Towards better generation and use of data within the basic education sector

Literature review and interview tool

Final report of 28 February 2017

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Contents

The current report is produced by Dr Martin Gustafsson (mgustafsson@sun.ac.za), who in turn made use of inputs from a range of reviewers and commentators, including Dr Nick Taylor, and David Douglas.

Whilst this version does not have an overall executive summary, *there are summaries provided in boxes at the start of major sections*.

1 Introduction

The current report presents what is largely the result of desktop analysis to inform a broader project examining the use of data in two South African provinces, **KwaZulu-Natal** and **Western Cape**, to strengthen service delivery in schools. The inception report for the project provides details on the project design[1]. The project is titled '***Assessment of education department data use in provinces and the formulation of recommendations aimed at improving systems and service delivery outcomes***'. The scope of the project can be described as 'data generation and use', where 'data' means databases, and not, for instance, digital materials used in the classroom for teaching and learning. The inception report moreover explains that the products of the current project, including the current report, are primarily aimed at officials in Treasury, both national and provincial, the national Department of Basic Education and the nine provincial education departments. Thus the two provinces are used as case studies from which a wide range of stakeholders can learn, the aim being to arrive at specific solutions which can accelerate the move to quality service delivery driven to a greater degree by effective data use.

The inception report indicates that there is a need to use some of the project's resources to produce tools with very specific purposes, apart from the overall analysis of data generation and use in the schooling sector. The specific tools which will be produced are **school-level report cards** drawing from Grade 12 examinations data. This partly explains why the current report pays special attention to school-level report cards existing in a few other countries.

A further special area of focus in the project (and to some extent in the current report) is how provincial departments **plan and manage spending on educators and teachers**, a topic which would include the hiring of these professionals, the management of salaries and benefits, performance management to promote 'value for money' in the sector, and incentives aimed at retaining educators in the sector.

The current report will inform other products emerging from the project, such as reports on the **findings emerging from interviews** with a range of stakeholders (the current report includes a generic interview tool), **slideshows** to communicate concepts and findings, the **school-level report cards** and their technical documentation, and a final set of **policy recommendations**.

The current report is structured as follows:

- Section 2 introduces a basic **three-way framework** used for the project as a whole. This framework has been adopted partly to balance a focus on more technical issues around data, information systems and metadata reports, on the one hand, and a focus on less tangible issues relating to organisational culture. Clearly both types of issues need to be taken into account if one is to plan for a better use of data.

- Section 3 provides a **review of the relevant literature**, with one sub-section focussing on literature from the world in general, and a second sub-section focussing on literature from South Africa. A wide range of texts are consulted, from academic articles to analyses produced by South Africa's Auditor-General. Texts were selected on the basis of their ability to throw light on the education data situation in South Africa, and solutions going forward.

- Section 4 focusses on selected **policies**, where 'policy' is understood broadly to encompass any instructions and guidelines. A first sub-section deals with global guidelines, which are currently in a state of some flux given the migration from the

[1] The seven-page inception report is dated 18 May 2016.

Millennium Development Goals (MDGs) to **Sustainable Development Goals** (SDGs). A second sub-section looks at how a few rich-country schooling systems deal with data and statistics in their annual reports, meaning these reports are used as an indication of the accounting instructions existing in those systems. It will be argued that this allows for a useful comparison with the corresponding policies in South Africa. A second section focusses in particular on **guidelines provided by National Treasury** to education (and other) departments with respect to performance information, given the influential nature of these guidelines.

- Section 5 provides an account of **how performance information is actually dealt with** in the education plans and reports of the two South African provinces (KwaZulu-Natal and Western Cape) and two developed country systems (New South Wales in Australia and New Zealand). It is argued that whilst one cannot simply apply a 'recipe' from outside the country to South Africa, examining how other countries go about reporting on education issues can be extremely informative.

- Section 6 provides an overall **'map' of the data existing** within the South African schooling system, and how the various data should ideally contribute towards innovation and development. The 'map' is accompanied by a narrative description.

- The **generic interview tool** appears as an appendix to the report.

The current report aims not just to describe what the various sources say. It also evaluates these sources, but with caution. The terrain of data use in government generally, and education systems specifically, can be controversial. Where controversies exist, these have been explicitly acknowledged and as far as possible a balanced account of the various arguments has been presented.

2 The triad of systems, human capacity and organisational culture

Figure 1 below provides a three-way framework for understanding problems and solutions relating to data generation and use in the schooling sector. It is roughly in line with frameworks presented in other reports with a similar purpose[2].

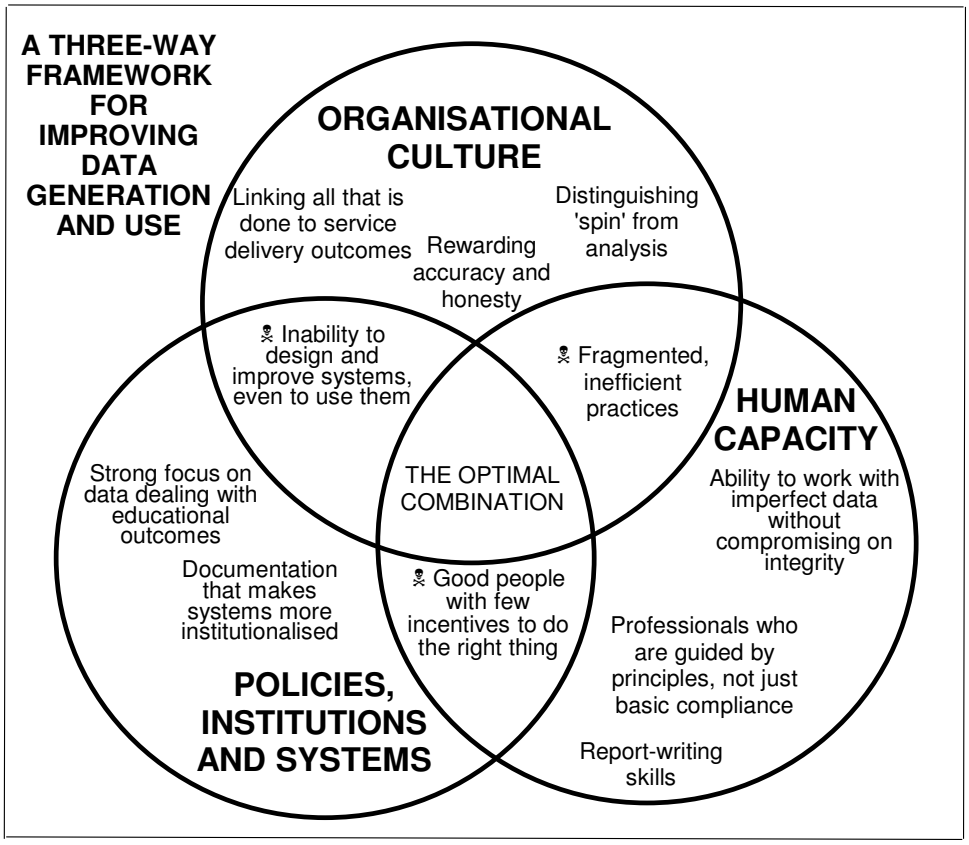
Policies, institutions and systems are relatively concrete things which are relatively easy to analyse. Clearly, the effective use of data requires appropriate policies, institutions and systems. For instance, in education there needs to be a sufficient emphasis on data on the **outcomes** of schooling. Without adequate data on what learners learn in schools, it becomes especially difficult to assess whether the budget is being directed to the right things. If outcomes improve or deteriorate, planner may be unaware of this and thus unsure whether they should consolidate gains, or 'go back to the drawing board'. Whilst the agency of individuals in promoting good data use is important, a situation where the departure of an individual results in the collapse of a data collection or analysis process is untenable. Institutions need to focus on **institutionalising** their systems, partly by ensuring that sufficient documentation on these systems exist. If an individual leaves, a replacement should be able to take forward the work, partly by learning from **documented past practices**.

Human capacity needed to promote effective data systems is relatively difficult to gauge because what is required is multi-faceted. Knowledge and experience in areas such as **database design**, **web-based interfaces**, and **statistical**, **psychometric** and **economic** data analysis are clearly important. However, it is also necessary for people to understand how best to apply their skills in what is often the difficult environment of the public service, where processes easily become overly bureaucratic, there is generally a shortage of sufficiently

[2] See for instance United Nations: Data Revolution Group (2014: 21).

skilled staff and tensions easily arise between politically-driven imperatives and professional ethics[3]. Skills needed thus include the skill of balancing the need to spread one's attention across a broad range of projects and tasks, whilst at the same time ensuring that at least a few critical ones are completed and add value, however indirectly, to service delivery. For data analysts, a critical skill is to use data which are imperfect for monitoring purposes, for instance by comparing results across different datasets, and to explain how large the risks are associated with, for instance, missing values. If imperfect data are completely rejected by analysts, important opportunities to build on government's knowledge base are lost. A common problem in government is that data analysts and systems developers are not able to communicate their concerns, partly due to weak **writing skills**, and that those in the organisation who are good report-writers do not understand data. Building report-writing capacity is important, as is ensuring that people with different skills complement each other on specific projects.

Figure 1: Systems, human capacity and organisational culture



Finally, **organisational culture** is important. To a large extent this is generated by **leaders** in the organisation. For data to be properly used, there needs to be a special emphasis on the outcomes of the organisation. Staff need to see their work as contributing towards, for instance, better quality schooling. Processes such as data collection should not come to be seen as ends in themselves. Leaders in a government department need to assist in maintaining a distinction between public relations information, or the 'good story' which all governments need to construct for public consumption, and honest communication between officials in government. Data should be the basis for honest assessments within government of what is occurring. Officials should not be 'spindoctoring' to each other. In fact, incorrect use of data

[3] According to the National Development Plan, these are all worrying problems in South Africa (National Planning Commission, 2012: 408-29).

to cover up problems, or resulting from carelessness, should carry negative consequences, whilst accurate use of data should be rewarded.

3 Current e-government thinking of relevance to us

The heading for this section includes the term '**e-government**'. In many ways, the project that this report forms a part of is about improving e-government, in particular if we use a broad understanding of e-government, as in the following:

> eGovernment is the use of information and communication technologies (ICTs) to improve the activities of public sector organisations. Some definitions restrict e-government to Internet-enabled applications only, or only to interactions between government and outside groups. Here, we do not - all digital ICTs are included; all public sector activities are included. (http://www.egov4dev.org/success/definitions.shtml, accessed June 2016)

What is useful about the term 'e-government' is that it emphasises internet-based communication, including such communication between government and private citizens. Whilst there is much e-government involving communication *within* government, it seems useful to emphasise communication with citizens, as this is in line with the notion of a more responsive government. The emphasis of school-level report cards in this section should be seen in this light.

The following two sub-sections deal with the global and South Africa-specific literature respectively, and focus on e-government thinking which is of relevance for the current project. Each sub-sections begins with a summary. The two sub-sections follow roughly the same sequence of issues.

3.1 The global literature

The global literature confirms that the question of how best to employ data to improve the service delivery of schools, or other public institutions, is complex. With respect to public services in general, more data are not necessarily a move in the right direction. Whilst data can assist good management, the research points to system weaknesses brought about by an over-emphasis on the supply of data, and an insufficient focus on good data use. Investing in e-government initiatives can be beneficial, yet assessments of projects undertaken, in particular in developing countries, point to a high risk of failure in these initiatives, often because the design of the systems does not take into account realities such as human capacity constraints and the type of information that is likely to convince leaders to move from more intuitive planning to more evidence-based planning.

Turning to the use of data in schooling systems, important innovations have occurred in recent years, especially as far the measurement of learning outcomes is concerned, and lessons are continually being learnt. A fundamental matter is that data systems need to fit the government's and society's outlook on the level of *school autonomy*. Highly centralised schooling systems require particular data, whilst a system with high levels of school autonomy requires rather different types of data. The matter is not an easy one because schooling systems are often centralised in certain respects, but not in others. There may be high levels of centralisation currently, but government's intention is for schools to become more autonomous. Parts of the schooling system may be more autonomous than others.

Arguably the most important debates on data and school performance in recent years relate to data on learning outcomes. Specific techniques have been tested to assist managers in determining when schools are improving and when they are not. Clearly,

knowing this is vital when it is decided which schools or regions need to rethink their strategies. The literature is clear that inappropriate measurement techniques can and often do result in incorrect indicators of trends, which in turn can lead to the wrong strategies. For instance, 'selection effects' in examination systems, or factors influencing who gets to participate in the examination, need to be taken into account. Standardised testing systems need to pay careful attention to how results are equated across years and (where relevant) the correctness of sampling procedures. Measurement needs to translate into behavioural change. In this regard, much of the literature has focussed on schooling systems that have implemented some kind of school report card system. Such systems, if properly implemented, can help schools and managers in the education administration make the right decisions.

The vital link between school autonomy and data use. This sub-section begins with a discussion of school autonomy and the implications of this for data. Many education experts would not immediately see a link between the two, but this link is emphasised in some of the literature, and here it will be argued that understanding this link is vital for planning data systems. The World Bank's SABER[4] initiative provides a useful starting point. This initiative has performed a stocktaking of sound practice around the world in both school autonomy and education information management systems (EMIS). With respect to autonomy, the initiative promotes the 'triple-A' of autonomy, assessment and accountability. Schools should be as autonomous as possible, and assessment and accountability systems are needed to ensure that schools employ their autonomous powers in the interests of service delivery[5]. The preference for autonomy, as opposed to a more centralised approach, in the SABER documentation is that autonomy linked to equitable funding by central authorities appears to produce better educational outcomes according to the research.

In a schooling system characterised by high levels of autonomy, there has to be much movement of data both 'up', from the school to the administration, and 'down', from the administration to the school.

> The interrelations between autonomy, assessment, and accountability can be compared to a "closed-loop system", or one in which feedback constantly informs output. In a closed-loop system, data does not flow one way; instead it returns to parts of the system to provide new information that dynamically influences results.[6]

All this may sound impractical to 'centralists' faced with the challenge of large numbers of dysfunctional schools. There is a natural reluctance to give dysfunctional schools more powers. To some extent the SABER materials acknowledge that the move to greater school autonomy is not easy. In particular, it is emphasised that simply giving schools more autonomy, without at the same time strengthening assessment and accountability systems, is not feasible. Thus in some ways the debate around school autonomy is a debate around how to improve assessment and accountability systems.

A highly centralised and highly autonomous scenario. The following table draws from the SABER work in trying to clarify how data would function very differently in two hypothetical schooling systems, one highly centralised and one where schools are highly autonomous. Of course an actual schooling system may find itself between the two hypothetical positions. For instance, personnel decisions may remain centralised, whilst non-personnel decisions are decentralised. Yet the point remains that the level of decentralisation, or school autonomy, has large implications for the type of data the schooling system needs. A centralised system needs to focus a lot on gathering large amounts of data on many processes, in other words data must

[4] Systems Approach for Better Education Results.
[5] Demas and Arcia, 2015.
[6] Demas and Arcia, 2015: 6.

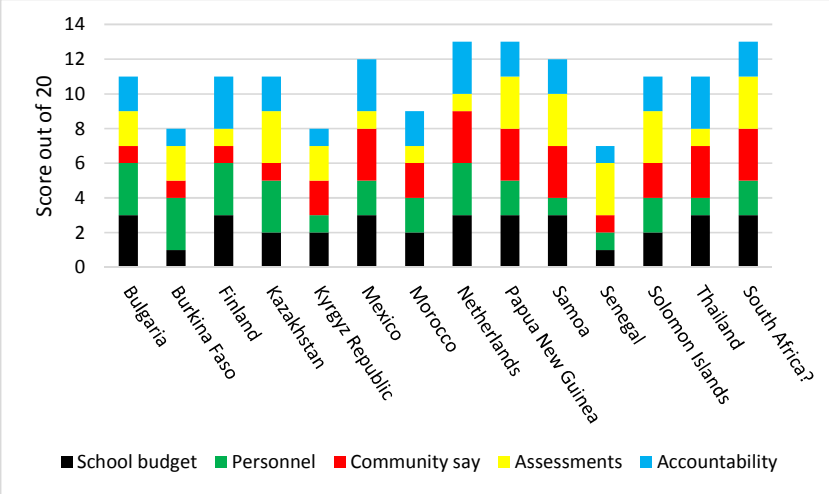
flow largely 'upwards' to a large central data warehouse. A more decentralised system, whilst it would also need a central data warehouse, is not as dependent on centralising data on school resources, but must at the same time ensure that data flow 'downwards' to school and that through accountability processes, schools use the powers they have been given to 'take ownership' of poor outcomes.

Table 1: Levels of school autonomy and data implications

	Highly centralised schooling system	*A system with high levels of school autonomy*
General purpose of data	To provide the centre with enough data to manage the logistics of the system, for instance the deployment of teachers.	To allow the centre to distribute funding equitably across the system, but also to monitor whether schools do what they should do, and to provide feedback to schools in this regard.
What kinds of 'big data' (i.e. not sample-based) get prioritised	Data on everything that must be distributed to schools, such as teachers, books, furniture, but also data on assessments such as central examinations.	Data on funds reaching schools, plus assessment data, both with respect to standardised tests and fully-fledged examinations.
Typical challenges during data collection	Complexity resulting from the fact that large volumes of data on different things, often coming from different organisations (for instance external suppliers), must be integrated.	Complexity in the design process arising from the need to judge schools fairly, for instance the need to gauge schools relative to their socio-economic challenges, meaning credible data on the latter is needed.
Typical challenges during data utilisation	Highly complex data processing needed at the centre, for instance to decide which teachers should teach in which schools, or how many new books to issue to schools each year.	Putting together information packages on school performance which are sufficiently clear and useful to, for instance, school principals and parents.
The consequences of poor quality data on school resourcing	The misallocation of specific resources such as teachers and books, a misallocation which is complex and relatively difficult to fix.	The misallocation of school funding, a misallocation which is not very complex and is relatively easy to fix.
The consequences of poor quality data on school performance	Problems in relation to data on *resources* can take attention away from performance, and towards continuously resolving central provisioning problems. Problems in relation to data on *performance* can result in support services being directed to the wrong schools or wrong problems.	Poor data on performance might undermine school efforts to secure the right pedagogic fixes, for instance if poorly performing schools are led to believe they are performing well.
Corruption risks	Large-scale corruption at the centre, where large contracts are concluded, if sufficient checks and balances are not in place.	School-level corruption in the form of the incorrect use of public resources, in particular in an environment where principals and teachers face no consequences for poor school performance.

The following graph illustrates SABER's five elements of school autonomy and how different countries have adopted different levels and types of autonomy. The South Africa bar is based on speculative values discussed in the following sub-section (South Africa has not been evaluated by SABER).

