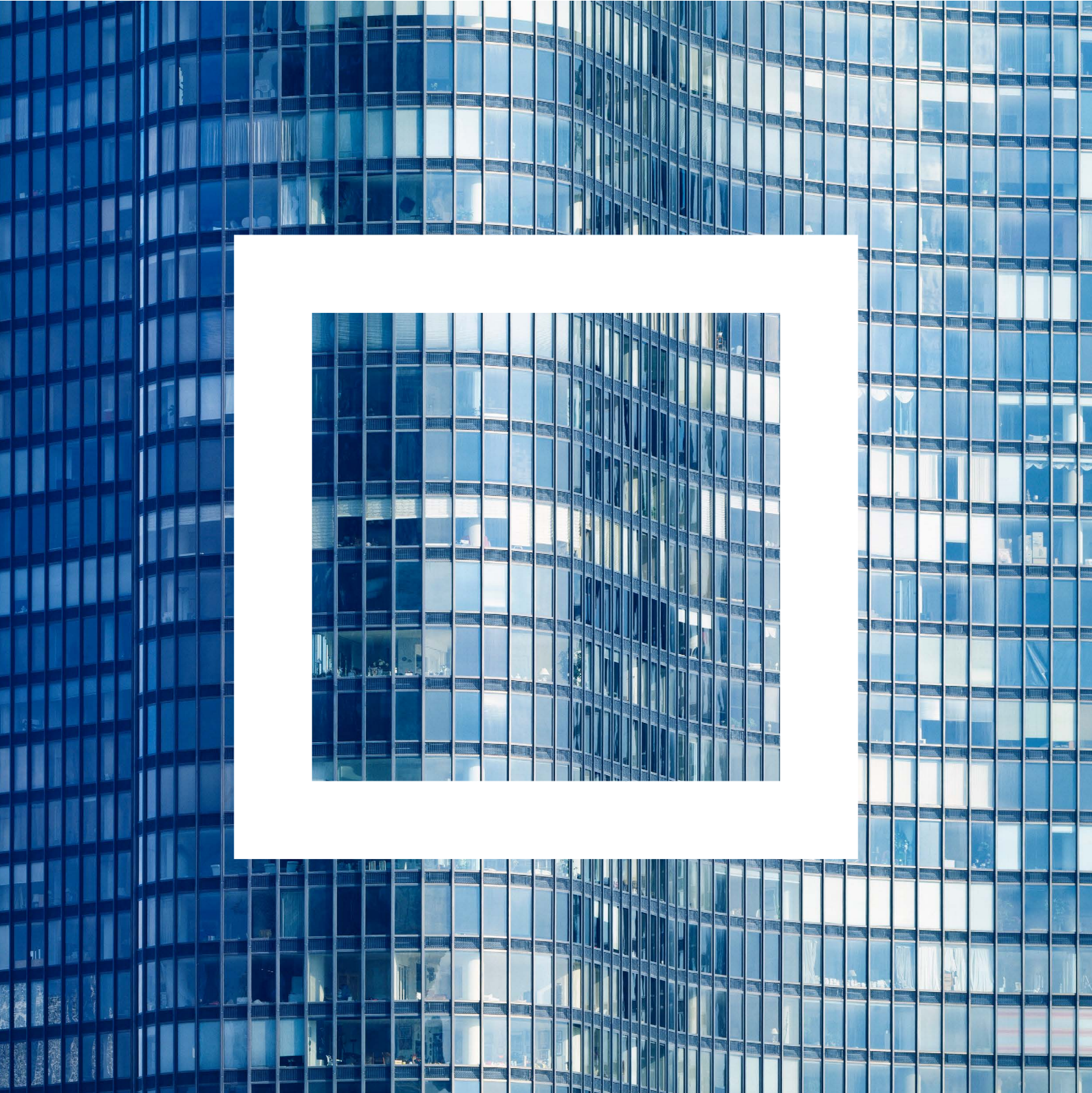ACCA Think Ahead

CHARTERED ACCOUNTANTS™
AUSTRALIA + NEW ZEALAND

DIFFERENCE MAKERS™

ANALYTICS IN FINANCE AND ACCOUNTANCY

About ACCA

ACCA is the Association of Chartered Certified Accountants. We're a thriving global community of 227,000 members and 544,000 future members based in 176 countries that upholds the highest professional and ethical values.

We believe that accountancy is a cornerstone profession of society that supports both public and private sectors. That's why we're committed to the development of a strong global accountancy profession and the many benefits that this brings to society and individuals.

Since 1904 being a force for public good has been embedded in our purpose. And because we're a not-for-profit organisation, we build a sustainable global profession by re-investing our surplus to deliver member value and develop the profession for the next generation.

Through our world leading ACCA Qualification, we offer everyone everywhere the opportunity to experience a rewarding career in accountancy, finance and management. And using our respected research, we lead the profession by answering today's questions and preparing us for tomorrow.

Find out more about us at **www.accaglobal.com**

About Chartered Accountants Australia and New Zealand

Chartered Accountants Australia and New Zealand (Chartered Accountants ANZ) represents more than 125,000 financial professionals, supporting them to build value and make a difference to the businesses, organisations and communities in which they work and live. Around the world, Chartered Accountants are known for their integrity, financial skills, adaptability and the rigour of their professional education and training.

Chartered Accountants ANZ promotes the Chartered Accountant (CA) designation and high ethical standards, delivers world-class services and life-long education to members and advocates for the public good. We protect the reputation of the designation by ensuring members continue to comply with a code of ethics, backed by a robust discipline process. We also monitor Chartered Accountants who offer services directly to the public. Our flagship CA Program, the pathway to becoming a chartered accountant, combines rigorous education with practical experience. Ongoing professional development helps members shape business decisions and remain relevant in a changing world. We actively engage with governments, regulators and standard-setters on behalf of members and the profession to advocate in the public interest. Our thought leadership promotes prosperity in Australia and New Zealand.

Our support of the profession extends to affiliations with international accounting organisations. We are a member of the International Federation of Accountants and are connected globally through Chartered Accountants Worldwide and the Global Accounting Alliance.

Chartered Accountants Worldwide brings together members of 13 chartered accounting institutes to create a community of more than 1.8 million Chartered Accountants and students in more than 190 countries. Chartered Accountants ANZ is a founding member of the Global Accounting Alliance, which is made up of 10 leading accounting bodies that together promote quality services, share information and collaborate on important international issues.

ANALYTICS IN FINANCE AND ACCOUNTANCY

This global research explores how analytics affects finance and accountancy teams within organisations, as well as the roles and skills of professional accountants.

The insights in this report are based upon over 30 in-depth interviews with finance leaders, financial analysts and data specialists across the globe, representing a range of industries, and from a range of industries and organisation types. The report draws on these interviews to demonstrate at first hand the natural evolution from finance departments that handle just financial information to those dealing with a diverse array of non-financial information, generating value and using business intelligence to produce tangible results. Insights have also been drawn from a survey of 1,150 accountancy and finance professionals, including ACCA and Chartered Accountants ANZ members and future members. The survey was conducted in October 2019.

Location

- United Kingdom, **17%**
- Malaysia, **7%**
- Pakistan, **6%**
- Australia, **5%**
- Hong Kong SAR, **4%**
- United Arab Emirates, **4%**
- Republic of Ireland, **4%**
- Other, **54%**

Sector

- Accountancy, **20%**
- Financial services – small / medium sized, **6%**
- Financial services – large, **8%**
- Corporate sector, **46%**
- Not-for-profit, **5%**
- Public sector, **11%**
- Other, **4%**

Role
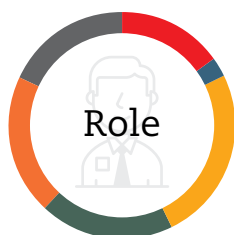
- Professional services, **15%**
- Professional services leadership, **3%**
- Finance and accounting, **25%**
- Risk management and compliance, **19%**
- Finance leadership, **20%**
- Education, **0%**
- Other, **18%**

Foreword

Helen Brand
Chief executive, ACCA

Ainslie van Onselen
Chief Executive Officer,
Chartered Accountants
Australia and New Zealand

The technological revolution of which we are a part has vastly increased the amount of data and information that is available to us. From that data we can generate insights and support effective decision making. Finance and accountancy professionals need to be at the forefront of this analytics revolution.

The COVID-19 pandemic has heightened the need for organisations to be agile and responsive, developing plans to cope with a range of scenarios and opportunities as they continue to evolve. The agile and the nimble have exploited their data assets and developed responses that can be implemented readily and used to support business survival.

Yet the findings of this report are that many accountancy and finance professionals are still using rearward-looking analytics: reporting on past performance and telling their stakeholders what has happened. There has never been a greater need to invest in forward-looking analytics that help decision makers explore the potential range of options for the future and match this to the monitoring of current actions. If accountancy and finance professionals fail to develop our skills in the appropriate directions, to provide our stakeholders with forward-looking insights, they run the risk of being marginalised.

Both ACCA and Chartered Accountants ANZ continue to evolve their qualifications and continuing education programmes to ensure that members and future members can develop the relevant skills. In this report we offer insight as to the skills needed and reflect upon the need for accountants to understand the problem and articulate the analysis, as much as their need for skills relevant to data and applications use.

This is a developing area, and continued advances in technology and how we choose to apply it in our everyday lives will mean that the opportunities for forward-looking insights will continue to grow. ACCA's partner NTT DATA offers some insightful perspectives on this in the report.

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Executive **summary**

The role of the chief financial officer (CFO), and of finance and accountancy has moved beyond traditional financial and accounting oversight into working increasingly as key advisers to business, where the critical need is for making near real-time, data-enabled decisions.

Finance teams have long used descriptive analytics, presenting information as dashboards and reports describing past events. Even today, it is rare to find extensive use of predictive and prescriptive analytics. We interviewed the chief executive officers (CEOs), CFOs and finance team members of over 30 organisations globally from a range of companies, including retail, telecommunications and utilities. The data accessible to finance teams has grown rapidly over the last decade and in line with the exponential growth of data from the Internet of Things (IoT), eg sources of data from sensors and equipment. This trend shows no sign of slowing down.

Two roles exist for the CFO and finance teams, the first involving, as always, addressing finance-related problems. The other, an emergent role as seen from the survey responses and in-depth interviews, is being the enabler of decision making for the entire organisation by taking on the championing of analytics use beyond the traditional finance boundaries. All the interviewees expressed a desire to achieve better and faster decision making for their organisations. This is the primary focus of analytics.

