ICAEW

Evidence, not assumptions

Audit insights: data analytics

Contents

Foreword

Reports from external auditors aim to build confidence in financial statements and give credibility to companies and comfort to their stakeholders. Companies also benefit from the insight that auditors have into business processes and the wider market environment.

External auditors see many issues during their work in auditing financial statements that have a broader application and are of wider interest than the financial statements alone. This includes issues related to an organisation's assets and liabilities, people, processes and the market in which it operates.

Audit insights is an opportunity for external auditors to share some of their knowledge of specific sectors with the public, capturing more value for a wider audience. Shared insights and observations have been brought together in an environment which protects client confidentiality to produce this document.

Executive summary

Data analytics is changing the way many people think about business, and the skills that will be needed in years to come. Management, auditors, regulators and government all have an interest. This publication describes external auditor insights into the impact of data analytics on the businesses they audit, and provides management with a high-level approach to data analytics.

Data analytics works at different levels. It can be important for businesses to use it simply to demonstrate to the world that they are not old-fashioned and to bring about the many improvements to performance it facilitates. Data analytics is, however, a business issue, not just a technical one. It has already changed the way many businesses achieve their existing objectives. It helps improve returns, which is critical to justifying the necessary investment. But it also has the potential to bring about more fundamental changes to a business in terms of what it does, the markets it operates in, and in terms of the business model and management's culture and style. In some cases, data analytics **demands** these changes if the business is to survive and thrive.

In section **1 Getting started**, we look at the basics: at what the term 'data analytics' means and the range of activities it covers, why it is important, the insights it provides and, in broad terms, at the relevant culture, control, and governance issues.

In section **2 Improving business performance**, we look at how management can now achieve better results by streamlining operations and cutting waste, without making any fundamental changes to the business model. Many businesses have already transformed their revenue, profit streams, operations and working capital management using data analytics. Improvements in the value chain and financial management are generally the first steps any business takes in using data analytics.

In section **3 Rethinking management and control**, we look at how management's culture and style need to change to use data analytics to get to the market faster, improve the quality of the offering, move into new markets the business would not have considered before, and to keep ahead in existing markets. We consider moving beyond the desire to enhance business performance, to exploit the faster, evidence-based, experimental approach to business development that data analytics supports, in contrast to well-established but slower, linear, preventative approaches to management and control. We highlight the importance of keeping governance and control structures aligned with decision-making and control processes as they actually operate, particularly when data analytics starts to play a more significant role in a business.

Finally, in section **4 Thinking ahead** we explore in more detail:

- the impact of data analytics on SMEs and the likely changes in markets arising from smaller and more agile entrants eroding entrenched advantage deriving from size and scale;

- how regulated businesses and regulators can work together to ensure that regulation facilitates and encourages business innovation, and results in better quality, more cost-effective regulation; and

- the need for business, professional bodies, government and educators to work together to ensure that the business leaders of tomorrow are equipped with the right skills.

Businesses are increasingly managed using evidence provided by data analytics rather than assumptions derived from experience. The use of data analytics and the associated enhancements to business performance are not cost or risk-free: data analytics represents a significant challenge to the established order in many respects. Businesses that do accept the challenge need to protect their investment by using it thoughtfully. In each section of this publication, we set out a series of questions for management to think about when considering data analytics and the related opportunities and threats.

1. Getting started

What does management need to deal with before it considers improving business performance? And what are the wider strategic implications of data analytics?

WHAT 'DATA ANALYTICS' MEANS

The term 'data analytics' covers a wide range of activities including:

- the review of full data sets to find exceptions and then drilling down into the detail;

- the development of meaningful linkages between different data sets and other information; and

- predictive analytics, including complex modelling, which supports the optimisation of decision-making.

Data analytics also involves the use of algorithms, visualisation and modelling techniques. The skills needed at various points in this spectrum are correspondingly wide-ranging. They include the ability to manipulate data, mathematical and statistical skills and, just as importantly, the experience, judgement and flexibility to make the right linkages, interpret analyses and use them appropriately to support decisions. How this skill set is developed is an important area of current debate.

THE IMPLICATIONS OF DATA ANALYTICS FOR MANAGEMENT

Why now? Why is data analytics so important all of a sudden? The hype suggests that it is widely used in businesses of all sizes. Some businesses, including some SMEs, are using it very effectively but it will take longer for others. A number of critical technological changes have made this possible. The greatly reduced cost of data storage, efficient algorithms and better software generally – visualisation software in particular – have made the retrieval and analysis of data and its high quality presentation much cheaper and faster than before. The reduction in the cost of data analytics tools, the growth in computing power and data sources, ease of use for a wide range of people and the need for competitive advantage and other benefits associated with data analytics, all explain why data analytics is suddenly on everyone's agenda. The potential for change brought about by data analytics is real.

Data analytics does have limitations: it is only as good as the data analysed and the people analysing it. The investment will be hard to realise if the tools are not properly tailored, if staff are not trained in how to use them or if management uses them ineptly. Good quality tools not being used at all for the want of skills and training is not uncommon. Given the overall investment required, third party vendors and staff with an interest in the tools and the skills to use them should be challenged to demonstrate how data analytics will work for the business as a whole.

Few tools used in data analytics are entirely new. Analytical tools embedded in spreadsheets have been used effectively for many years. Nevertheless, data analytics does 'democratise the analysis', making it more accessible to a wider range of people, as well as more accurate, faster and detailed.

