schools to register basic information about learners, teachers and the school. It also has modules for curriculum, where task-level marks can be tracked; for school finance, where all school receipts can be tracked and submitted to districts; and for learning and teaching support material (LTSM), transport and nutrition.

SA-SAMS enables school leaders and administrators to undertake a number of tasks, including time-tabling, attendance, filling the annual school survey and tracking learner marks. Despite this, provinces have taken varying stances on using SA-SAMS. Some have adopted it in 100% of their schools via mandatory policy, while others currently have no schools on the system. As a result, the use of SA-SAMS varies greatly across the country. In some areas it is widely used for all its modules, in others it is used only to record learner and teacher information, and in others it is not in use at all.

Exhibit 4 **Duplication of data requests to schools**

Number of survey questions asked per quarter

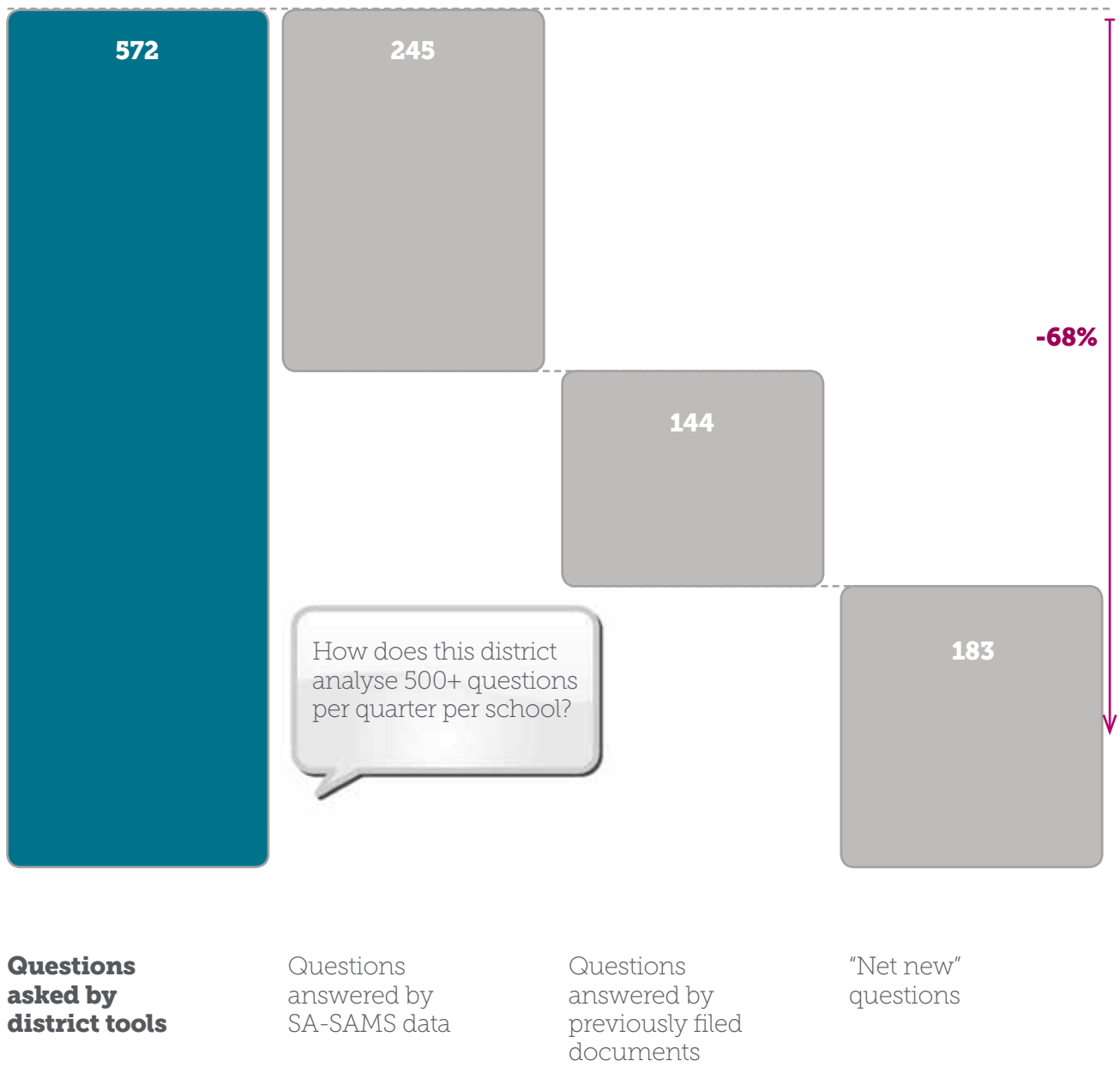


Exhibit 5: **Significant effort is spent collecting data across a number of goals, but ultimately little impact is created**



time spent gathering and storing data. This leaves very little institutional capacity for analysing data, producing outputs or managing with data – actions that schools feel have been ignored under current practices. (The next three chapters provide several case studies and examples of these problems, from across South Africa.)

Compliance versus improvement

The data collected today from South Africa's schools covers a broad swathe of topics – but most of it is not used to drive ground-level action. In effect, data are primarily collected to check processes rather than to measure performance. Data requests mostly ask schools about their characteristics (e.g., student numbers) for financial planning purposes and about their progress in completing tasks for compliance purposes. Rarely are data collected to understand the drivers of student performance. Most stakeholders therefore feel that data are primarily used to inspect rather than to support.

As Exhibit 6 shows, data collection is currently driven mainly by a policy compliance imperative, which results in data being passed “upwards” in the system – rather than by a performance imperative, which would result in data being shared “downwards” and “sideways” to put them into the hands of those who can use them most directly to act on student learning and school improvement.

Trust and verification

Compounding the problem, limited verification and sharing undermines trust in the data. Where operations, process completion or student achievement data are tracked, they are rarely shared with a broader set of stakeholders vertically (e.g., province to national) or laterally (e.g., Finance Department to HR Department). As access is not shared (and data outputs often not communicated), stakeholders make new, duplicative requests to schools and ultimately proliferate new databases. This re-collection produces many databases and data trails with extremely varied accuracy and completeness.

Duplication and “malicious compliance”

On the ground, schools that are required to complete and re-complete these requests understandably report high levels of frustration – with some resorting to

“malicious compliance”, where unchecked or inaccurate data are submitted simply to display compliance. The final landscape of inaccurate and scattered data undermines faith in data outputs, and this produces a vicious cycle – more re-collecting of data, more copies of the same metrics in various disjointed systems, and further undermining of trust in anything designated as “the official numbers”.

Operating environments: Understanding context

In evaluating the South African data landscape, we must be aware of the operating contexts of its schools. Indeed, the schools and districts are so diverse that it is essential to understand both their specific data challenges and their opportunities for improvement. To understand these contexts, the research team focused on three key factors: accessibility, resourcing and technology.

Accessibility

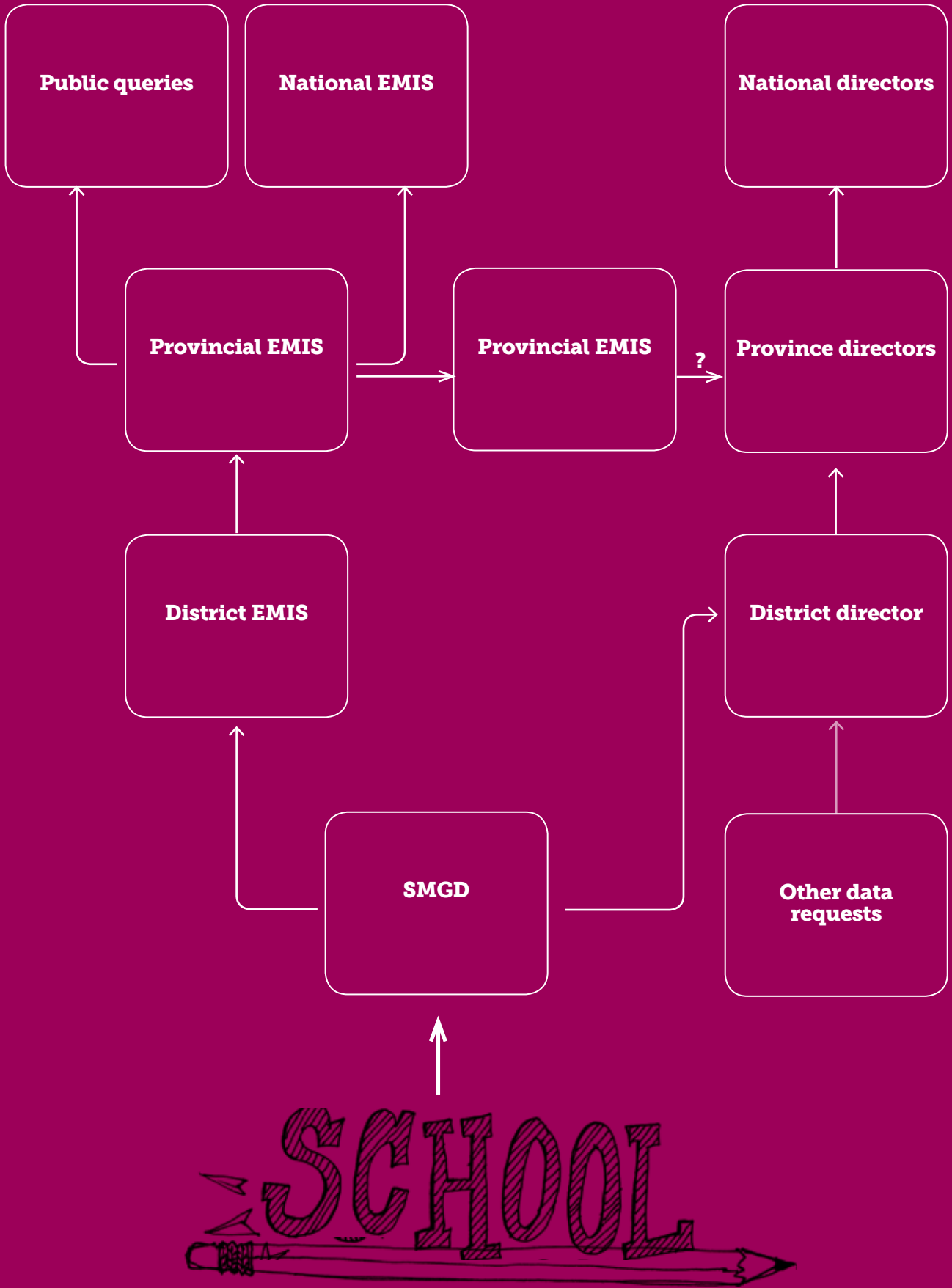
South African school environments range from fully rural to fully urban. This difference is often correlated with the number of schools per circuit, but in a surprising way: rural circuits tend to have a greater number of schools (often more than 30 per circuit), spread over vast geographic areas. In contrast, urban circuits typically have fewer schools (sometimes fewer than 20 per circuit), concentrated in a relatively small area. This difference is driven by both official and personal decision-making: district and circuit offices tend to be concentrated in urban areas, with relatively few education officials wishing to live and work in rural areas.