Figure 2: Levels of school autonomy in developing countries



Source: http://saber.worldbank.org/index.cfm.
Note: The four evaluation levels (used in each of the five categories) of latent, emerging, established and advanced were converted to scores of 1, 2, 3 and 4 for the purposes of this graph.

Risks and opportunities associated with indicator-focussed planning. A rather separate matter which is important for planning data in the schooling system is the risk of too much bureaucracy, and even incentives for fraud and inefficiencies, resulting from too much information and data being used in inefficient ways. In the academic literature from rich countries there has been an ongoing debate since the 1970s about the profusion of measurement in government. Debates often centre around the merits of the New Public Management (NPM) school of thought and 'performance-based management'. The arguments in favour of measurement are strong, which would explain why so many governments have increased the number of things they measure. Arguments against the trend have tended to emphase the risk that a preoccupation with narrowly focussed indicators can lead to narrow-minded bureaucrats and an eroding of what is described as a 'public sector ethos'[7], or a broad-minded approach to solving problems. Much of the criticism of existing measurement approaches in government has focussed on what is seen as too much supply of information (or an 'information overload'), and too little interpretation and use of the information.

> There is a need to remember the distinction… between performance measures and performance indicators. A measure is analogous to reading a number from a dial – it has a strong sense of precision. Indicators are more imprecise and usually signal that further, more detailed, investigation is warranted. Most of the information available about public sector performance is in the form of indicators. Do public sector managers have the capabilities to design, interpret and respond to performance indicators? … Having more information helps decision-making, but it is not a substitute for judgement. Too much information, as is well known, results in overload and analysis paralysis.[8]

Resistance to measurement in the education sector. Critiques against measurement can be particularly strong on the education sector. In particular, teacher unions have in many countries opposed standardised testing and how the resulting data are used. For instance, there has been a fear that data will be used to judge teachers unfairly, without taking into account weak professional training, the need for further in-service training, and the difficult circumstances that teachers face in many schools. On a more political level, tests are often

[7] Diefenbach, 2009: 896.
[8] Jackson, 2011: 23-4.

seen to carry a 'neo-liberal' agenda[9]. However, there also important counter-arguments stating that more and better data on learning outcomes, linked to accountability systems, should be seen as an integral part of the welfare state and the fight against social inequality[10].

Indicator-focussed planning in developing countries. Most of the literature on matters such as performance-based measurement in government has focussed on developed or rich countries. There are good reasons to believe that developing countries pose a number of unique challenges which are poorly covered in the literature. Pritchett[11] has been highly critical of how data have been used (or abused) in developing country governments, partly as a result of the kinds of demands foreign donors impose on these governments. Pritchett refers to a problem of 'isomorphic mimicry', whereby developing country governments construct a superficial appearance of functionality, without acknowledging deeper problems which impede their functionality, including weak and cumbersome data systems. Similar arguments have been made by Inbar (1996: 92) in a book on innovation in education published by Unesco's International Institute for Education Planning (IIEP) which, though two decades old, remains relevant today.

Risks inherent in overly targets set purely through a non-technical political process. Pritchett argues that overly ambitious targets are one key reason for government failure in developed countries. Such targets can lead to manipulation of data to create the appearance of success or, conversely, can lock governments into a perpetual sense of having failed, even if reasonably good progress is being made. Inbar (1999: 36) points to the importance of targets being negotiated, not imposed from above, in order for targets to be reasonable and 'owned' by implementers. What is probably also overly ambitious is the curricula of developing countries, something which can exacerbate an exaggerated sense of failure and has far-reaching implications for how learners are tested and test data are interpreted[12].

The need for an integrated EMIS *strategy*. So how should education systems ensure that data use fits the type of schooling system currently in place, and the type of system envisaged for the future, and that typical problems such as information overload and the under-utilisation of data are avoided. SABER has emphasised strongly the need for an over-arching information strategy which can guide the various stakeholders involved in the collection and use of data in a schooling system[13].

Questions around how to achieve integrated *data.* Whilst the need for an integrated *strategy* seems fairly straightforward, the matter of data integration seems more complex. Calls for more data integration are often heard, but what exactly this entails is not always clear and possible risks may not be acknowledged[14]. Specifically, the simple fact that data integration is in the first instance a matter of ensuring that the same unique identifiers are used in different systems is often overlooked. Clearly, of the payroll and school infrastructure systems use different identifiers for schools, data integration is not possible. Data integration is often understood as meaning the use of one software platform for all data, and completely integrated data warehouses. Such solutions, which vendors often promote, clearly come with new costs. It is probably necessary to assess on a case by case basis when the costs of further data integration are justified by the benefits.

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[9] See for instance the 2010 resolutions of Education International (EI), the world federation of teacher unions (Education International, 2011).
[10] Benveniste, 2002.
[11] See for instance Pritchett, Woolcock and Andrews, 2012.
[12] Pritchett and Beatty, 2012.
[13] Abdul-Hamid, 2014.
[14] See for instance World Bank (2015), where is it argued that a problem with the school data systems of the State of Maryland in the United States is insufficient data integration. Presumably there are logical cost-benefit reasons why a highly developed schooling system would not have adopted higher levels of data integration.

The importance of external audits of information systems. Data can help to bring about more accountability in a schooling system, but those who design and operate the information and knowledge generation systems need themselves to be accountable. SABER thus emphasises the importance of having periodic and independent evaluations of these systems, possibly in the form of a 'utilization-focussed evaluation' where the point of departure is that all data must useful and serve the interests of service delivery. Heeks (2006), a prominent authority on e-governance in developing countries, warns that independent evaluations must be truly independent and impartial. Evaluators should have no commercial interest in identifying gaps in the existing systems, as this could lead to investments in systems not actually needed. Heeks also warns against blindly applying rich country standards when the systems of developing countries are evaluated.

The optimal design of standardised testing programmes. A large body of literature has emerged, particularly in the last decade or so, on how best to measure progress in the learning outcomes of schools and whole schooling systems, with a view to helping decision-makers[15]. A few methodological issues stand out. Results need to be made sufficiently comparable across time through some 'equating' or 'anchoring' method, meaning that to some extent tests need to be the same in different time periods. This brings about challenges with regard to the 'security' of tests. The parts of the test which are common over time should not be leaked. This is relatively easy to address in a tightly controlled sample-based testing system aimed at gauging progress in a country, or some sub-national region. However, in a testing system involving all learners in the system the problem is not that easy to address. To some extent employing a mix of a census-like and sample-based measurement can solve the problem. Amongst developing countries, relatively successful national testing programmes in Chile and Brazil have been fairly well documented in English. World Bank analysts consider Brazil's system world class and 'superior to current practice in the United States and in many other OECD countries in the quantity, relevance, and quality of the student and school performance information it provides'[16].

Using school performance data as a basis for rewarding teachers. Chile's testing programme has been linked to monetary rewards paid to schools as a whole, to be shared amongst all teachers. This type of approach is clearly preferable to one which provides individual teachers with monetary rewards, given the tendency of the latter approach to lead to a sense of unfairness amongst school staff, in a context where it is extremely difficult to attribute performance improvements amongst learners to specific teachers. Even at the primary school level, large improvements in one grade could be the result of the groundwork having been properly laid in a previous grade. Importantly, even though school-level monetary rewards based on learner performance data are implementable, they may not be worth the effort and cost. A number of economists have argued that there is little evidence that these monetary rewards are the cause of sustained educational improvements[17].

A strong focus on school report cards. Many governments have implemented school report cards, or short reports summarising how well a school performs relative to other similar schools. These report cards are partly intended to stimulate the right kind of interaction between parents and school staff. Basically, if a school performs poorly, parents should know this so that they can put pressure on the school to tackle the problem with the right strategies, strategies which could include agreements between parents and the school around what measures should be taken in the home. SABER puts forward the 'My School' report card of Australia as a good example. Anyone can access any school's report card on the 'My School' website. For each school, one finds the average performance of the school in standardised tests, a measure of the socio-economic status of learners, and how well the school performs

[15] Clarke, 2012.
[16] Bruns *et al*, 2012: 7.
[17] Binder and Contreras, 2008.

relative to other schools in the same socio-economic category. Socio-economic status data draw largely from records the school maintains on the occupations of parents[18]. Developing countries have introduced similar systems. The box below describes features of a school report in Chile[19]. In line with the idea that accountability systems should themselves be interrogated, researchers have subjected the Chilean report cards to an external evaluation of sorts[20]. One of the findings of the researchers was that the designers of the report cards generally over-estimate the capacity of parents, and even some principals, to interpret the meaning of the report card, suggesting that piloting a school report card before taking it to scale seems advisable.

DETAILS FROM A CHILEAN SCHOOL 'REPORT CARD'

Format: Details viewable online, PDF printout comes to 35 pages (with large font and many large and simple graphs).

- ✓ Results as average school-level scores from national standardised tests, in mathematics and reading, are provided for grades 2, 4, 6 and 8. In grades 6 and 8 social sciences included as a third subject.
- ✓ The percentage distribution of results in each of the tests across three levels is given: adequate, basic, insufficient.
- ✓ Average scores per grade and subject for the school are compared to statistics from the previous year and to schools of a similar socio-economic level. Socio-economic level is indicated using five categories, from 'low' to 'high', and the categorisation draws mainly from responses of parents in the school in question relating to their highest level of education and the household's income.
- ✓ Ratings for each grade, using four indicators, of learner wellness and the school climate are provided. The four indicators deal with individual self-esteem, social cohesion in the school, nationbuilding and healthy lifestyles. Data come from background questionnaires filled in by learners when tests are run.
- ✓ Advice on what the statistics in the report can and cannot be used for is given. For instance, there is a warning that comparisons across grades are not meaningful, and that results should not be used to judge individual teachers.

Healthy interrogation of the accuracy of widely-quoted education statistics. There has been what can be described as a healthy shift in emphasis from encouraging governments to start collecting data on schools and increase the scope of these data, to encouraging governments to be a bit more careful about the accuracy of data and statistics. A report commissioned by Unesco's Institute for Statistics (UIS) found large discrepancies between enrolment ratios using enrolment data from schools and population data from households, compared to enrolment ratios using just household data[21]. The general conclusion one can draw is that in many developing countries enrolments are inflated, partly as this allows schools to attract more state resources, and that ratios based only on household data can be considered more accurate. Turning to statistics from international testing programmes, work

[18] North Adelaide Primary School was selected (in 2016) to view the functionality of the system at https://www.myschool.edu.au.
[19] School number 12502, Colegio Andino, was examined (in 2016) at http://www.simce.cl (this same website also provides background information relating to, for instance, the methodology used for socio-economic categories).
[20] Taut *et al*, 2009.
[21] Stukel and Feroz-Zada, 2010.

by Jerrim (2013a, 2013b) stands out. He has concluded that a lack of quality controls in England's implementation of the PISA[22] programme resulted not just in inaccurate statistics for the country, but also inappropriate policy conclusions by the government. Of note is the fact that Jerrim is not against international testing programmes. He acknowledges their value for education planning, and argues that on the whole PISA produces reliable results, but warns that testing programmes need to be carefully implemented, for instance in relation to the timing of tests and sample design. It is moreover important that methodologies should be documented and be open to public and academic scrutiny.

Total failure of up to a third of e-government projects. E-government projects often require the building of complex networked computerised systems, involving government and private contractors. What is probably not sufficiently appreciated in the enthusiasm to innovate and acquire new technologies are the many risks of failure. According to Heeks (2006: 18), who has assessed several of these projects in developing countries 'one can estimate that between one-fifth and one-third of all egovernment projects fall into the total failure category'. Only around 15% of projects were considered successes, with the remainder being 'partial failures' (Heeks, 2003). Though these findings are around a decade old, there seems to be no reason to believe the situation has changed substantially. How do such high (and costly) failure rates come about? Heeks refers to the problem of 'design-reality gaps', meaning amongst other things an over-estimation of the capacity of people to use the completed system, and a lack of willingness amongst leaders to allow their decisions to be driven by data. The reality that is assumed to exist by the designers of the system does in fact not exist.

Innovation and maintenance. Inbar also warns about under-appreciated risks associated with systems innovation: 'The need for system maintenance can be overlooked in the flood of enthusiasm that often accompanies innovation' (Inbar, 1996: 42). If new systems divert too much attention and resources away from existing system, the older systems may fail, which can led to a net loss for the organisation and the service delivery process.

3.2 The South African literature

It is noteworthy that much of the analytical literature dealing with the South African basic education sector generally, and its data in particular, is difficult to obtain. Important documents are not available on the Web, even where there appears to be no good reason not to make these documents widely available. In fact, it is in the interest of organisations like the Department of Basic Education for education debates in the country to be informed by the analysis it produces itself or commissions analysts to produce (often in collaboration with partners such as Unicef and the World Bank). Better 'knowledge management' practices appears to be one relatively simple enhancement which could bring about better policy debates, and ultimately more informed policy positions with a broader 'buy-in'.

The overview which follows is informed by a number of documents, including arguably all the most important non-public documents.

An observation which has been made by several analysts is that information systems are weakened by insufficient overall policies specifying, for instance, what the ultimate purpose of the system is. This raises the risk that system designers will focus on the wrong things, or that people attempt to use the system for purposes for which it was not intended. To cite a few concrete problems, the Annual National Assessments (ANA) programme (which is an information system, but obviously a lot more as well) is said to lack mechanisms to communicate results in appropriate ways to, say, schools, perhaps

[22] Programme for International Student Assessment.

because this function got lost given the considerable focus on producing aggregate national and provincial results. Similarly, the SA-SAMS school management system appears to be under-utilised as a tool to enhance school functionality, partly because policy indicating that this is the system's primary function is not clear enough. Monitoring and evaluation (M&E) appears not to be guided by an overall policy, at least not one aimed at fixing specific data collection and use problems raised in the current report. None of this is meant to imply that systems such as ANA have not succeeded having a positive impact on what happens in schools. However, opportunities are lost when there is insufficient policy guidance. Of course, the required policies need to do specific things. They need to be informed by actual problems, in particular in schools. They need to be advocated and disseminated with a clear purpose: they should be influencing the behaviour of specific people in specific ways. And they should be revised from time to time as lessons are learnt. They should not be overly idealistic or ambitious (they should not be 'wishlists') and whilst they should include over-riding principles, they should also make reference to specific systems and practises.

What is difficult to establish with the existing analyses is the degree to which different types of public schools enjoy different levels of school autonomy, and whether the trend has been towards more or less autonomy. As argued in the previous sub-section, knowing this is vital for guiding investments in data. Some evidence points to a conflict between a pro-autonomy stance in the formal policies (and in the National Development Plan) and practices whereby provincial authorities withhold more powers, in particular in relation to non-personnel funds, than they should. Concerns around corruption in schools have to some extent strengthened the argument for more centralised control. Very importantly, Auditor-General (AG) reports, which have far-reaching impacts on how the education departments plan, reflect a strongly pro-centralist view on solving education problems. Education departments are expected to have rather detailed data on needs, down to the level of the individual educator and learner, and should provision services and resources such as in-service training and textbooks accordingly. The AG reports moreover point to departments that are not coping well with these information responsibilities. What is telling is that the 'management responses' of education departments appearing in the AG reports essentially mirror the AG's centralist view on solving problems. In these responses, the education departments emphasise the need to fix central provisioning systems, but make almost no reference to other systems, in particular systems aimed at enhancing the accountability of schools, systems which could promote the 'value for money' principle of the AG.

How to ensure that schools, and specifically school principals, become empowered in the right ways so that they can play their role in educational improvement is not a straightforward matter. It is not the purpose of the current report to make recommendations in this regard. However, if there is ambiguity around the long-term direction, this could lead to poor investment decisions in the area of information systems. For instance, if a commitment over the longer term to more empowered school principals is not made clear enough, the sector may over-invest in systems designed to solve problems centrally, and under-invest in systems designed to make schools more accountable. Put differently, investing in systems aimed at dealing with realities which one sees as ultimately coming to an end (for instance poor school management) is very different to investing in systems aimed at fulfilling functions one believes will always be necessary (school accountability).

Difficulties around establishing the school autonomy trend in South Africa. How autonomous are South Africa's schools, for instance by international standards, and how 'pro-autonomy' are South Africa's policies on schools? As implied by the previous sub-section, these questions are vital for understanding what long-term investments in data should focus on. Answering the questions is not easy, partly because practices are different in different

parts of the country, and whilst formal policies may be very supportive of school autonomy, there are a number of important policy signals which call for a rather centralised approach to solving South Africa's schooling challenges.

Policies promoting school autonomy often diluted in practice. On the policy side, the South African Schools Act favours strong participation of parents in school improvement, though the school governing body[23]. It also favours moving towards greater control over non-personnel funds by schools, as the capability of school principals improves. The National Development Plan sees empowered school principals as key agents working towards a better schooling system[24]. To explore actual practices, Figure 2 from the previous sub-section was expanded to include a South Africa bar, after some consideration of the justifications behind the ratings of other countries, and consideration of what the literature indicates is currently occurring in most of South Africa's schools. It should be emphasised that there is far from an abundance of South African literature on this, so any analyst must depend to some degree on general knowledge. One of a few empirical sources is a 2009 Unicef-funded report on school funding, drawing from a sample of 500 schools, which finds, amongst other things, that intentions around school-level controls over funds in the policies are often diluted in practice by provincial administrations[25]. (This report is not publicly available on the internet. One thing that this section will find is that many reports which are not of a particularly sensitive nature are not publicly available, and possibly not even available to relevant decision-makers. There seems to be a general problem with the way knowledge is managed.) Some analysts indicate, anecdotally, that the legacy of apartheid manifests itself partly in an approach whereby school principals in historically white schools are allowed to run their schools relatively independently, whilst principals of historically black schools are subjected to far more 'micro-management' from above. If historical legacy, and not the capacity of individual school principals, guides the powers actually given to principals this would be wrong and inefficient. However, it should be noted that there has been no systematic research into this and many other school autonomy questions. The analysis leading to Figure 2 was a rather rough one, yet it seems useful. South Africa is probably rather similar to many other countries when it comes to the powers given to schools. The drive, promoted by bodies such as the World Bank, but also many education researchers not linked to the World Bank, to promote school autonomy has probably not been particularly successful or unsuccessful in South Africa.

Arguments and traditions favouring a centralised approach to schooling. Concerns around school-level corruption are one reason why arguments in favour of a centralised schooling system often appear strong, despite what the policies say. For instance, a recent report on corrupt practices in the appointment of school-level staff arrives at the conclusion that some human resources functions should be moved from the school up to the provincial administration[26]. But arguments for a centralised approach are probably also driven by tradition, specifically the fact that administrators working above the school have traditionally enjoyed considerable direct powers over schools.