For example, a European utility finance function no longer focuses on just financial data. But through leveraging analytics champions and blending technical data from electricity distribution equipment and tools, the finance team helps make decisions on service provisioning and grid maintenance that go well beyond the finance issues. In a North American organisation providing services to contact centres, the CFO makes strong use of analytics to help make decisions on pricing and technical engineering and support requirements, thereby directly contributing to the global growth of the organisation. The partner of an Australasian Big Four professional services firm now

sees broader engagement with the use of big data to help clients establish where internal controls have broken down for entire organisations and understand every single transaction, going well beyond the purview of traditional audit.

The turning point for CFOs and finance teams is to move beyond improvements in financial decision making to driving analytics across entire organisations.

A changing role for the CFO and finance teams

ACCA and Chartered Accountants ANZ jointly conducted the interviews with finance and accountancy professionals across the world to explore the impacts of analytics on CFOs and finance team members. Five key areas of focus and action emerged from the conversations, highlighting the journey commencement in 2020 over the mid-term to 2023. These were:

- governance and data management
- big data is a reality
- hybridisation of talent
- decision-making enablement and
- predictive/prescriptive analytics.

Furthermore, our survey shows that analytics is key to driving business efficiencies, improving planning, budgeting and forecasting, improving risk management. Therefore, during this unprecedentedly volatile time, leadership needs to show vision, understanding, courage and adaptability (George 2017). CFOs and their finance teams are at the forefront of guiding organisations through unforeseen challenges, using data and analytics to generate the right information at the right time to enable appropriate decisions.

The analytics opportunity for finance teams

Analytics is an essential business skill set, and analytics technology is a critical mechanism helping extract value from data in organisations. But the emergence of big data as a reality beyond financial information to include a diverse array of non-financial information sources from the so-called 'Industry 4.0'[1] (Figure ES1) technologies of machines, customer relationship management (CRM) systems, mobiles, sensors and external data, including environmental data, places analytics at a critical juncture.

Data complexity is increasing significantly, large volumes of data, as well as a variety of data sets, are available but not limited to the business departments of sales, marketing, finance and manufacturing. Among this flood of data, executives find difficulties in making decisions about what actions to take. The CFO who is able to assess the disruption COVID-19 is creating to both the business model and operations has the opportunity to take analytics capability and data well beyond the finance function to assist and support the enterprise holistically

during difficult times and beyond. Along with developing new talent and skill sets, and through investment in technology, using analytics in finance enables the CFO and finance team to generate competitive advantage and growth for the entire enterprise.

This report highlights the role of the CFO and finance team in supporting and expanding the analytics paradigm beyond the boundaries of the finance function. The message from finance leaders, professionals and data specialists is clear. Better, faster data-driven decision making across organisations will arise from accountancy and finance professionals led by bold CFOs who embrace analytics. Furthermore, the analytics capabilities providing rear-view insights are giving way to analytics providing future-looking scenarios and predictions while supporting management, operational and strategic decision making.

Yet our survey shows a reluctance among respondents to move from looking backwards to looking ahead. Traditional reports are in the comfort zone for the majority of finance teams. Such reports are institutionalised and their relevance to decision making is often not questioned. Often these reports go unread and modern visual techniques are not used to highlight key insights. Today, report readers are looking for quick, 30-seconds-to-one-minute reads, they want to decide quickly and move on so the businesses can remain agile and keep up with rapidly changing global markets. Finance teams need to use data to look ahead to remain relevant in organisations. They need to address the weighting of time applied to historic analysis and balance this between historic and forward-looking analysis. These skills are already in the tool kit of the finance professional; the need is to increase the use of those skills relevant to today's business needs.
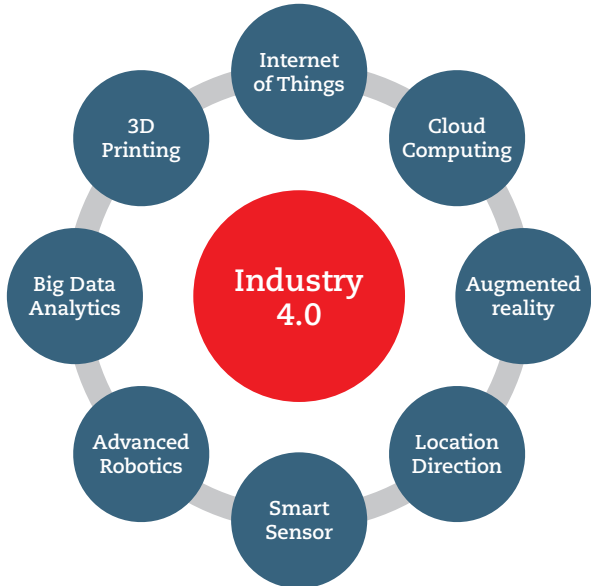
Skill sets needed to derive value from analytics

It is important to ensure that you invest in the relevant skills to support maximising the value from analytics (Figure ES2). These skills are a combination of technical skills, application proficiency and softer skills such as critical thinking and problem solving. The ability to relate the analytics to the business issue is fundamental. It is not just a technical issue it is a business issue.

FIGURE ES1: Industry 4.0

FIGURE ES2: Skills needed to derive value from analytics

| Finance and accountancy | Data literacy | Data extraction | Application knowledge | Problem solving and critical thinking | Visualisation | Storytelling |

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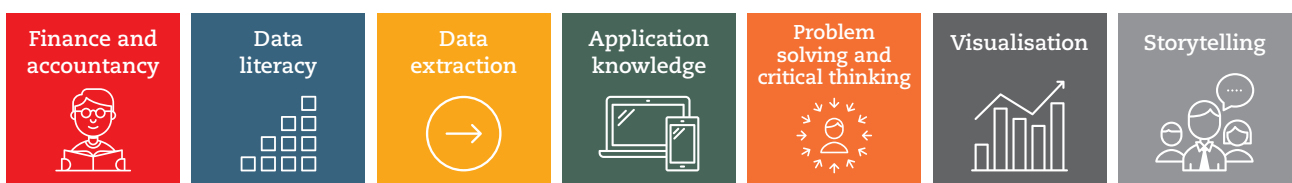
1   A reference to the term the 'fourth industrial revolution' created by computerised technology and artificial intelligence and coined by Klaus Schwab, the Founder and Executive Chairman of the World Economic Forum (Schwab 2017).

So, in summary, what should the CFO and finance team do?

Consolidating insights from the in-depth interviews supporting this study and the analytics in finance survey, five key areas of focus and action emerge as essential to ensure the creation of truly data-centric, analytics-driven organisations in 2020 and beyond (Figure ES3). They are governance and data management, big data is a reality, hybridisation of talent, decision-making enablement, and predictive/prescriptive analytics.

FIGURE ES3: Five areas of focus and action for the future development of analytics in finance teams

| Governance and data management | Big data is a reality | Hybridisation of talent | Decision-making enablement | Predictive and prescriptive analytics |

The trends have applicability not only across different sectors but for small businesses and large enterprises alike. An overarching strategy is to embrace and encourage transdisciplinary analytics crossing traditional boundaries, eg finance, analytics and cybersecurity.

To ensure proper data **governance** the CFO and inance team should:

■ ensure that you have appropriate data governance procedures in place to classify data correctly and align its use to strategic objectives

■ ensure that data ownership across the organisation is clearly established

■ align data collection with needs for data-driven insight and avoid collecting data for which no users exist

■ minimise security risks by avoiding use of personally identifiable information (PII) in analyses

■ ensure that data cleaning and preparation do not remove important data that could be used to identify outliers and anomalies[2]

■ champion the development of a playbook for the correct use of data in conjunction with other functions and teams.

Given the emergence of **big data** is a reality for the CFO and finance team, they should:

■ develop and execute a strategy for the finance function that focuses on appropriate technologies, such as Cloud-based services, that support the development of a real-time analytics capability

■ consider how data extraction can be best managed from legacy systems to ensure that analytics capabilities can be developed

■ generate a catalogue of certified external data sources complementing internal data, refreshed on a regular basis to ensure that new sources are captured. Finance should own the catalogue and update process as the use of external data leads to a direct impact on financial decisions and beyond

■ ensure that analytics projects support accessibility to more diverse structured and unstructured data, recognising the need to collaborate across the organisation in data collection

■ evaluate activities that lead to descriptive analytics to determine whether they continue to add value to the organisation.

▶

2 Anomalies have information value, as seen from the work of Alan Turing and his team at Bletchley Park during the Second World War. They used anomalies to decrypt the Enigma cipher (Hamer 1997).

So, in summary, what should the CFO and finance team do?

Beyond this, to move towards hybridisation of **talent** the CFO and finance team should:

- roll out a data literacy programme for everyone, using examples ranging from improvements to in-house financial decision making to automation of activities by any other areas of the organisation

- extend analytic capabilities to a wider group of users; this will require investment in the right mix of skills and capabilities to ensure that you adjust the appropriate balance for changing business needs

- curate self-service resources for the organisation, including podcasts and online communities

- host regular educational events, hackathons and an analytics book club, alternating between external guest speakers and those from different teams in the organisation to ensure that skills remain current.

Decision-making enablement for the CFO and finance team will enable them to:

- communicate with internal stakeholders about how data analytics, in particular predictive analytics, can assist in the strategic decision-making process

- ready the finance team to help enable better and faster decisions across the entire organisation by developing a model for using real-time data to make decisions

- categorise decision making for strategic (C-level), managerial (functional), operational (business process), development (new product or service) and customer differentiation (external customers)

- revise business-case documentation to identify projects that focus on predictive and ideally prescriptive analytics

- keep track of any disruptive innovations to help achieve better, faster decision making.

Use of **predictive and prescriptive analytics** across the organisation will enable the CFO and finance team to:

- standardise the master data (the most valuable information shared across the organisation) in the organisation

- begin to identify outliers across the organisation on a continuous basis, to give a potential early warning of an emerging problem or opportunity

- devise Excel templates for the decision-making model to help operationalise thinking about decision making

- explore the potential for using open source components for the entire analytics value chain – a structured query language (SQL) database, machine learning and end-to-end processing; this is especially important if you are providing analytics software and services either as a business serving practices and SMEs or a BI Competency Centre servicing internal clients

- pilot collaboration between experts and business users using open-source software such as RapidMiner or KNIME.

A perspective from NTT DATA

In the past, technology has been a barrier between businesses and the exploitation of data. The cost and complexity of the technology required made it hard to foresee a return on investment. This, however, is no longer the case.

Businesses of all sizes have easy, low-cost access to powerful tools for the analysis and manipulation of data. There are still certain skills in data engineering and data science that are required, but exploiting data is no longer a question of overcoming technical challenges; rather a challenge of managing people. There must be buy-in at all levels of a business that what the data shows is worth knowing, that the data is clean and well curated, and that analytics is undertaken with high levels of rigour and accuracy.

If all of these things can be achieved, business leadership will trust data. They will trust analytics. And they will trust the insights that are generated.