The use of data analytics involves a transition. For a few businesses, decisions are genuinely being driven by the insights provided by data analytics. Many businesses continue to validate decisions after the event using data analytics, and some are doing both. Similarly, dashboards and other visualisation tools are widely used by management and some are used to assess risk. In other cases, assessed risks are determining the visualisations commissioned. Again, an element of both is often present.

Insights provided by data analytics often confirm what management believes and this is more valuable than is sometimes acknowledged. Insights occasionally come as a genuine shock but more often they demonstrate that business processes do not work in quite the way that middle management thinks. The level of granularity data analytics can provide does not, of itself, guarantee improvements to business operations, but it has the capacity to facilitate highly focused and effective change.

Internet search functions played a major role in the development of the tools used in data analytics but many of those used in business were first developed in the financial services sector in the early 2000s. The use of data analytics in that sector is well established and some of it is now outsourced.

Examples of the use of data analytics in business include:

- using tools such as predictive modelling to analyse fund performance in the financial services sector, and using simpler tools to perform interest and dividend recalculations;

- performing sophisticated and mature analyses of store and branch performance in the retail sector;

- evaluating the impact of health and safety training on accidents in the extractive industries; and

- recruiting the right people – important in any industry – using ex-post CV analyses to highlight the effectiveness of HR policies and procedures.

DIFFERENT STRATEGIC APPROACHES TO DATA ANALYTICS

Data analytics, like other technologies and tools, has a role in gaining and maintaining competitive advantage. Businesses of all sizes increasingly appreciate the importance of understanding how their competitors are using, and are likely to use, data analytics in the future. To the extent that those with specialist skills in the area are in short supply, this matters now, as well as in the longer term. Management needs to think about the risk of being overtaken by competitors. Will there be a tipping point in a few years' time, at which point it will be too late to catch up?

Data analytics is by definition an innovative technology which facilitates experimentation in a manner and on a scale not previously possible. Modelling tools based on data analytics have a role in product and service development, scenario planning and project management, among many other things. Planning decisions to date have been taken on a sequential basis, using relatively limited information combined with judgement based on experience. Planning activities can now take place on a more iterative basis because of the availability of high quality information that can be produced quickly and cheaply, including evidence supporting a wide range of alternatives. Graduate recruitment programs have for a long time been about collaborative problem solving and scenario planning, a trend accelerated by the addition of data manipulation and visualisation tasks to the mix.

Data analytics is being developed and run within companies in different ways. Some companies are making it central to their strategic development, in much the same way that companies in the financial services sector, among others, decided decades ago that technology more generally would drive their businesses. Others have decided – for the time being, at least – that while data analytics is a powerful tool, it is a means to an end whose role is to provide support, with a myriad of applications across the board. Some businesses, including many in media and professional services as well as those in the technology sector, will use data analytics in three ways: as part of their core offering, to develop their own new products and services, and to run the business itself.

It is not yet clear who, if anyone, 'owns' data analytics within business or who will take the lead with it going forward. People in a number of different roles, including operations, marketing and finance, currently drive data analytics. In some businesses the use of data analytics in the finance function is leading the way but in many it is driven by operations or marketing, where the tools were first developed and used.

All of this is important strategically in terms of human resources. Expectations change quickly. Less than 20 years ago, business leaders had genuine concerns about whether the advent of computers meant that everyone would have to learn to type, and about the implications of that for recruitment and training, including sensitivities about status. It certainly seems possible that the ability to use **simple** data analytical tools embedded in spreadsheets will become as commonplace, in time, as the ability to use a keyboard, particularly in professional services. Nevertheless, decisions still have to be made about whether everyone will ultimately be expected to understand data analytics and use more sophisticated tools, or whether it is likely to remain a specialist area, at least for the time being.

TECHNICAL SPECIALISTS AND BUSINESS LEADERS

Technical specialists are currently needed to test the algorithms used to calculate technical insurance provisions. They are needed to perform reconciliations, identify outliers, and explain all of this to non-specialists. Such specialists are in short supply and there is an important debate to be had about the balance needed between people skilled in using data analytics tools, and people who understand and can manipulate the underlying components. There is an equally important debate about the extent to which those using the tools can safely do so without understanding the underlying components. These skill sets may not necessarily be easy to develop in tandem.

Management and auditors need to understand the assumptions built into models and the impact of those assumptions on specific calculations. A long-standing issue brought back into focus by data analytics is the importance of assumptions made by developers, such as the exact definition of cut-off points, the exact timing of a security pricing and assumptions regarding categorisation and classification.

There is an unmet demand for good quality staff skilled in the use and management of data, the software that manipulates it, systems, statistics, and mathematics. 'Data scientists', 'data analysts' and 'data assurance' specialists – terms often used loosely and interchangeably – have to understand and adapt to new circumstances quickly, and be agile and resilient in the face of competing demands and constant change. Such individuals may lack relevant business skills.

Key issues management has to address include where technical specialists sit within the management structure, and the potentially disruptive effect changes to that structure have on the existing balance of power and perceptions thereof. Certain specialist technical skills, more common among the young, are of limited use without the confidence and experience to exercise judgement in a shifting environment. Tomorrow's business leaders will still need to be able to apply their experience to determine what looks and feels 'right' within different business models.

THE CHALLENGE FOR MANAGEMENT

- Are our competitors using data analytics? What are they using it for? Can they tell whether it has made a positive contribution to their bottom line?

- How can we build data analytics into our corporate strategy? Is it a core business process or will it be a specialist tool to support our existing model?

- Have we challenged advocates of data analytics to describe the insights it might actually provide for us, and what difference it will make to our business?