Auditor-General findings and the question of decentralisation. The reports of the Auditor-General (AG), and the responses of the education departments to these reports, reflect a thinking which is rather pro-centralist[27]. Why this conclusion is drawn will be explained. This pro-centralist stand is likely to influence the kinds of data that departments invest in. Moreover, the AG reports tend to describe an education administration that is not coping well with its responsibilities. Serious concerns have been raised around management in general,

[23] Naidoo, 2005.
[24] National Planning Commission, 2012: 310.
[25] Gustafsson, 2009.
[26] Department of Basic Education, 2016a.
[27] Auditor-General, 2015c: 17-18, 29, 31, 34, 42; Auditor-General, 2015a: 135, 142.

and information management in particular. Certain aspects of performance, such as the management of procurement and projects, are said to be worsening. The fundamental problem, according to the AG reports, is said to be lacking leadership at the centre. This is important, and could suggest that there is a limit to how much fixing can be done at a lower and more technical level in the departments when it comes to information management. By implication, the AG reports are saying that the problem is *not* overly ambitious projects, or overall capacity constraints in the country.

Teacher development and book procurements. In what respects does the AG promote a centralist approach to tacking education sector problems? To illustrate, the AG's 2015 sector report sees it as the responsibility of the education department to know what in-service training teachers need, at the individual level, and to provide the necessary training to the right teachers. The emphasis in the AG report is not, for instance, on the more decentralised approach of incentivising teachers, partly through the monitoring of learner results in schools, to form study groups, or 'professional learning communities' (PLCs), to assist each other in developing capacity. PLC-type programmes have in fact become rather popular in many countries, and are mentioned in the DBE's teacher development strategy[28]. However, the AG report does not go as far as proposing a comprehensive teacher capacity national database, including details on past training attended, something which has been advocated by the South African Council for Educators[29] (and which appears not to have been implemented successfully in any other country). The AG's reports describes as serious problems of incorrect deliveries of books to schools. Too often an excess of books will be delivered to a school. Books in the incorrect language are often delivered. Even Western Cape, which tends to receive favourable findings in the AG reports, has been found to experience serious book delivery problems. Proponents of greater school autonomy would argue that a part of the problem is that the book distribution model being followed is too centralised, and requires data collection and use which is difficult to realise, in particular in the context of a bureaucracy with limited capacity. The solution, according to these proponents, would be to move towards a situation where schools themselves use funds allocated to themselves to decide what books they wanted delivered, possibly through a central procurement agency. To some extent it appears as if schools do have this freedom, but a high degree of centralisation nevertheless seems to characterise book procurements across the nine provinces. The AG does pay some attention to transfers of public funds to schools, but how this does or should co-exist with central procurement is not explored[30].

Differing understandings of 'performance'. AG reports are of course highly influential and can be viewed to some extent as reflecting the actual intentions of government, regardless of what policies say. Importantly, 'management responses' by the education departments to the AG findings essentially reflect an affirmation of a rather centralised approach to managing the schooling system. What is also telling is that data on learning outcomes, and systems aimed at gauging these, receive virtually no coverage in the AG reports. Performance is viewed to a large degree in terms of a department's ability to deliver the right goods and training to schools. A rare reference, within an AG report, to 'dependency syndrome' risks associated with an overly top-down approach to managing the schooling system, is the following, which forms part of the DBE's management response:

[28] Department of Basic Education, 2011.
[29] South African Council for Educators, 2012.
[30] A graph and the accompanying discussion in Auditor-General (2015a: 139) indicates that Free State would have decentralised controls over public funds to a far greater degree than other provinces. Specifically, the graph indicates that 56% of all funds transferred to school accounts are in this province, though the province only accounts for around 5% of school enrolments in the country. Some querying of this revealed that this graph is an error and that there is nothing particularly unusual about Free State with respect to school-level control over public funds.

> The department will be working with the Organisation for Economic Cooperation and Development (OECD) to develop a survey on teachers' perceptions and the necessary conditions for ensuring quality teaching, efficiency and accountability in the basic education system. Support without accountability, breeds a dependency syndrome.[31]

Moreover, the AG has acknowledged risks associated with a failure to devolve some financial controls from the province level to the district level:

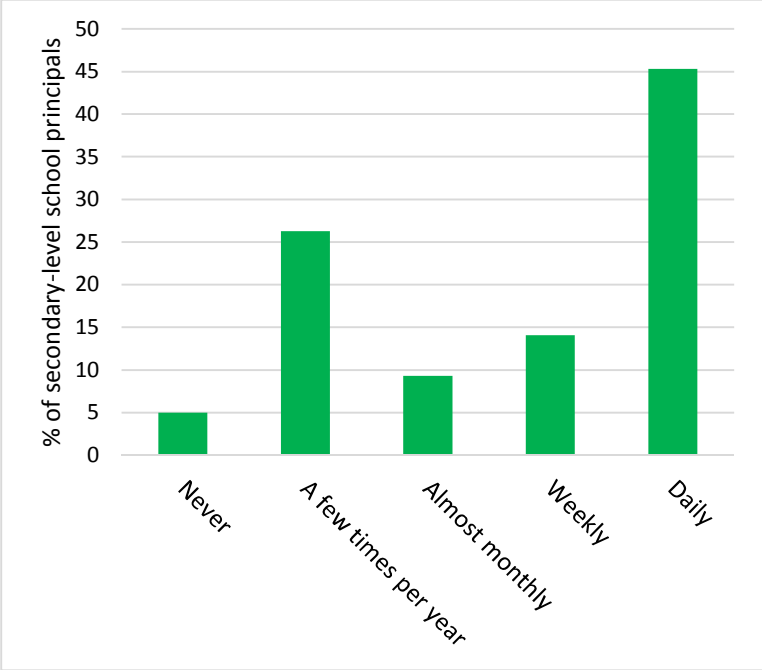
> The effect of managing the budget centrally is that it inhibits the education districts from planning and executing interventions that are consistent with the districts' teacher development needs, for which they are responsible.[32]

However, what seems absent in the AG reports is a focus on the school as an agent of change in the system, and on ways of ensuring that schools are given as many management powers as they can successfully handle.

Capacity of schools to use data. The argument for giving schools more powers is strengthened if, for instance, school principals display a critical level of capacity when it comes to using data for managing education and the resourcing of schools. Unfortunately there is little evidence on the capabilities of school principals, and school-level actors in general. Arguably the closest South Africa has got to a systematic survey was the 2006 Second Information Technology in Education Study (SITES)[33], which in the case of South Africa involved collecting information from a representative sample of 500 secondary schools. The data are now old, but they remain an important point of reference on how to study information technology use in schools. SITES also arguably reflects the problem of data collected and then barely used. Despite the high cost of the survey, it appears it resulted in just one little-known academic paper[34] and the data appear not to have been used for any planning purposes[35]. The data reflected in the following two graphs are of course dated, and one can assume that the reality today would be better than the situation in 2006. Already in 2006, 72% of secondary school principals were using a computer for writing documents, and 54% for timetabling (Figure 4). Clearly, even in 2006 some level of data analysis on computers, by principals, was occurring in a large portion of the schooling system.

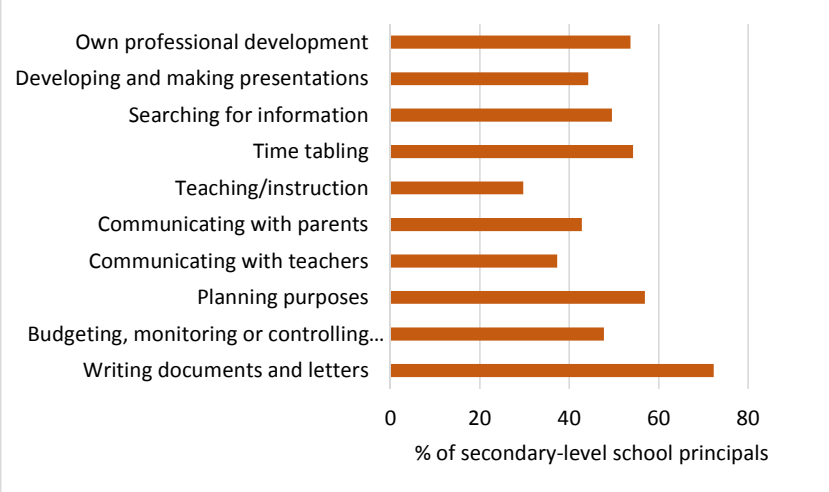
[31] Auditor-General, 2015c: 51.
[32] Auditor-General, 2015a: 130.
[33] See http://www.iea.nl/sites_2006.html. SITES stands for Second Information Technology in Education Study.
[34] See Blignaut *et al*, 2010.
[35] The survey itself appears not to have been repeated after 2006, at least not as an international survey.

Figure 3: School principal use of computers 2006 (I)



Source: Own analysis from South Africa microdata downloaded at http://rms.iea-dpc.org.
Note: The question asked was: 'Altogether, how often do you personally use a computer?'.

Figure 4: School principal use of computers 2006 (II)



Source: As for previous graph.
Note: The question asked was: 'Do you use your computer for any of the following?'. Answers could be yes or no. Around 11% of principals provided no response. These were all considered as having said 'no' for the purposes of the above statistics.

Compliance but not management in relation to South African education data. A landmark report on data use for school management purposes is the 2013 report *Success by numbers* financed by the Dell Foundation[36], and involving interviews with around 300 stakeholders. This report describes successes, but also a range of problems, many of which

[36] Dell Foundation, 2013.

have to do with organisational culture. The DBE's sector plan, in drawing from the Dell report, acknowledges these problems:

> … fundamental problems include a widespread culture of unquestioning compliance in many parts of the system, which results in a situation where managers devote a large amount of effort to completing forms and submitting data with little understanding of what the data are used for, or how the effort contributes towards better schooling. This situation leads to data that are often of a poor quality. More consideration of how data will be used, and insistence that data should result in reports that can assist managers at all levels of the system, are needed for e-education progress to be realised. ... The limited capacity of managers and planners to prioritise represents a further fundamental problem, according to the report. Too many priorities, each linked to complex reporting procedures, are likely to overload the system.[37]

In terms of the school autonomy argument, a lacking sense within schools that they themselves are key agents of change, results in a situation where schools simply comply with data requests, which clearly carries an opportunity cost in terms of the other activities in a school, without really expecting anything in return, and without worrying much about the consequences of poor quality data.

Too many indicators. The problem of an information overload in government, something often described in the global literature, is seen as a real problem in the South African education sector according to two lecturers in a course directed at officials, and available in the form of webinars[38].

The 2012 assessment of M&E in the sector. An overview of monitoring and evaluation (M&E) in South Africa's basic education sector, commissioned by the DBE and funded by Unicef, resulted in a 100-page report[39]. Unfortunately, this report is not publicly available and appears not to be easily accessible even to officials within the education departments. Perhaps a part of the knowledge management problem is that there is no insistence that reports get released when they are not completely in line with the thinking and priorities of the current leadership. Not releasing such reports, however, is wasteful in the sense that these reports often contain important descriptive information which a wide range of stakeholders would find useful, even if the recommendations of the report are not all accepted by government. Not releasing at least descriptive information means that education debates conducted by academics, journalists, politicians and others have less information to draw from. This can also result in the unnecessary duplication of work in later reports. The 2012 M&E report arrived at 48 recommendations. Much emphasis was placed on the need for an overall M&E strategy in the sector. This is similar to the SABER insistence that overall information strategies are needed in education (see the previous sub-section). Understanding why the 48 recommendations in the 2012 report appear not to have been taken forward, at least not in any explicit way, seems important for the project that the current report forms a part of. One can speculate that there was not a sufficient sense of how one might prioritise across the 48 recommendations. Moreover, the recommendations were arguably not sufficiently specific, in the sense that they did not refer specifically enough to data collection and use systems currently in place which would need to change.

A narrower versus a wider understanding of 'EMIS'. The South African literature makes it clear that in South Africa, as in other countries, different sections within the education administration deal with different data, and institutional structures often determine who uses what data. South Africa tends to attach a narrow meaning to the term 'EMIS' (for education management information system). EMIS is taken to mean largely enrolment data when

[37] Department of Basic Education, 2015a: 17-18.
[38] Estian Calitz at https://www.youtube.com/watch?v=VPhuXTcPZRQ and Martin Gustafsson at https://www.youtube.com/watch?v=4ncyBl9saHo.
[39] Department of Basic Education, 2012a.

logically the term should span all data required for education management, including for instance payroll data, and finance data[40]. This seems symptomatic an 'information silo' effect whereby the education departments tend not to use all the relevant data they have access to in a holistic manner when analyses are conducted.

Capacity to produce (or use) audits of information systems limited. There have been many audits and evaluations of information systems in the basic education sector aimed at improving these systems. Key reports are briefly discussed here. Two general patterns seem to emerge. One is that methodological complexities are often under-appreciated. If these complexities are not properly dealt with, audits can end up being inaccurate, or not sufficiently convincing to users. A second general pattern is that audits are often not utilised by the intended users to the extent they should be. A part of this latter challenge seems to be the knowledge management problem referred to earlier. After some years, audits become inaccessible simply because they are not properly archived.

Auditing of enrolment data. A number of data quality audits focussing on Snap Survey enrolment data have been commissioned by the DBE[41]. A part of the reason why these audits have not been widely used is that questions have been raised about the methodologies used, for instance the way fieldworkers visiting schools deal with the matter of learners who are absent on the day of the school visit. The Auditor-General has found enrolment data to be deficient, though the extent of the problem and the methods used to arrive at these conclusions are not clear (at least not in the publicly available report)[42]. In general, the AG's assessment of EMIS capabilities in all provinces (with the possible exception of Western Cape) is not favourable (here the narrow meaning of 'EMIS' is used)[43]. Amongst the factors contributing to failure, according to the AG, are poor overall planning (which would encompass the absence of the overall strategies advocated by the 2012 M&E report) and weak human capacity amongst those running the systems. Though large budgets have been directed towards fixing information systems, these funds have been redirected to other priorities (presumably teacher salaries). The AG has moreover identified serious risks inherent in the current move away from survey-based collection of enrolment data towards a reliance on a central database of the records of individual learners. Essentially, systems and staff seem, according to the AG, not ready for this important move[44]. Some findings of the AG seem contradictory. For instance, despite the problems identified in the AG's reports, five provinces were found to display no significant data quality problems. It seems unlikely that this is true. How data quality is gauged is clearly complex and what seems necessary is a more explicit set of criteria and processes for determining the quality of data. An internal DBE report of 2014 evaluated the national learner-level LURITS dataset, which has existed since 2010, and found that an incomplete coverage of schools and learners within schools, as well as violations of the principle that each learner should only have one unique identifier, were noteworthy problems[45]. Statistics South Africa conducted a headcount census of learners in all schools in two provinces in 2013. The enrolment audit element of the census was inconclusive and so the final Stats SA reports focussed on a description of school conditions, using the data collected[46].

Auditing of learner performance data. In several years the DBE has included a 'verification' component in the Annual National Assessments (ANA) programme, involving

[40] For instance KwaZulu-Natal: Provincial Treasury (2010: 8) uses the narrow definition of the term.
[41] See for instance Department of Basic Education (2012b).
[42] Auditor-General, 2015c: 24.
[43] However, even in Western Cape noteworthy problems exist. For instance, a province-specific report by the Auditor-General (2015b: 37) found the education and health sectors in Western Cape to have weak information technology practices relative to other sectors in the same province.
[44] Auditor-General, 2015a: 133-4.
[45] Gustafsson, 2014.
[46] Statistics South Africa, 2013a, 2013b.

the oversight of testing processes in schools and independent marking by an external agent. Whilst the aggregate results from verification schools have been compared to results from non-verification schools, and have been found not to differ substantially, in the official ANA reports[47], the detailed reports by the verification agent have not been made public or been widely distributed. To illustrate the extent of this background work, the 2013 verification work resulted in a 300-page report which included analysis at the level of items (or questions)[48]. Spaull (2012), in a Unicef-funded report for the DBE (also not publicly available), examined correlations in the ANA results across grades in two provinces and found more within-school consistency in the results in Western Cape schools, compared to schools in KwaZulu-Natal. The conclusion drawn was that Western Cape's ANA data provided a more reliable reflection of the quality of learning and teaching in schools. A 2008 report by commissioned by Umalusi, the public examinations oversight body, analysed patterns in the classroom-based 'continuous assessment' data used, in part, to determine each Grade 12 learner's final examination results, and found that the grading of work by the learners' own teachers was considerably less reliable than examination marks determined by markers external to the school (this report is available on the Web)[49].

The importance of examining actual microdata data in the audit process. On a more general level, a 2010 Unesco Institute of Statistics (UIS) report on the quality of education statistics across Southern African Development Community countries found South Africa's statistics to be relatively good[50]. However, a proviso is in place here. This audit relied mainly on interviews and desktop analyses of reports. It did not involve an actual examination of data. Assessing the quality of statistics without actually looking at inconsistencies within the underlying data is clearly not optimal, yet this seems rather common practice. What also seems fairly common, is the reduction of the state of data quality to a single evaluation figure, without sufficient recognition of the multi-faceted nature of data quality[51]. Put differently, unless single indicator values on the 'health' of data are properly justified, such values can result in misleading trends over time, or misleading comparisons across different parts of the system. Finally, Van Wyk (2015) offers an overview of data of the South African education system and makes the important point that data integration problems are largely a question of problems in the way unique identifiers of, for instance, schools and learners are managed.

Analysis into the suitability of particular learner performance data to gauge progress. Assessing whether learner performance data are sufficiently consistent over time to allow for the gauging of educational progress is a particularly complex area, and conclusions should depend on how the information on progress will be used. If the intention is to inform managers in a general way, this is clearly very different from the use of performance trends to take action against under-performing school principals, for instance. Importantly, even performance values which are not consistent at face value over time, may still be useful if they lead to reliable *rankings* of schools over time. An internal DBE report[52] examined correlations at the school-level between 2012 and 2013 ANA results and found these correlations to be higher at the Grade 9 level than at the grades 6 and 3 levels (the correlations being 0.72, 0.62, and 0.55 respectively). The implication is that secondary schools generate ANA test data which are more amenable to gauging school performance trends than primary schools. Gustafsson and Taylor (2016) find that if a school's average mark in the Grade 12 mathematics examination is used for ranking purposes, the average ranking change between two consecutive years is just 0.5 of a percentile, meaning this measure of performance seems appropriate for gauging progress. Essentially there is not a worryingly high degree of random

[47] Department of Basic Education, 2014a: 49.
[48] Department of Basic Education, 2014b.
[49] Van der Berg and Shepherd, 2008.
[50] UNESCO: UIS, 2010.
[51] See for instance KwaZulu-Natal: Provincial Treasury (2010: 4).
[52] Department of Basic Education, 2015b.