There is undeniably a skills shortage in the fields of data engineering and data science. Gartner estimate that half of businesses lack the data literacy and artificial intelligence skills that they require (Panetta 2019).

So how can this be overcome?

There are some realities that need to be accepted:

■ The perfect data scientist, who understands finance, sales, marketing, and machine learning does not exist. Analytics should be a dialogue between business stakeholders and technologists. By creating blended teams, insights can be generated more quickly and to the exact requirements of the business.

■ Maintaining data quality is hard. It is essential to be transparent about the quality of the data that exists and is in use, so informed decisions can be taken on how much weight to give the analytics. To enhance the quality of the data, organisations need to work to embed the principles of data as a shared asset and shared responsibility.

■ Getting good insight from your data is going to take a concerted effort and will cost money, but the potential returns on investment are significant and can make the difference between a surviving business and a thriving one.

If a business can accept these realities and work to overcome them, they will have gone a long way to building a culture of data trust.

Once this trust has been built, a world of analytical opportunity will open up; the move from examining historical data to see what has happened, will change to using data to predict what may happen. This shift to forwards looking analytics, will enable businesses to see the impacts of changes before they are taken and will let them run smarter, leaner and more profitably. We will continue to need to look backwards, in part to validate the accuracy of our new predictive models.

Building this trust is a core principle of successful analytics programmes and finance teams are excellently placed within modern businesses to be the champions of this trust. Finance professionals hold many of the skills to bridge the gap between data scientists and businesses. They already hold a position of trust in regards to financial data and can easily apply their knowledge to data in other domains.

This report sets out some clear steps that the CFO and finance team can take to begin this journey to embracing data and analytics and being the agents of change to allow businesses to make the most of this precious asset. ■

Simon Williams,
Chief Executive Officer, NTT DATA UK

NTT DaTa

THE ABILITY TO RELATE THE ANALYTICS TO THE BUSINESS ISSUE IS FUNDAMENTAL. IT IS NOT JUST A TECHNICAL ISSUE IT IS A BUSINESS ISSUE.

1. The **opportunity for analytics** in finance and accountancy

1.1 Analytics – the story so far

The history of analytics, as for much of the technological and business environment, is a story of continuous evolution. Analytics can be traced back to the 19th century, when Frederick Winslow Taylor first started undertaking time-management exercises. In the 1960s (Figure 1.1) the increasing use of computers allowed the application of statistical techniques to data on a consistent basis.

Relational databases[3] were invented by Edgar F. Codd in in the 1970s (Codd 1970) and became popular in the 1980s with the increasing use of SQL to mine the data. Relational databases and SQL allowed data to be queried as it was generated and are still used today.

The term 'business intelligence' was first used in 1865 but it was popularised in 1989 by Gartner (Power 2007), who used it to describe decision making based on searching, gathering and analysing data. The large-scale enterprise

resource planning (ERP) software of the time included business intelligence (BI) modules (so-called 'BI 1.0') that allowed users to interrogate large-scale databases.

Data mining started in the 1990s (BI 2.0), allowing the discovery of patterns of data in ways that had not previously been possible. Businesses started to predict future sales on the basis of historic trends.

Big data (BI 3.0) was first defined by Roger Magoulas in 2005 (Halvi and Moed 2012). He was defining large amounts of data that the computing resources of the time found hard to manipulate and analyse. In the same year, 'Hadoop' was developed, allowing the manipulation of such data. The advent of Cloud-based computing has increased our ability to analyse the large volumes of data that we, as a society, now create. It provides us access to open-source tools that can be applied to vast sets of data that are stored in the Cloud. The time of analytics, or advanced analytics, has arrived.

FIGURE 1.1: Analytics – the story so far
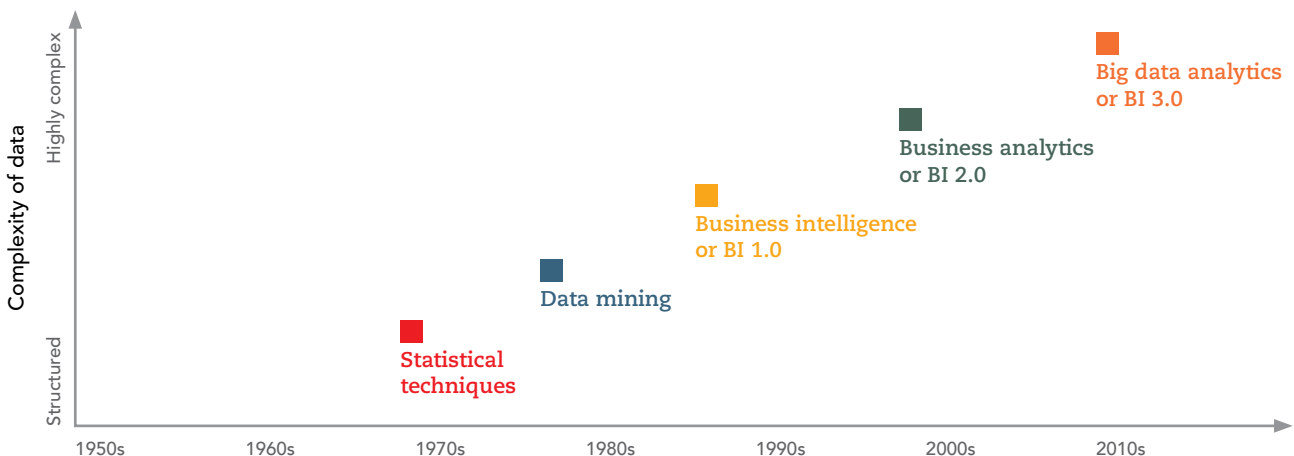
3   A database structured to recognise relations between stored items of information.

1.2 What is the opportunity?

Analytics helps extract valuable insights from data and make better decisions. In this light, the role of the finance department is changing to help inform all business decisions, including those beyond the finance function. With analytics, the finance function no longer serves only as a 'data keeper' or provider of financial reporting. The move is away from transactions alone to the support of decision making, using both financial and non-financial information. As bookkeeping and financial statement preparation require less human intervention, there is a shift towards spending more time on management and less time on accountancy.

ACCA has produced a series of reports, including this one, that focus on the evolution of the finance function (Figure 1.2). This changing role of the finance function in organisations to one of providing insights based on data sources is increasingly understood, as referenced by ACCA

and PwC in their report *Finance Insights – Reimagined* (ACCA / PwC 2020) but the way forward remains elusive. The design of the future finance team over the next 5–10 years is coming into focus (as considered in ACCA / PwC's report *Finance: A Journey to the Future?* (ACCA / PwC 2019)). There is an opportunity for the CFO and finance team to assist organisations in making better, faster, more appropriate and more soundly based decisions.

The use of data that represents a broader view of organisational activities in achieving its purpose, such as the data relevant to the capitals as defined in the International Integrated Reporting Council's six capitals framework[4] (ACCA / PwC 2020), provides an approach beyond financial reporting to allow the telling of data stories connecting the purpose of the business directly to decision making resulting from the use of analytics. These stories probably encourage more funding and investment than would be otherwise available.

FIGURE 1.2: ACCA's finance function reports

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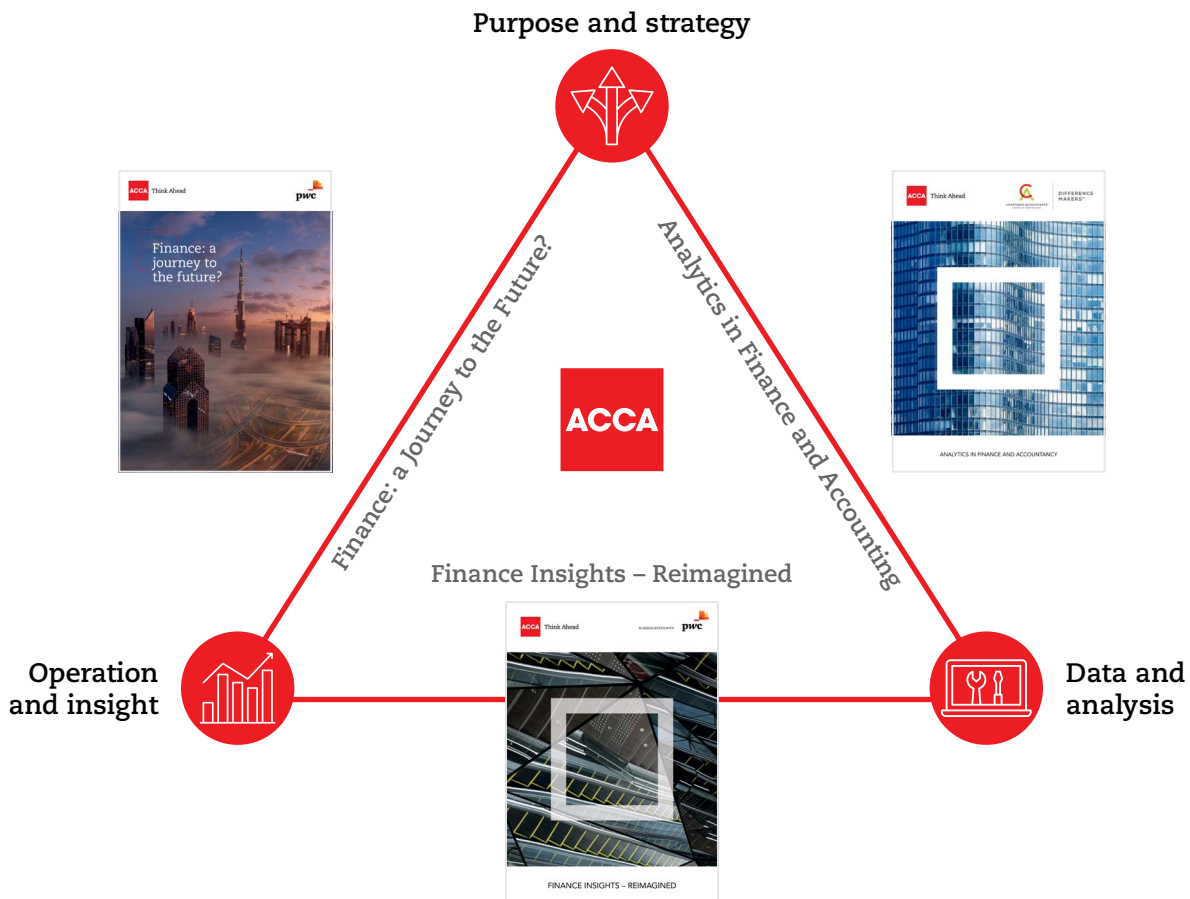
4 The six capitals were developed by the International Integrated Reporting Council (IIRC) in 2013 as a representation of the of the 'resources and relationships used and affected by an organisation' (IIRC 2013). The six capitals are financial, manufactured, intellectual, human, social and responsible, and natural.