- How can we use data analytics to experiment? Does it have a role in product innovation? What might we be able to do with data analytics that we can't do now?

- Are we expecting everyone to use this technology? To what extent? If we need to recruit specialists, can we articulate the skills we are looking for and at what level?

2. Improving business performance

How can management achieve better results now by streamlining operations and cutting waste, without making fundamental changes to the business?

THE VALUE CHAIN

The uses of data analytics seem endless. In business, simple data analytics tools embedded in spreadsheets have been used for many years to improve:

- **revenue and profit**: data analytics provides a better understanding of customers and their buying patterns and thereby improves the quality of decision-making; and

- **operational efficiency**: this includes cost reduction, through a better understanding of suppliers, stock and logistics.

We all understand that supermarkets use information about our buying patterns to provide us with vouchers, but there is less awareness of the data analytics used to optimise the layout of petrol stations and the significance of the distance between chocolate and the tills. Internet shoppers may not be aware of the data analytics behind Amazon's 'next best action' marketing or eBay's 'next best offer', but they benefit from it, as they do from the wider use of data analytics in the retail, financial services and telecoms sectors.

Many recent changes facilitated by data analytics are about granularity and the ability to take more variables into account, and to experiment. Data that could not previously be retrieved or structured in a useful manner is now used to enhance decision-making. Data analytics facilitates quantification to back up judgement calls, reduces the need for guesswork, and provides reassurance to senior staff with responsibility for process and decision-making.

Profit maximisation in the retail sector using mark-down algorithms is replacing guesswork based on experience or intuition – 'halve the price and see what happens – it usually shifts most of what's left'. The sensitivity of sales to price reductions and timing also facilitates much greater precision in provisioning.

Data has been analysed for many years to optimise logistics in general and stock management in particular. The characteristics of successful supply chain management in organisations such as Walmart are well understood and while much of what is now described as data analytics is not entirely new, it is a great deal faster and more sophisticated.

Companies are improving their logistics management by analysing satnav data that tracks the movements of fleets of vans carrying spares. They now understand, at a much more detailed level than before, where the vans are going and what they are carrying, so that fewer can travel shorter distances, carrying less.

Data analytics is increasingly used to drive other aspects of operational efficiency. Information gleaned from customer loyalty programs is now used to finesse operations and marketing, by using it to understand patterns of returns – whether to the point of sale or centrally, for example – to help position an entity's interactions with customers.

Revenue collection for larger telecoms companies depends substantially on whether revenue is billable in the first place. They 'leak' a percentage of their revenue, partly because of weaknesses in billing systems but also because of the fraudulent use of handsets, SIM card cloning and the unauthorised usage of legitimate accounts. Such companies make extensive and effective use of data analytics to deal with these types of fraud.

In some industries, particularly systems and software development, data analytics is an integral and central part of product development. 'Lean' methodologies (such as Lean Sigma Six) applied to product development in these industries involve the development of 'minimum viable products', with just enough features to learn about how they operate. This is less expensive than putting together a more developed product with more features, which increases cost if the product fails.

FINANCIAL MANAGEMENT

Well-run companies have used spreadsheets for decades to perform good quality analyses of working capital data. Even so, insights yielded more recently by the new tools, including spreadsheets with embedded tools, can still come as a surprise to management. Detailed analyses of working capital ratios, average payment times, agreed terms with customers and suppliers, and early payment discounts sometimes suggest that the approach to customer and/or supplier relationships needs to be reconsidered.

Directly or indirectly, data analytics can highlight the limitations of automation, as well as straightening out management's understanding of systems. There is often less standardisation in transaction processing than management likes to think, hence the persistence of staff employed to apply judgement where systems cannot cope with certain types of exceptions. It is common for management, internationally or otherwise, to seek to automate as much as possible even where a large proportion of transactions are unsuited to this type of commoditisation. Manual interventions become necessary if management ignores the fact that relevant populations – whether they be debtors, creditors or fixed assets – are insufficiently homogenous to be accommodated in their entirety within automated systems. Such interventions are also needed to deal with issues requiring the use of judgement and structural inefficiencies, and sometimes simply because that is the way things have always been done.

Data analytics can improve accountability by helping management focus on controls more effectively in the real higher risk areas, rather than in areas management believes are higher risk.

A common insight arising from data analytics is that despite attempts to impose standard terms of trade on customers, and a belief among managers that such terms are in fact imposed, customers often end up having different terms. This is because they are less homogeneous as a group than management thinks they are, and because many systems are unable to take account of individual debtor circumstances. Such systems may not produce information that highlights the level of manual intervention needed to operate them and it is not uncommon for management's understanding of systems to be incomplete. Data analytics can highlight such issues.

If the scope of processing controls is circumscribed, it represents a potential control risk. Being aware of such a fact is important for management. If the board thinks that a receivables system is automated, it should be helpful to have it pointed out that 35% of transactions are processed manually, and that the entity employs three people solely to process credit notes. Auditor insights into the nature and extent of these 'manual workarounds', how they arise, why, whether they are justifiable and what, if anything, can be done about them can be valuable to management (subdividing responsibility for a ledger is a common response). Even so, such insights may provide little in terms of audit evidence for the auditors providing them.

Systems are increasingly capable of accommodating variations in debtor circumstances. For example, utility companies are starting to redefine the way they chase debt using detailed demographic profiles: the well-off are pursued first because there is a greater likelihood that they have simply forgotten to pay. The granularity of such analyses also improves precision in provisioning.