'noise' in the data. However, the authors also argue that selection effects arising from dropping out before Grade 12 should be controlled for, given the tendency of schools to manipulate entry into Grade 12 to improve indicator values[53]. They find that an even more stable measure than the average mathematics mark is a Grade 12 performance indicator calibrated relative to enrolment in Grade 10 three years earlier. Gustafsson (2016a) has examined why Grade 12 mathematics and physical science results have moved in opposite directions in recent years and concludes that slight changes in the level of difficulty of the examinations explain this anomaly. Thus lower average scores may not necessarily reflect a decline in the quality of teaching and learning in specific schools. It is argued that one can control for this fairly simply and obtain trends which are more informative for decision-makers if one selects an anchor group of high-performing schools which are assumed not to be in a state of decline. Similar adjustment techniques have been employed by Foxcroft (2006).

Questions around South Africa's enrolment and population totals. The 2010 UIS evaluation of South Africa's education statistics indicates that one area where improvement is needed is the consistency between learner counts conducted by the education system and household-based population counts managed by Statistics South Africa[54]. Inconsistencies in this regard are common in developing countries, but what makes South Africa unusual is that enrolment estimates are too *low* relative to the population figures. The tendency is for the reverse occur. Gustafsson (2012b, 2015) has examined this matter in some depth and has concluded that population figures for the school-age population are probably too high. This has important implications for the way enrolment ratios are calculated.

Data on ICTs in schools. A survey targeting all schools in 2009 aimed to create a national picture of information and communication technologies and their use in schools, partly to inform national strategies in this area. It appears as if only one report has emerged that uses the data, and that report is not publicly available. Much of the report focusses on problems with the data quality and with data completeness[55].

The future of the Annual National Assessments programme. The Annual National Assessments (ANA) programme, launched in 2011 and temporarily suspended in 2015 as a result of teacher union concerns, is clearly one of the most important innovations in the schooling system in recent years. During 2016 it was undergoing a re-design process, partly through negotiations between the DBE and teacher unions. How teacher union demands, international best practice and local South African expert opinion should be reconciled is clearly not a straightforward matter. ANA is more than just a data collection programme. Its very existence sends important signals to schools around what should prioritised. Data use strategies need to form an integral part of the programme. ANA has been the subject of a number of reviews. Arguably the most comprehensive one emerged from collaboration between the World Bank and the DBE, culminating in a 2013 report (not available publicly). This report argues strongly that many of the deficiencies of ANA arose because there was not a sufficiently clear policy on what the overall purpose of the programme was. As a result, the design of the programme was in many instances contradictory. For instance, confusion as to whether school-level average marks could be used as a basis for gauging school improvement over time meant some stakeholders did use the results for this purpose, though the official reports advised against such comparisons, even at the province level. Analysis of the data has suggested that average marks can in fact not be used to determine whether schools have improved. The following recommendation from the 2013 report regarding the use of ANA would be important in terms of the design of ANA school-level report cards:

[53] See for instance Taylor (2009).
[54] UNESCO: UIS, 2010: 21.
[55] Van Wyk (2012) and Van der Berg *et al* (2012).

> Reporting templates should be field-tested with each audience prior to proceeding with large-scale production and dissemination of reports. It is important that the process not be biased by artificially limiting the reporting options; typically, lower-level information consumers prefer less formal styles and media, even if the messages are important. Disseminating information through appropriate media and formats will increase the probability that the information will affect behaviour.[56]

Clearly, average marks or school rankings derived from the averages would need to be deemed sufficiently reliable if school report cards were to be useful. Whilst the 2013 report is not publicly available, its recommendations have been explicitly incorporated into the DBE's plans[57]. A review of education challenges in KwaZulu-Natal, released in 2010 before ANA was taken to scale, considers ANA the most cost-effective tool for bringing about school improvement. This argument remains relevant today:

> [The Annual National Assessments] will provide detailed tracking of how the system performs each year, enabling focused interventions. Establishing effective feedback mechanisms across the system – feedback based on reliable information and sound principles – is the single biggest intervention that allows for an immediate impact on efficiency and quality. It is also one of the cheapest and most tangible ways to make a measurable difference, mainly because it enables an explicit view of the actual performance of the system and of any improvements that may have resulted from interventions. It provides the key leverage point from which to effect the most change for the least effort and lowest cost.[58]

Data and the 'post provisioning problem'. There is considerable debate around what is commonly referred to as the 'post provisioning' problem', where popularly this is understood as the challenge of ensuring that the right teacher is employed to teach each class, and that classes are not too large. Strictly speaking, the post provisioning policy is a formula for distributing posts across schools, on an annual basis, based on the available budget, but the 'post provisioning problem' is often seen as including matters such as the total funding available for teacher salaries, the supply of new teachers, mismatches between educator qualifications and the classes these educators teach, and irregularities (including corruption) in appointment processes. A 2015 submission by the DBE to the Presidential Remuneration Review Commission[59] includes a section summarising the dynamics and challenges associated with the wider post provisioning problem. Holistic analyses of the problem are rare, which clearly makes the determination of policy solutions difficult. In terms of data, whilst there are problems related to what data are available, and the quality of these data, by far the largest challenges appear to reside on the side of data utilisation. It is perhaps useful to think of the post provisioning data problems in terms of the following four headings:

- **Determining the available budget.** This should be a relatively easy task. Essentially planners need to determine how much money is available for the next school year to spend on the remuneration of educators distributed through the post provisioning model. This means, amongst other things, considering trade-offs between school educator remuneration and other budget items, in particular spending on non-personnel items such as books and scholar transport, but also spending on non-educator staff in schools and staff outside schools. A key reason why this part of the process has not worked as it should, is that some provincial education departments, perhaps seven of the nine, have deliberately underplayed the analysis of affordability and simply declared the number of posts ideally desired[60]. This has two consequences. Firstly, it has resulted in budget crises which are then resolved by cutting other budget items within the financial year (or bail-

[56] World Bank, 2013: 45.
[57] Department of Basic Education, 2015a: 15.
[58] KwaZulu-Natal: Provincial Treasury, 2010: 1.
[59] Department of Basic Education, 2015c.
[60] See in particular the extensive review of the problem by Deloitte (2013), in a report for the DBE funded by Unicef.

outs from the Provincial Treasury). Secondly, it has resulted in new posts being declared, but then not filled due to affordability problems. In essence, this latter consequence is about promising schools resources, but then not providing them, or providing them to only a few schools (a dynamic which creates space for corruption). The challenge is thus largely one of leadership. However, there are also technical data utilisation challenges. Arguably more convincing reports on what is affordable would make it more difficult for unaffordable posts to be declared. Whilst the costing of basic salary costs is fairly straightforward, what is less straightforward is the cost of benefits, partly as these depend on the evolving choices of employees. Differences between the personnel costings of provincial education departments and provincial treasuries are often said to occur, and can be difficult to resolve. This suggests there is a need for capacity building and the development of standard costing models[61].

- **Distributing affordable posts.** This step of the process involves using enrolment data for the current year, including data on what subjects learners take in grades 10 to 12, to determine how many posts each school qualifies for in the next school year. This step is relatively well implemented in the better managed provincial departments, but the national software used for this analysis is said to be difficult to use and could result in inappropriate school post establishments, depending on the settings in the software. Some have argued that the post provisioning model should be more detailed and complex and should take into account more school factors when determining entitlements to posts[62]. Clearly additional complexity would carry some data costs, and would make the model less transparent. Gauteng appears to have consistently favoured secondary schools over primary schools to much greater degree than other provinces. How this has come about is not clear, but it could be related to the way the software has been used[63]. For such important distribution patterns to be left to a few settings in a software tool is clearly not optimal and is indicative of insufficient ongoing monitoring, including the monitoring of across-province differences by the DBE.

- **Understanding multi-year budget pressures.** It is important for the provinces and the DBE to forecast how many educators are likely to be employed in schools over the medium- to long-term. In part, this information is needed by universities which train future teachers, and youths considering teaching as a career. A key complexity here is that the average unit cost of educators changes over time as new policies are phased in, for instance policies relating to the numbers of 'promotion posts' in schools, and as older teachers retire and new teachers move into the system (younger teachers earn considerably less than older teachers). What is in general not appreciated by planners in the education departments is that due to a surge in retirements in the near future, resulting from the age distribution of the teacher workforce, the average unit cost of an educator is expected to decline considerably. This has far-reaching implications for the establishment of teaching posts in the coming years. More capacity to do this analytical work is needed, as are better analysis tools. The establishment of a multi-purpose and sophisticated teacher supply and demand model has been seen as desirable for many years. Experiences in other countries suggest South African planners are probably over-optimistic about what such a model could do. What is probably required is not a single model that will answer all questions, but instead more human capacity combined with several tools developed by specialists, and shared amongst these specialists, in response to specific analysis questions[64].

[61] Gustafsson, 2012a: 46.
[62] KwaZulu-Natal: Provincial Treasury, 2010: 41-3.
[63] Gustafsson, 2016b: 35.
[64] Department of Basic Education, 2015c: 21, 27.

- **Monitoring the effectiveness of the system.** Ultimately, the post provisioning system, in its broad sense, must facilitate improvements in learning and teaching in the classroom. To monitor whether this might be occurring, and to inform policy change, ongoing analysis of the data is needed. There is a need to track and interpret trends relating to, for instance: class sizes (by developing country standards, South Africa's classes are exceptionally large[65]); mismatches between enrolments, staffing and the number of classrooms per school[66]; and the management of teacher time in schools. The closest the DBE seems to have got to the production of regular and standard monitoring reports covering the staffing of the schooling system is its periodic *Education human resources planning report*[67]. This report covers educator attrition, movement in and out of the public system by individuals, age profiles of educators, the acquisition of qualifications by staff, staff tenure, trends with respect to young joiners, and learner-educator ratios. The report stands out as a particularly good data-driven report in the DBE, in part because it makes use of multiple data sources in creative ways and includes an informative narrative which deals with risks and opportunities in terms of the sector's priorities. This report seems an excellent point of departure for strengthening monitoring in relation to human resources and for guiding provinces, in particular those which struggle in this area. A couple of things should be improved with regard to this important report, however. It would be benefit from more rigorous peer-reviewing (even within the DBE). Moreover, it should make use of the expenditure data in Persal so that issues such as benefits and unit costs of employees can be examined. Linking the Persal data to EMIS data, at the school level, would permit crucial analysis in relation to the effectiveness of the post provisioning process.

Evaluations of SA-SAMS. The South African School Administration and Management System, or SA-SAMS, has existed for almost a decade. It is a stand-alone school management tool, dealing with a range of areas, from teacher attendance to timetabling to learner marks, which has also come to be used as a conduit for transmitting data from schools to the provincial department, and ultimately the DBE. Its quality and impact on school management has not been well understood as there have been few evaluations of the system. The 2013 Dell Foundation report, whilst positive about many aspects of SA-SAMS, points out that its design and usage is reduced by there not being a clear enough policy on how SA-SAMS is meant to enhance school management. The 'value proposition to principals' is not made clear[68]. This observation is similar to ones referred to above, where systems are weakened by an insufficient formal sense of what the system is intended to do. A major user requirements specification (URS) for future enhancements to SA-SAMS, developed in 2016, includes a number of critiques of the existing system[69]. Four stand out. Firstly, the SA-SAMS interfaces are not sufficiently user-friendly to attract users to the modules of the system considered voluntary insofar as they do not gather data needed by the department. This contributes to the sense that SA-SAMS is simply a data submission tool, not a school management tool. Secondly, parts of SA-SAMS are not aligned to existing policies, for instance the part dealing with teacher appraisal information. Thirdly, the software is unstable and has been known to crash and cause data losses. Fourthly, partly as result of the previous three weaknesses, the quality of data submitted through SA-SAMS is too often poor. The URS sees a part of the solution being the migration of SA-SAMS to a web-based platform.

The provincial SA-SAMS databases. To varying degrees, provinces require schools to submit SA-SAMS data from the 17 modules of SA-SAMS to the province, in the form of

[65] Spaull, 2016.
[66] See Gustafsson (2016b) for an analysis of the relationship between teacher numbers and learner numbers in schools.
[67] See for instance Department of Basic Education (2013).
[68] Dell Foundation, 2013: 40.
[69] Department of Basic Education, 2016b: 8, 20, 24.

standard computer files. The submitted data are merged through a relatively labour-intensive process and then become accessible to provincial users in a 'Sequel Server', or Microsoft SQL Server, environment. The only regular forwarding of these data to the national level is in the form of the province's LURITS submissions. LURITS data are stored in national SITA[70] mainframe systems. Other SA-SAMS data from the provincial databases is occasionally requested by the DBE. It appears that what is available on the provincial Sequel Server systems has been growing over time. Unfortunately, it seems there has been no proper data quality and completeness assessment of the available data, even for one province.

4 Policy frameworks

The current section views 'policy' broadly, as documented instructions or guidelines, issued by government, to bring about efficiency and focus in the actions of a multitude of actors.

4.1 International guidelines and commitments

The 2015 switch, within the United Nations (UN) reporting systems, from the Millennium Development Goals (MDGs) to Sustainable Development Goals (SDGs) are likely to have an impact on education data and statistics in the education sectors of all countries, including South Africa. Above all, the UN has affirmed the global emphasis on using data in better ways, and investing more in systems. The SDGs moreover reflect the strong shift in emphasis towards measuring what learners in schools learn.

Millenium Development Goals to Sustainable Development Goals. Indicators prioritised by the United Nations (UN) system influence the way countries organise and interpret their education data in a number of ways. A key shift occurring in 2015 was the replacement of the Millennium Development Goals (MDG) with the Sustainable Development Goals (SDGs). How might this influence education data in South Africa? One thing that is clear is that the new planning frameworks associated with the SDGs support the move towards more and better use of data to bring about change. That this has financial implications for countries is made clear:

> The SDGs require annual reporting of high-quality data from all countries. This, in turn, will require much greater investments in building independent, impartial national statistical capacities and strengthening statistical quality and standards.[71]

The UN and data quality. On the other hand, certain difficult but important issues have been largely sidestepped, including the role of UN bodies in the data quality assurance process. What should these bodies do when country data are clearly inconsistent and accurate? This has implications for international comparisons. In the past, bodies such as the Unesco Institute for Statistics (UIS) have largely avoided interrogating the data they receive. There has also been a tendency to produce indicator specifications without testing the extent to which these specifications are implementable[72]. This arguably sets a poor example for national governments, which may do the same thing. Yet the UN's policy emphasis on improving data quality remains strong:

[70] State Information Technology Agency.
[71] United Nations: Sustainable Development Solutions Network, 2015: 7.
[72] Several UIS indicator specifications are widely considered to be difficult to implement by analysts. An example would be the primary school completion ratio, which is likely to render strange results due to the nature of the grade repeater data of most developing countries. See http://mdgs.un.org/unsd/mi/wiki/2-2-Proportion-of-pupils-starting-grade-1-who-reach-last-grade-of-primary.ashx#p4.

> People and the planet could also be harmed inadvertently, if data that have not been checked for quality are used for policy or decision-making and turn out to be wrong.[73]

Three new learning outcomes indicators in the new SDG system. The MDG to SDG shift comes with a strengthened emphasis on learning outcomes data. Only one of the five school-related MDG indicators dealt with outcomes. This was the literacy rate for the population aged 15 to 24[74]. Of the six school-related SDG indicators, three deal with learning outcomes. The first of the three deals with reading and mathematics competencies of learners at the end of primary schooling, the second with the same issues at the end of the lower secondary level, and the third with the cognitive skills acquired by children aged 36 to 59 months (ages 3 to 5)[75]. There are vital shifts that are likely to provide considerable impetus to the 'testing movement' in education systems around the world. The three learning outcomes indicators are all expressed in terms of the percentage of children achieving desired performance levels. What the desired performance levels should be is a matter left for individual countries to determine. However, it is advised that countries learn from programmes such as SACMEQ[76]. Moreover, the work of the Learning Metrics Task Force, a research group based at the Brookings Institute, is given prominence[77].

Standards for the monitoring the use of ICTs in schools. One noteworthy UIS tool, which appears not to have been employed in South Africa yet, is a set of specifications gauging the use of information and communication technologies (ICTs) in schools[78]. Such a tool could help to assess the readiness of schools to use data for planning purposes.

4.2 South African policies and guides

This sub-section pays particular attention to a few influential guidelines produced by National Treasury which impact in several ways on how data and statistics are handled across sectors, including the basic education sector. The guidelines in question are comprehensive and draw from advice emerging from other countries. At the same time, the challenges education departments face in the area of data are daunting, and in many respects these departments are not coping with their responsibilities. The latter is made very clear in the reports of the Auditor-General.

The aim of the current section is to explore how the advice and policies directed at education department planners could be strengthened to improve practices. Part of the challenge is to strengthen National Treasury guidelines as lessons are learnt. But a part of the challenge is also for the basic education sector to develop better guides and tools of its own to improve the current situation.

The requirements for handling, for instance, performance information in the Treasury manuals are ambitious, especially in the context of weak capacity in the education departments. Capacity building is needed, but so is prioritisation. Doing everything poorly is not as good as focussing on getting a few things right, and then replicating good practices in other areas. What is clear is that good planning and reporting principles can be difficult to put into practise in the context of tensions between the political and administrative layers of government. How should administrations deal with the inevitability of clearly over-ambitious targets set by politicians, for instance? These are not uniquely South African challenges. The relationship between the education

[73] United Nations: Data Revolution Group, 2014: 6.
[74] United Nations, 2008.
[75] United Nations: Sustainable Development Solutions Network, 2015: 137-141.
[76] Southern and Eastern Africa Consortium for Monitoring Educational Quality.
[77] See also UNESCO: UIS (2013).
[78] UNESCO: UIS, 2009a.

departments and the Auditor-General (AG) can be a difficult one. For example, the AG understandably sets stringent criteria for data quality, yet some of the most important data needed to inform education planning do not fulfil these quality criteria. How should planners go about using imperfect data? A key capacity constraint seems to be the lack of skills to use actual microdata, or perhaps insufficient time devoted to this. Defining indicators in the absence of a good understanding of what data currently exist, and what the typical limits of data are, does not seem to be good practice. Moreover, analysts who lack the skills required to 'dig into' the microdata behind indicator values are less likely to interpret indicator trends accurately.