The effect is that urban schools, whether in richer or poorer neighborhoods, typically receive considerably more visits, attention and support from district and circuit officials than rural schools do. This is further compounded by the fact that rural schools vary more in size and shape than urban schools do. In a single rural district, some schools may teach all 12 grades and others just three, ranging from small to very large by learner enrolment; this further complicates the task of officials supporting such schools.

Resourcing

There is extreme disparity in the resourcing of South Africa's school districts and schools – across multiple factors such as staffing, availability of vehicles to visit

Exhibit 6: **Data flow upwards to satisfy compliance requirements**



schools, access to phones and access to photocopiers. Some districts the research team visited had just one person responsible for overseeing and supporting all the schools in the circuit, often over a huge geographic area (see sidebar), while others had up to 10 people per circuit responsible for these tasks, each with a specialist role such as “special needs”. Likewise, circuit and school staff in some districts the team visited had limited access even to landline telephones to communicate with each other, due to budgetary restraints, while in others the school staff were equipped with smartphones loaded with “apps”, for reporting school maintenance needs, for example.

Technology

Technology has a strong influence on the capacity to collect and use data. Schools that have power, telephone access, internet access, adequate computer hardware and software, and reasonable levels of computer literacy and training, are at an advantage. For example, access to computers and the internet makes data collection much simpler and faster; schools without such access must collect data on paper, often with multiple sign-offs.

Unsurprisingly, SA-SAMS is used more widely in schools and districts with good technology access. But it should be emphasised that installing computers in schools is not enough to create a good technology environment: the research team visited several schools where donated computers went unused, because staff had not received the necessary training and support to operate them, software had not been updated, or internet access was patchy or non-existent. Although technology access is not a driver of “better” data, it is an indicator of difficulty in collecting data, and can foreshadow the need for significant effort from districts.

Three archetypal South African educational environments

Although district landscapes are very diverse, using the above factors to group districts can help identify both the problems and possible solutions. The research team identified three archetypes and labeled them as follows:

1. **Builders.** These are districts containing many rural schools with limited interaction with the district. There are typically large numbers of these schools

RESOURCE CONSTRAINTS AND THE CHALLENGE FOR DATA

One circuit manager the team interviewed provided a vivid example of the challenges in resource-constrained parts of South Africa’s school system – and the opportunities for using limited resources more efficiently. This official was single-handedly responsible for oversight and support for nearly 30 schools across a vast rural area, many accessible only by poor roads. He reported that he was able to visit only a third of the schools each month, because departmental rules allowed him to claim reimbursement for only 1,600 km of travel – and he said he was still waiting for reimbursement for the previous six months’ travel. He therefore typically focused on the schools nearest the district office to complete the required number of school visits, with the result that schools in remote areas were rarely, if ever, visited.

When presented with other solutions, the circuit manager said he could not email schools, as his office had no internet connection – and neither did most of the schools. His ability to phone them was limited, as the telephones in his office were disconnected after 11 am to save costs. He could not send hard copy letters to them either, as there were no funds to buy printer toner or to fix district photocopier machines.

Yet even in this highly challenged context, this circuit manager conceded that there was an immediate opportunity for improvement and better use of resources: concentrating visits on the schools with the poorest matric pass rates, a best available proxy for the secondary schools most in need of support.

per district (i.e., more than 450) and per circuit (i.e., more than 30), with limited technology access at district, circuit and school levels. For these districts, the main form of support for schools is provision of infrastructure and assets. Circuit and district resources in Builder districts tend to be spread thinly, and most activity is “check-listed” as officials must regularly be on the ground at schools. There is generally high focus on the matric pass rate, but other areas of performance are not prioritised and are difficult to track given the limited resources and technology.

- 2. Architects.** These districts usually contain a mix of urban and rural schools, with varying staffing levels in circuits and district offices. The schools are mostly internet-connected and reasonably well-resourced, although in many cases they must find ways to manage, with staff posts standing vacant. Infrastructure issues are adequately addressed, so the data collected is mostly used for understanding school operations; however, schools in these districts often feel that data collection is largely for compliance purposes. Management generally considers performance to be as important as other needs, including finances and delivery of teaching materials. Standardised exams have been recently introduced in many of these districts, but demand for insights is low.
- 3. Experimenters.** These districts contain mostly urban, well-connected schools with a smaller circuit size (i.e., fewer than 20 schools per circuit) and larger circuit teams. Here we often find that well-resourced district and circuit offices have been collecting school operations data for some time and started to shift their focus towards student performance, over other categories of data. These schools often have standardised exams and common papers, and are exploring innovative ways to serve schools using technology solutions.

The magnitude of the data challenge differs markedly for these three archetypes – as do the parameters for data-driven school improvement efforts. We revisit the archetypes in the final chapter of this report, where we consider the major opportunities for making better use of data in each type of district.

The next three chapters map our detailed research findings about the South African school system's data capabilities, against each of the phases of the data-driven decision-making framework.

Across the country, the research team's interviews revealed enormous frustration – at the inefficiencies and duplication that create so much wasted time and effort in data collection today, and at the fact that the data collected seldom translates into insight or action.

Chapter 4

Detailed research findings – Assessment

It is in the Assessment phase of the data-driven decision-making cycle that South Africa is currently strongest. South Africa is aware of the problems and already making considerable effort to capture data. However, much of this effort is wasted because the country has not prioritised a few clearly focused improvement goals. Moreover, existing financial and bureaucratic incentives often promote a “box-ticking” approach to compliance, rather helping to produce reliable and useful data.

This chapter presents the research findings for the Assessment phase in two steps: A. creating shared focus on measurable goals and B. capturing data to measure progress against goals (Exhibit 7).