Applying data analytics tools to underlying transactional data and recalculating output for comparison with ledgers can highlight other issues of which management was not previously aware. Examples include:

- stock provisions calculated on flawed bases, such as provisions that do not take account of returns, resulting in some items erroneously showing as negative quantities;

- stock provisions based on items showing no movement in 90 days, which only works if no additional stock has been bought in for the first time or to fulfil a specific order;

- doubtful debt provisions for anything over 120 days based on the due date rather than the invoice date (ie, the provision is effectively for anything over 150 days); and

- higher levels of systems and controls override in these areas than management is aware of.

Data analytics is increasingly applied to risks such as fraud, bribery and corruption at a high level, as well as at a more granular level. Large payments to government officials are at least as important as handing out difficult-to-obtain sports tickets. Data analytics can help senior management decide on which risks and areas to focus on.

Governance risk and control (GRC) modules within SAP facilitate the analysis of tables to identify outliers. Kickbacks in the oil industry have been identified using relatively simple data analytics based on the timing of invoices and the volume of purchases going to certain individuals through purchase ledgers.

Payroll is often considered a potentially high risk area for many reasons. That perception usually leads management to implement good quality controls in a highly automated environment. However, some larger organisations are starting to apply data analytics to payroll as a means of improving operational performance, as well as using it as a control measure.

Analyses highlighting payments to different individuals going to the same bank accounts, or trends in overtime, can serve as indicators of fraud and error, but also as indicators of operational dysfunction and the need for improvements to budgeting, and/or operational, management or HR systems. This is as important within the services sector as it is within manufacturing. While many well-run organisations already perform this type of analysis, new data analytics tools have made better quality analyses available to a wider range of entities and to a wider range of individuals within those entities.

Some larger firms of auditors now offer data analytics services to SMEs, focusing on payroll and purchasing controls within Sage systems, for example. Straightforward tests for supplier or employee duplication are possible as are tests on payroll data, including tests for incorrect NI numbers, dual payments and pay rises outside certain parameters. Many such tools, now applied as a matter of course, were originally developed as forensic tools.

Auditors are also beginning to develop proprietary industry benchmarks from their use of data analytics. The scope for this is limited because to avoid confidentiality breaches, there must be a deep and wide pool of data to draw on. Where that is the case, industry standards are often already publicly available. Auditors are nevertheless developing benchmarks in a number of new areas, such as where charts of accounts are used within a particular sector or geographical region, and for particular account areas. For example, entities of a certain size and nature often have a predictable number of bank accounts. If a certain type of entity holds an average of 10 bank accounts, and 95% of such entities have between 5 and 15, but the audited entity has 60, that information can be valuable to management.

THE CHALLENGE FOR MANAGEMENT

Have we considered how data analytics could:

- Free up resources we have tied up in stock?

- Expedite better quality workflows and shorten the gap between cash going out and coming in by analysing the conversion in more detail?

- Improve credit control through a better understanding of how we enforce our credit terms?

- Reduce the time we spend chasing people who aren't going to pay by understanding more clearly who we extend credit to?

- Make more accurate provisions for doubtful debts based on better quality, evidence-based assumptions?

3. Rethinking management and control

We consider the fundamental changes to business culture and management style that are needed to help businesses develop in areas and markets they could not previously consider, and to help keep competitors at bay.

DATA ANALYTICS, MANAGEMENT STYLE AND CONTROL

Data analytics is changing the way many businesses achieve their existing objectives. Improved returns are critical to justifying the necessary investment. But data analytics also has the potential to bring about more fundamental changes to a business in terms of products and services, the markets it operates in, the business model and management's culture and style. It seems likely that in many cases, data analytics will ultimately demand these changes if the business is to survive. If management does not appreciate this, and in particular the significance of data analytics as a business issue rather than just a technical one, there is a risk that the business will, sooner or later, be overtaken by competitors who do understand it.

Fundamental changes to business culture and management style are needed if data analytics is to be used effectively to get to the market faster, with a better offering, and to develop and move into new markets the business would not have considered before. These changes may also be needed simply to keep ahead of the competition in existing markets. Management needs to move beyond the desire to enhance business performance if it wants to exploit

the faster, evidence-based, experimental approach to business development that data analytics supports.

Exploiting this approach to business development may involve abandoning, or at least de-emphasising the more traditional, planned and slower, more linear, preventative approaches to management and control. It also requires management to trust, unshackle and empower some of the people and tools it has, in the past, simply sought to control. These are often younger people. The potential disruption to the established order this represents highlights the wider costs and risk that data analytics entails. But **not** going there can present a potential risk to the existence of the business itself, in the longer term. Keeping governance and control structures aligned with decision-making and control processes as they actually operate is important, particularly when data analytics starts to play more significant role in a business.

Audit firms seem to have grasped all of these issues early on. Larger firms now have significant investments in sophisticated data analytics that are a critical part of their core offering to the listed company audit market. They continue to make the associated changes to their governance and control structures to reflect the change in the way they perform audits.

One key feature of data analytics is its capacity to facilitate evidence-based management. Going forward, judgement based on experience will be applied in different ways to new areas. Investment decisions increasingly involve the use of evidence-based evaluation tools. Data analytics alters perceptions of risk and methods of risk management because the ability to experiment without committing resource significantly reduces the need to rely on hunches.

Other key features of data analytics include the unprecedented level of granularity it offers in terms of properly defined outliers, and the speed at which analyses can be performed. Detailed data analysis has always been possible but the time and effort involved have acted as a deterrent. Data analytics is a powerful force for control and discipline, and has important implications for management style. Insights from data analytics facilitate change and improved efficiency, and this frees up time for renewed focus on business objectives. There is a risk that this never happens though, if management chooses to use data analytics simply to extract as many efficiency gains as possible.