There are many policies and guidelines dealing with how government data should be collected and used. Some policies relate specifically to the basic education sector. The aim in this sub-section is not to provide an overview of all the key policies. This has been done previously, for instance in the 2012 monitoring and evaluation (M&E) review of the DBE. Instead, this sub-section focusses on a set of rather developed guidelines produced by National Treasury which influence the use of data in several different ways, in part because these guidelines are considered benchmarks for effective reporting by the Auditor-General. These National Treasury guidelines create a good point of departure for discussing a variety of policy and technical issues which are important for understanding the way data are used in education planning. Specifically, three Treasury documents are considered:

- ***Framework for managing programme performance information***[79]. This 28-page document from 2007 explains a number of important performance information concepts and functions. It seems fairly standard in the sense that it is conceivable that other well-functioning countries would produce similar guides. There is a strong focus on service delivery outcomes. The framework is fairly generic in the sense of not being particularly South Africa-specific. Moreover, it does not strongly mandate government departments to do specific things.

- ***Framework for strategic plans and annual performance plans***[80]. This 49-page document from 2010 explains the importance of linking budgeting and general planning, and then stipulates a basic structure for five-year strategic plans and annual performance plans which should be produced by government departments. Examples of the 'technical indicator descriptions' which should be included in the plans are provided, including one for an education indicator, namely 'Percentage of the population aged 6 to 15 attending schools'. This framework clearly has prescriptions which departments are expected to follow.

- ***Performance information handbook***[81]. This 78-page document from 2011 appears particularly important and influential with respect to how government departments go about using data, at least as far as performance management is concerned. It lays out in considerable detail how departments should use data to gauge and stimulate performance, or service delivery. In particular, three substantial chapters deal with, respectively, how to draw up a PI (performance information) framework for the department, how to assess the quality of PI data, and how to analyse PI data.

An education-focussed assessment of the Treasury tools. What follows is an assessment of the strengths and weaknesses of the above three documents, but in particular the third one and, by implication, an assessment of National Treasury's approach to getting departments to use data in better ways. The assessment is obviously done from the perspective of the basic education sector, though certain observations are likely to be applicable across other sectors

[79] National Treasury, 2007.
[80] National Treasury, 2010.
[81] National Treasury, 2011.

too. In part, the aim of the assessment is to feed ideas and proposals into the generation of future versions of the abovementioned documents, the assumption being that these types of policies need to be reworked periodically, perhaps every five years, as organisations gain experience and learn from their successes and mistakes. However, the aim of the assessment presented below is also to inform the contents of a possible education-specific guiding document which could assist education officials in applying Treasury rules within their sector, the assumption being that sector-specific dynamics require sector-specific ways of interpreting Treasury rules. In fact, the Department of Education and National Treasury jointly released such a guiding document in 2006[82]. This 155-page document appears to have been eclipsed by subsequent Treasury manuals, but the DBE seems to have committed itself formally towards developing a new tool of this nature in its management responses to the Auditor-General's observations of the sector:

> …the [DBE] will establish a more exacting set of norms and standards for planning, monitoring and reporting in detail, as well as analysis and feedback in relation to shortcomings.[83]

Strengths. The strengths of the three Treasury guidelines listed above would include the following (page references refer to the performance information handbook):

- **Convincing arguments in favour of clearly good principles.** The Treasury guides represent milestones towards more systematic and efficient planning and reporting processes in government. They have been influential, as evidenced in for instance the format and approach followed in plans and reports in the education sector. The emphasis on establishing whether data used to gauge progress are quality data is obviously important. The same applies to the emphasis on understanding a sector's or the country's planning processes relative to good practice elsewhere. This is referred to as 'benchmarking' (40). The use of relevant literature to inform the guides is valuable. Linked to the handbook is an online archive of some 25 documents. (As one might expect, given the earlier discussion, there are few documents which draw from practices in developing countries. There are just two: one dealing with local government in South Africa, and one with education in Malaysia[84]. One OECD report[85] rates a number of developed countries in terms of the effectiveness of their schooling systems, drawing from the types of policies used in the countries. This OECD initiative is thus somewhat similar to the World Bank's SABER work discussed previously.)

- **A strong emphasis on human capacity.** The emphasis in the Treasury handbook on human capacity and its inclusions of a 'capacity requirement checklist' (48) is important. It is made very clear that for performance information to be used properly, a critical level of skills is required amongst departmental employees.

Matters worth exploring further. The following are questions which seem important in relation to performance information, at least in the basic education sector, but on which clearer guidance may be necessary, either within the Treasury documents or accompanying manuals produced for the sector. (Again, page references are to the Treasury handbook.)

- **Learning from actual South African practices.** The Treasury documents, but in particular the handbook, require departments to maintain a large number of systems and documents in order to manage performance information properly. To a large extent

[82] Department of Education, 2006.
[83] Auditor-General, 2015c: 51.
[84] The Malaysian paper deals with the measurement of several aspects of school quality, drawing from interviews with teachers and administrators in ten schools. There is not a strong focus on learning outcomes as understood in South Africa.
[85] Gonand, Joumard and Price, 2007.

Treasury replicates demands made of government departments in other countries, in particular developed countries. The list of things a department should do can seem daunting, especially in South Africa's context of a fairly weak and under-capacitated public service (as described, for instance, in the National Development Plan[86]). Some are likely to consider the demands of the handbook overly idealistic. There is some acknowledgement in the Treasury handbook that different government departments in the country are at different stages of development. But specific advice on how to resolve several pressing real-world problems, in particular in a South African context, seems largely absent (examples of these problems are described in the bullets that follow)[87]. One obvious solution would be to document effective (but even weak) practices, especially those found in departments facing typical capacity constraints, and then to let this inform the way forward. Put differently, basing instructions and guidelines on a few case studies into what departments actually do would be helpful. The focus should not just be on remarkable 'best practices', but also on the factors underlying poor performance in certain departments.

- **Organising information in the context of formal audits.** Performance information that will be audited by the Auditor-General must understandably pass relatively stringent quality tests[88]. However, much information that is not able to pass such tests does and should influence planning. Often information that is not highly precise is deemed important enough to take into account when decisions are taken, partly because more precise information is not available. Examples would be data from small samples, or test data where tests are not strictly comparable (this would be the case of the Annual National Assessments data) and data where records of how the data were collected are incomplete. What should departments do with such data? Should there be a separation between data which the department believes can pass Auditor-General quality thresholds, and data which it believes will not pass such thresholds. What should be included in what documents in order to ensure that the AG is presented with credible performance information, whilst at the same time a department takes all relevant data into account when planning?

- **Working with 'aspirational' indicators.** It can take years between determining that an indicator is important and warrants an investment in new data, and actually obtaining good enough data. Giving an indicator official status can assist in justifying investments in the required information systems. But how should these 'aspirational' official indicators feature in official planning documents?

- **Accepting initial testing of various indicators.** The politics around educational progress changes a lot over time, and our knowledge of what interventions work and what should be measured also evolves rather rapidly. Indicators which seemed important three years ago, may no longer seem important now, so to some extent there is a need to adapt indicator sets on a continual basis. At the same time if indicator sets and specifications change too much, it becomes impossible to measure progress as one is not able to compare 'apples to apples'. How should the trade-off between relevance and stability be

[86] National Planning Commission, 2012.

[87] A couple of appendices in the handbook do discuss actual practices, but arguably the cases chosen are not optimal, at least from the perspective of the education planner. One appendix deals with a global initiative being piloted to improve the focus on environmental sustainability within government reporting. This type of work is typically highly complex and has therefore been most successfully implemented in developed countries. A second appendix presents a one-page performance information report from South Africa's Department of Human Settlements. Whether this should be considered an example of good practice, and why, is not discussed.

[88] The AG has in fact found that around three-quarters of the information on performance in the education sector as a whole in 2013-14 did not pass its quality tests (Auditor-General, 2015c: 20).

managed? How does one ensure that departments do not continue to spend money on indicators and data which are no longer sufficiently relevant?

- **Providing clearer warnings against 'indicator overload'.** The handbook does contain some guidance in relation to the key matter of 'indicator overload'. There should ideally not be more than 20 indicators per 'layer of management hierarchy' (12). The exact meaning of this could be clearer. Generally this guidance would be clearer if it drew from what has actually been observed in specific plans and reports of government departments.

- **Using the data as one's point of departure in certain situations.** The handbook is rather strong on insisting that indicators that are strategically important should be determined first, and then then one should see whether data exist. If they do not, one should assess whether the required data can be cost-effectively collected (52). Starting with indicator identification, based on what is important, sounds rational and is in fact the approach taken by the Unesco Institute for Statistics (UIS). However, there are drawbacks with this approach. Selecting indicators based on the data one already collects has its merits. In an institution where the capacity to use data is weak, it is likely that starting with the identification of indicators will result in indicators which are impractical and not implementable. This can waste a lot of time. If planners who are not strong in the use of data start by understanding what data exist, seeing whether useful indicators can be calculated from these data, and only then move on to thinking about what additional data are needed, a more efficient reporting process could come about, and planners will build their capacity in the use of data. What is probably not good is to have planners, or designers of indicators, who have barely any experience in the use of data. The problem of designing (and implementing) indicators in the absence of a good understanding of what data exist is not unique to South Africa. Arguably this is a problem too in the UIS system. For instance, the UIS requires countries to submit grade repetition statistics, which the UIS then uses to calculate and publish country-specific indicator values, with virtually no acknowledgement of the fact that schools very often have an incentive to under-report grade repetition[89].

- **Making more use of economical data gathering methods.** Arguably the value of using random sampling is poorly understood in government. In part, this may be because officials have experienced poorly designed samples. The list of questions appearing in the Treasury handbook which should be asked when sample data are used is important (32). However, the handbook could have been clearer on when sample-based data are likely to be more cost-effective. One example of *non*-sample data in the handbook is interesting because arguably it represents a case where sample-based data could be more cost-effective. In the handbook example, a system-wide indicator on the number of primary school learners fed a meal every day uses as its ultimate source signed delivery notes specifying food delivered to schools (55). Numbers of meals from these notes would be added across all days and schools to produce a global figure. The implied accounting exercise is ambitious, and carries risks in relation to missing data. How difficult the accounting for all meals (roughly 800 million a year for the whole country) would be depends largely on how service providers are paid. But perhaps a more fundamental problem is that delivery of a meal to a school is not necessarily a guarantee that a child will be fed. This particular case is perhaps a classical one where sample-based monitoring would be preferable. Such monitoring would allow for collection of information from learners themselves, and the observing of the feeding process in the school.

- **Using confidence intervals correctly when sample-based data are used.** The Treasury manual does discuss confidence intervals, which typically arise when sample-based data are used (28, 32). But what is not clear in the handbook, or even in many statistics

[89] See for instance the requirements in UNESCO: UIS, 2009b.

textbooks, is how to gauge *trends* when sample-based data are used. Essentially reporting then requires some understanding of difference-in-means tests.

- **Reporting when different sources produce very different statistics.** A common problem in the education sector is that different data sources will produce substantially different statistics. Stats SA and education department counts of enrolments differ by a large margin, as discussed in an earlier section. Even different sources within the education system can produce different statistics. For instance, teacher absenteeism statistics can differ substantially if unannounced fieldworker visits are used, compared to analysis of school teacher attendance registers. How should such disparities across sources be taken into account when reports, which may be subject to formal audits, are compiled?

- **Understanding the value of data with lags.** The Treasury handbook emphasises the importance of statistics which are current and reflect developments during the reporting period in question. Whilst this is logical, it is also true that some of the most important indicator values in the education sector have a long lag. The SACMEQ international testing programme, perhaps the most important data source for understanding the quality of primary schooling, has in the past had a lag of around three years between data collection and reporting. The Annual Survey of Schools has experienced lags of at least a year. What is easily forgotten is that when plans are drawn up for the schooling sector, an indicator based on data which is, say, two years old may in fact be more useful than an indicator based on more current data, simply because the former deals with more strategic matters than the latter. These complexities should be taken into account in the guidelines, partly so that the importance of 'old' data is not under-appreciated.

- **Avoiding simplistic interpretations of indicator trends.** Readers of reports can easily conclude that an indicator trend in one direction is unambiguously good, whilst a trend in the opposite direction is unambiguously bad. As implied in parts of the handbook the matter of progress is often more complex than this. Under certain circumstances an upward movement in an indicator can be good, under other circumstances bad. For example, a rise in attendance in capacity building activities for teachers is probably mostly thought of as a good trend (17). However, a decline in the numbers could also be desirable if this reflects the fact that fewer staff require capacity building.

- **Creating and maintaining categories of socio-economic status**. Particularly in education, breakdowns of indicator values by socio-economic category (or, in the case of South Africa, race), can be important for monitoring and planning. Clearer guidance is needed in terms of the creation of socio-economic categories beyond what appears in the handbook (39, 41). In South Africa, such categories, in particular the school quintiles, have drawn largely from population census data. As seen in section 3.1, in other countries the education sector may collect its own socio-economic data.

- **Exercising controls to counter the 'gaming' of indicators.** Self-interest may result in the deliberate distortion of indicator data. This type of 'gaming' of systems can occur at many levels. School principals may inflate enrolment numbers to attract more resources to their school. Leaders and managers of entire schooling systems have been known to 'game' the numbers to enhance their own standing[90]. It is of course a form of fraud. This type of behaviour occurs so easily that it could be argued that all indicator design processes should include mechanisms for reducing this risk.

[90] A fascinating case is that of Michael Barber's use of Pakistan's enrolment data. Jishnu Das, a senior economist at the World Bank, has accused Barber, a world authority on indicators, of deliberately misinterpreting Pakistan's data in order to inflate the apparent success of Barber's 'deliverology' methods (Das, 2013).

- **Dealing with targets determined through a non-technical and entirely political approach.** The handbook assumes that the setting of indicator targets is an entirely rational process. However, in reality targets, especially ones in which the public is strongly interested, get set by politicians, more as a process of signalling aspirations than of calculating what is optimistically possible. What is optimistically possible, according to analysts, is often considered 'just not good enough' by politicians. This tension can result in targets which are clearly unattainable. What should planners be advised to do when this happens? There are no easy answers. One risk is that planners will distort indicator values to reduce apparent under-performance. Perhaps the best advice is to accept that very politically driven targets are often unattainable and then in the reporting process to focus less on 'under-performance' relative to the target, and more on progress made in the past with respect to the indicator, plus some discussion of how close actual progress has been to progress that could be considered the best possible (perhaps based on benchmarking against well performing systems).

- **Documenting precedents in the auditing process.** Auditors and education planners are likely to continue having rather different views on education indicator values in the schooling sector. This need not be a problem, as long as the conversation between the two sides is informed and systematic. One way of making the interaction between the two sides less unsystematic and ad hoc is to establish a national 'database' of precedents around issues such as when data are of a sufficient quality, or when trends can be a reflection of adequate progress. This would mean maintaining a national document containing precedents which both the DBE and the Auditor-General thought were important and could serve to inform education planners and auditors in future.

- **Integrating information systems planning into the organisation's general plans.** Treasury's handbook requires departments to establish a number of plans in relation to strengthening performance information. It is probably true to say that many government departments in South Africa suffer from 'plan overload', in the sense of having too many plans, with many overlaps between plans. This type of overload can in turn create an overload of reports and planning and monitoring committees, and ultimately too little effort devoted to clearly productive activities such as managing data collection processes, data analysis, and the communication of findings. There may even be incentives to over-invest in plans, if capacity to implement is weak. Put differently, an excess of planning can be a way of avoiding the risk of failing in some implementation activity. One way of dealing with this problem would be to insist on integrating more activities into the general plans of the department, in particular the annual performance plan and the department's operational plan.

5 Actual use of indicators in official plans and reports

The 2014 and 2015 annual reports of the education departments of KwaZulu-Natal and Western Cape were compared to each other, and were then also compared to similar reports from Australia and New Zealand. The aim of the exercise was to identify areas of improvement for South Africa's reports (and report-writing generally).

Above all, what should be strengthened in the South African reports is a sense of strategy, and a focus on the ultimate aim of improving what learners learn. The 'silo effect' seems rather strong in the South African reports. Human resources information and trends, for instance, tend to be looked at in terms of traditional human resources management procedures, without the link to sector outcomes being made clear. Fixing this type of problem involves considering what aspects of the organisation's human resources need to change if educational improvement is to come about, and then to examine the human resources data with a view to understanding problems and spotting

solutions. This implies closer collaboration of people across the different 'silos' of the organisation.

The comparison to the non-South African reports points to further possible enhancements to the South African reports: a greater use of graphs, a stronger focus on long-range historical trends, and perhaps reports which are shorter, yet say more.

This section delves into very specific uses of indicators, and statistics in general, for understanding whole schooling systems, a key aim being to arrive at useful generalisations about what works well, what does not work well, and what the areas of improvement should be. Section 5.1 compares KwaZulu-Natal and Western Cape with respect to two consecutive annual reports per province. Section 5.2 expands the analysis to encompass reporting practices in two non-South African schooling systems, those of New South Wales (in Australia) and New Zealand.

5.1 Western Cape and KwaZulu-Natal

For each province, the annual reports produced by the education department in 2015 and 2014 were analysed. These reports are large, and so the analysis concentrated especially on reporting with respect to two issues: staffing in schools (including the monitoring of teacher distributions, moving of teachers across schools, attrition and replacement) and Grade 12 examination results. For each issue, the analysis was broken down into 'basic consistency of the numbers' and 'relevance of the numbers for strategy'. The annual reports studied were downloaded off the websites of the two education departments. In the table below, '2014 report' refers to the 2013/14 report released in 2014, whilst '2015 report' refers to the 2014/15 report released in 2015. In general, the 2014 reports are discussed only where they provide information which would not be seen by looking just at the 2015 report.