Step A: Creating shared focus on measurable goals

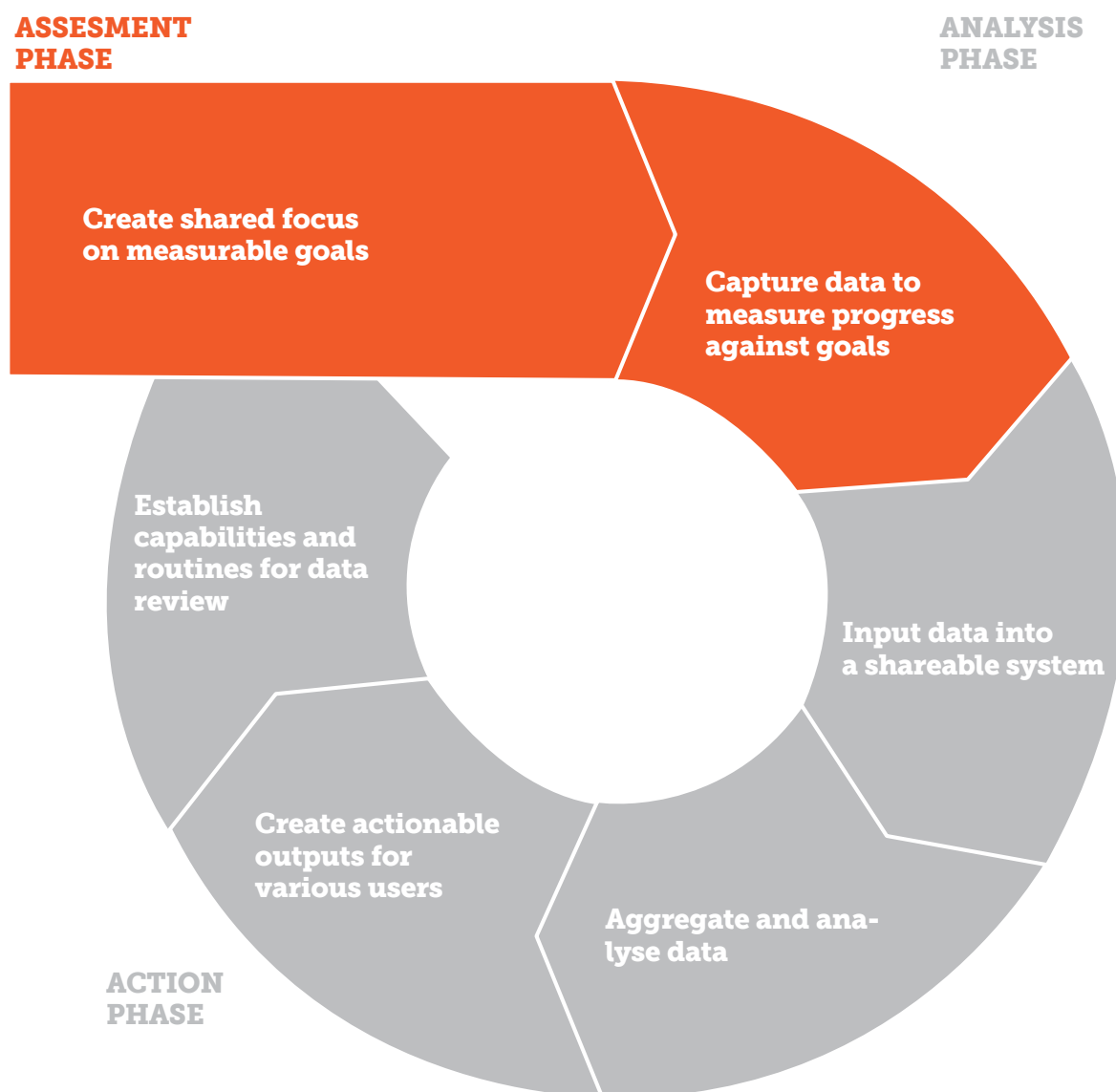
Key findings:

- There is good understanding of the major challenges facing the schooling system, but limited prioritisation of improvement goals for which stakeholders across the system can be held accountable.
- Intense national focus on the matric pass rate has been achieved – but this metric is not an entirely accurate marker of success, and it does not measure performance in previous grades.
- Although not intentional, the focus on learner numbers and matric pass rates has led some stakeholders in the system to take perverse action – reporting false information for financial and reputational benefits.
- Nonetheless, the ability to focus internal and external stakeholders on the matric pass rate represents a major opportunity to focus efforts on a slightly expanded and more meaningful set of metrics.

The first key finding is that while South Africa has clear improvement goals for schooling based on a good understanding of the challenges, there are too many goals for stakeholders to focus on meaningfully. Almost none of our interviewees could name more than three or four of the 27 goals of the National DBE’s Action Plan 2014. When asked which ones they focused on and had targets for, most could offer nothing beyond “a matric pass rate in secondary schools” or a vague statement about “improving learning in primary schools”. Inevitably, the absence of a sharper sense of national focus leads provinces, districts and schools to set their own local priorities. Indeed, the research found that many of the metrics designed by the national government to track progress against the Action Plan are not tracked at the school level today, and many teachers do not know what these metrics are.

The lack of clear priorities forces stakeholders to focus their efforts on three kinds of metrics: those that are widely publicised, those with compliance or reporting requirements, and those that are tied to financial resourcing. As a result, districts and schools often lack the capacity to keep focus on other important goals, including primary school performance, drop-out rates and teacher attendance.

Exhibit 7: **Research focused on understanding capabilities across a data-driven decision-making cycle – from collection to output and use**



DESCRIPTION

Assessment

A Create shared focus on measurable goals

- Have we defined the goals that we want to track?
- Are these goals understood and shared by all stakeholders?

B Capture data to measure progress against goals

- Have we identified the right metric(s) to track?
- Who will capture this metric and how?

Analysis

C Input data into a sharable system

- Where will data be stored? Who will input it? How?
- Are there checks and balances on data?

D Aggregate and analyse data

- What system(s) will aggregate and hold data?
- How is data analysed for use?

Action

E Create actionable outputs for various users

- Which stakeholders will receive outputs? How often?
- How will the collected data be tailored for users?

F Establish capabilities and routines for data review

- Is data used in a regular and timely manner? How?
- What specific actions are taken based on results?

Publicised metrics

By far the most prominent publicised metric is the matric pass rate, which is the key metric for all secondary schools and acts as a proxy for each school district's performance overall. The national media spotlight on this number places heavy emphasis on the importance of improving the matric pass rate in high schools across the country. However, the overwhelming focus on the matric pass rate can mean that other educational goals are sacrificed. For instance, schools that seek to improve the matric pass rate can prevent students from reaching Grade 12, or from sitting for the matric exam, since lowering the denominator can increase the pass ratio. Because progression metrics are not prioritised, and because the total number of graduates is not prioritised, schools that engage in such perverse behaviour are rewarded with better publicity.

A second type of publicised metric can be dubbed "the fire that's burning". When faced with these metrics, schools over-react and prioritise goals that are reported on and highlighted by national or local media. As an example, the 2012 textbook crisis was heavily covered by national newspapers and television and resulted in coverage-weary districts and principals scrambling to create (or in some cases feign) textbook surety. Although this is mostly a positive outcome, it has had negative side-effects: many schools have been encouraged to over-order textbooks, or reduce oversight on other essential functions such as learner transport. "Burning fires" and bad publicity can motivate schools to action and accountability, but they are clearly not an effective replacement for strategic focus on a narrow subset of measurable goals.

Metrics for compliance/reporting requirements

For most principals and system officials, metrics for compliance and/or reporting requirements are another top priority. Failure to follow policy can often lead to a designation of "non-cooperative" or, worse, the principal's removal. Indeed, the impression in several of our conversations at district level was that compliance was success, as opposed to performance being success.

Although consistent reporting practices can have their upside, schools report that the requests that fall into this category have multiplied in recent years. As more

and more time is devoted to mandatory requests, schools' frustration is building – with many districts claiming principals have resorted to "malicious compliance".

As a particular example, most schools mentioned the Annual School Survey. Completion of the survey is required by the National DBE, and failure can result in the school being reported to provincial educational officials as "non-compliant". Schools thus feel pressured to complete the survey (some 35 pages long) – even when data are not available or unknowable. Schools and districts report that the goal of reporting is to complete the submission – rather than to ensure the content is accurate.

In contrast, curriculum data collection is elegant in its simplicity: schools are required to submit quarterly mark schedules to district managers. This submission is required by the district. Most schools are provided with templates, and teachers spend time with HoDs (heads of department) and principals reviewing the marks for tasks and activities for students in their school. Schools report that the templates are helpful for managing their schools and understanding performance, with many principals stating they would keep such a record even if it were not required. As this reporting goes beyond compliance, and is widely used, submissions for this reporting requirement tend to be of higher quality than those for the Annual School Survey.

Metrics tied to finances

Metrics tied to publicity and requirements were directly referred to by interviewees, but metrics tied to finances were mostly just hinted at in school discussions and were cause for concern in district and provincial offices. Because some self-reporting metrics create direct financial results for social grants, school funding, teacher posts or principal pay, South Africa's data reporting system has created incentives for parents, teachers, principals, districts and provinces to create "ghost learners". The critical metric at play, the total number of learners enrolled, directly affects each stakeholder – and is virtually unverifiable in the current schooling environment. There is thus a strong incentive for many parties to inflate this number artificially. This contributes to high drop-out statistics (as "ghost learners" can never actually write matric), increased spending in the education sector, and overall mismanagement of resources.

Of course, with a “fixed pie” of resourcing, the implicit pressure on even well-intentioned school leaders to inflate numbers can be high: “If I do not inflate my numbers and my neighbouring schools do, then I will get a smaller share of the resources than I would be entitled to if there was no inflation. Therefore to secure resources for my school, I will inflate too.”



Step B: Capturing data to measure progress against goals

Key findings:

- South Africa is successful in capturing standard data across the system on certain metrics, such as curriculum statistics. However, standard processes and templates are lacking for many other metrics.
- Likewise, South Africa has already put in place an appropriate cadence for data collection for a number of metrics – such as demographic data, collected annually, and learner test marks, collected quarterly.
- Despite this success, data collection currently places an unnecessary – and in many cases overwhelming – burden on educators. There are opportunities to reduce this burden by up to 50% through standardisation, data-sharing, assigning collection responsibility to other staff, eliminating other duplication and/or through technology advancements.

Today, most effort in South Africa is expended on this step of the cycle: schools, districts and provincial governments invest considerable time and resources in capturing and recapturing data. Many principals interviewed were extremely frustrated by this, and reported spending far too much time answering queries – which took time away from managing their schools (see sidebar).

EXAMPLE OF SUCCESS: BUILDING FOCUS AROUND ATTENDANCE AND TARDINESS IN GAUTENG

To drive change across a large urban district in Gauteng, a new district director focused her district resources on improving learner attendance and punctuality. The district communicated its concerns on this topic to all constituent schools. It partnered with nearly 20 of the most affected schools to develop creative solutions and test their effectiveness: partnering with the local SAPS to give learners loitering on street corners a strong message to get to school; holding assemblies in the afternoons to impress upon learners the importance of arriving on time; and posting a staff member at the gate every day.