Until recently, senior management's view has effectively been from the equivalent of 35,000 feet because there has been neither time nor appetite to do more. Staff knew that much of their work and behaviour was effectively unobservable. Data analytics has changed this. Detailed observations in highly specific areas, such as the automatic comparison of historic exchange rates with those used in expense claims, cannot fail to have an effect on behaviour.

There is an ongoing debate about the behavioural and ethical implications of this type of enhanced scrutiny. Management can now see into places it could not see before, which has the potential to make it smarter, and the controls it puts in place more effective. But data analytics also has the potential to be perceived as a sinister means of surveillance and it is important that it incentivises better and more appropriate behaviour, rather than resentment and avoidance behaviour. The use of data analytics, if poorly managed, can be counter-productive and there is a real risk that management's approach degenerates into unproductive micro-management.

Management needs help in acknowledging and dealing with the vast increase in its capacity to ask questions at every level. Resource constraints that used to limit the nature and extent of questioning have gone, and the expectation is that the new powers data analytics brings to management will be fully and well-used.

DATA ANALYTICS AND GOVERNANCE

In some entities, data analytics continues to provide insights into the effectiveness of controls and governance. Modern transaction processing generally involves less human input than it used to, and the IT function and decisions taken by data specialists operating outside that function can have a significant effect on a business. Long-standing issues about how IT functions interact with the broader business are well-understood but data analytics has brought some of them back into the spotlight again.

An issue involving the misreporting of student numbers by universities, who were subsequently overfunded, arose partly from data collation errors and partly because of the way in which IT staff, who were disengaged from the wider process, interpreted rules governing the calculation of student numbers with reference to students joining, leaving and changing courses.

There are also worries – once again, not entirely new – about a lack of awareness in some entities of the way in which IT can drive business strategy. Decisions about the design of data, dashboards and other reports can be critical to business performance. If management is not aware that certain types of data are available, or that it can be analysed in different ways, something as simple as the design of a report by a relatively unior member of staff can have a disproportionate impact on the business. There is increasing awareness of the need for management to ask questions in this area, so that the consequences for the wider business are properly thought out. The increased use of data analytics should lead to increased accountability and proper recognition and representation of the IT function, among others, within the governance infrastructure. Management needs to understand 'the art of the possible', and the need for and value of the technically complex preparatory steps that are necessary for the successful implementation of data analytics. Others with key roles in driving data analytics in a business need to understand the business implications of the decisions they make, regardless of where they sit within the entity.

UNDERSTANDING HOW CONTROLS REALLY WORK

The use of data analytics often highlights the fact that controls in general, but particularly within the finance function, are more complex than management imagines, and are sometimes inefficient or over-engineered, especially if legacy systems are poorly maintained. It can also demonstrate incidentally that functionality is underused, through an analysis of journals, for example. Many systems have good quality routines for monthly closing and roll-forward, but the facility is not always used. Management may be reluctant to admit that it is inefficient for staff to continue to write journals to clear down systems and create the opening balances in the subsequent period.

Segregation of duties, authorisation, approval and access controls may be weaker than management thinks. We note above how the use of data analytics can show that more people are involved in invoice processing than management thinks. An even bigger surprise can be the number of staff with permission to modify systems. The implications of this can be significant. After they are initially set up, and as a business develops, the number of people with permission to modify systems tends to increase as systems change. The intention may be to remove them when they no longer need a particular access or level of authorisation, but this does not always happen.

While management is often on top of the basics, such as posting invoices and cash receipts, it is often less comfortable with changes to IT systems more generally. Management sometimes gives those with responsibility for such systems what they ask for in terms of permissions and access, in the hope that it will make seemingly difficult problems go away. The problem is not new but the use of data analytics can draw attention to it. The important point in all of this is for management to recognise the opportunities such insights provide for improvement. These insights have always been possible using walk-throughs, but resource constraints have meant that it has rarely been possible to look at the whole system in such detail and in such a short space of time, without the uncertainty involved in sampling.

MANAGEMENT'S CONTROL FOCUS

To date, management's overriding objective for controls has generally been preventative, making sure that things happen as they should do by stopping them going wrong. Controls are also designed to detect things that do go wrong, and to deal with them, but the focus has to date been firmly on the former – prevention being better than cure.

The balance is shifting, partly because of the reliability of automation, but also because of the detective capabilities of data analytics. Data analytics is moving management's attention in many businesses away from preventative and towards detective controls. Auditors observe that the effective use of data analytics is only possible if this subtle but important change of mindset occurs. Well-designed automated preventative controls are a great deal cheaper, more reliable, widely available and easy to use than they once were. Management therefore increasingly focuses on detective controls, whether automated or manual, at a later stage. Cost-benefit decisions are being made about replacing preventative controls, involving the manual scrutiny of documentation, with semi-automated detective controls, such as the production and review of dashboards.

> Dashboards can be produced automatically and reviewed manually to identify breakpoint clustering – attempts to avoid authorisation or trading limits by dividing transactions so that they fall just under regulatory trigger points. Previously such clustering would only have been identified by a manual review of transactions.
>
> Preventative controls are designed collectively to ensure that only genuine creditors are paid the right amount for properly authorised goods received and services rendered. One such control, commonly embedded in enterprise resource planning (ERP) systems, matches bank details in payment runs to the creditor's listing. Data analytics tools can perform such checks in real time, immediately before the payment run is made.