The effective use of analytics is essential to the continued transformation of the finance function Figure 1.3).

As finance functions increasingly adopt three roles, transactional efficiency, compliance and control and business insight, the use of analytics, particularly forward-looking analytics that uses both financial and non-financial information, is essential. No longer can finance functions ignore this opportunity: a failure to do so will increasingly see them marginalised in favour of those who can address the business needs.

For this research, we not only interviewed CFOs and finance team members in a variety of industries but also spoke with policymakers who interact with social enterprises. Possibilities exist not only to fund projects to help economic growth but also to improve the lives of people, linking to organisational purpose and creating social benefits representing a many-fold return on the capital. Thinking about decision making in these terms helps foster an evangelism not normally seen in the workplace.

There was a consensus across all the in-depth interviews as that we carried out as to the future opportunity for analytics use by CFOs and finance teams, enabling unified decision making across entire enterprises. Building on

the historical financial data focus, and the reliance on evidence-based decisions made using analytics, the future position is clear. The CFO and finance team will leverage the use of analytics for the improvement of decision making across the entire enterprise, using not only financial information but also the deluge of non-financial information and new data sources available. These decisions include not only strategic ones but those at the operational level, down to the allocation of resources.

Analytics provides a fulcrum for making decisions that connect business strategy with operations. One interviewee, the CFO of a European organisation, made it clear that the use of analytics over the next five years will drive business strategy, allowing better decisions, planning and forecasting.

Similarly, a North American CFO said that their CEO and leadership team already look to the CFO, not just for numbers but also for all decision making with an analytic aspect. The same CFO interfaces with all the different areas of the business, including strategy and sales teams, and assists with the work allocation of technical teams. But the ability to make decisions as fast as data becomes available (so called 'real time decision making') is still some way off and for most businesses getting close to this is good enough.

FIGURE 1.3: Analytics and the transformed finance function

Source: adapted from ACCA/PwC 2020
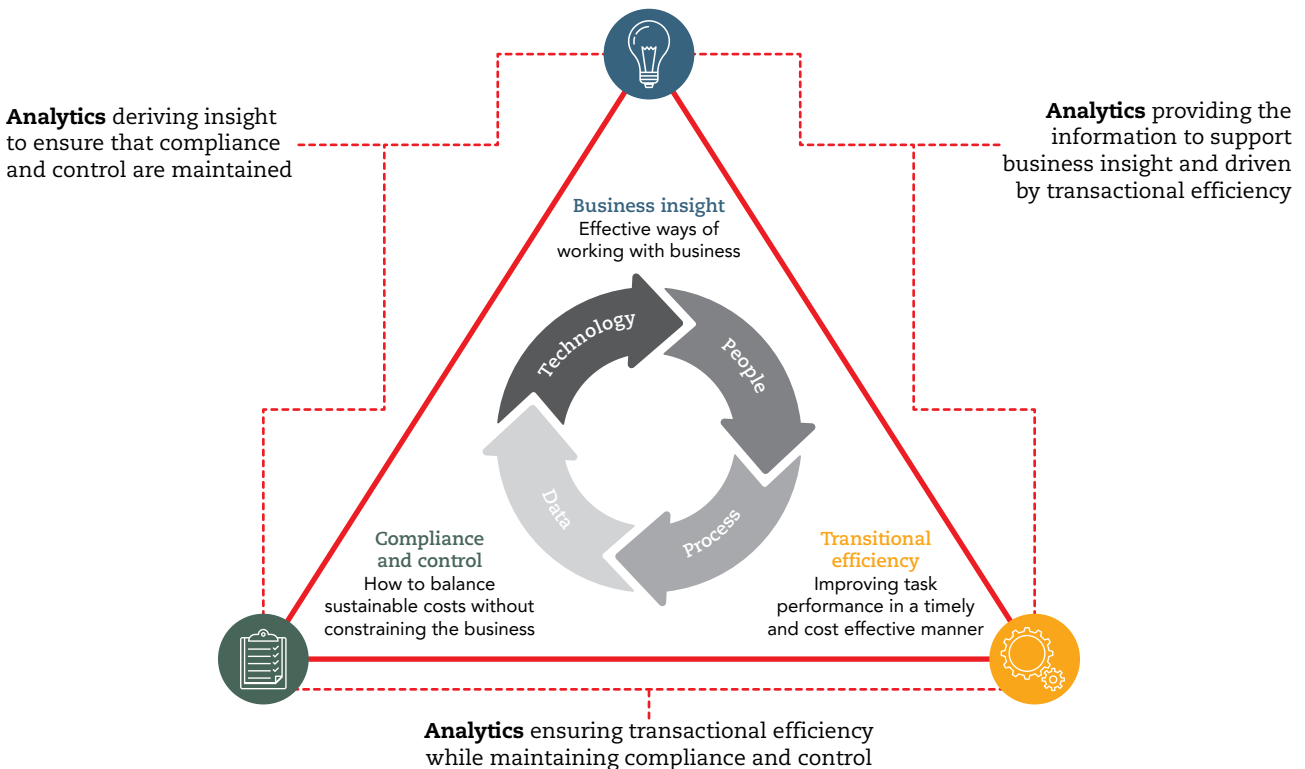
The perspective from the CEO of a UK service provider reinforces how the context of a business determines the extent to which it needs access to 'real-time' data. Yet another European CFO reminds us that the drive for analytics is about making the right business decisions. The data available is no longer just financial data but also non-financial data capable of supporting service delivery and infrastructure maintenance.

The tendency to emphasise only the accuracy of the numbers when making decisions is giving way to the increasing use of non-financial information and looking beyond mere description of transactions. This non-financial data helps provide a broader understanding of impacts on an organisation, further extending the reach of the finance function across enterprises to support management decisions.

Public sector leadership participants from the Australasian region recognise the opportunity to make better decisions but within the context of investing public money.

The importance of decision making and supporting processes cannot be overstated and directly affects the bottom line of a company. A McKinsey study reveals the return on investment (ROI) of decisions improves by 6.9% when raising a company's decision-making process from bottom to the top quartile (Lovallo and Sibony 2010). To ensure superior decisions, the CFO and finance team need to infuse analytics into the decision-making processes across the organisation. During our research interviews, there was much discussion about the different

types of analytics, tools and algorithms, but processes and frameworks are equally important. A well-proven framework for blending business and data understanding that is available to organisations of all sizes is CRISP-DM (Cross-industry Standard Process for Data Mining). The CRISP-DM framework breaks the process of data mining into six phases, as discussed in the box below and as illustrated in Figure 1.4.
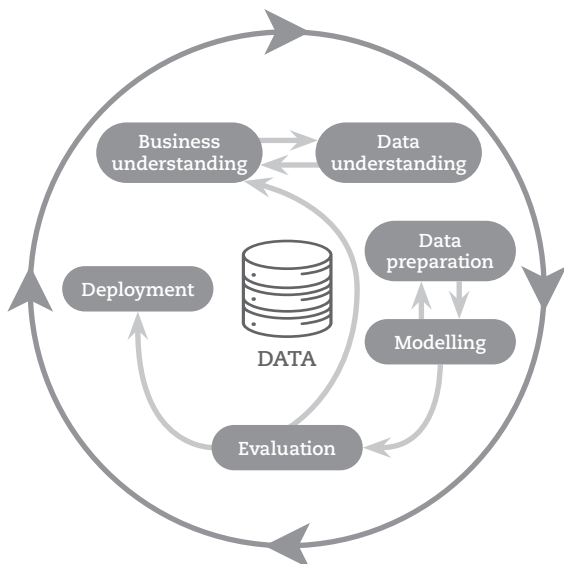
CRISP-DM framework

How do we get started on analytics projects? How do we organise an analytics project? What do we need to do to ensure that the analytics project being undertaken is ethical? How do we know we have achieved the successful completion of an advanced analytics project?

All these questions have one thing in common: they require an approach that will help organise the multiple steps that constitute analytics projects. Notably, analytics projects vary in their duration and the skills they require. Thus, an approach, framework or methodology acts as an ordering mechanism for multi-step analytics projects of varying durations. Additionally, a common approach allows projects to be replicated by any team member or by those outside the delivery team.

CRISP-DM is the most widely used analytics process standard (Chapman et al. 2000). Thus, it is the closest thing we have to a standard model for implementing predictive and prescriptive analytics projects. All other contemporary methodologies appear to be variations of the initial CRISP-DM framework. The CRISP-DM framework can be used to build ethical guardrails into the stages of an analytics project (Cunningham 2020) ensuring biases in the data are known and safety measures implemented to ensure that the model is free of extraneous influences. ■

FIGURE 1.4: CRISP-DM process framework

Source: IBM SPSS Modeler CRISP-DM Guide (IBM nd)

1.3 The analytics project

How do we get started on analytics projects? How do we organise an analytics project? What do we need to do to ensure that the analytics project being undertaken is ethical? How do we know we have achieved the successful completion of an advanced analytics project? All these questions have one thing in common. The answer to them, and more, is to have a framework to help organise analytics projects. Such a framework needs to cover activities beyond the development of the analytic models and should help avoid the too-hasty application of analytic techniques while dealing with missing data, or producing

an 'answer' to a problem that has not been properly defined. What is needed is a framework that has stood the test of time for nearly two decades. You may believe that with the pace of technological change this framework must surely be superseded. But CRISP-DM still survives; it is the standard model for predictive analytics and is being adopted for both the development and audit of machine-learning projects (Clark 2018).

1.4 The biggest opportunities

The survey respondents (Figure 1.5) support the notion that for analytics in finance, faster and better decision making (51%) will be the key benefit and overarching opportunity to emerge over the next five years. Furthermore, the aim of supporting strategy development (supported by 31%) emerges as significant in underpinning respondents' desire to use analytics to inform strategic decision making. Better planning and forecasting (49%) as well as understanding and management of risks (40%) are of similar importance and require access to similar data sets. The support for decision making and risk taking by leveraging real-time analytics is apparent. It reflects the desire for real-time insights into performance (expressed by 38%) and improvement in data quality (38%). There is a need for clearer visualisation of trends and predictions (expressed by 37%) and recognition of the exciting nature of the predictive capability of data analytics and the opportunity for finance teams to move from the reporting of finance and accountancy measures to signposting the future. The testing of complete data sets is considered the least important of the opportunities offered by analytics (15%).

1.5 Four Vs of big data

Key executives and business owners, in organisations of all sizes, are making decisions using big data. Numerous businesses generate or accumulate a significant amount of non-financial unstructured information, including global positioning system (GPS) data, data from mobile phones, temperatures from sensors, free-form text in questionnaires, website customer interactions, social media conversations and video from security cameras. The hallmark signature of this big data in our context is that it represents the non-financial information (NFI) generated between transactions.