Staff from all the district departments have paired with pilot schools and have seen a dramatic improvement in learner attendance after only six months – absenteeism and lateness have been reduced by around 70% in these schools.

When asked why she started with attendance, the director said: “We must all decide to start with one problem to solve, because we cannot solve every problem at once. For our district, I have chosen learner attendance – it was something that principals all agreed needed to be addressed, and an area that I knew we could find success in changing. Also, I wanted to prove to my principals that I am here to help them succeed – and in the end, small steps like this are just the beginning of our journey.”

EDUCATORS SPEAK – FRUSTRATION AT DUPLICATIVE AND REDUNDANT DATA REQUESTS

“If they ask me for it once, I’ll give it to them perfectly. But they ask me for it so many times and I know they mostly never look at it, so I just write whatever is quickest.” – Principal

“I spend about 60% of my time on administrative tasks – which are only being reported to the district.” – Deputy Principal

“It is very irritating to be asked to answer the same questions over and over – why doesn’t the district use SA-SAMS? All the answers are there.” – Teacher

“It would be like heaven if we could eliminate all the unnecessary paperwork that we have to do twice.” – Admin. clerk

“If I knew what data the district manager wanted, I would be able to provide him with the data monthly.” – District EMIS personnel

This excessive effort is driven by several factors. First and foremost, data requests outweigh data use. Due to the layers of international, national, provincial and district level reporting requirements, schools often find themselves reporting information that is only ever used to answer external queries. Next, data are not often standardised and shared between departments or branches, leading to re-capture of existing data. Districts are often not aware of the numerous surveys generated in each of their departments, let alone the overlap in content that the volume of surveys creates. In addition, because there is no single system for storing data and no common definition of data, individuals often see themselves as responsible for collecting “new” data that are relevant to their responsibilities – yielding highly duplicative effort and poor data quality.

As multiple copies of data are collected, multiple “versions of the truth” emerge, reducing confidence in the numbers, and generating more data requests due to mistrust of existing data. To compound the problem, limited skills mean that not all data formats are easy to use for managers, many of whom then submit new request to schools in order to change the detail, format or layout of data. An institutionalised example of this exists in one province, where lack of faith in any digital system has created a policy in which both manual and digital submissions of data are required.

Due to the volume of data generated and collected, few districts have the capacity to accurately store, sort or analyse the data. Most collected data are never used – except as reference material in case of ad hoc questioning or as a paper trail in times of crisis. Because of this “data-trail mentality” in many educational offices from schools to districts, meeting data requests is widely seen as performance in itself. In fact, in many interviews stakeholders contended that compliance with reporting requirements means that the school has succeeded. Unfortunately, the school system’s learner outcomes do not back up this view.

In the cases where data are collected and screened, many administrators have realised that most collection procedures (e.g., surveys, paper filings) have no verification methods – and few are cross-referenced with other data submissions – leading to a common scenario where falsified information is submitted for the submitter’s gain.

EXAMPLE OF SUCCESS: STANDARDISING DATA COLLECTION IN THE FREE STATE

The Free State EMIS department has developed an innovative way to deliver the power of data to rural or “farm” schools.

Housed in their province’s Department of Education, the Free State’s “farm school administrators” are responsible for serving the needs of the smallest, most remote schools in each district. These administrators are tasked with printing pre-designed data templates for each farm school and delivering them to school leaders monthly. At the same time, the administrators collect completed templates from the previous month, and analyse the data on behalf of the school. Schools with few resources or assets are thus able to get deeper insight into their school operations, and even receive individually printed report cards for learners.

Discussing this practice, a provincial leader said: “It’s more than just collecting data from these schools – it’s giving them a new identity. Some of the farm school principals come into our office and thank us for the service, not because we are creating standards or demanding data, but because they are acknowledged as important members of the learning community when we invest the time and effort to create personalised reports for them.”

There is widespread awareness of the challenges that must be met to improve South African schooling, and much effort already made to capture data. But South Africa lacks clear focus on a few prioritised improvement goals around which data-collection efforts are concentrated.

Chapter 5

Detailed research findings: Analysis

Although South Africa has developed a robust data management tool in SA-SAMS, on the whole the country does a poor job of inputting and aggregating data in a systematic way. Unfortunately, most users and managers of SA-SAMS lack the standardised processes or requisite capabilities to combine or analyse data in such a way that actionable insights are generated for school improvement. Investment in developing standardised processes and management capabilities to aggregate and analyse a few common, prioritised databases could yield enormous benefits.

This chapter presents these findings for the Analysis phase of the data-driven decision-making cycle in two steps: C. Inputting data into a shareable system and D. Aggregating and analysing data (Exhibit 8).

Step C: Inputting data into a shareable system

Key findings:

- SA-SAMS is potentially well suited to function as a single, shareable system.
- Today, however, processes for inputting and aggregating data are not well defined across the school system – most often, data are kept locally, kept on paper, and/or collected by multiple entities. Most users lack access to aggregated data.
- Virtually all data collected are self-reported and unverified; this fuels duplication, as much existing data are not trusted. Even simple methods of data verification are not typically used – e.g., cross-referencing reported student numbers with test mark data, or checking reported test scores against random samples of actual marked tests.
- Because of the proliferation of data systems, there is no “single truth” on many key metrics. However, rather than investing in building the processes and capabilities to make a few existing data “pipes” more

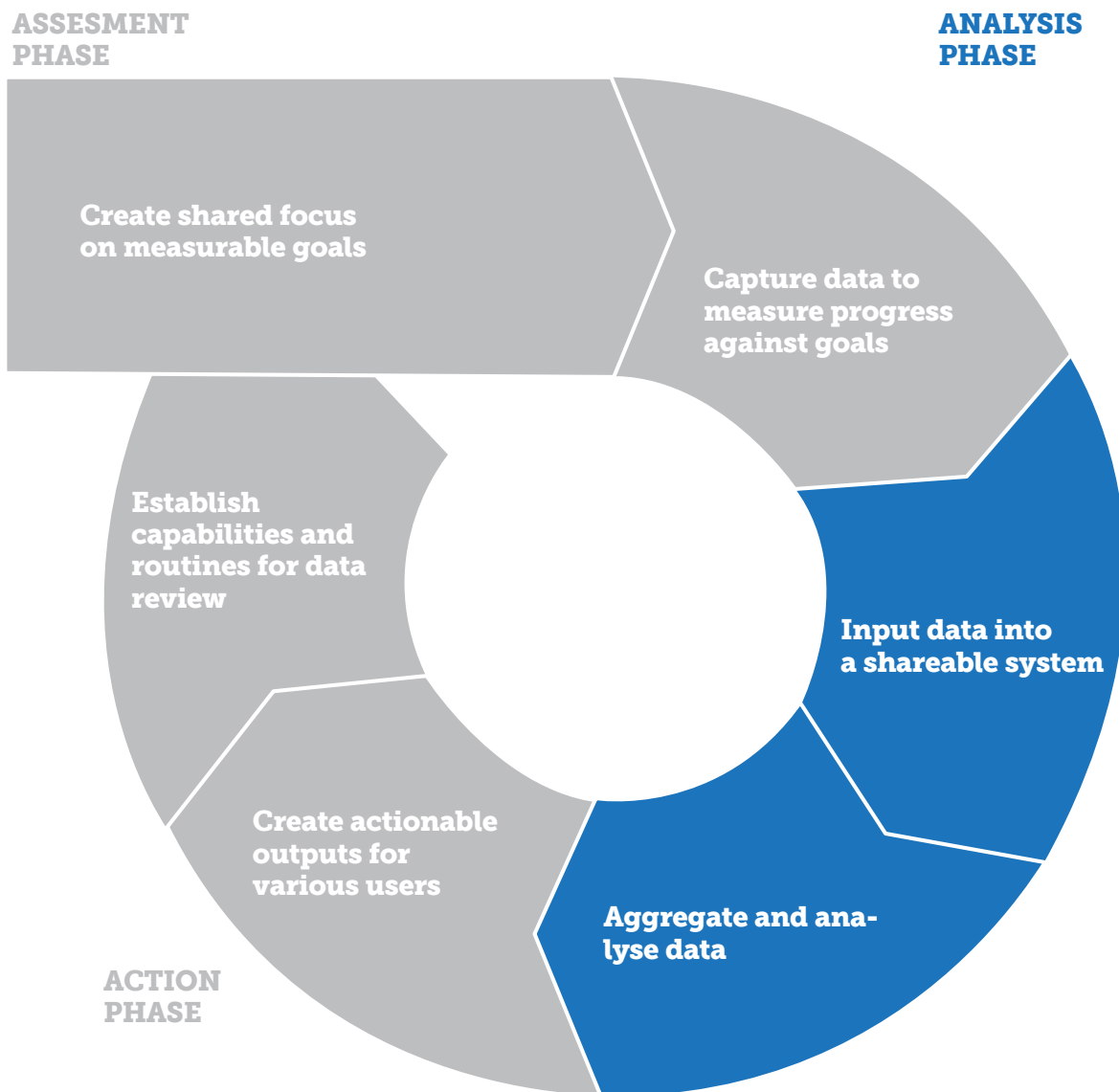
reliable and robust, the tendency is to discard existing data systems and repeatedly develop new ones.