Regardless of whether a control is applied at the input stage to prevent errors, deviations and fraud, or at the output stage to detect them, the biggest risks lie in the use of judgement in dealing with exceptions. The exercise of judgement is hard to control and assess, reperform or replicate at a granular level.

A control involving a reviewer deciding whether to authorise an invoice or to send it back cannot be reperformed or replicated using data analytics. For management, evidence from the operation of other controls can provide comfort that reviewers are exercising their judgement appropriately. Examples include the review of dashboards and other management information, including reviews of the number and value of accepted and rejected invoices by individual, and other after-the-event substantive procedures. It is also possible to infer the operation of such controls from evidence such as signatures on invoices falling outside acceptable parameters, for example, or the acceptance or rejection of certain invoices. However, auditors, regulators and standard-setters are not comfortable with this idea. No one knows whether someone simply hit the 'accept' button. Again, the issue is not new but data analytics has brought it back into focus.

While reperformance and replication of controls involving the use of judgement is difficult, the reperformance and replication of automated controls is easier. GRC modules within SAP now enable entities to reperform automated controls for themselves. But even this can result in false positives regarding the effective operation of controls where management does not have an up-to-date and accurate understanding of its own systems, or if it fails to configure or calibrate the tests properly, for example.

For regulated entities, the regulator's approach drives behaviour. There is increasing recognition among regulators of the importance of management's focus on judgemental areas, such as the detailed assumptions underlying the calculation of estimates, as well as the operation of systems and process controls. Recent profit warnings and adjustments to sales forecasts have arisen from changes to management assumptions about the extent of underlying customer interactions with digital platforms, and not from issues with the platforms themselves. A 2016 Prudential Regulation Authority paper *Solvency II: internal model approval process data review findings* describes how insurers' risk models deal with capital adequacy requirements, and emphasises the importance of understanding in detail the assumptions underlying the classification of assets as funds or equity, for example.

Some fear that the pendulum may swing too far. Prevention may well remain better than cure for important controls. If an inappropriate transaction has been entered into or if services have been rendered to a poor credit risk, for example, the damage may have been done and the entity is exposed. While data analytics may facilitate a faster reaction, by putting the customer on a watch list, for example, the risk may be reduced but it will not be eliminated. Measuring the benefits of preventative controls has never been easy but some take the view that in higher risk situations, such as those in which data is managed offshore, preventative controls must remain paramount because of the time lag before control failures come to light and logistical difficulties in dealing with them after the event.

Preventative controls will also remain important because poor quality data that makes its way into systems makes for poor quality data analytics and decision-making. The effect of 'turning off' preventative controls and using data analytics on a real-time or near real-time basis is intended to help management focus on good quality data to make better quality, informed decisions. In practice, it can highlight data quality issues. Data analytics is not necessarily cheaper or more reliable than processing controls. Nevertheless, senior management's focus is generally moving away from detailed input and process-management activities to the monitoring and management of output, which is also evident in the growth of lean, evidence-based, adaptive management systems. These involve collaborative experimentation, rather than the construction of systems from first principles followed by control, monitoring and remediation.

Despite this shift in emphasis, regulatory focus on preventative systems and process controls seems likely to continue for some time. It also seems likely that data analytics will continue to play an important role in compliance, wherever the emphasis lies. For example, the operating effectiveness of systems and process controls in accordance with the Financial Conduct Authority's (FCA) Client Assets Sourcebook (CASS) remains a key issue for FCA-regulated entities. Data analytics is also likely to play an important role in compliance with the extended scope of the EU General Data Protection Regulation, which may replace existing data protection legislation in the UK in 2018. Some larger financial services providers currently consider their core transaction processing controls to be strong enough to permit them to outsource the related data analytics. The new EU data protection requirements are broader and less specific than those under the existing regime, and they may result in entities having to think harder about how to protect their data.

Some take the view that all data analytics has done is to enable management to double up on controls, relatively cheaply, at both the input and output stages. Even so, management still has to decide on the balance of preventative and detective controls, and the shift described potentially diminishes the significance of control problems associated with ramshackle legacy systems, partly because it gives rise to the possibility of control and audit by recreating output using independent models. Internal and external auditors are asking the same questions as management, using the same data sets to see if they come up with the same answers. This can be a great deal more effective than checking inputs to outputs, particularly on a sample basis.

There is a challenge for internal auditors to move up the value chain in all of this and to continue to be the eyes and ears of management before the external auditors arrive. Most leading internal audit consultancies now de-emphasise substantively testing transactions and

process on the grounds that management should have first-line monitoring controls to do this effectively, enabling internal audit to move into more judgemental areas.

THE CHALLENGE FOR MANAGEMENT

If we seek to increase our use of data analytics, can we:

- Better align our governance and control structures with how our business actually works?

- Move towards management based on what is actually happening and reduce our reliance on traditional preventative controls?

- Simplify our authorisation and approval procedures based on more effective detective controls?

- Make sufficient changes to our governance and control structures to put sophisticated data analytics at the heart of our business?

- Ensure that what we spend on data analytics helps us improve the business as a whole, as well as doing what we already do better?

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4. Thinking ahead

We consider how data analytics enables SMEs to challenge bigger players, how it paves the way for regulated businesses to challenge regulators, and what needs to be done to ensure that people with the right skill sets come through in the longer term.