Since the Renaissance, we have been diligently capturing and recording financial transactions using double entry bookkeeping and accounting systems, but the NFI is often not collected or used. Current business is represented through transactions (sales and operational indicators), but the future situation depends on human empathy and relationships. Examples of related information include user-generated content about the use of branded products, ratings, reviews, one-to-one conversations, distress signals from customers and geolocation of customer activities. But how do these affect the financial situation? Consider for one moment a hotelier. She pays attention when TripAdvisor rankings change as this affects revenue in the near future. But it is probably insufficient and inefficient for the business owner simply to await the financial statements prepared by the accountant on a regular basis before taking action on the discrepancy between revenues projected earlier and those that will reflect the change in demand for rooms.

FIGURE 1.5: What do you see as the biggest opportunities for your team in using analytics over the next five years?

TABLE 1.1: Business sources of big data – non-financial information

BUSINESS PROCESS	NFI – SOURCES OF BIG DATA WITHIN ORGANISATIONS
Property, plant and equipment	Online databases complementing historic value
Marketing	Social media, email, Google search, website analytics and even health data from wristband devices and smartphones
Accounts receivable	Full textual description (unstructured data) of goods or services
Purchases and sales	Radio frequency identification (RFID), GPS and Bluetooth beacon
Cash	Mobile payment, electronic credit and Apple Pay or Android via near-field communications (NFC)
Customer service	Email, social media, call centre records (CCR)
Supply chain	RFID, GPS, video (logistics centre) and temperature
Inventory	RFID, GPS and video (stocking warehouse)

Table 1.1 provides some suggestions about the types of non-financial information that could comprise the big data an organisation might use.

Thinking about the different NFI sources available to a business, a wine business example helps illustrate the importance of this non-traditional information. When Orley Ashenfelter, an economist, 'ran the numbers', he discovered wine quality = 12.145 / 0.00117 x Winter Rainfall + 0.0614 average growing season temp – 0.00386 harvest rainfall (Marland 2014). Remarkably, this equation helped predict the 'wines of the century' for 1989 and 1990. Predicting the price of an Australian Grange Hermitage uses similar techniques. The website Liquid Assets (Ashenfelter and Quandt 2020) provides a repository for both wine articles and data. Interestingly, the data for the predictions in hotel revenue and price of wine is to be found outside these existing businesses and accounting information. In New Zealand, the ANZ Truckometer (Zollner 2020) connects the non-financial information of road traffic density, with the future state of the NZ economy. While counterintuitive, the ANZ light traffic indicator provides a six-month lead on GDP activity. According to Zollner, 'Traffic flows are a real time and real-world proxy for economic activity'. But the lockdown owing to COVID-19 did sever the relationship between traffic and GDP.

Increasingly, this practice of using data held outside businesses to provide predictive capability in advance of actual events or publication of the financials reflects the 'democratisation of data' (Handler 2013). This requires professionals and consumers alike to gain access to data freely to help make data-driven decisions.

FIGURE 1.6: Four Vs of big data

There are four recognised components of big data (Figure 1.6), as explained in the following paragraphs with reference to the experiences of the interviewees.

One supermarket chain CFO uses big data built on customer purchases and weather data to forward-order ice cream; another CFO works with electricity grid data and smart meter data not only to help pinpoint faults in the network but also to service consumer demand proactively; still another builds business models on car exhaust-pipe data. One CFO considers behavioural data to be the

DNA of the business, and captures data from customer interactions in telecommunications, healthcare and insurance. Similarly, the insights manager at a government agency works with depersonalised behavioural data. The CFOs and executives interviewed across various business sizes and industries are making decisions using big data, especially that on **VARIETY**. Several interviewees from the UK and Asia already look at organisational website data as ripe for creating value.

In the COVID-19 pandemic, e-commerce has been continuously transforming retailing and food commerce from in-store purchases to stay-at-home orders. Thus, it is natural for CFOs and finance teams to leverage website data to create value. Whether the CFO and financial team can achieve competitive advantage over other professionals will only be seen when they step forward and integrate the big data acquired into the financial performance measures they regularly provide to businesses. The website of any organisation is a natural starting point. A decrease in online customer visits compared with a previous period is a potential indicator of a future drop in sales. Analysis of the Google analytics reporting on website views helps provide a view of sales potential well before a sales transaction entry is recorded by the business or lost to a competitor. The task at hand for the finance team is connecting the non-financial information with financial data to create predictive capability (see Chapter 3, section 3.4).

In the utility, manufacturing and retail sectors, CFOs handle data generated by smart meters, sensors on technical equipment or consumer interactions on social media. The velocity of this data can be extremely high at times and results in the accumulation of large volumes of data when testing is taking place or special offers are being made to consumers. Some of this data may require monitoring in real time and thus require an infrastructure that can handle big data. The **VELOCITY** of data constitutes the second V of Figure 1.6.

In the utility and manufacturing sectors, the value of the data is dependent on its veracity (its accuracy). But the sensor data is prone to equipment faults and noise. The cleaning of such data is an important step in extracting value. **VERACITY** constitutes the third V of Figure 1.6.

For all interviewees, the volume of data is large and this precludes using a single machine for storing, processing and analysing it. The examples of big data among those providing research inputs are 'Industry 4.0' applications: social media data, website clickstream data from e-commerce applications, behaviour data from call centres, machine sensor data from electricity utility systems, data on cargo ships transporting food around the globe, credit risk models and, of course, transactional data from banking and financial applications. **VOLUME** constitutes the fourth characteristic of big data represented in Figure 1.6.

One of the more unusual big data sets brought to attention by the Australasian public sector leadership interviewees is data combined with the lived experience stories of families. This data set builds on a government-published microdata research database about people and households. The linked data combines interactions with government, including life events (eg education), income, benefits, migration, justice, and health.

Interviews with audit professionals, including partners and managers with the Big Four from North America and Australasia, show that internal and external auditing practices are using big data. Historically, audits use small samples taken at a point in time, but auditors using big data and analytics now take up and review entire data populations. Taking a big data approach results in audit quality improvement as well as benefits from a client perspective, providing insights on areas for improvement, especially for internal controls.

In Chapter 3 we will explore the various types of analytics used to extract value from big data, such as descriptive, diagnostic, predictive or prescriptive analytics.

THE VOLUME OF DATA IS LARGE AND THIS PRECLUDES USING A SINGLE MACHINE FOR STORING, PROCESSING AND ANALYSING IT.

Big data and audit

The organisational trend of using big data has emerged and a move to embracing advanced analytics (predictive and prescriptive) is now found in external audit engagements: the big data and analytics audit. Further, the auditors themselves witness at first hand their clients' adoption of Cloud technologies, Industry 4.0 sensors and use of external data, including social media.

As an example, Clara, the new audit platform from KPMG, gives external audit an ability to generate rich actionable insights and visualisations, use predictive analytics, and leverage external and unstructured data. This intelligent platform helps with:

1. bringing efficiencies and enabling auditors to derive to better informed judgements because of the insights from analysing more transactions. If used in risk assessment, it can also help with the identification of areas that are more susceptible to fraud

2. creating value for the client from the audit investment by providing insights on control breakdowns

3. automation, as a number one priority for achieving efficiency (this is not about cost cutting).

In fact, client executives want to use analytics in a similar manner to the auditor, with access to dashboards, benchmarks, control issues, actions taken and exceptions. But the real value goes beyond that of the tools and comes from the actual insights from the auditor and use of professional judgement.

In terms of the newest analytical procedures in the big data and analytics the undertaking of the audit is the process mining of event logs. This procedure allows extraction of transactions from processes. Business process issues are picked up through comparison matching with the original intent of the process. This technique provides the potential for identifying transactions not detected through traditional audit and that probably violate internal procedures, bypassing approval or even violating segregation of duties. Through process mining anything overridden by the internal controls but appearing as an anomaly requires further investigation.

The implication for skills and talent development in the new data-rich analytics audit platform environment is that graduates with a STEM (science, technology, engineering and mathematics) background will need to be recruited, along with data specialists. For graduates, the level of training now covers a comprehensive understanding of internal controls.

Another area meriting attention is testing, a high-risk criterion and as such the testing team cannot be automated. But historically, the audit has been the training ground for the next generation of CFOs. This might indeed change, as in future CFOs may need to be great data scientists and may well enter the profession as trained data specialists conversant with advanced analytics.

Much training is on the job, making use of LinkedIn's on-demand training where appropriate. Some tools of choice for external audit are Alteryx (an analytics process automation tool), Microsoft Power BI and the SQL database. Data specialists are expected to have an understanding of Python programming language. Owing to the nature and sensitivities of the work only approved technologies from a global listing in audit use with identified flows qualify for use in audit engagements. This ensures quality control over the tools and model development. Furthermore, the use of listed tools ensures that any challenge regarding the use of certain tools or models on an audit are defensible.

Scepticism, judgement, and ethics remain crucial aspects of finance professionals' development and training as they need to look beyond the records and seek to understand the management-control processes, to provide audit evidence.

The costliest aspect is the collection of detailed evidence. Challenges exist in integrating the analytics platform with client ERP platforms, owing to the variations even within the same major vendor platforms of SAP, Oracle, or Microsoft. The minimum requirement is journal entry testing for the different ERP platforms. The situation and access to data is improving, with clients building data lakes with operational and external data.

The use of big data and variety of non-financial information, including social media data, pictures from pdf files, and data from video, audio, GPS and sensors provides the means for conducting advanced analytics, and combining internal with external data not only yields audit evidence but also enables risk assessment.

The key lessons are to start with core processes such as revenue and follow the sales transaction order from order initiation to dispatch / provision and invoicing. Above all, the focus is on standard repeatable processes.

The biggest opportunity emerging for the future is the use of more machine learning in audit, and technologies to help automation. Additionally, the audit in a big data analytics environment can undergo reconceptualisation to a progressive or real-time audit concentrating on risk and management controls. Audit will move away from being a backward-looking regulatory annual or quarterly obligation and validation exercise ensuring that external transactions are recorded accurately. The judgement of the auditor is more, not less, important in a big data analytics audit. ◼

1.6 Challenges in maximising analytics

What is obstructing organisations when making decisions today? The CFOs interviewed suggest that problems are caused by the omission of foundational elements, namely data governance and data quality. But the finance team remain responsible as custodians of accurate data while the CFO's role is changing. The CEO of a UK service provider argued that the business analyst role is pivotal and requires the finance professional to be conversant with decision-making processes and, with support and empowerment, be able to document fully and subsequently automate them, which in turn impacts the quality of decision making.

The survey respondents were also asked to select from a range of challenges for their teams in the use of analytics (Figure 1.7).