The National DBE developed SA-SAMS in order to help school leaders administer their schools better. The tool is a free, lightweight application built on top of an MS Access database, which allows administrators to keep track of their schools’ operational data. SA-SAMS has three core modules where schools can register their students, teachers and school information. SA-SAMS also contains a module for curriculum, where task-level marks can be tracked; a module for school finance, where all school receipts can be tracked and submitted to districts; and other similarly capable modules focused on LTSM, transport and nutrition.

While SA-SAMS may not be aesthetically elegant, its features and functionality are quite robust and enable administrators to undertake a number of tasks, including timetabling, attendance, filling the annual school survey, and tracking learner marks. Despite this, provinces have taken varying stances on using SA-SAMS. Some have adopted it in 100% of their schools via mandatory policy, while others currently have no schools on the system.

From a technical standpoint, SA-SAMS was designed to create local databases to collect granular (student-level) data, which can then be aggregated at district level, provincial level and eventually in a national database. However, several obstacles (discussed in further

Exhibit 8: **Research focused on understanding capabilities across a data-driven decision-making cycle – from collection to output and use**



DESCRIPTION

Assessment

A Create shared focus on measurable goals

- Have we defined the goals that we want to track?
- Are these goals understood and shared by all stakeholders?

B Capture data to measure progress against goals

- Have we identified the right metric(s) to track?
- Who will capture this metric and how?

Analysis

C Input data into a sharable system

- Where will data be stored? Who will input it? How?
- Are there checks and balances on data?

D Aggregate and analyse data

- What system(s) will aggregate and hold data?
- How is data analysed for use?

Action

E Create actionable outputs for various users

- Which stakeholders will receive outputs? How often?
- How will the collected data be tailored for users?

F Establish capabilities and routines for data review

- Is data used in a regular and timely manner? How?
- What specific actions are taken based on results?

detail below) stand in the way of it fully meeting this objective. These include:

- The fact that the SA-SAMS value proposition to principals is not fully understood.
- A lack of technical support and training for educators, who often lack computer skills to begin with.
- Insufficient authority vested in education management information system (EMIS) departments to manage the data pipeline.

SA-SAMS value proposition to principals not fully understood

The SA-SAMS system was designed to enable school administrators to track operational data and make school life easier, while also creating a database of operational data for district, provincial and national use. Unfortunately, this vision has not been realised – mainly because SA-SAMS is viewed as a compliance tool. Because provinces have required schools to use SA-SAMS to submit student, teacher and school data, schools see SA-SAMS as an electronic replacement for headcounts and school visits. Further evidence of this is that SA-SAMS is most often used by school administrative clerks – not principals.

Given the user base, the tool is usually used only as often and as deeply as its district requirements dictate. As clerks lack authority in the schools, most principals remain unaware of the data that SAMS tracks. Seen in aggregate from the principal's perspective, SA-SAMS is an administrative reporting tool with stringent requirements. As a result, in many schools, the SA-SAMS computer literally sits collecting dust through the year, until the next annual survey collection or district extract requires it to be booted up.

Lack of technical support and training for end users

What complicates the situation further, however, is that in rolling out the standard SA-SAMS tool, its developers did not also design standard operating procedures or training materials. Inevitably, most provinces have designed training material on their own, and most have struggled to provide the training required to empower thousands of educators across their territories.

In this disjointed model of training and support, traditional software issues appear daunting.

Technical support and software updates pose a problem to many users, as provinces lack the capacity to offer robust support and central programming teams are late to hear about and fix problems at the school level. Ineffective solutions or delayed responses only further frustrate a naturally uncomfortable user base. Recent issues with software updates and “patches” have been criticised by schools and districts alike, and are often cited as a primary hurdle for increasing SA-SAMS adoption countrywide.

Although the policy goal is to have SA-SAMS operational in 100% of schools, in many of South Africa's schools the application must be used by staff who are largely computer-naïve. This, along with limited training and support, creates strong incentives for schools to avoid using SA-SAMS.

Further, most districts reported that they lacked the technical capability to use the data that comes from SA-SAMS, and mostly viewed their role as collectors or “post-boxes”. This inability created great frustration amongst interviewees, as SA-SAMS data collection requires heavy efforts and few gains. To combat that, districts often create their own secondary pipelines for data and increase the onus on school administrators.

Insufficient authority vested in EMIS departments

To manage SA-SAMS, each district is supposed to have an EMIS department. This department is theoretically responsible for managing the data pipeline from school input through to national aggregation, but EMIS departments' roles across districts vary greatly. Since there is no official designation of where EMIS officials should sit within a district, districts select a variety of different functions to own EMIS, including Human Resources, Finance and Planning. Relegated to sub-function status, EMIS functions are then most often seen as the “managers of SA-SAMS” or “the coordinators of the annual survey”, and not the managers of data.

In addition, the function's relatively low rank in the district hierarchy means that EMIS (and in many cases, data) is often left out of management meetings and decision-making sessions. Without an able champion, SA-SAMS and the data it generates are often seen as tangential to business, not as an enabler for all district functions.

This reality is not confined to the district level: even at national levels, EMIS data are often not trusted or relied on. The lack of support for EMIS and SA-SAMS overall perpetuates the inefficiency of data collection – and is another driver of database proliferation, and overall poor data quality.



Step D: Analysing data to understand performance

Key findings:

- Standard analyses are defined and undertaken for the matric pass rate – but other metrics are rarely analysed. In part this is because the large volume of data collected, much of them on paper, means there is insufficient time or management capacity for either aggregation or analysis.
- Most analyses are “surface-level”, with very little “root cause” analysis undertaken to understand the drivers of good or poor performance. Even for the matric pass rate, few efforts are dedicated to identifying the causes of low pass rates in a robust, data-driven manner. Most analysis is aggregation (e.g., average pass rate) and even where trend analyses are done, it is rarely with an explicit management question in mind and they therefore fail to provide insight to guide strategic action.

Because data are typically kept and managed in “silos” at district, provincial and national levels, so too is analysis undertaken in such silos – when it is undertaken at all. As there is no single source of data and most data are not verified, most of the analysis undertaken seems neither to be shared nor trusted.

Moreover, even when analysis is done, its depth is rarely useful. Most analysis is undertaken without a scientific approach, such as developing a hypothesis and testing it across the data. Instead, most analysis involves stakeholders grappling with a raw data table, and searching for patterns. Although analysis is done both manually and in spreadsheets, the lack of a “question-guided” methodology limits the depth of analysis that is possible, and the insights that can be drawn from data.

The sheer volume of data collection (e.g., checklists on the school governing body, finance, LTSM, discipline, nutrition, social services.) is a major limiting factor

EXAMPLE OF SUCCESS: INVESTING IN A SINGLE DATA SOURCE IN THE EASTERN CAPE

Despite the challenges of rolling out SA-SAMS, the Eastern Cape has made a bold commitment to a future centred on the tool. Leaders in the Eastern Cape have charted a journey towards all-digital data submissions by distributing SA-SAMS, laptops and 3G cards to all schools – a major commitment in a largely rural province. The province has also funded an extensive training programme, teaching principals and administrators to use the newly available tools.

The provincial education department has gone further, setting ambitious targets for all schools to use SA-SAMS by 2014. To bolster their incentives, officials are recommending policies that mandate use of SA-SAMS for submission of learner number data, and for internal analysis presentations. They have also established consequences for schools that do not meet these targets, ranging from increased training to reduced school funding.

When asked about this significant transition to SA-SAMS, a high-ranking provincial official said: “It is important to lift our schools up and praise their hard work, but it is also important to raise the bar higher. We can do both.”

For all the effort that stakeholders invest in data collection, they typically see little output in the form of information, insight or guidance to support school improvement. This is also the phase where there is likely the greatest opportunity for impact: creating a focused set of clear, action-oriented outputs could galvanise change across the school system.

EXAMPLE OF SUCCESS: REBALANCING DISTRICT RESOURCES WITH A SIMPLE ANALYSIS IN MPUMALANGA

Complex analysis is not necessary to ensure data are useful, and nowhere is that more evident than in Mpumalanga. In one district visited, the director used a very simple analysis to determine where to focus intervention efforts, and the results show a significant improvement across the district.

The simple approach involves ranking all secondary schools on the basis of their matric pass rate, and applying tiered interventions depending on performance. For struggling schools, the district director imposes quarterly district common papers, more circuit manager visits and additional investment from curriculum advisors. This in turn creates more and more data for districts to use to understand its poorest performing schools. Equally, and conversely, top performing schools are freed from the responsibility of completing common papers, and also receive fewer data requests from the district.

This simple policy allows the district to spend more time collecting, analysing and acting on data from the schools that need help most, while lessening the burden on their well-performing peers. When asked about his policy, the director said: "Why should I bother my top performers, and why shouldn't I support my struggling schools? After all, I am not asking questions just to ask – I'm looking for answers."

when considering the time needed for running an analysis. Most district and circuit time is spent collecting and filing data – and repeating the process for the next cycle. When combined with the limited familiarity with digital data manipulation and lack of analytic skills at the circuit manager and curriculum advisor levels, few insights get drawn from the vast landscape of school data.

This phenomenon will be difficult to change without considerable effort. Currently, even the most well-versed circuit managers prefer to look at data in tables and are unfamiliar with graphs or charts as representation of trends. Standard analyses do exist for understanding curriculum results, but they are often not designed to highlight progress in specific, pre-determined areas, and most do not compare schools' performance to other similar schools or to historical results. Without this information, and indeed the mindset of asking guiding questions to understand the roots of performance, insights will continue to be limited to surface-level judgments of success and failure.