DATA ANALYTICS, MARKETS, SCALE AND SMEs

One view of data analytics is that it works best at scale in entities with the resources to support the substantial investment required, and with the appetite for the risk involved and the reserves needed to wait for the payback. Others take the view that while the leading-edge technology in data analytics may be developed in larger entities, in the longer term it will take root in the SME market. They believe that it will have a democratising effect, empowering everyone. Proponents of this view point to spreadsheets, an almost universal tool, now embedded with good quality and increasingly sophisticated data analytics tools. They also point to the development of data analytics applications by and for SMEs and micro-entities.

The key question for many entities, including SMEs, will be whether and how their competitors use data analytics, and whether they have or can find people with the skills to develop it. The appearance of smaller, more agile entrants in any market further erodes some of the advantages previously enjoyed by incumbents simply by virtue of size and scale.

Many smaller entities make good use of tools embedded in cloud-based packages such as Xero. These systems increasingly have the capacity to 'learn' about the way an entity processes transactions, enabling systems to post the double entry automatically from bank statements, for example. User-friendly drag and drop technology embedded in packages such as such as Tableau and QlikView are used by many smaller businesses whose main strength is in data collection and analysis, such as those providing design, media support, PR, branding and

communications services. Many such entities use – and are in some cases dependent on – emerging low-cost analytics platforms as a core business activity. They overlay raw data with these tools as their main business offering, and only afterwards do they start to think in more detail about the need for integrity in the underlying data. The application of data analytics to the clients of such businesses is sometimes hampered by poor quality data. There is no point in applying analytics to data compromised by a lack of segregation of duties or IT controls, for example.

Those engaged in developing bespoke data analytics software for smaller entities express caution about the brave new world of tools embedded in spreadsheets and free and low-cost software. They point to the limitations of the former and the need for extensive modifications to the latter in many cases. Nevertheless, while tailored and bespoke tools are always likely to produce better quality and more reliable analysis, the availability and success of free and low-cost software and the widespread use of spreadsheets mean that both are likely to serve as an entry point to data analytics for many SMEs for the foreseeable future.

Some of the best examples of data analytics embedded as controls are in larger entities in financial services, the sector in which many of the tools were originally developed. Reporting on key risk indicators using data analytics is now routine in that sector. Larger organisations generally, including government departments, often have entire departments devoted to data capture and analysis. Some have invested in the modern architectural infrastructure required to optimise the use of data, but many continue to use spreadsheets or add-on tools. A large number will only be able to move ahead with data analytics when ERP providers have finished building the tools into their core systems.

REGULATORS AND DATA ANALYTICS

Regulators are seeking to embrace two aspects of data analytics: understanding how those they regulate use the technology, and how they use the technology themselves as part of their regulatory activities. Regulatory frameworks are evolving to accommodate data analytics. There are tensions between those who believe that regulators, including prudential regulators and accounting and auditing standard-setters, need to take a radical approach to rewriting regulatory frameworks to accommodate data analytics, and those who believe that it can and should be accommodated within existing frameworks.

Proponents of the former view point to the insurance industry, which is changing to deal with the fast-disappearing assumption that it is impossible to predict risks on an individual basis. They believe that some of the basic regulatory assumptions about risk, sampling, controls and evidence are outdated. They argue that regulators must think the unthinkable if they are to maintain their standing and influence, and believe that if they do not, there is a risk that mature and sophisticated regulatory frameworks will ossify and that the wider regulatory regime will be marginalised.

Data analytics challenges regulators in several ways.

- There is a risk that regulators simply do not keep up with those they regulate, either for want of resources or because of a scarcity of specialists with the right technical skills. Many regulators depend partly on those in the later stages of their careers ie, those approaching retirement or recently retired from the ranks of those they regulate, but there are few data analytics specialists who fall into this category.

- Regulators need to understand the different ways in which those they regulate use data analytics. There are likely to be many different models, all of which will be in a state of flux for some time to come. Data analytics may be central to how regulated entities perform the regulated activity, or a support function, or both. Regulators will need to understand any shift in focus from traditional preventative controls to more real-time detective controls, and the implications that has for regulatory processes. The distinction may not be clear and if regulators do not understand how those they regulate use data analytics, regulatory effectiveness and perceptions thereof may be compromised.

- There are expectations that regulators will themselves use data analytics in their activities, to assess and manage risk, using information provided by those they regulate, and in particular to identify outliers. Those they regulate are now able to provide regulators with far more information than before. Regardless of how well regulators configure their own analytical tools (if indeed they have any), and regardless of the nature or extent of information demanded of regulated entities, there will be problems that regulators miss. Those problems may well be evident in actual data held by the regulator or in data that the regulator could have requested.

Rightly or wrongly, it seems likely that an expectation will develop that regulators can and should know what is going on in every corner of every entity they regulate, at all times, and that regulators should monitor everything that those they regulate do, on a real-time basis. Managing these expectations, and admitting that despite the mass of data available to them, they may miss something, involves acknowledging regulatory limitations. It should also lead to a renewed debate about checks and balances within the wider financial reporting supply chain and the need for the commitment of **all** stakeholders to regulatory propriety and good corporate behaviour.

It also seems likely that data analytics will enable regulators to develop new industry benchmarks and other information useful to those they regulate. Demands for that information from regulated entities to help them improve their own performance seem likely to increase.

TOMORROW'S PEOPLE: MANAGEMENT, AUDITORS, GOVERNMENT AND EDUCATORS

The challenge of auditing highly complex financial models used in exotic financial instruments has forced some auditors to develop skills in creating their own models to replicate or emulate those of management. It is just as common, however, for management to be interested in the output of auditor data analytics. These include cash-flow simulations for investment purposes to highlight potentially risky business components. If management cannot replicate this type of output, it may seek to buy the auditor's software or ask auditors to run their routines on a monthly basis. This necessarily involves discussions about independence.