For small and medium-sized enterprises (SMEs) (Figure 1.8), the picture is different from that in larger enterprises. SMEs may receive part-time CFO services or be one of a number of clients of a 'portfolio CFO', according to the UK CEO of a software provider to the SME community. But the same Cloud-based analytic tools for large enterprises are available to SMEs. The availability of these tools helps spawn opportunities for accountants in practice.

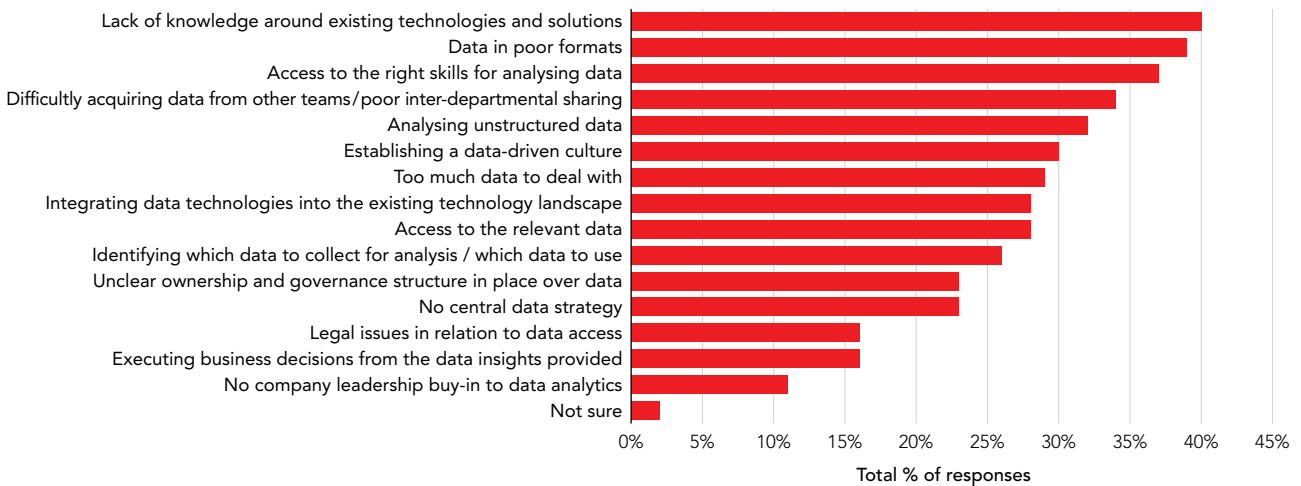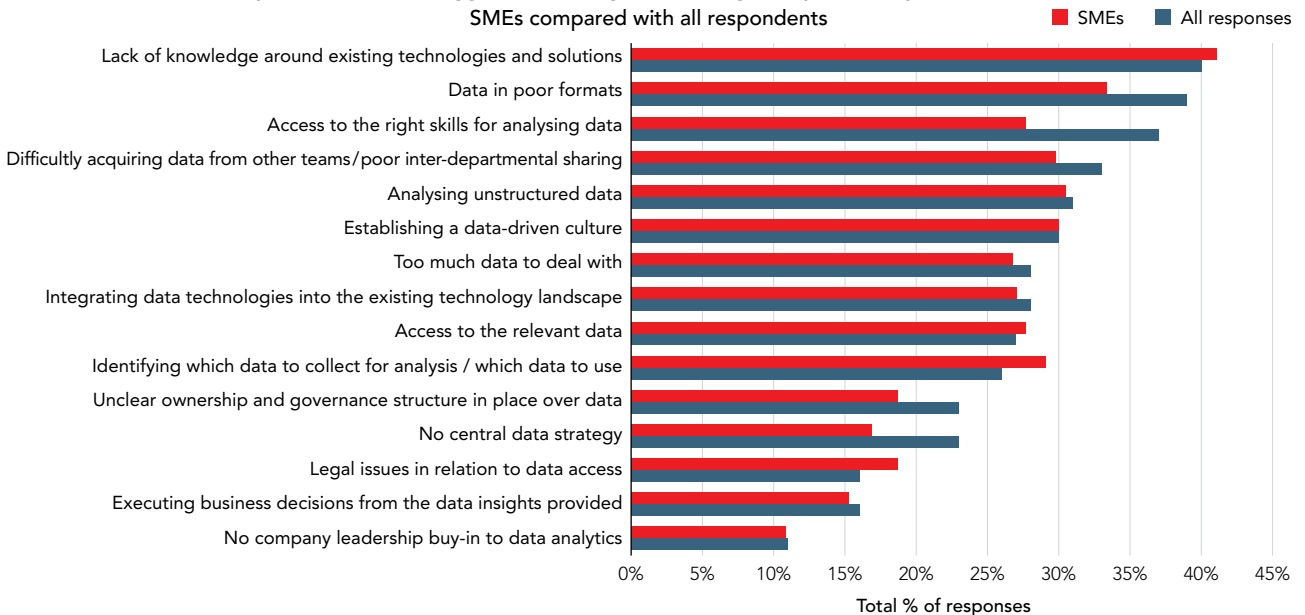**FIGURE 1.7:** What do you see as the biggest challenges in using analytics for your team?

FIGURE 1.8: What do you see as the biggest challenges in using analytics for your team?
SMEs compared with all respondents

For one Australasian provider of SME analytics software, data-driven decision making becomes possible, helping businesses uncouple decision making from 'gut feelings', a phenomenon linked to poor outcomes.

As organisations attempt to increase their use of data, several areas hold companies back. The key challenges are a lack of knowledge of available technologies (40%), poor data formats (39%), gaining access to the right skills for data analysis (37%), analysis of unstructured data (32%) and establishing a data-driven culture (30%).

1.7 Data strategy

The CEO of a UK software and service provider argued that the development of any analytics project must begin with a data strategy completely aligned with the organisation's business strategy and business model. The data strategy will then meet the real business needs. Since a data strategy framework sits at the convergence of analysis, data control and management, this concept ideally suits a CFO who sees data as a valuable asset rather than a liability or cost centre. The data strategy provides for organising, governing, analysing and using the information assets of an organisation (DalleMule and Davenport 2017). Two distinct strategic components exist and require a suitable balance between data defence and data offence (Figure 1.9).

- The data defence focus is on risk minimisation and ensuring regulatory compliance using analytics.
- Data offence directly supports business objectives of growth using activities to support decision making through dashboards and generating customer insights from data models and analysis.
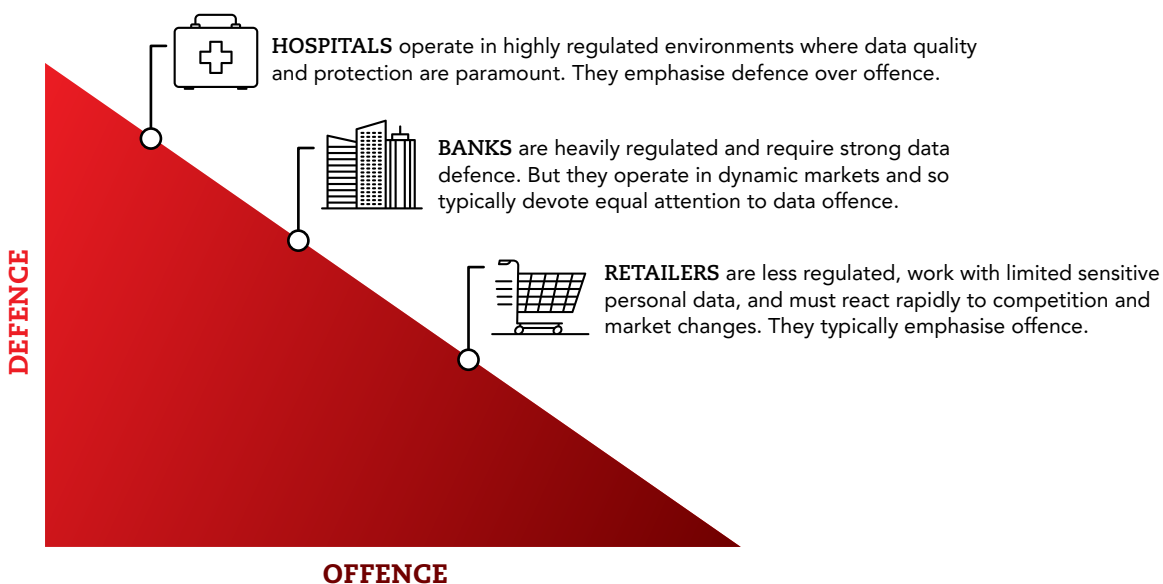
Organisations interviewed for this research follow a mix of these data strategies. The financial service providers and retailers follow an offensive strategy, while an automotive parts supplier operating within vehicle emission standards and a public sector organisation are both pursuing a more defensive data strategy. Companies focusing on security and governance tend to follow a defensive strategy while predictive analytics is the hallmark of an offensive strategy.

CFOs want to develop data and insights with an eye on the future but struggle with the availability of suitable data. But when focusing on a business problem, a finance-led analytics approach leads to unlocking significant value for the organisation. Most organisations providing input for this research work primarily with internal data and a scarcity of companies and case studies exist that exploit external data sources. Nonetheless, one North American CFO of a multi-billion-dollar business made it clear that the entire business model and revenue stream for that organisation builds on the analysis of external customer

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FIGURE 1.9: Data strategy – data offence vs data defence

The Data-Strategy Spectrum

A company's industry, competitive and regulatory environment, and overall strategy will inform its data strategy.

HOSPITALS operate in highly regulated environments where data quality and protection are paramount. They emphasise defence over offence.

BANKS are heavily regulated and require strong data defence. But they operate in dynamic markets and so typically devote equal attention to data offence.

RETAILERS are less regulated, work with limited sensitive personal data, and must react rapidly to competition and market changes. They typically emphasise offence.

DEFENCE

OFFENCE

Source: Leandro Dallemule & Thomas Davenport © May 2017 The Financial Brand

data from external systems across the world. Another North American manager with one of the Big Four professional service firms mentioned the case study of a logging company delivering timber with a fleet of trucks to a national chain of building supplies outlets. Here, the GPS data from trucks blends with traffic incidents, predicted time duration on route and weather. Both cases provide inspiration for organisations to make more use of external data. (Also, see the vintage wine and ANZ Truckometer examples for use of external data for value creation (box) (Chapter 1, section 1.5) and enhancing decision making.)

This data from external sources, referred to as 'orthogonal data' by Henke et al. (2016) because it is independent of the internal data, has the potential to change the business model for an organisation. Integrating external data from several sources and combining into an already running in-house BI system will help generate descriptive and predictive analytics, as well as prescriptive analytics (see Chapter 3).