Chapter 6

Detailed research findings: Action

This is the phase in which South Africa's data performance is most lacking. For all the effort that stakeholders invest in data collection, they typically see little output in the form of information, insight or guidance to support school improvement. This is also the phase where there is probably the greatest opportunity for impact: creating a focused set of clear, action-oriented outputs could galvanise change across the school system.

This chapter presents these findings for the Action phase of the data-driven decision-making cycle in two steps: E. creating actionable outputs for various users and F. establishing capabilities and routines for data review (Exhibit 9).

Step E: creating regular actionable outputs for stakeholders

Key findings:

- Outputs that are produced from school data are generally intended for international, national and provincial audiences – with very few data outputs produced for the purpose of informing, enabling and guiding districts and schools.
- Outputs are typically very hard to interpret, most often taking the form of raw and vast data tables. Ironically, by listing everything, these data tables often make it difficult to focus on any one item in depth.
- Where outputs are created, the production of those outputs is often delayed, with reports often published several months – and in some cases even years – after the data are collected, limiting their usefulness to guide improvement action.

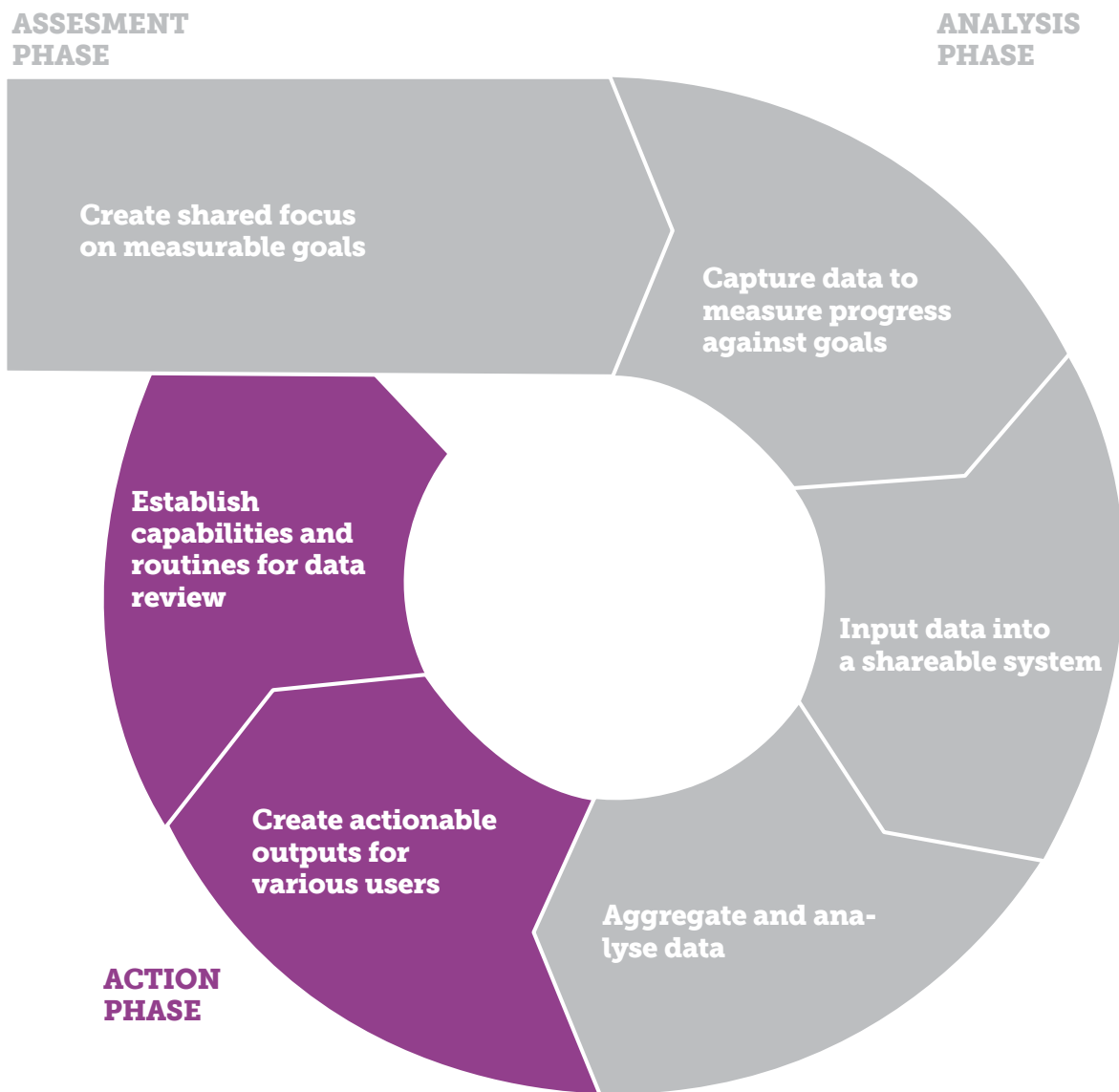
There is currently little institutional focus on creating outputs of any kind from the data that are gathered.

National and provincial departments typically create generic, high-level reports (e.g., detailing the number of schools and number of learners in a particular area) leaving local users without material. Often, these reports take an extremely long time to be produced, and are not useful to schools when they are finally distributed: for example, the SA School Realities report for 2011, using data collected in mid-2011, was published in late 2012.

Despite the existence of large sets of data, and smaller subsets of analysis, virtually no outputs are produced specifically for schools. This results in a system-wide “one-way flow” where data are passed up from schools and there is little return of data to close the loop and inform schools about their performance (even on operational factors). Because schools and districts generally do not know how their data are used, they are often frustrated by what they experience as an unending upward submission of data without feedback or apparent use, and they resort to “malicious compliance” to meet requirements.

National and provincial departments are trying to solve this problem by building the capacity to give various users online access to data through what is referred to as a business intelligence layer, a “pull-based” system of viewing data outputs. However, in provinces where these layers have been set up (e.g., the Western Cape, the Free State), most schools do not know about this feature. In the absence of an operat-

Exhibit 9: **Research focused on understanding capabilities across a data-driven decision-making cycle – from collection to output and use**



DESCRIPTION

Assessment

A Create shared focus on measurable goals

- Have we defined the goals that we want to track?
- Are these goals understood and shared by all stakeholders?

B Capture data to measure progress against goals

- Have we identified the right metric(s) to track?
- Who will capture this metric and how?

Analysis

C Input data into a sharable system

- Where will data be stored? Who will input it? How?
- Are there checks and balances on data?

D Aggregate and analyse data

- What system(s) will aggregate and hold data?
- How is data analysed for use?

Action

E Create actionable outputs for various users

- Which stakeholders will receive outputs? How often?
- How will the collected data be tailored for users?

F Establish capabilities and routines for data review

- Is data used in a regular and timely manner? How?
- What specific actions are taken based on results?

ing procedure that creates demand, these systems are largely unused despite the large investments in business information technology. A pull-based business intelligence layer also requires that users have enough capability with computers and data to know what data they need, access that data, and analyse them. Although many front-line users can do this, many more cannot – unless they are provided with adequate training and support.



Step F: Establishing standard business practices and capabilities

Key findings:

- Because schools and districts typically lack access to data outputs, they lack the “fuel” for effective management meetings. Managers must therefore drive performance largely on the basis of gut feel and anecdote, rather than on data – or else not drive performance at all.
- The lack of data outputs means that schools and districts are unable to gauge the impact of many of their improvement interventions accurately. As a result, action plans are often generic and non-specific, follow-up on whether plans have been implemented is lacking, and unsuccessful plans are often repeated in subsequent years.
- There is a major opportunity to create data-driven performance conversations across the system – an essential step towards developing accountability for results and identifying and solving the problems that impede better learning.

As few data insights are gathered, and even fewer outputs created, districts often cannot use data to focus attention and drive decision-making. Few districts are able to set targets and measure performance against targets, unless these are generic targets set for all schools (e.g., all schools must achieve a 70% matric pass rate).

Furthermore, effective routines for using data do not exist in most districts and schools. Although some districts hold quarterly accountability sessions with circuit managers and principals, most districts lack structured, standard meeting times and agendas, and cannot rely on recent data to inform discussion. Instead, meetings in most districts discuss anecdotes or operate on “touch and feel” from the circuit teams

EXAMPLE OF SUCCESS: SHOWING SCHOOLS PERFORMANCE DATA IN THE WESTERN CAPE

Closing the loop and providing schools with the benefits of data requires a targeted – but not necessarily extensive – effort built around a subset of useful data. To this end, the Western Cape has designed a set of easy-to-read, visual outputs to help schools understand their performance on the district’s literacy/numeracy exams (“Lit-Num”).

Every year, schools across the Western Cape receive a standard output for Grades 3, 6 and 9 in literacy and numeracy, with a few basic analyses explaining school performance on the mandatory exams. School leaders can quickly see, in a standard bar chart, how their student body performed, and in what sub-topics they excelled and struggled. Furthermore, the standard exam also displays how students fared on questions both at their grade level and below it. This simple set of information, all derived from the test paper itself, is designed to enable schools to refocus their mathematics and language curricula, investing more time and effort on the sub-topics and grades where students struggle.