KwaZulu-Natal	Western Cape
Staffing in schools	
Basic consistency of the numbers Both the 2014 and 2015 reports dedicate considerable space to statistics on personnel, 80% of whom would be schools-based staff (numbers on p. 82 compared to p. 138). The 2015 report has a 55-page section dedicated to human resources (HR). On the whole, numbers are clear and consistent, but there is scope for improvement. Total employees is not altogether clear. In parts of the 2015 report it seems the number is around 121,000 (p. 138), but in others around 108,000 (p. 157). This seems to be due to the fact that the latter figure only includes 'critical occupations'. It could also relate to when in the year employees are counted. This type of discrepancy ought to be explained. On p. 141 of the 2015 report figures suggest, at face value, that the sector does not make use of temporary teachers. This is clearly not the case (see for instance p. 42 of the 2014 report), so the meaning of the 2015 report figures should be clarified. A table explaining the breakdown across personnel expenditure categories only accounts for around 80% of personnel spending (p. 137, 2015 report). It is not clear what the other 20% would represent, though it is probably pension contributions. This could be clarified. Numbers on dismissals on p. 158 are not entirely consistent with those on p. 183 (2015 report). The numbers are small, yet important given the signals that dismissals send across the system, so it seems important to clarify why discrepancies exist (presumably they relate to lags between disciplinary findings and actual terminations). The learner-educator ratio is discussed in the 2014 report but apparently not in the 2015 report[91]. In the 2014 report, the ratio is said to be 29.1, but the learner and educator values quoted suggest the ratio would be a slightly different 29.6 (p. 20). This could have been explained. In general, it is worth explaining how the LE ratio is calculated as there are many different methods which can be used, and one should be discouraging the comparison of differently calculated ratios. For instance, the fact that Grade R is offered in primary schools, whilst it may not be absolutely clear who teaches Grade R and who teaches other grades, could create complexities which must be dealt with when the LE ratio is calculated.	***Basic consistency of the numbers*** The 2015 report includes a 35-page section dedicated to human resources (HR). There is moreover an informative two-page summary of HR developments and statistics in the section dealing with the administration budget (pp. 38-9). On the whole, numbers are clear and consistent. In this regard the Western Cape (WC) reports seem stronger than the KwaZulu-Natal (KN) reports. The 35-page HR section of the 2015 report includes tables which roughly follow the formats of the corresponding 55-page section in the 2015 KN report, implying a national template is used. In the WC, there are also discrepancies between employee totals which could have been explained, but these discrepancies are smaller than in the KN reports. As with the KN reports, how the learner-educator ratio has been calculated could have been explained, though using key learner and educator totals in the WC reports does seem to reproduce the published LE ratio. As in the case of KN, the WC HR section of the annual report could have benefited from more narrative explaining the meaning of the various tables. The WC reports do, however, make fairly good use of footnotes to explain what figures in the HR tables mean.

[91] It is worth noting that the KwaZulu-Natal annual report of 2015 available on the web (and in PDF format) is not electronically searchable. Having reports which are searchable has obvious advantages, in particular where one is dealing with long documents.

KwaZulu-Natal	Western Cape
In general, there is very little narrative in the HR section of the reports, and this is arguably a problem. A table on p. 137 of the 2015 report is repeated on p. 139, which suggests that final checking and editing of the report was not what it should be.	
Relevance of the numbers for strategy Whilst the importance of improving learning outcomes is made very clear in the reports, the sections of the reports dealing with HR do not display the concern about the link between human resources and sector outcomes one should ideally have. Instead, the HR sections are largely shaped by basic HR management concerns, and the structure of data within the payroll system. Obviously HR management concerns must to a degree inform what is reported, but the link to outcomes, via for instance learner-educator ratios, teaching qualifications and skills, and so on, ought to be made very clear. (The matter of the average learner-educator ratios, and inequalities across schools in this ratio, is briefly discussed on p. 20 in the 2014 report, but seems absent in the 2015 report, despite the fact that the available numbers suggest the ratio would be worsening.) Not displaying this link clearly suggests not just a reporting problem, but probably also an organisational 'silo effect' problem. HR works in a 'silo', finance works in a 'silo', and so on. Even in terms of basic HR management issues, there appears to be a strong need to make the reports more strategic, more focussed on identifying where the current challenges lie and explaining how the organisation is dealing with them. One key problem emerging from the figures is a high post vacancy ratio of 8.4% in 2015 in schools, which is said to be due to budget shortfalls (pp. 136, 141). In the previous year this ratio was a considerably lower 5.7% (p. 80, 2014 report). At face value, this is a very serious challenge which should be explained better. For instance, it could be clarified how many vacant posts in schools are teacher posts, and how many are schools-based management posts. How inequitably is the problem distributed across schools and across poverty quintiles? How exactly do temporary appointments perhaps alleviate the problem? Is it realistic to expect the vacancy rate to decline given medium-term budget trends? A second key problem for the sector implied by the numbers, if one takes them at face value, is an extremely high level of staff attrition. According to the 2015 report, the attrition rate for teachers was 9.3% (p. 153). This seems alarmingly high. Moreover, it appears that only 55% of the almost 6,000 teachers who left the system were replaced. These figures are all so worrying	***Relevance of the numbers for strategy*** The link between staffing and learning outcomes could have been made clearer in the Western Cape (WC) reports, yet the strategic importance of staffing does seem to come through more clearly in the WC reports than the KwaZulu-Natal (KN) reports. In WC, the LE learner-educator (LE) ratio is discussed in both the 2014 and 2015 reports, and both the primary- and secondary-level ratios are given. However, inequities across schools in this ratio are not discussed. There is some discussion of the capacity of educators, in the sense of educator qualifications (p. 134 of the 2015 report). In the KN reports this seemed to be absent. The WC does not seem to be affected by the high vacancy ratio experienced (or apparently experienced) in KN. With regard to the other problem highlighted in the case of KN, namely a high attrition rate, it is unclear from the WC figures what the situation is in this province. High numbers of terminations are a bit difficult to understand, but a footnote attempts to explain that this is simply a matter of employees moving in and out of consecutive temporary contracts (p. 139, 2015 report). But what remains unclear in the WC report is what the attrition rate is. Figures on p. 139 suggest it is just under 3.0%. Figures on enrolments and schools-based educators (pp. 59-60) point to a slight improvement in (a lowering of) the LE ratio (educators increased faster than enrolments). A noteworthy table appearing in the WC HR section (but not that of KN) is one containing resignations by age category (p. 142). However, for this table to illuminate what the attrition problem may be it should be accompanied by some information on what percentage of staff within each age category resigned, and how this is changing over time. In the 2015 WC report, there is an even stronger suggestion than in KN

KwaZulu-Natal	Western Cape
that they warrant some discussion of the values themselves (are the figures really reliable?) and what the trends mean for service delivery in the sector. A part of the overall dynamic seems to be the fact that there were high levels of 'expiry of contract' in the financial year (p. 158). Were some of the affected employees teachers? Educator totals over two years suggest there have been problems in staffing schools insofar as educators in schools declined by 1.7% whilst enrolments increased by 1.0% (p. 82). This translates into a considerable 0.8 learner increase in the learner-educator ratio. This critical matter ought to have been discussed in the report. Turning to the matter of annual pay progression for educators performing at a satisfactory level, according to the performance management system, the 2015 report apparently suggests that only 84.2% of educators pass this critical level (p. 162). This is probably not the case and the low percentage is likely to be explained through factors such as temporary appointments. However, given the magnitude and strategic importance of this issue, it ought to be explained. Much of the HR analysis uses 71 'critical occupations' categories, of which one category, 'Other occupations, permanent', accounts for a full 81% of everyone. It is often not clear which categories represent educators. Though the 71 'critical occupations' do not seem to cover everyone, they do include relatively non-critical (in the sense of non-scarce) people such as cleaners. Several categories are occupied by just one person. The challenge seems to be to devise a set of categories which are more relevant for the annual report, and which 'unpack' the truly critical category of school teachers and their schools-based managers. Five pages in the 2015 report (p. 171) are full of zeros and saying nothing other than that performance rewards were not paid to anyone. This may be driven by reporting template requirements, but is nonetheless unnecessary and adds to the sense of an insufficient focus in the annual report on what is strategically important. Perhaps the team working on the HR information in the annual reports could use the following questions to guide their work. Will categories used in the report make sense to people outside the HR section of the organisation, including those in organisations to which the Department reports (Legislature, Premier's Office, for instance)? What do the numbers say about the most important challenges facing the Department? What can one tell from trends emerging when the latest figures are compared to figures published in earlier annual reports? Do the numbers point to areas	that a large number of teachers are not performing at a basic satisfactory level. At face value, only around 73% of teachers reach this level (p. 147). As for KN, this is probably an accounting issue, not an actual performance issue. But given the importance of the matter, it could be explained. One big advantage with the formats in the HR section of the WC reports is that they clearly differentiate between educators and non-educators, to a much greater degree than the KN reports. This type of differentiation is obviously vital for understanding how education service delivery occurs. In general, the WC reports have a more streamlined system of categorisations of employees, meaning the exceptionally long tables of the KN reports are avoided. To conclude, the 2015 reports point to more problems around the actual implementation of school staffing in KN, compared to WC. However, the way the problems are accounted for in the KN reports adds an additional problem: it is not quite clear what the nature and magnitude of, say, the vacancy and attrition problems are. The WC reports provide in general better accounts of the system, so should WC face problems similar to KN, it appears as if WC would be in a better position to diagnose the problem. This is not to say that there is no room for improvement in the WC reports. As has been pointed out above, by applying a somewhat more analytical and risk-focussed approach to the statistics published in the reports (and the data behind them), WC could clarify matters such as inequalities across schools in the LE ratio and the educator attrition rate. The guiding questions appearing at the end of the KN discussion are thus also applicable to WC.

KwaZulu-Natal	Western Cape
where the solutions to existing problems could be found?	
Grade 12 examination results	
Basic consistency of the numbers Grade 12 examination figures seem consistent within each of the two annual reports, and across the two. What helps here is probably the fact that the data are all drawn from a single, high-stakes data warehouse.	***Basic consistency of the numbers*** As for KwaZulu-Natal (KN), the consistency of the Grade 12 numbers in the Western Cape (WC) reports was good.
Relevance of the numbers for strategy There are serious problems with the way Grade 12 examination results are used to guide strategy, but the nature of these problems is somewhat elusive, and the annual reports essentially follow what is the 'national culture' around interpreting Grade 12 results, a culture which (as explained in a previous section of the current report) is problematic. The 'pass rate' (overall NSC passes over candidates) is clearly considered an important headline indicator of progress in the KwaZulu-Natal reports. The drawbacks of this indicator for the measurement of progress, drawbacks relating to the way subject choice, grade repetition and dropping out all influence the indicator in complex ways, are not discussed in the reports. It is noteworthy that the 2014 report attributes the 2013 better-than-expected pass rate of 80.5% to the success of 'an intensive intervention programme'(p. 57), whilst in the 2015 report, in response to the 69.7% pass rate of 2014, the Department in a sense concedes defeat and 'commits to work harder' (p. 105). This displays a rather serious misunderstanding of how educational improvement works. Educational quality tends to move, if it moves at all, rather slowly. Abrupt movements in indicators of outcomes generally point to problems with the measure, not abrupt changes in the capacity of the system to produce educational outcomes. Not understanding this can lead to faulty interpretations of trends, but also incorrect conclusions around whether current interventions are working or not. Other Grade 12 indicators used in the reports, such as the number of learners passing mathematics, are also subject to interpretation difficulties, similar to those applicable to the pass rate. From the perspective of preparing learners to fill important gaps in the labour market, what seems missing in the reports (but also in the national debates around Grade 12 results) is some	***Relevance of the numbers for strategy*** Most of the key comments in the KwaZulu-Natal column would apply to Western Cape too. Many problems in relation to the use of Grade 12 results to gauge systemic progress are clearly national. One thing WC does better than KN is to point out that shifts in the pass rate and pass headcounts do not necessarily reflect quality trends. For instance, the 2014 declines are discussed relative to similar trends at the national level, and through reference to the tightening of standards (pp. 36, 93, 2015 report). A step forward would be to attempt to 'see through the data noise' and to establish what the true trends were, perhaps through the use of subject-specific analyses and 'anchor schools' which are assumed not to have experienced actual declines in the quality of teaching and learning. WC also presents an important analysis of Grade 12 enrolments relative to earlier Grade 10 enrolments, in an attempt to establish whether more youths are surviving through to Grade 12 (p. 49). Ideally, this analysis should explore whether the positive trends seen are indeed due to improvements in retention, or whether they simply reflect reductions in Grade 10 grade repetition (the latter is a distinct possibility and the trend is likely to be the outcome of a complex interaction of both repetition and retention patterns).

KwaZulu-Natal	Western Cape
discussion of achievement in key subjects, such as mathematics, at a level which would make the learner eligible to enter university programmes such as engineering. Progress in combatting inequities by quintile or race should ideally also receive more attention in the annual reports. There is some analysis of inequities across quintiles (p. 105, 2015 report), and this suggests that inequities are not being reduced. A key problem across the schooling system with the way Grade 12 results are reported, is that figures nearly always cover just year-end full-time candidate results, meaning supplementary examination results and passes amongst part-time students (subject-specific passes and the obtaining of the NSC) are not taken into account. This results in a substantial under-reporting of actual outcomes. The 2014 report acknowledges that supplementary results are not taken into account, but does not explain why (p. 26). References to the province's performance relative to that of other provinces is virtually absent from the annual reports, yet such information could assist greatly in understanding whether the province is producing 'value for money'. In fact, KwaZulu-Natal does better than the rest of the country when it comes to Grade 12 passes relative to the population. Ideally, planners and managers in the KwaZulu-Natal system would be aware of this and would show a keen interest in this pattern.	The WC reports reflect even less analysis of inequalities across schools and quintiles in Grade 12 results, than the KN reports. This gap ought to be addressed.

5.2 A comparison against non-South African rich-country systems

A table on a subsequent page compares features of the annual reports of four different education administrations, those of KwaZulu-Natal, Western Cape, New South Wales (in Australia) and New Zealand[92]. One report per system is analysed here. The aim of the exercise is to obtain a suggestive indication of the direction that the South African provincial reports should be taking. Obviously, the reporting styles and methods of, say, Australia are not necessarily what South Africa needs. Yet the comparison points to some interesting differences which are suggestive for the types of improvements needed in South Africa.

The two non-South African administrations were selected because they are from developed countries with high levels of capacity, so one might expect them to reflect better practices. New South Wales has the highest school enrolment of Australia's states, making it somewhat comparable in size to the two South Africa provinces. New Zealand's system is smaller, but still comparable. Crucially, both the New South Wales and New Zealand administrations are employers of their system's school teachers, making their responsibilities similar to those of the two South African provinces. Finally, foreign administrations whose reports would be in English were targeted.

Certain methods used to count tables, graphs and indicators in the four annual reports should be explained.

- Tables in the report were divided into four categories: (1) tables where content cells (so cells other than row and column headings) consisted above all of a narrative, as opposed to one statistic in each cell; (2) tables consisting above all of statistics, where the statistics were non-financial but were also not related to assessments or examinations (teacher counts would thus be an example of what could be included); (3) tables consisting of assessment or examinations statistics; (4) tables consisting primarily of financial statistics.

- Categories (2) and (3) were considered under the heading 'Tables with non-financial statistics' in the table below. Tables were counted, but the approximate total space of these tables, in terms of pages, was also estimated. For instance, a table might be considered to occupy one-third of a page. Extremely small tables consisting of one or two rows were mostly not counted, unless they carried a strong thematic importance.

- Under the row heading 'Financial statistics (in terms of pages'), the number of pages taken up by category (4) is given.

- The graph count appears under the heading 'Graphs'. A graph with an accompanying table illustrating the graph values was considered a graph, and the table was not counted.

- Under the heading 'Pages with tabular narrative' the number of pages taken up by category (1) is given.

- What was counted as an indicator? Values describing the same thing in at least two years in order to indicate a trend were considered indicator values. Such values which were labelled 'indicator' (or something similar) were automatically counted as indicator values. One indicator value broken down by, for instance, regions was counted as a single indicator. Values in tables or graphs, even where some formal designation as an indicator was absent, were counted as indicator values, as long as it seemed the intention was for these values to indicate a progress trend. Thus examination results for several years in a table would be considered indicator values, but not teacher counts across several years, as

[92] The non-South African reports obtainable at http://www.dec.nsw.gov.au and http://www.education.govt.nz.

the latter would typically not point to progress. Where absolute values and percentages referring to the same thing appeared in the report, just one indicator would be counted.

A COMPARISON OF EDUCATION DEPARTMENT ANNUAL REPORTS				
	KwaZulu-Natal	**Western Cape**	**New South Wales (Australia)**	**New Zealand**
Name of organisation	KwaZulu-Natal Department of Education	Western Cape Education Department	New South Wales Department of Education	Ministry of Education
Report	*2014-2015 annual report*	*Annual report 2014/2015*	*Annual report 2015*	*The Ministry of Education Annual report: For the year ended 30 June 2015*
Length in pages	313	269	166	136
School budget and learners	2,987 USD million / 2,918,000 learners = **1,024** USD per learner	1,172 USD million / 1,094,000 learners = **1,071** USD per learner	9,493 USD million / 1,200,000 learners = **7,911** USD per learner	5,420 USD million / 760,000 learners = **7,132** USD per learner
Basic structure (and pages). Symbols refer to the use of *non-financial* statistics. ★ means statistics are used in a narrative, ■ in a table and Δ in a graph.	➔ High-level strategic priorities (2) ➔ Narrative on achievements by the head of the department (41) ★■ ➔ Description of key laws and policies (4) ➔ Organogram (1) ➔ Achievements against 26 national goals (10) ★ ➔ Spending and performance figures, plus narrative, for nine budget programmes (33) ★■ ➔ Details on conditional grants and capital expenditure (3) ➔ Description of risk and fraud reduction processes (2) ➔ List of matters raised by the provincial legislature and departmental responses (13) ➔ Internal audit processes and findings (8) ➔ Details, largely statistical, on human resources (55) ★■ ➔ Auditor-General's report (5) ➔ Financial statements (108)	➔ Overview of spending figures and spending priorities by the head of the department (7) ★ ➔ Organogram (1) ➔ High-level strategic priorities (3) ➔ Detailed plans for improvement in two specific areas (telecommunications services and victim support) (9) ★■ ➔ Overview of current challenges in the sector (8) ★■Δ ➔ Spending and performance figures, plus narrative, for nine budget programmes (60) ★■Δ ➔ Details on conditional grants and capital expenditure (14) ➔ Details on financial management and auditing processes (16) ➔ Details, largely statistical, on human resources (35) ★■ ➔ Auditor-General's report (5) ➔ Budget appropriation details (29) ➔ Accounting policies used (9) ➔ Financial statements (29) ➔ Specifications for ±45 indicators	➔ High-level strategic priorities (1) ➔ Overview of the size of the sector (2) ★■ ➔ Organogram and description of the organisation (3) ➔ Description of performance and priorities across four programmes (40) ★Δ ➔ Overview of financial situation (2) ➔ Auditor's report (2) ➔ Financial statements (30) ➔ Details, largely statistical, on human resources (10) ★■ ➔ Details on various public accountability issues★■ ➔ Details on financial management and special payments (47)	➔ Graphical summary of strategic indicators and their values (1) Δ ➔ Overview of the size of the sector (1) ★Δ ➔ One-page diagram showing links between resources and outcomes (1) ➔ Description of recent developments and challenges, as well as plans for the future, with a focus on five key indicators, mostly dealing with learning outcomes (29) ★Δ ➔ Explanation of vision and mission of the Ministry and description of partner organisations (4) ➔ External auditor's report (3) ➔ Account of expenditure and performance (relating to inputs, processes and client satisfaction, but not learning outcomes) with respect to seven budget programmes (two for tertiary education) (35) ★■ ➔ Financial statements (54)

A COMPARISON OF EDUCATION DEPARTMENT ANNUAL REPORTS				
	KwaZulu-Natal	**Western Cape**	**New South Wales (Australia)**	**New Zealand**
		(19)		
Tables with non-financial statistics	**68** tables spanning **±57** pages. If only tables including assessment or examination results are counted the figures are: **3** tables spanning **±6** pages.	**58** tables spanning **±35** pages. If only tables including assessment or examination results are counted the figures are: **7** tables spanning **±5** pages.	**29** tables spanning **±9** pages. No tables dealt with assessment or examination results.	**12** tables spanning **±15** pages. The only tables with assessment or examination results are those providing graph figures.
Financial statistics (in terms of pages)	**102** pages.	**54** pages.	**59** pages.	**24** pages.
Graphs	No graphs.	**10** graphs, of which **6** with assessment or examination results.	**34** graphs, of which **25** with assessment or examination results. (9 graphs deal with tertiary education)	**9** graphs, of which **5** with assessment or examination results.
Pages with tabular narrative	**33** pages.	**44** pages.	**1** page.	**0** pages.
Non-financial indicators with average years covered	**85** indicators spanning on average **2.0** years. If only indicators dealing with assessment or examination results are counted the figures are: **32** indicators spanning on average **2.0** years. (39 indicators are considered official 'programme performance indicators', of which 19 deal with assessments or examinations. All these official indicators span two years.)	**103** indicators spanning on average **2.6** years. If only indicators dealing with assessment or examination results are counted the figures are: **27** indicators spanning on average **2.8** years. (47 indicators are considered official 'programme performance indicators', of which 19 deal with assessments or examinations. All these official indicators span two years.)	**50** indicators spanning on average **6.0** years. If only indicators dealing with assessment or examination results are counted the figures are: **33** indicators spanning on average **5.8** years. (9 indicators in total deal with tertiary education.)	**83** indicators spanning on average **2.2** years. If only indicators dealing with assessment or examination results are counted the figures are: **5** indicators spanning on average **4.2** years. (76 indicators, none dealing with learner assessments, but several dealing with client satisfaction, fall under the seven budget programmes. All these indicators span two years.)
Auditor-General's focus	Apart from financial statement, also performance indicator values and attainment of targets.	Apart from financial statement, also performance indicator values and attainment of targets.	Only financial statement.	Apart from financial statements, also performance information.