Figure 1.10 shows how respondents viewed the characteristics of data used by their organisations. Well over 50% of respondents said that their data was secure, trustable, up to date and easy to access, while fewer than 50% found their data to be easy to analyse, easy to use and clean. The least amount of agreement occurred when they were asked whether the data was always used in the correct way (only 38% claimed it was). Accountancy and finance professionals typically want totally trusted data but there is a suspicion that we over-emphasise that at the expense of timely decision making. Would we make a different decision using 100% accurate data than if it were only 80% accurate? So, we need to think about what we really need. Over one-third of the survey respondents suggested that they were comfortable with the way in which they used their data. If, as accountancy and finance professionals, we are complacent then we will not recognise the opportunities that data and analytics give us.

FIGURE 1.10: Thinking about your own organisation, to what extent do the following characteristics describe your data?
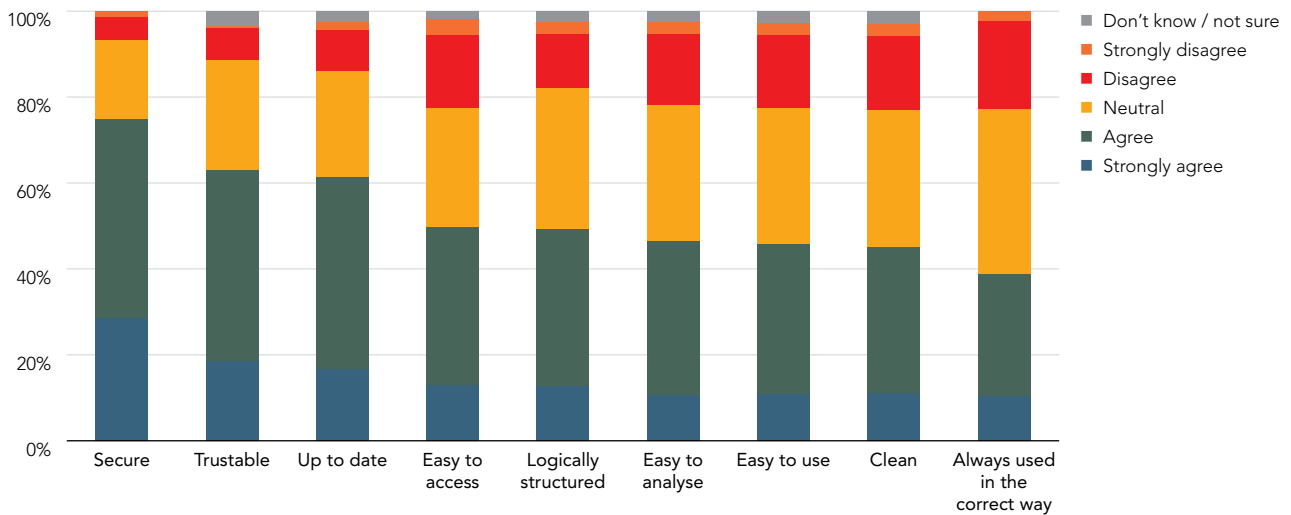
IF, AS ACCOUNTANCY AND FINANCE PROFESSIONALS, WE ARE COMPLACENT THEN WE WILL NOT RECOGNISE THE OPPORTUNITIES THAT DATA AND ANALYTICS GIVE US.

"

2. The **current state** of play

## 2.1 Technologies supporting data analytics

In spite of the increasing impact of the 'Fourth Industrial Revolution', which has caused large and small companies in every industry to consider how to leverage new technologies to reimagine the business, Excel continues to remain an analytics tool of choice among CFOs and finance teams. Throughout the discussions, interviewees spoke about the need for systems capable of handling big data and presenting visualisations. For the purposes of this research, we designate these systems as 'BI tools'. Often the term 'analytics' will be used as shorthand to mean a particular BI tool and not the technique.

Figure 2.1 highlights the generation of data stories from using the BI tool. The tools listed are not an exhaustive list but highlight interesting, new and innovative open-source analytics. Since the data science community prefers open-source languages such as R and Python over commercial software, the tools from key vendors including Microsoft are designed for use with open-source tools and languages. The yellow caption in Figure 2.1 highlights the functionality that BI tools such as Microsoft Power BI highlight on the futures roadmap.

In the interviews, the most often-mentioned tool by far was Microsoft Power BI. 'Tableau' and 'Alteryx' received some mentions. These tools all incorporate advanced statistical or machine learning techniques to gain insights from data. Alteryx is a data-blending tool enabling a business user, or more usually an analyst, to blend, cleanse and transform data from multiple sources and combine it into a single dataset for analysis. To analyse the output, an expert and a business user can review it in graphical form in Tableau.

FIGURE 2.1: Finance data-stories generation from BI analysis

*open source visualisation dashboards
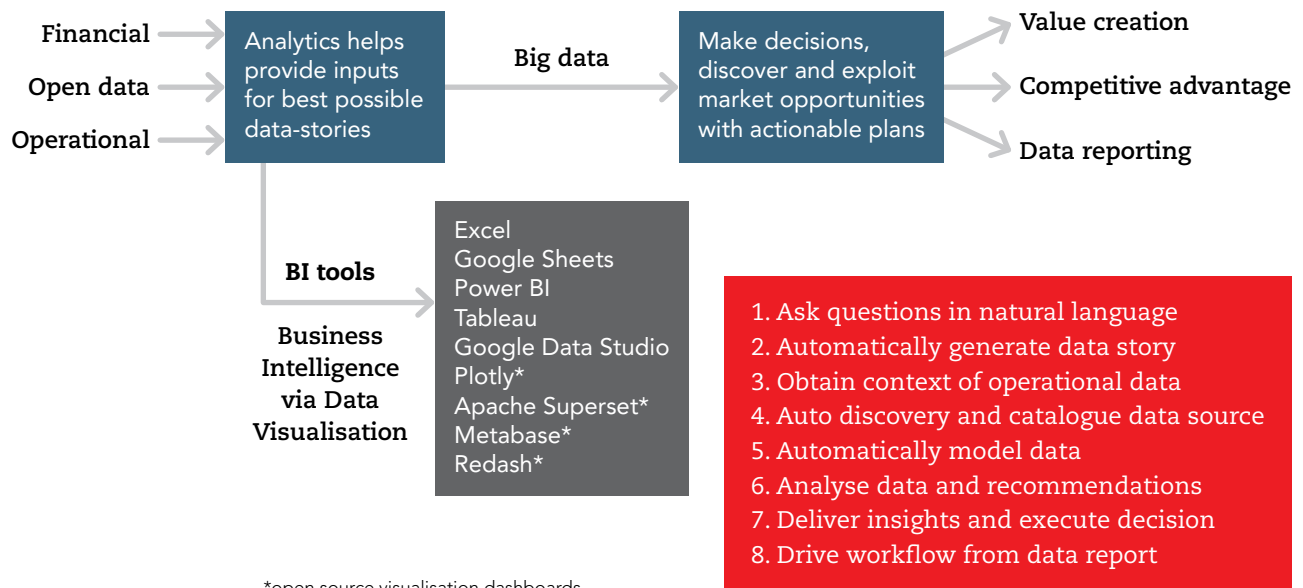
A new way of working with data is well under way; the frequent mention of these tools and training by the interviewees suggests adoption across a wide range of industries and organisations.[5]

The analytic tools available as an integral part of financial systems SAP and Oracle financials, although being used, did not appear to receive as much interest. Many interviewees were using older versions of these platforms with less functionality in this area. This contrasts with the finance manager at a specialist funds provider who recognised the specialist nature of that industry and relied on the analytics capabilities available with the new specialised systems.

Small business users can access a specially designed range of analytic tools purpose-built for owners and advisers in small organisations. According to an Australasian SME consultant, the most important tools are:

- ◼ 'Fathom' for financial reporting and analysis
- ◼ 'Spotlight', to help visualise accounting data and use this for powerful reporting and forecasting, and
- ◼ 'Futurli', which makes predictions about a business after accessing all the accounting data available.

To use such software, SMEs must use the online accounting packages of Xero or QuickBooks.

Figure 2.2 shows that our respondents continued to see Excel as the 'work horse' for analytics across their organisations (81%) with data visualisation tools a far second (47%) among technologies used. Robotic process automation (used by 17%), machine learning (13%), artificial intelligence (12%) and deep learning (6%) cluster together and the level of interest suggests that respondents are at the early stages of implementing these technologies.

FIGURE 2.2: Which technologies are currently in use in your team to support data analytics activities / strategies / work with clients?
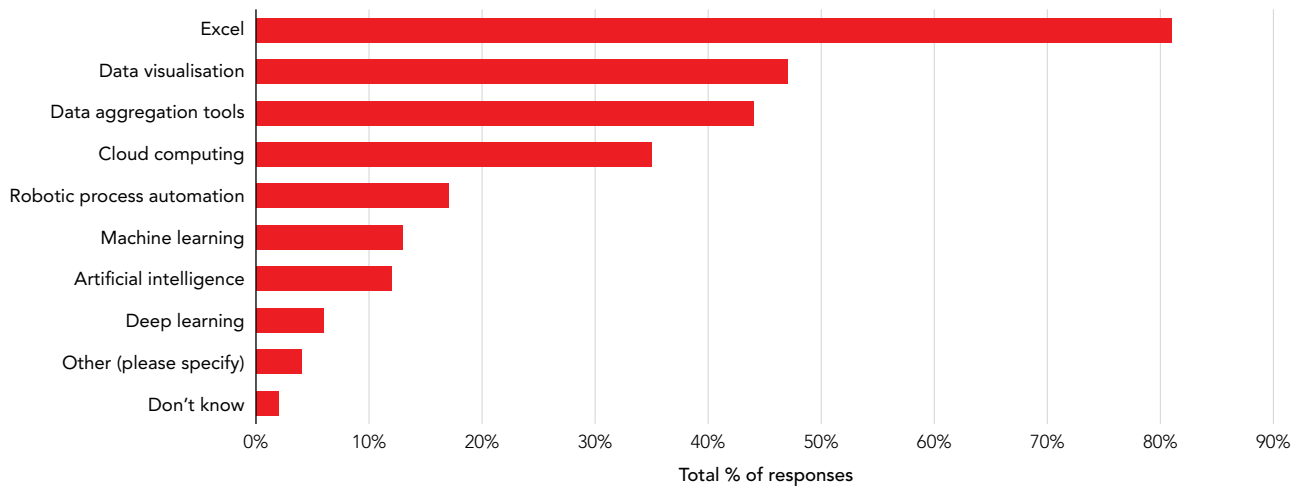
5   ACCA and Chartered Accountants ANZ reviewed the use of technology in ACCA / Chartered Accountants ANZ 2019.

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A small and medium-sized business and practice perspective

The most advanced of Cloud-based analytics tools available for large organisations are readily accessible for SMEs and small-to-medium-sized practices (SMPs).