While it is easy to ask the external auditors, others – including internal auditors and internal audit consultancies – can and should take and develop what external auditors find during the course of the audit. At present, auditors and management in many entities have the sense that auditors are 'providing' certain types of very specific data analytics to management as part of the external audit. Auditors promote and clients expect a high level of granularity. This seems unlikely to last as user-friendly data analytics tools become more widely available, and cheaper, and entities become more confident in their own use of data analytics. Tensions between the requirements of auditor independence and management use of auditor data analytics seem likely to diminish over time as the use of cloud-based systems with good quality embedded data analytics tools increases and as ERP systems develop, providing increasingly sophisticated and easy-to-use modules for management to interrogate.

Overcoming the challenges of scale and complexity and the associated risks more widely is where many auditors see their firms adding value going forward, by providing an independent view of the effectiveness of analytics embedded as controls by management. Auditors see themselves helping management assess the array of competing off-the-shelf and bespoke data analytics tools, using auditor-developed proprietary assessment tools to determine the quality of what is on offer in general and its suitability for the business in particular.

Analytical tools are not new and while a few no longer rely on databases or spreadsheets, most still do. Familiarity with those technologies is important because tools based on them are likely to persist. The hallmarks of the new tools generally are their capacity, user-friendliness and visualisation functions. Those skilled in these technologies, particularly in the use of the off-the-shelf packages now being developed for smaller entities, are in demand.

We note above the need for a debate about the balance between people skilled in using data

analytics tools, and people who understand and can manipulate the underlying components. We also note questions on the extent to which those using the tools can safely do so without understanding the underlying components. Do auditors need to have significantly enhanced statistical and mathematical skills? Or do they need to know just enough to work with data scientists effectively? Will auditors be replaced by data scientists performing automated audits with the help of just a small number of financial accounting and tax experts? All audit staff will need training to make high quality judgements about sophisticated analytics, and to determine when to step in to override analytics-based recommendations, in any case.

Audit firms are good examples of businesses that have addressed this issue, and different firms are taking different approaches. Some firms have already made it clear that they are seeking to increase the number of data scientists and data assurance specialists they recruit and train, just as they reduce their general graduate intake. Others are equally clear that while data analytics is an important part of their offering, they have no current intention to change in any fundamental way the sort of people they seek to recruit. Other businesses are even more diverse in their approaches.

Government, universities and professional bodies such as ICAEW are thinking about this balance, and about how to ensure that the demand is met and that people with the right skill sets come through. ICAEW is consulting with employers and regulators, syllabuses are being revised, and alternative qualifications and pathways to the profession, including apprenticeships, are being considered.

The challenge for everyone involved is to find people with the imagination, foresight and resources to develop data analytics and to use it effectively. We need to find them quickly.

THE CHALLENGE FOR OWNERS AND MANAGERS OF SMES

- How do we as an SME learn more about the potential of data analytics for our business, and what could the tools already available do for us?

- What opportunities are there for us to use data analytics to improve what we do, take us into new markets, or change what we do altogether?

- Who do we need to work with and what tools do we need to invest in to generate new business and take business from our competitors? Who could we stand on an equal footing with?

- Who do we already have who can use this technology? Can we get more out of the data analytics tools embedded in the spreadsheets we already use?
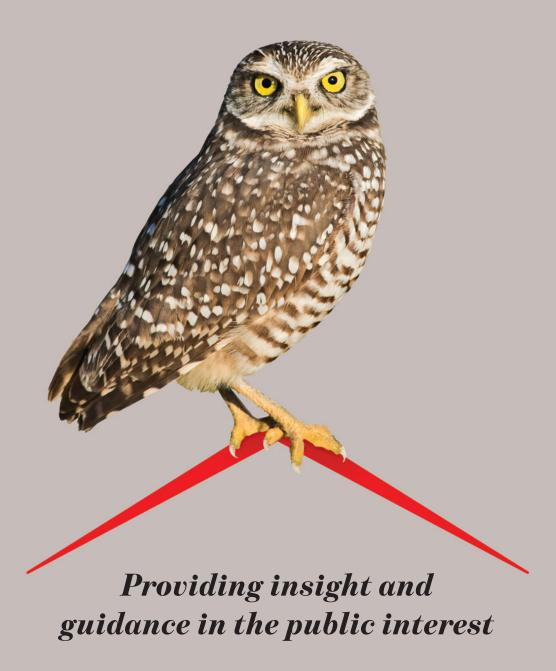
THE CHALLENGE FOR MANAGERS OF REGULATED BUSINESSES

- How can we challenge our regulator to optimise regulatory activity, and manage expectations about how they go about it and what it can expect to achieve?

- How can our regulator help us perform better?

- Can we contribute to a renewed and constructive debate about the limitations of regulatory activity and the importance and development of the wider system of checks and balances?

LONGER-TERM CHALLENGES FOR MANAGEMENT

- How should we prepare for the likely disruption to our markets that smaller, more agile entrants are likely to cause?

- How should we engage with professional bodies, government and others to make sure the skills we need will be available to us in the future?

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For more information on the Audit and Assurance Faculty, the current work programmes and how to get involved, visit icaew.com/audit. To learn more about *Audit insights* contact Henry Irving at henry.irving@icaew.com, or on +44 (0)20 7920 8450.

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