When asked about the outputs, a successful principal noted: “The biggest change for our school has been the report at the end of the LitNum test. We always knew our students were struggling in Grade 3 maths, but it wasn’t until we saw the report that breaks down student performance by question level that we understood the issue: our students perform well on Grade 1 and 2 level questions, but not Grade 3. We have followed up with our foundation phase teachers and have agreed to improve the pacing of our Grade 1 and 2 lessons, so that in Grade 3 our educators and learners have more time to dedicate to grade-level tasks.”

– substituting conversations about performance with confirmation that efforts have been made. While this practice is a matter for concern, it can be expected because district and circuit teams do not have access to usable data. Few insights are derived from the massive quantity of data they collect daily and weekly, and circuit teams are often tasked with completing checklists at every visit. As a result, they are generally unable to conduct performance-based conversations with their schools or performance reviews with their district peers.

Without insight into school performance, circuit managers cannot be strategic support partners to school; too often, they are perceived by schools as overhead or compliance, offering little value to administrators.

The final chapter outlines opportunities and offers recommendations for improvement.

EXAMPLE OF SUCCESS: ESTABLISHING STANDARD PERFORMANCE REVIEWS IN THE EASTERN CAPE

Districts across South Africa are struggling to use data as the backbone for performance conversations, but in some schools the practice has emerged quite strongly. In one secondary school in the Eastern Cape, school leaders and educators have developed a distinct system for using their own data to generate deep insights and specific intervention actions to support teaching practices.

Every four weeks, teachers at this secondary school meet in grade-level groups to discuss curriculum marks. As teachers convene, they discuss individual students they are concerned about and also class trends in performance on specific topics. They use their time together to discuss intervention strategies for specific students, or share insights into actions that have worked. After meeting in these groups, the teachers re-convene in subject groups and share their findings with peers in their subject. HoDs analyse the entire school's subject data and the group discusses positive and negative trends in curriculum performance. Once again, the groups design solutions and discuss their progress from the last meeting. To close the process, the principal and SMT require teacher groups to present their plans for success over the next four weeks.

These standard sessions have been so helpful that one teacher explained: "I don't see a way to teach learners without these sessions. We give learners books and tasks to guide them, and for educators, we have these monthly meetings to guide us. I am also learning every month: I learn more about my students, more about where they are struggling, and where and how I can help."

Chapter 7

The way forward

As previous chapters make clear, South Africa's school system faces tough challenges in translating data into better performance and enhanced educational equity – but there are tremendous opportunities too, no matter the starting point or environmental context of a particular school, district or province. In particular, there is a major opportunity to translate data that have already been collected into meaningful insights that can be shared across the system to drive improvement – in learners' access, attendance, retention, progression and performance.

Practical steps to drive better data collection, analysis and use

How can leaders shift the practice of what happens in school and classrooms – and do so systematically across the whole school system? The critical question is how best to focus efforts to strengthen data use. This study highlights districts and circuits as the logical starting point for such efforts, as these entities provide both the scale and the granularity to drive meaningful change (see sidebar).

How, then, might leaders at national, provincial and district level ensure that districts become effective drivers of best practice data collection, analysis and use? The research findings point to seven practical steps.

1. Limit the volume of goals a district is expected to prioritise and actively manage against

Ideally there should be no more than three to five critical goals per district—and in all cases with the leading goal being on learner achievement. The overwhelming number of goals communicated to districts and schools today is a prime reason that focus is spread thin and performance gains are hard to find. Streamlining the goals, and concentrating on just a few goals, and corresponding data points, can jumpstart various cycles of success.

The number of goals must be streamlined, but this does not apply to the content of the goals. For example, Builder districts might be encouraged to focus primarily on performance and only secondarily on access, infrastructure and attendance, and Architect districts to focus more on performance and progression.

This is not to say that responsibilities in other areas (e.g., transport, finance) should be neglected. Rather, those responsibilities should be managed separately. The key goals would be the ones for which data are most valued, most used and most communicated. Key performance indicators for these goals can then be put in place at every level, enabling the school and the district to see how their own efforts – whether in teaching, administration or other areas – help to achieve the “big five” goals.

2. Reduce data collected from schools to the minimum amount necessary to make decisions

This step is essential to eliminate duplication and reduce frustration at the school level. To accomplish it will require explicit national and provincial support, and it can be done in three stages.

The first is to eliminate duplicative reporting, removing all instances where schools are asked the same questions by different sources.

THE CASE FOR FOCUSING ON DISTRICTS

School and provincial leaders have key roles to play in any transformation of the school system. But it is the districts and circuits that are powerful agents for change.

Districts represent the atomic level of “systemic” change. Success across a district or circuit requires reliable and replicable solutions that are more than a one-off story of success. To bring about the changes needed across South Africa, such solutions are critical.

Solutions at the district level are quite scalable, given the educational architecture of South Africa. While success at a school will require more than 20,000 successful replications, success in districts offers a much shorter pathway to transformation, with 86 efforts being enough to transform the entire school system.

The argument for scalability might seem to suggest that provincial or national bodies should be the agents of change. But districts provide a level of specificity that enables pragmatic interactions with schools and teachers that are unavailable to the higher levels. It is in the classroom that the process of change must begin, and districts are the link to the teachers and principals who are the lifeblood of the system.

If we are to see wide-scale change, it must come from the district and circuit level. Broad brush-strokes at the national and provincial level cannot create solutions to deal with the variation across districts described in Chapter 3.

Perhaps the most pressing reason to focus on districts is that they have often been ignored as champions in the educational system. Most interviewees at the district level reported feeling that they were treated as “post-boxes”. At the national level, stakeholders agreed that the districts should be given more responsibility and support. At both national and provincial levels, the focus seems to be on empowering and transforming the districts.

The second is to avoid collecting data that can be sourced alternatively. This can be done by replacing requests to schools with requests to acceptable sources such as Statistics South Africa. It can also be done by school sampling (e.g., the number of pregnant learners in a district or province could be determined through the census or through a random sample of 200 schools, instead of requiring data input from every school in the district).

Third, and most difficult, stakeholders (including national and provincial officials) must be encouraged to stop collecting data that are used only for reference purposes. For example, principals in many provinces are routinely asked to report on when they have met with their School Finance Boards and what the agendas for these meetings were – but ultimately nothing is done with these data. Questions like these can be eliminated, or directed only to schools with financial restraint. They can be reinstated if and when there is a plan to generate insight and action from the data.

To aid in these processes, districts might consider an annual review of data collection instruments to understand the difference between data collected and data used. This could enable district leaders to remove unnecessary or unused data requests.

3. Create a central function, and local database, to store, manage and share information

The main reason why data is not used in districts is that there is no clear ownership structure for data. In each district, it is critical that a capable and empowered central function be given responsibility for storing and interpreting data in a central database, and for sharing data outputs with all district and school stakeholders. The EMIS office is the logical holder of this role – but it needs solid support if it is to become a key function with the necessary authority and capacity.

Importantly, EMIS officials should be given broader responsibilities. They should be responsible for a district-level database that would contain all data collected from schools and any data sent to or from provincial or national bodies. Such a database would not require extensive investment, and could prevent duplication and time delays in accessing already-collected data.

To further alleviate the burden on schools and free up capacity in district and circuit personnel, the EMIS office must also manage all requests to schools. Creating this level of oversight and accountability would ensure that schools are not overloaded with unnecessary, duplicative or unclear data requests and district time is not wasted in creating and collecting unofficial or extra data filings. To cement this, policy should state that no one in the district can cite data without using the central database or receiving EMIS endorsement. Clear data pathways like this can help identify data gaps, task responsible actors with fixing them, and eliminate multiple competing versions of “the truth”.

4. Build methods of verification to ensure data collected are accurate

To ensure data are accurate, the following three-stage procedure is recommended.

First, systems must introduce basic data validity checks at the time of input to recognise data that are in the wrong format.

Second, all self-reported data must be backed up by systems of checks and balances, including cross-referencing of data with other data points. For example, if reported student numbers for a school can be cross-referenced with the number of students reported in test marks, both operations and curriculum data users will be well served.

Third, sampling must be undertaken for verification purposes. Actual exam papers can be requested at random to verify test marks, or pre-selected learners' workbooks can be inspected on-site to verify student numbers.

Districts may argue that these verification steps already exist. But too many districts today task circuit managers and district managers with “sign-off” verification – where one person is responsible for inspecting

thousands of data points per school. Exhaustive verification methods like these are unlikely to be carried out effectively, given time and resource constraints. Strategic, systematic checks would be more effective. The three-stage verification described above should be practically achievable in the operating environment of a district.

5. Design and deliver easy-to-use, automatic analyses for province, district, circuit and school personnel

The essence of this recommendation is simple: start showing data to stakeholders. Outputs based on reported data must be produced to show stakeholders that their efforts are not wasted. Simple displays of this data can start to combat “malicious compliance”, as inaccurate or false data can be shown in the open.

Beyond just showing data, it is critical to ensure that outputs are easy to interpret, relevant to users' managerial tasks and easily actionable. Spelling out clear next steps, such as “These are the six schools that are struggling in your circuit, and here is the action needed” will go a long way to transforming data from a compliance tool to support for performance.

In designing such reports, it is essential to engage the audience. In creating a tool for teachers, for example, teachers must be involved (although this can be difficult in hierarchical organisations where managers are expected to know best). The format and frequency of such reports must be tailored to the context: in a Builder district they can be simple print-outs shared once a month, while an Experimenter district can develop higher-tech, more frequent reports. Finally, users must be trained in interpreting the reports.