The following differences seen in the above table, and in the reports themselves as the table was compiled, seem informative for the process of improving the annual reports of the two South African provinces, but also perhaps the general reporting practices and culture in these two systems:

- **More quantity may come with poorer quality.** The longest of the four reports described above, that of KwaZulu-Natal, is probably also the one with the most shortcomings in terms of, for instance, the clarity of statistics (see section 5.1 above). It would be plausible to think there is to some degree a trade-off between quantity and quality. A long annual report is more difficult to check and edit before it is finally released. Annual reports of education departments in South Africa should perhaps be shorter, better-focussed, and more carefully checked before publication.

- **The focus on HR is necessary, but could go deeper.** The presence of the section on human resources in the New South Wales (NSW) report seems to confirm the importance of having such sections in South Africa's reports. But a look at the NSW report also suggests what should probably have a stronger presence in South Africa's reports: longer-range employee headcount trends; breakdowns of schools-based staff by job description; a clear differentiation between staff at the primary and secondary levels.

- **Graphs seem to add value.** Only the KwaZulu-Natal report had no graphs. Graphs do seem to add considerable value in describing trends, in particular if longer-range trends are considered.

- **Narratives in tables come with certain limitations.** South African government reports are in general highly inclined to organise their narratives within tables. This has certain advantages. It can force report-writers to think through issues systematically. Tabular formats can be less daunting for readers. However, there are also disadvantages. Tables can unnecessarily cut narratives short which ought to be long or, conversely, result in 'padding' and unnecessary repetition of text as report-writers try to ensure that no cells are left blank. It is virtually impossible to expand a narrative that is already inside a table using graphs or further tables. Whether to use tables or a conventional narrative format should be thought through more carefully.

- **Key outcome statistics seem to need a longer trend.** Outcome indicators are particularly important. This could explain why such indicators are reported in terms of at least four years in the non-South African reports. The South African reports concentrate on a shorter period of two to three years, which may be inadequate.

- **The Auditor-General's key focus is financial accounts.** The fact that the auditor's report in the NSW report focusses only on financial information, and not non-financial information, is interesting and contradicts the notion that the movement towards more auditing of performance data is an inevitable trend. How fast the Auditor-General (AG) in South Africa should expand its scope within the area of non-financial data is a debatable point, especially in a context where AG staff are trained almost exclusively in financial accounting and are often not conversant with statistics in areas such as learner performance.

6 A 'map' of the existing education data terrain in South Africa

The diagram appearing below constitutes a 'map' of the systems generating and housing key data in the basic education sector. The emphasis is on national systems. Provinces have in many cases added their own systems to deal with specific needs and have in some cases adapted national systems. The purpose of the diagram is to facilitate integrated thinking of the

various systems. There is a strong emphasis on the link between schools and the administration, as well as on what data should ideally be used for.

Learner performance data. Schools generate on an ongoing basis **schools-based assessment** (**SBA**) results, or results of assessments schools themselves design. To some extent, schools make use of **SA-SAMS**, or the South African School Administration and Management System, to store SBA data. SA-SAMS is a stand-alone system designed to assist schools store data that must be submitted to the administration, but also to manage the school through the use of the data. The extent to which SA-SAMS is used within schools, in particular as far as school management is concerned, is not well known. Submission of data to the administration occurs through a facility in SA-SAMS which produces computer files in the prescribed formats. These files must then be transferred via e-mail or a device such as a memory stick to an office in the administration. SBA results are increasingly being considered a part of the core set of data which must be submitted. In schools where SA-SAMS is not used to store SBA results, paper-based systems may be used, or computerised systems other than SA-SAMS, for instance spreadsheet tools developed by teachers. SBA results are important for school-level decisions around **which learners to promote** to the following grade at the end of the year.

Schools participate in two national assessment systems, the Annual National Assessments (**ANA**), covering grades 1 to 9, and the **Grade 12 examinations**. Results from these assessments are entered into national mainframe systems by department officials, in some cases at the district level and in some cases at the province level. ANA and Grade 12 results are used extensively by officials in district offices to identify **schools displaying best practices** and **schools requiring support**. Large national reports are produced annually, drawing from the ANA and Grade 12 databases. The Grade 12 reports, but not the ANA reports, have included school-level performance statistics.

The national administration (Department of Basic Education, or DBE) manages the **testing of samples of learners** within national assessment programmes (such 'verification ANA') and international programmes such as TIMSS[93].

What research and development (**R&D**) would one ideally have, given the kinds of data available? One can assume that above all the national level, but also to some extent provincial administrations, would have the resources to pursue R&D. Clearly assessment data, combined with other data, should be used to determine what kinds of **interventions** seem appropriate for specific types of schools. Success and failure need to be gauged in terms of the ability of schools to attain existing curriculum standards, but a part of the research should also focus on the **appropriateness of existing curriculum standards**. R&D should also encompass research into existing systems and the quality of data with a view to improving these systems. Of particular importance is continual research into the **comparability of assessment data**. It important for an education system to know when its educational outcomes are improving, and how large these improvements are, not just so that successes can be celebrated but also because these trends should influence the degree to which existing support interventions are continued, and the degree to which they are halted and replaced by new ones. The effectiveness of existing approaches to **distributing assessment results amongst actors** in the system should moreover be evaluated from time to time.

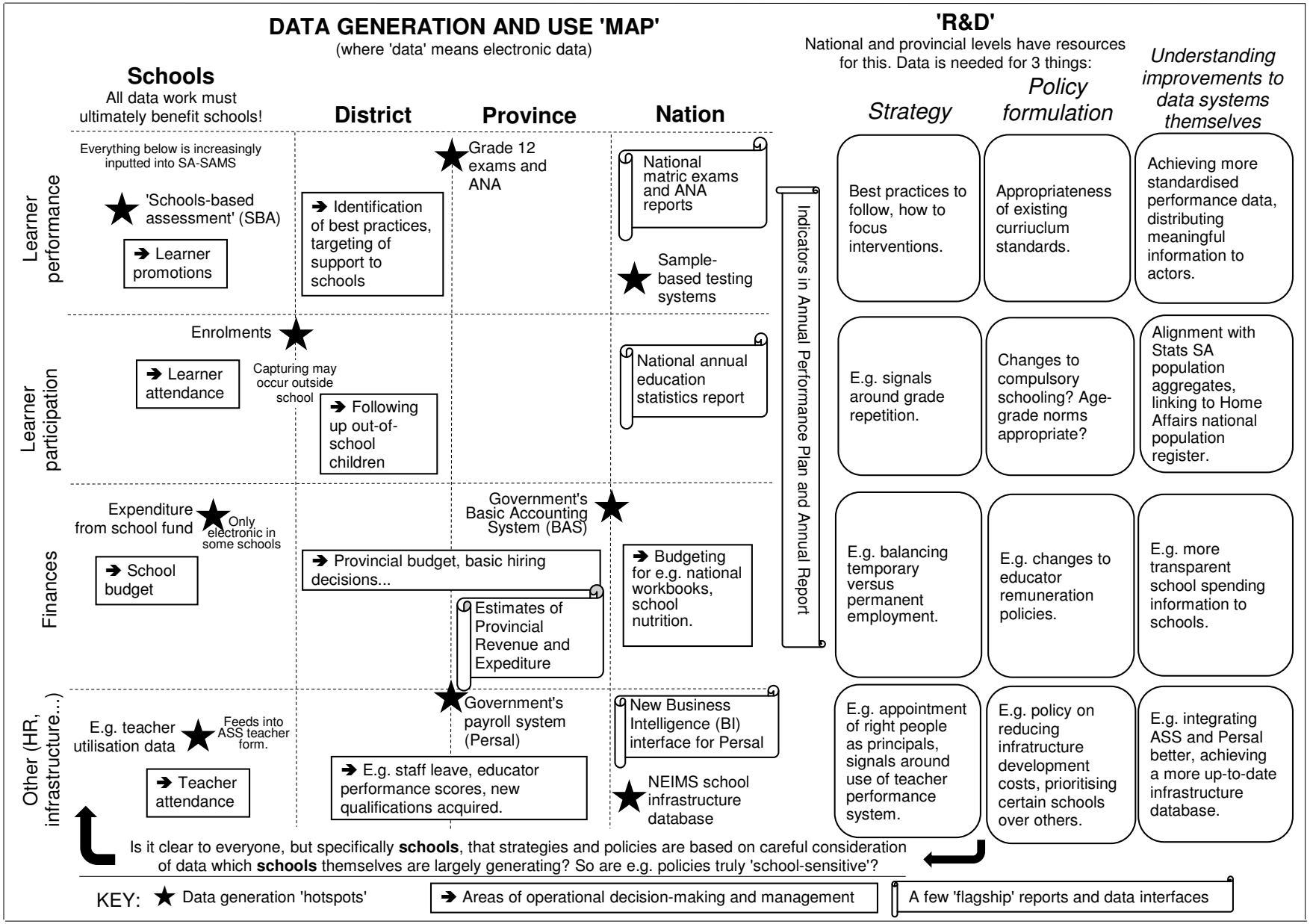
Learner participation data. SA-SAMS includes a facility to enter the personal details of all **enrolled learners** in in a school. The great majority of schools now feed their SA-SAMS individual learner data through to a national database, LURITS[94]. This feed occurs four times a year, but special importance is attached to enrolment numbers at the start of each school

[93] Trends in International Mathematics and Science Study.
[94] Learner Unit Record Information Tracking System.

year. Having data on each learner reduces opportunities for the fraudulent inflation of enrolment numbers, something which can attract additional resources to individual schools. Ideally, data on individual learners should moreover assist the administration in identifying where **children of compulsory school-going age are dropping out**. In the case of a minority of schools, paper-based lists with individual learner details are submitted to the district, which then feeds these details into LURITS. SA-SAMS includes a facility to track the daily **attendance of learners**, but data in this regard are in general not fed into any central system.

Enrolment details for the start of the school year down to the district level are published every year within **national reports** (*School realities* and *Education statistics in South Africa*). These reports are used for various purposes, including the distribution of public funds across provinces through National Treasury's equitable share formula.

Analysis of enrolment data are important for a number of reasons. Levels of **grade repetition** need to be understood so that educational needs and the cost-effectiveness of the schooling system can be balanced. The relationship between learner age and learner grade should be understood, partly so that the right policies and strategies with respect to **compulsory schooling** and **age of entry into Grade 1 can be pursued**. Moreover, any discrepancies between the education system's learner data, **Statistics South Africa household statistics** and the **Home Affairs Population Register** need to be understood, partly because discrepancies can point to data quality problems.


DATA GENERATION AND USE 'MAP'
(where 'data' means electronic data)
Schools
All data work must ultimately benefit schools!
District
Province
Nation
'R&D'
National and provincial levels have resources for this. Data is needed for 3 things:
Strategy
Policy formulation
Understanding improvements to data systems themselves
Learner performance
Everything below is increasingly inputted into SA-SAMS
'Schools-based assessment' (SBA)
➔ Learner promotions
➔ Identification of best practices, targeting of support to schools
Grade 12 exams and ANA
National matric exams and ANA reports
Sample-based testing systems
Best practices to follow, how to focus interventions.
Appropriateness of existing curriuclum standards.
Achieving more standardised performance data, distributing meaningful information to actors.
Learner participation
Enrolments
➔ Learner attendance
Capturing may occur outside school
➔ Following up out-of-school children
National annual education statistics report
E.g. signals around grade repetition.
Changes to compulsory schooling? Age-grade norms appropriate?
Alignment with Stats SA population aggregates, linking to Home Affairs national population register.
Finances
Expenditure from school fund
Only electronic in some schools
➔ School budget
Government's Basic Accounting System (BAS)
➔ Provincial budget, basic hiring decisions...
Estimates of Provincial Revenue and Expediture
➔ Budgeting for e.g. national workbooks, school nutrition.
E.g. balancing temporary versus permanent employment.
E.g. changes to educator remuneration policies.
E.g. more transparent school spending information to schools.
Other (HR, infrastructure...)
E.g. teacher utilisation data
Feeds into ASS teacher form.
➔ Teacher attendance
Government's payroll system (Persal)
➔ E.g. staff leave, educator performance scores, new qualifications acquired.
New Business Intelligence (BI) interface for Persal
NEIMS school infrastructure database
E.g. appointment of right people as principals, signals around use of teacher performance system.
E.g. policy on reducing infratructure development costs, prioritising certain schools over others.
E.g. integrating ASS and Persal better, achieving a more up-to-date infrastructure database.
Indicators in Annual Performance Plan and Annual Report
Is it clear to everyone, but specifically schools, that strategies and policies are based on careful consideration of data which schools themselves are largely generating? So are e.g. policies truly 'school-sensitive'?
KEY:
Data generation 'hotspots'
➔ Areas of operational decision-making and management
A few 'flagship' reports and data interfaces

Financial data. The Treasury system underpinning the government's financial accounting, or **BAS** (**Basic Accounting System**) works well. There are a sufficient number of points where data are entered and reporting systems are considered robust. The tracking of historical expenditure patterns is of course important for forward planning, including decision-making around budgets and around the hiring of additional staff. With regard to the latter, provincial education administrations must continuously balance the number of **temporary teacher appointments** against the number of permanent appointments, keeping in mind shifting demands across schools and budgetary constraints. Provincial reports with financial aggregates, notably the **Estimates of Provincial Revenue and Expenditure** (EPRE), produced by provincial treasuries, and the annual reports of provincial education departments, are informative partly because standard formats for the country have been adopted.

At the national level, the DBE's finances are important for determining what can be spent on the conditional grant transferred to provinces for **school nutrition** as well as the **national workbooks** which are distributed physically to schools across the country. The DBE must moreover analyse the personnel spending patterns in provinces if **national remuneration agreements** governing educators are to be informed and sustainable.

What falls outside of BAS is the **spending undertaken by schools** using funds transferred to them by the provincial administration. SA-SAMS includes a financial management module designed for schools, but the extent of its use is not clear. Yet virtually all schools do maintain some form of financial accounting, either paper-based or computerised. SA-SAMS financial data are not fed through to any central database.

To varying degrees of success, provincial education departments **monitor non-personnel spending on schools through BAS**, and communicate their findings to schools, in order to ensure that policies on minimum per learner spending are adhered to. What makes this monitoring complex is that not all this spending takes the form of transfer payments. Depending on the financial management readiness of schools, the provincial department may spend the school's money on behalf of the school.

Human resources and other data. Virtually all public employees in the schooling sector are paid through the **government's payroll system**, **Persal**. Persal, like BAS, is a robust system though the degree to which it carries up-to-date non-financial data which informs payments, such as data on **teacher qualifications**, **leave of absence** and **performance management scores** in line with the Integrated Quality Management System (IQMS) varies by province. The DBE has recently launched a new internet-accessed **Business Intelligence** (**BI**) interface which facilitates the analysis of Persal data at the national and provincial levels.

Schools maintain a variety of records on their staff, for instance **daily attendance records**. To some extent SA-SAMS is used for this, though data are not fed through to a national system. What is fed through to a national database each year is a set of data per teacher, sometimes referred to as the Annual Survey of Schools teacher questionnaire data, which includes **information on what subjects and grades each teacher teaches**. Up to 2009, the questionnaire included a table where the teacher would specify hours spent per week teaching different grades (and, for grades 7 to 12, also different subjects).

Good analysis of the available human resources data at the provincial and national levels can assist in determining whether **the right people are being promoted** into, for instance, school principal positions and whether the **IQMS performance management system is being implemented** in a manner which contributes towards school improvement. Moreover, **effective integration of different datasets**, in particular payroll data and data on teacher utilisation, can assist in the detection of inefficient practices.

Other key databases in the sector include **NEIMS**, the National Education Infrastructure Information Management System. This database is designed to contain relatively detailed physical infrastructure data per school. It is periodically updated by service providers who physically assess schools, and also through the use of reports from provinces on completed infrastructure projects. Updating through the latter mechanism is considered problematic, and can lead to inaccuracies in the database.