6. Use new outputs as guides for performance dialogues and accountability meetings between districts and circuits, and circuits and schools

A few big things are needed from a district management perspective. To start with, regular, prescriptive management sessions must be held between district managers and circuit managers, circuit managers and principals, and principals and HoDs and teachers. These performance-focused conversations should be built into every actor's work schedule and must ultimately guide support and instructional practices.

If this is to happen, outputs and conversations must identify specific performance patterns and the underlying drivers of poor performance. With this in mind, principals, HoDs and teachers can work to develop strategies to eliminate these weaknesses and set immediate goals for improvement. Overall, school systems must connect data insights to classroom change, with performance meetings as the vehicle for communication and accountability.

To achieve consistency, districts should set standard meeting agendas for these sessions and create templates and tools to support conversation. Many districts may need to reallocate management support, to ensure that district management spends most of its time with the schools and circuits that need most support. Indeed, management support should not be spread equally among all schools in a district – unequal support is needed to ensure more equal outcomes.

7. Shift the mindset of district staff, so they see themselves as agents of change, not inspectors or compliance-driven data conveyors

Perhaps most challenging of all, people must be won over. District staff need support and ongoing reinforcement to help them understand that success consists of achieving results against agreed performance indicators, not just completing required tasks. This extends to every staff member – for example, even a nutrition specialist in a district must accept responsibility for improving learner performance.

Winning hearts and minds will require collaborative approaches to communicating successes, strategising over failures and reinforcing the fundamental goal of all education stakeholders: creating a brighter future by helping learners to do better every day. This shift can be accelerated by demonstrating the impact of success – starting with small but tangible wins before tackling the most difficult obstacles.

Opportunities for data-driven school improvement in different operating contexts

These practical steps translate into a range of opportunities for data-driven school improvement for each of the three archetypes of school district set out in Chapter 3:

1. **Builders** – districts comprising a large number of rural schools with limited touch-points to the district.
2. **Architects** – districts comprising a mix of urban and rural schools, with varying staffing levels in circuits and district offices.
3. **Experimenters** – Districts comprising mostly urban, well-connected schools, with smaller circuit size and larger circuit teams.

Opportunities for Builders

Here data can help schools and districts achieve much greater operational efficiency with their limited resources – and they can gather and use those data with very little technology or investment. As in Punjab, a core set of metrics can be collected regularly and reliably from schools in simple, paper-based systems. The circuit and district teams centralise analysis and use simple visual outputs of basic data to pinpoint – in a fact-based, not gut-feel way – which schools most need management support, infrastructure upgrade or other interventions (see sidebar). Very often, data can drive interventions to solve quite basic problems in areas such as school facilities, teacher absenteeism and teaching materials, which in turn can have a major impact on performance.

Builders must be careful not to overcomplicate data collection and use for either schools or for district officials. They should avoid over-investing in collecting data on a wide range of metrics that these districts are not equipped to process or interpret, and that schools will struggle to collect accurately or use meaningfully. Large investments in technology may be appealing, but substantial improvements can be made with small changes to analogue systems.

Opportunities for Architects

For architects, which generally have well-established data-collection routines, a major opportunity lies in extracting greater knowledge and insight from the effort they are already making (see sidebar). Because the challenges facing these districts can vary significantly, spending time to identify and focus on a few key issues can help Architects chart a path towards improvement. Following in the footsteps of Minas Gerais, these districts can strive to highlight a set of priority goals, establish a simple subset of metrics, and leverage technology to collect and analyse data. Guiding district resources based on these outputs

The most critical reason why data are not used in districts is that there is no clear ownership structure around data.

LEVERAGING WHAT WORKS AT THE PROVINCE LEVEL – THE NORTHERN CAPE

A good example of how provinces can support Architect districts is ongoing in the Northern Cape, where provincial officials have leveraged successful technology from other provinces instead of developing their own.

Using systems already designed, tested and rolled out across the Western Cape and the Free State, the Northern Cape has been able to focus its resources on improving standard practices across its districts. Equipped with an educator attendance system, and a host of modules for SA-SAMS, the Northern Cape is well on its way to becoming a data and technology-driven province.

INSIGHT IN THE CLICK OF A BUTTON IN THE WESTERN CAPE

After significant efforts to capture learner-level data over many years, the Western Cape's efforts in CEMIS have started to bear fruit. Along with the granular, learner-by-learner, data that allow educators and administrators to track students across the province over time, the Western Cape has also developed a set of over 100 "on-demand" analyses through their EduInfoSearch system.

As all schools, circuits, districts and provincial officials have access to the EduInfoSearch system (with varying rights of viewership), analyses of learner numbers, locations and curriculum are only a click away.

can go a long way in driving performance across schools. As with the builders, extensive investments in technology may appear appealing, but a targeted and measured plan for how and why technology is useful should accompany any such outlay.

Opportunities for Experimenters

These districts, many of which are already technology-enabled and data-savvy, have an opportunity to generate greater depth of insight from data, with higher specificity about the steps schools can take to improve performance – and the steps that districts can take to support them (see sidebar). In Gauteng, for example, principals have been equipped with Blackberries, as a tool to communicate specific data in real time to the district. The phones come loaded with a set of "apps" that allows instant reporting of issues at schools. The principal can take a photo of the problem, send it to a central site in one of a number of pre-set categories (plumbing, electrical, etc.), and monitor the response from the central maintenance team. While the impact of many of these investments is yet to be determined, making calculated investments in unique and sensible sets of technology can help Experimenters to obtain data that is richer, more timely and more accurate.

Acronyms and abbreviations

DBE	Department of Basic Education
EMIS	Education Management Information System
FET	Further Education and Training
HoD	Head of Department
LTSM	Learning and Teaching Support Materials
LURITS	Learner Unit Record Information and Tracking System
PIRLS	Progress in International Reading Literacy Study
SACMEQ	Southern and Eastern Africa Consortium for Monitoring Educational Quality
SA-SAMS	South African School Administration and Management System
SGB	School Governance Body
SMTs	School Management Teams
TIMMS	Trends in International Mathematics and Science Study

Appendix: Goals of the National DBE's Action Plan 2014 Towards the Realisation of Schooling 2025

The National DBE has developed the *Action Plan 2014 Towards the Realisation of Schooling 2025*, which sets out a series of bold improvement goals. These goals can be grouped into five major categories:

1. Student achievement

- Goal 1. Increase number of learners in Grade 3 who, by the end of the year, have mastered the minimum language and numeracy competencies for Grade 3.
- Goal 2. Increase number of learners in Grade 6 who, by the end of the year, have mastered the minimum language and numeracy competencies for Grade 6.
- Goal 3. Increase number of learners in Grade 9 who, by the end of the year, have mastered the minimum language and numeracy competencies for Grade 9.
- Goal 4. Increase the number of Grade 12 learners who become eligible for a Bachelor's programme at a university.
- Goal 5. Increase the number of Grade 12 learners who pass mathematics.
- Goal 6. Increase the number of Grade 12 learners who pass physical science.
- Goal 7. Improve the average performance of Grade 6 learners in languages.
- Goal 8. Improve the average performance of Grade 6 learners in mathematics.
- Goal 9. Improve the average performance of Grade 8 learners in mathematics.
- Goal 18. Ensure learners cover all the topics and skills areas that they should cover within their current school year.

2. Student participation and progress

- Goal 10. Ensure that all children remain effectively enrolled in school at least up to the year in which they turn 15.
- Goal 11. Improve the access of children to quality Early Childhood Development (ECD) below Grade 1.
- Goal 12. Improve the grade promotion of learners through Grades 1 to 9 phases of school.
- Goal 13. Improve the access of youths to Further Education and Training (FET) beyond Grade 9.

3. School resourcing and provisioning

- Goal 14. Attract a new group of young, motivated and appropriately trained teachers into the teaching profession each year.
- Goal 15. Ensure that the availability and utilisation of teachers are such that excessively large classes can be avoided.
- Goal 19. Ensure that every learner has access to the minimum set of textbooks and workbooks required in accordance with national policy.
- Goal 20. Increase learners' access to a wide range of media, including computers, which will enrich their education.
- Goal 24. Ensure that the physical infrastructure and environment of every school inspire learners to want to come to school and learn, and teachers to teach.



- Goal 25. Use schools as vehicles for promoting access to a range of public services amongst learners in areas such as health, poverty alleviation, psycho-social support, sport, and culture.
- Goal 26. Increase the number of schools that effectively implement the Inclusive Education Policy and have access to centres that offer specialist services.

4. Professional development and oversight

- Goal 16. Improve the professionalism, teaching skills, subject knowledge and computer literacy of teachers throughout their entire career.
- Goal 17. Strive for a teacher work force that is healthy and enjoys a sense of job satisfaction.

5. Management and community support

- Goal 21. Ensure that the basic annual management processes take place across all schools in the country in a way that contributes towards a functional school environment.
- Goal 22. Improve parent and community participation in the governance of schools, partially by improving access to important information via the e-Education Strategy.
- Goal 23. Ensure that all schools are funded at least at the minimum per learner levels determined nationally and that funds are utilised transparently and effectively.
- Goal 27. Improve the frequency and quality of the monitoring and support services provided by district offices to schools, partly through better use of e-Education.