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PROJECT ON EDUCATION DEPARTMENT DATA USE

Interview guide

1. Introduction

This project is aimed at improving **data generation** and **data use** in the basic education sector, in particular within the **provincial education departments**. These nine pages are meant to guide the interviews between the researchers and interviewees.

The project's understanding of 'data' is a conventional one. We are concerned with **databases**. We are thus *not* looking more broadly at, for instance, digital content for teaching purposes.

The scope of the project is clearly broad, and the issues are often highly complex. Whilst we want **breadth** in the project, we are also committed to more **depth** in a couple of areas. Firstly, we are particularly interested in how the data work you are involved in influences the **school**, as the key point of service delivery. Secondly, we have agreed to pay particular attention to **assessment data**.

Sections 4 to 6 of this interview guide cover three areas used to organise the work of this project: (a) **policies, institutions and systems**, (b) **human capacity** and (c) **organisational culture**. We believe that these three areas allow us to cover the matter of data use comprehensively.

Confidentiality is important within this project. You (the interviewee) should feel free to be **frank** about, for instance, your work environment. The researchers will **not include the names of interviewees in their reports**. Moreover, findings will be written up in such a way that it would not be possible to conclusively attribute opinion X to person A. In short, the researchers take the confidentiality of the interview seriously.

2. What is your role in the organisation?

First we would like you to briefly describe your role in the organisation, both what you are officially expected to do and (probably more importantly) what you actually do. In particular, we would be interested in how you are involved in **generating** or **using** any of the following datasets. By 'using' we mean not just use of the primary microdata, but even 'using' in the sense of interpreting statistics coming out of the data. This is a core list. We could also be interested in other datasets.

The core list of datasets:

★ Grade 12 examinations data.
★ Annual National Assessments (ANA) data (or similar province-level data).
★ Sample-based assessment data (e.g. Systemic Evaluation or SACMEQ)

★ SA-SAMS/EMIS/LURITS[95] (could include learner and teacher attendance data, also the data covered by the ASS teacher questionnaire).
★ BAS[96] (departmental finance data).
★ Persal payroll data.
★ Physical infrastructure data (especially insofar as this relates to schools).

We would also like to know if you are involved as a **producer** or **user** of key plans and reports in your organisation, some of which are listed below. (Even if you are not a primary producer of a report, but contribute data or comments to other people who are producers, we'd like to know about this.)

A few key plans and reports:

★ Annual Performance Plan of the Department.
★ The education section of the Estimates of Provincial Revenue and Expenditure of the province.
★ The Annual Report of the Department.
★ Quarterly performance reports of the Department.

3. What are your key interests and general opinions regarding data use?

First, some general questions, not specifically in relation to data: ➔ Are you from a school teaching background? ➔ What has been the focus of your post-school studies? ➔ Are you studying currently? ➔ In what areas would you like to develop your skills going forward?

And on data… There are many skills areas which contribute to good data use. Here is a list of a few. Where are you relatively strong, and where not? What skills are most important for your work? What interests you most?

Important skills:

★ Design (even conceptualisation) of computerised operational systems (possibly web-enabled).
★ Design or conceptualisation of web-based data sharing and querying facilities.
★ Questionnaire design.
★ Design of learner tests for comparing performance over time.
★ Budget formulation.
★ Formulation of plans and reports with indicators and targets.
★ Scenario generation in, for instance, Excel.
★ Writing reports based on other people's data analysis (could include a lot of graph production).
★ Basic analysis of large non-sample sets of microdata (no need to worry about confidence intervals).
★ Analysis of sample-based microdata (confidence intervals *are* a concern).

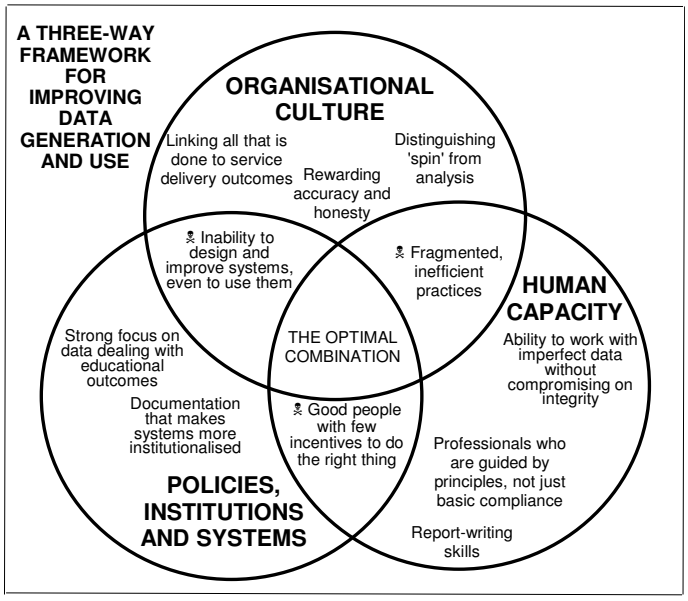
[95] South African School and Administration Management System, Education Management Information System, Learner Unit Record Information Tracking System.
[96] Basic Accounting System.

★ Analysis of item-level test data (often requires specialised analysis techniques).
★ Impact evaluation of projects (possibly with 'treatment' and control groups).
★ Explaining numbers in slide presentations.

The role of data in government is a complex and often controversial matter. What is your take on some of the following topics? (If you do not have strong opinions on them, that's not a problem, you can simply ignore them.) ➔ The use of new technologies for collecting data. ➔ Data which are collected and not used for any purpose. ➔ Dangers and opportunities associated with imperfect data (data with errors and missing values). ➔ The quest for 'perfect data'. ➔ Indicators, including their design, the quantity of indicators used, and targets. ➔ Using data to reward or punish individuals or institutions (in particular schools). ➔ The move towards more measurement of learning outcomes in schools. ➔ Access by researchers and the public in general to government data. ➔ The way data are used to defend or criticise government actions.

4. POLICIES, INSTITUTIONS AND SYSTEMS

From here on we look at three areas that need to be addressed if better generation and use of data in education are to be achieved. The first of these three areas is **policies, institutions and systems**. The other two are **human capacity** and **organisational culture**. The interviewer(s) will briefly justify this three-way categorisation of the issues through reference to the following diagram:



We are interested in understanding **how things currently work** (or perhaps don't work!), the **degree to which things are getting better or worse**, and your understanding of **how the situation can be improved**. On improvements, we should distinguish between **more immediate solutions**

which are doable in the near future (one to three years) and **solutions which take longer to implement**. We want to touch on both.

By '**policy**' we mean any document intended to guide or instruct people what to do. So here anything from the National Development Plan down to instructions to data capturers would be 'policy'.

The following box contains a number of issues relating to policy on data, issues which emerge, directly or indirectly, from the following government plans: National Development Plan; Medium Term Strategic Framework 2014-2019 for 'Outcome 1: Basic quality education'; *Action Plan to 2019: Towards the realisation of Schooling 2025* (the earlier *Action Plan to 2014* was also consulted).

POLICIES ON DATA GENERATION AND USE

- ✓ The need for a clear and logical policy underpinning the **Annual National Assessments** (ANA) programme, including guidelines for how different levels of the system, from teachers up to the national Minister, should use ANA data to improve schooling.
- ✓ The need for clearer policy on rights and responsibilities around the gathering, storing and use of data relating to the professional conduct of teachers, in particular data on **teacher subject knowledge**, **professional development activities**, performance monitoring, disciplinary decisions and **absenteeism**.
- ✓ The need for policy on the storing and use of data emerging from **competency assessments** where such assessments occur as part of a hiring or promotion process.
- ✓ The need for clearer policy on how learner-level attendance and enrolment data (in particular **LURITS**) should be used to add value to the process of schooling, for instance interventions to **reduce dropping out**.
- ✓ The need for a firmer policy basis for the areas of **e-education** and e-governance, dealing with matters such as standards and how to take technology investment decisions.

The questions are as follows: ➔ What are the policies you know (possibly from the above list) and which influence how you work with data? ➔ Are formal policy documents important in your work (if much of the work occurs on the basis of verbal instructions and trust, then policy documents may not be important)? ➔ Are existing policies perhaps not clear enough, or contradictory, or do they perhaps over-specify what must be done, at the cost of professional judgement? ➔ How useful are the current guides on how to calculate and interpret indicator values? ➔ How could the introduction of new policies, or changes (perhaps simplifications) in existing policies, assist in your work (this is assuming that improvements are necessary)?

There are a few widely-used Treasury manuals dealing with the use of data and statistics in planning and reporting. Key documents are listed below. If you are a user of these documents, we would be very interested in your opinion of how useful they are and how they might be improved.

★ *Framework for managing programme performance information* (2007).
★ Framework for strategic plans and annual performance plans (2010).
★ *Performance information handbook* (2011).

By '**institutions and systems**' we mean a number things: ★ Technologies for gathering, transferring, storing and processing data. ★ Documentation that describes specific datasets (often referred to as 'metadata'). ★ Institutional systems such as regular monthly meetings to deal with (amongst other things) data issues.

The next box highlights a few system issues emerging from the plans.

INSTITUTIONS AND SYSTEMS ISSUES

✓ The need for easier extraction from existing system of the **overall number of National Senior Certificates obtained**, a number which would include part-time students, students who improve their results through supplementary examinations, and Independent Examinations Board students.

✓ The need for better tools, such as **school report cards**, to share information with parents and communities.

✓ The need for a more dynamic and robust **SA-SAMS**[97] which combines management utility in the school with the gathering of data needed by the Department for monitoring and planning purposes.

✓ The need for access to and use of TVET[98] college learner data so that **movements between schools and colleges** can be better monitored.

✓ The need for better and more easily accessible **basic data on teachers**, including teachers paid by school governing bodies, in particular as far as their employment trajectories, qualifications and subject-specialisations are concerned.

✓ The need for better information systems to operationalise the wider '**post provisioning process**', and to monitor the physical infrastructure and teacher utilisation dynamics behind typical problems such as over-sized classes and mismatches between the specialisation of the teacher and the teacher's teaching responsibilities.

✓ The need for periodic surveys of **teacher opinions** to inform human resources planning.

[97] South African School Administration and Management System.
[98] Technical and vocational education and training.

- ✓ The need for systems which make it easier for schools to gauge **what the state spends** on them.
- ✓ The need for the sample-based collection, from schools, of data too costly to be collected on a census basis, for instance in relation to curriculum coverage, **school satisfaction with district services** and school governance.
- ✓ The need for better monitoring of **access to books** and basic educational materials amongst learners.
- ✓ The need for better data on the state of **physical infrastructure in schools** and current and future school building initiatives.
- ✓ The need for better databases on suppliers of goods and services, including **suppliers of in-service teacher training**.
- ✓ The need for better **desktop data viewing systems**, designed to satisfy the specific needs of key managers and planners, and drawing from a multitude of inter-linked data sources.

➔ Are there issues in the above list where you have strong opinions on how things could be improved? If so, what are these opinions? Do you think your province has been particularly effective in dealing with some of these issues? What additional issues would you like to see in a list such as this one?

➔ How large a problem is a lack of basic **technologies** in your work? Think about the computers you use, network speeds, software. We would like some details.

➔ How **secure** and **accessible** are databases in your work (assuming this is something that affects you)? Are there data warehouses you can access from your desktop, or do you physically have to obtain copies of the data from other people? Have important data been lost, or do you believe there is a risk of this, due to inadequate storage systems? How easy is it to obtain data from many years back if you want to look at long-range trends?

➔ What successes, if any, has your organisation had in implementing '**dashboards**', user-friendly and dynamic interfaces aimed at, for instance, managers to give them the statistics they need? How important do you believe such systems are?

➔ Does your organisation have any experience of **school report cards**, or centrally produced information sheets dealing with individual schools, produced for instance to allow schools to compare their performance to that of other schools? What is your opinion of such tools? What other approaches does your organisation employ to disseminate data in a systematic manner to schools? **Are, for instance, lists with school-level Grade 12 results used in a systematic manner?**

➔ How big a problem is **non-standard identifiers** for schools, teachers, and learners in your organisation's systems? How does this limit what you can do?

➔ It seems that a general problem in government is insufficient **documentation** (metadata), a problem which results in an over-reliance, when it comes to data, on what is in the heads of a few individuals, and insufficient 'institutional memory'. Do you think this is a problem? If so, why do you think there is not better or more documentation?

➔ Are you happy with arrangements, such as regular **meetings**, to get people to talk to each other and share data? Are additional meetings or structures needed? Are there perhaps too many meetings?

➔ How **accurate and reliable** are the data you are familiar with? If you believe data are inaccurate and unreliable, what do you think is needed to remedy this situation?

➔ To what extent do you believe there is **under-investment in systems** in your organisation because the leadership lacks faith in those dealing with data and information?

The focus above has been largely on 'the negative', shortcomings and how to improve the current situation. However, you may also like to highlight what you believe are a few exemplary policies and systems which could serve as inspiration for other government organisations.

Let us reflect a bit on **trends**. Things may be bad, but becoming slowly better.

Or the situation may look good currently, though you sense things are sliding down slowly. Perceptions on these matters are vital for the research. Introducing new initiatives in a context where there are already initiatives moving things in the right direction may not be a good thing. So what do you think? Is the situation as far as policies, institutions and systems changing, getting better, getting worse? Why is this happening?

You have by now probably come up with a number of ideas for improving the current situation. The question is **what to prioritise**. If there were, say, **three key things** you believe should be prioritised in the coming three years, what would you like these things to be? We want to limit ourselves to what is **practically possible**, and **affordable**, of course. Moreover, keep in mind what the core business of the schooling system is: **To get as many learners as possible to learn what they should learn in the curriculum, and hopefully even excel in this.** Even if your focus is not assessment data, you need to justify your choice of key priorities in terms of how this contributes to the core mission of the sector.

5. HUMAN CAPACITY

We can break this area down into two sub-categories: (1) The **skills** of existing staff. (2) The number of people available to do the work, so the **staffing level**.

Issues relating to these sub-categories from the plans are:

HUMAN CAPACITY ISSUES

- ✓ The need to have more people able to use data to explain the reasons for successes and failures in the sector. A part of this need is about having people who understand **impact evaluation** techniques.
- ✓ The need for more people able to understand **modern testing techniques**, including the use of item banks and the generation of scores using item response theory (IRT).
- ✓ The need to have more people in the education departments able to **cost different approaches** to, for instance, building schools and paying teachers.
- ✓ The need to overcome psychological and other barriers preventing a **move to better information technologies**, as these become more affordable and widely available.

➔ **Skills of existing staff.** Previously, you were asked to assess your own skills with respect to a list of 'important skills' (see section 3 of the interview guide). Now we would like you to reflect on these skills (as well as issues from the above 'issues list') in relation to **the staff of the organisation as a whole**, and **your section** in particular. Keep in mind the focus is on work with data, though of course certain generic skills are cross-cutting. So what are the critical skills shortfalls? To what extent do these shortfalls undermine a culture of professionalism in the workplace? To what extent do they limit creative approaches to dealing with data problems, such as problems arising when data are incomplete? How skilled are people at assessing when data are accurate and when they are not?

> ➔ We would like to pay particular attention to past **capacity building efforts**. How well-focussed have these been? What do you believe should be prioritised going forward? In answering this question consider a wide range of skills development possibilities: formal part-time studies at universities; short face-to-face training programmes; e-learning initiatives.

➔ **Staffing levels.** To what extent are capacity problems around data use a question of insufficient staff? Why are there not enough staff? Is the problem the funding of posts, or the availability of skills in the labour market? Is the mismatch between the demand and supply of staff perhaps related to excessive demands, in other words trying to get too much done?

Back to **trends**. Is the human capacity situation, with regard to data, getting better or worse in your opinion? Why?

Again, let's prioritise. What two or three things should be prioritised in the coming years to build human capacity?

6. ORGANISATIONAL CULTURE

This is necessarily an area of much subjectivity and sensitivity. To repeat, we would like a frank discussion, and the confidentiality of the interview is respected.

Issues relating to organisational culture and data appearing in government's plans include:

ORGANISATIONAL CULTURE ISSUES

- ✓ The need to promote more **evidence-based decision-making** and planning.
- ✓ The need for a sufficiently nuanced and careful use of **learner performance results** in a context where these results may easily be misinterpreted.

Here are some questions:

➔ Is the **accuracy and reliability** of data and statistics sufficiently high on your organisation's list of priorities, in your opinion? What happens to you, your colleagues and the sector when inaccurate statistics are distributed? What are the accuracy and reliability issues when it comes to **learner performance data**?

➔ There will always be some political '**spin**' around numbers in government. Ideally this should be about highlighting good stories, not using incorrect information. How well is 'spin' handled by your organisation? How does this affect the behaviour of staff when it comes to the use of data and statistics? In particular, do you think statistics relating to outcomes, in particular learner performance, receive enough of the right kind of attention?

➔ Is there the right kind of focus in your organisation on using statistics to gauge the **overall and long-term progress** of the organisation, government or sector? Put differently, is progress viewed in terms of things like learner performance and participation, or in terms of more cyclical matters, such as responses to crises?

➔ Do statistics play the role they should in your organisation's **planning and decision-making processes**? Please elaborate on your response, perhaps with reference to the following issues: the reliability of the available statistics; **learner performance differences across categories of schools and across school grades and subjects**; capacity amongst both the producers and users of statistics as well as communication between these producers and users.

➔ Do you believe your organisation is sufficiently focussed on **what goes on 'down below' at the school level**? How might this influence the inclination of the organisation to gather data on the opinions of, for instance, school principals and teachers through surveys? How might this influence the

inclination towards returning, say, district-level statistics to schools so schools can gain a better sense of their relative performance and use this to inform school management?

➔ Is there a sufficient sense of the **costs**, human and financial, of producing good statistics in your organisation? Are costs pushed up by **inefficient practices**? Is your organisation being **too ambitious** when it comes to data gathering, given its resources?

➔ In deciding what to prioritise in the areas of information systems and data analysis, do you believe your organisation pays **enough attention to data on educational outcomes**, in particular on what learners learn and whether they drop out of schooling too early? Where the organisation deals with data on inputs and processes (in relation to teachers, school financing, textbook deliveries, infrastructure development, and so on), do you believe this is done in such a way that the 'end product', quality education, is sufficiently emphasised?

➔ What is the approach of your organisation to **sharing data** with outside organisations to promote evidence-based planning? Do you think such sharing and data analysis partnerships present specific opportunities, or risks?

Do you believe the **trend**, as far as the organisation's culture is concerned, is in the right direction? Why do you say this?

What two or three things should be prioritised in the coming years to build an organisational culture that is more conducive to good data generation and use?