This includes Microsoft Power BI, which is suitable for complex modelling, and machine learning using Azure Cloud services and the Salesforce Tableau analytics platform. As SMEs experiment with technology and become data literate, SMPs are having to respond and even develop SME analytics solutions more suited to small businesses than the commercial enterprise analytics tools. During COVID-19, SMPs have no longer had to convince members of the practice or clients of the benefit of analytics in generating information.

The accelerated use of analytics by SMPs for SMEs during the pandemic has not only helped them gain an appreciation of analytics in finance but also enabled access to government assistance wage subsidies and tax stimulus. Access to that assistance requires a demonstration of significant decline in income compared with the same period in the previous year. For SMEs to demonstrate eligibility requires a real understanding of the numbers and an analysis by the SMP. One Australasian consultant and SMP argued that businesses might actually make more money by recognising revenue, sorting through staffing and making more use of their data than would otherwise be possible. This allows them to shake up the business and get rid of 'fat'. Rather than pivoting, business is vaulting to a business model change. Locating the assets and exploring how they can be reworked are the key issues. Exemplars of this shift are gin companies that are now making their own sanitiser brand, a change seen globally. Local cafés are selling picnics and focusing on their take-away service.

According to the Australian consultant interviewed, even the SMP accountancy professionals are changing. During COVID-19, a tax accountant who was used to hiding behind a computer has been providing online advisory services using Zoom videoconferencing and the Skype communication tool. The same consultant and practitioner runs an online support group for SMEs, with each session

running into two hours. This Australasian support group covers the globe with attenders from Malta, Ireland, the UK and US.

To support SMEs and help them gain familiarity with analytics (particularly predictive analytics) and 'off the shelf' software, the Australasian consultant made several suggestions.

1. Within the accountancy tools such as Xero, MYOB or QuickBooks ensure that you have a good chart of accounts with few clear expense lines and different jobs, and use a suitable tool for each project.

2. The next step is extraction of the transactions and data from the accounts. DataDear (https://www. datadear.com/) helps extract data into Excel and generates reports using pivot tables for a rapid analysis.

3. With an understanding of the accountancy data, cash flow forecasting and scenario planning are achievable using Float (https://floatapp.com/au/for-businesses/), which provides an automated two-year forecast and scenarios built on the current cash position. The scenarios might include the loss of a major client, late payments or a new hire.

4. The use of financial prediction software is the core of Futrli's Predict. Automatically pulling all the financial data sitting in the Cloud accountancy system, Predict acts like a GPS, providing accurate cash flow forecasting and the future business position inclusive of (but not limited to) cash, sales, spend, profit and tax.

The SME–SMP perspective of the founder of a UK accounting, consulting and data analytics business has led this interviewee to follow a different trajectory when engaging clients. The first step of the methodology is to gain an understanding of the early stage business

▶

🔍 A small and medium-sized business and practice perspective

through the business strategy and by segmenting the customer markets to help inform and align the financials, and reporting from the ground up, with the essence of the business. It involves understanding the key stakeholders in the business and the metrics and information that support decision making. This understanding allows the founder's company to gain sufficient knowledge to run the finance function for a client. From an analytics perspective, the choice of tool such as Looker (Google), PowerBI (Microsoft), Klipfolio (from a Canadian software company) or Tableau (Salesforce) is secondary to understanding the sources of not only financial data but also the non-financial data and the best approach to ingesting the data. The sources include electronic point of sale systems, e-commerce websites, customer relationship management (CRM) and warehouse systems. Bringing all this together provides greater confidence in decision making for the business owners. It requires a hybrid of skills covering accountancy and finance, basic technology, and data skills. The development of such skills is achievable by giving data specialists and data scientists training in accountancy and management information.

Challenges for the founder include the necessity of communicating to SMEs the power and value of analytics that they may never have used before. The key person providing a mandate for analytics in one SME business in Asia is typically the CEO. The business owner or CEO ensures collaboration takes place for data sharing. Thus, the focus is not on financial information but on actionable insights. This is important owing to the high cost, for an SME, of implementing the analytical tools. The cost is dependent on the requirement for bespoke visualisations aligning with the business strategy and

carefully generated charts from key data sources. The end-user experience is built on alignment with the client's business strategy.

The CEO of an Asia-based data technology applications provider sees analytics technology as helping analyse and cut through much more data than using only Excel and mental skills. A variety of software is available to generate analytics and this CEO's finance team is actively involved in the business, helping to understand client requirements and acting as a bridge between the customer and software development team. The finance team use predictive analytics internally to help understand customer behaviour and proactively manage delivery resources. Within the business itself, dashboards help the finance team present the company performance. A technical team works on coding analytics programs while finance understands the requirements. When the technical team struggles with storytelling, the finance team's collaboration helps to generate the right visualisation of the information. Importantly, the finance team members can help the client to understand the business case and ROI. The finance team helps monitor the ROI on a continuous basis.

The CEO runs an internal academy for training in relevant skills. This does not preclude attendance at public conferences to help close any gaps in knowledge of the tools and how to use them. The soft skills requiring development are those needed for selecting visualisation methods for different data sets or problems and using storytelling to support the chosen visualisation. These soft skills complement the existing finance and accountancy skills, so a tech (analytics) aware finance professional needs them all. ■

2.2 Where is analytics being used?

Predictive sales analytics, client profitability, product profitability and cash flow analytics are well established applications of analytics among the organisations interviewed. A UK data specialist goes beyond using analytics to help predict areas of improvement, instead focusing analytics on finding improvements in the business model. Most notably, business-to-business models are facing immense pressure to understand customer requirements. This use case arises from the need to bypass the traditional failing channels such as 'bricks and mortar' retailing.

Analytics are being applied beyond finance and marketing to embrace all the functional areas of an organisation. The rationale for using analytics has several elements:

■ extracting value from data

■ achieving competitive advantage

■ supporting strategic and tactical goals

■ achieving better decision outcomes

■ achieving better organisational performance and

■ producing knowledge (Holsapple et al. 2014).

The use of analytics for workforce planning, HR or people analytics has seen an acceleration during the COVID-19 pandemic. A North American manager with a Big Four professional services firm and ACCA network panel member is helping government with demographics planning and resourcing, moving the front-line workers to places with lower instances of COVID-19 out of harm's way. Data analytics helps build reporting on take-up of federal government incentives. Focusing on people who have lost their jobs allows government executives and public sector decision makers to make refinements to policy and update the incentives in the longer term. Similar reporting to identify small businesses damaged by COVID-19 gives government the ability to plan incentives for businesses during the time of COVID-19.

COVID-19 has changed ways of working, including more flexible arrangements, fully working from home, spending time with children during the day and making more time available by reducing or eliminating commuting. Such changes have resulted in the need for rapid implementation of remote working strategies and deployment of new technologies for business continuity, where needed. Analytics tools are playing a considerable role 'in helping to provide resources wherever staff may be, where previously only the one office had to be so resourced. Since the onset of COVID-19, and in some cases a reduction of work, analytics has helped to use resources efficiently. Previously, a simple pipeline tool and group discussion provided sufficient input for two-to-three-month resource planning. Today, a COVID-19 resourcing tool helps a Big Four professional services firm with balancing demand for engagements with resource availability in different parts of a country or even across borders. The processing of small business government incentives for businesses coping with COVID-19 in North America needed 400 people in a week. Previously, recruiting this group would have been an almost impossible task and recruitment required vetting of the people applying with a knowledge of business accountancy. The project met the objectives, requiring the completion of paperwork for each application to support the accounting information available.

🔍 CASE STUDY: The challenges of master data

One of our challenges is having good data to work with. This is a problem of discipline and this is one of the issues in that we have with master data. For years we have been exerting pressure on the top management to make sure that this problem is resolved.

We have good infrastructure. We invest a lot of money. We train people. But when it comes to managing our master data this is one of our biggest issues. We know that we have a problem in for example with our sales and marketing departments. They are late with the master data maintenance in the system or they provide the wrong master data. They make mistakes and they outsource the process. So, it becomes even more of a mess. Yet it becomes a stereotype when you automatically say this is the problem, and you know we live with this. You need to explain that if we want to have good decision making this needs robust analytics and that requires good quality data otherwise your analyses become false. ■

As the CFO moves beyond the finance function, it becomes essential to apply analytics to uncover value and go beyond achieving cost reduction and process efficiencies. This is less about transactions and more about deriving value from data to help drive the growth of organisations.

The ability for analytics to transform business processes is beginning to emerge. For example, take the collections process. The traditional approach is to prioritise accounts on the basis of the size of the account or days since invoicing. With analytics, an organisation can prioritise on the basis of factors that help pinpoint the likelihood of payment within a given time frame. Using proactive email, a collection request can be made to the customer. So the use of analytics completely changes the process.

Organisations are not just exploring or using analytics to focus on existing operations (Figure 2.3). According to our survey respondents, the top two benefits of using analytics are improving efficiencies (67%) and improving planning, budgeting, and forecasting (also 67%). Beyond these reasons, improvements in risk management (48%) and testing as well as improving controls (45%) are both helping derive value from data. But the advantages go deeper: improving revenue (37%) and supporting new product or service development (33%) detecting fraud (27%) and meeting regulatory requirements (26%). In summary, respondents are using data for far more than just gaining insights for managing customer relationships (30%). Almost the least-experienced benefits that respondents derive from their data are meeting regulatory requirements (26%) and understanding competitors (17%). For the finance team, the least important reason for their use of analytics is the identification and management of talent (14%).

2.3 Who is responsible?

Most respondents (62%) to the survey clearly understand their responsibilities for implementing data analytics (Figure 2.4).

Most often, the responsibility for implementing analytics across the organisation falls on the CFO (40%) with the CEO well behind (28%), as shown in Figure 2.5. Other roles do not have anywhere near the same responsibility or authority from the leadership team. The appearance of the audit partner suggests that, notwithstanding the independence challenges, the increasing use of big data analytics in audits is attractive to businesses. Furthermore, the business will use data analysis in a similar manner to the audit, hence the relatively strong influence (15%) of the audit partner on implementing data analytics.

FIGURE 2.4: Are responsibilities clearly allocated when implementing data analytics in your team?
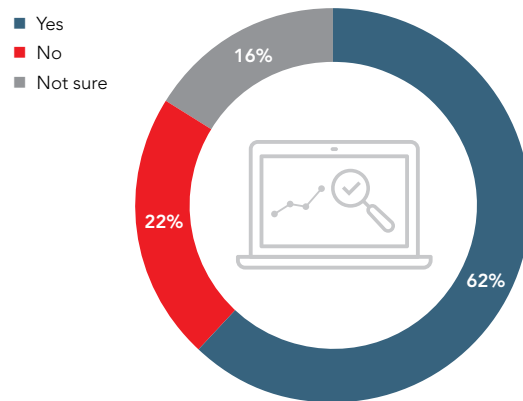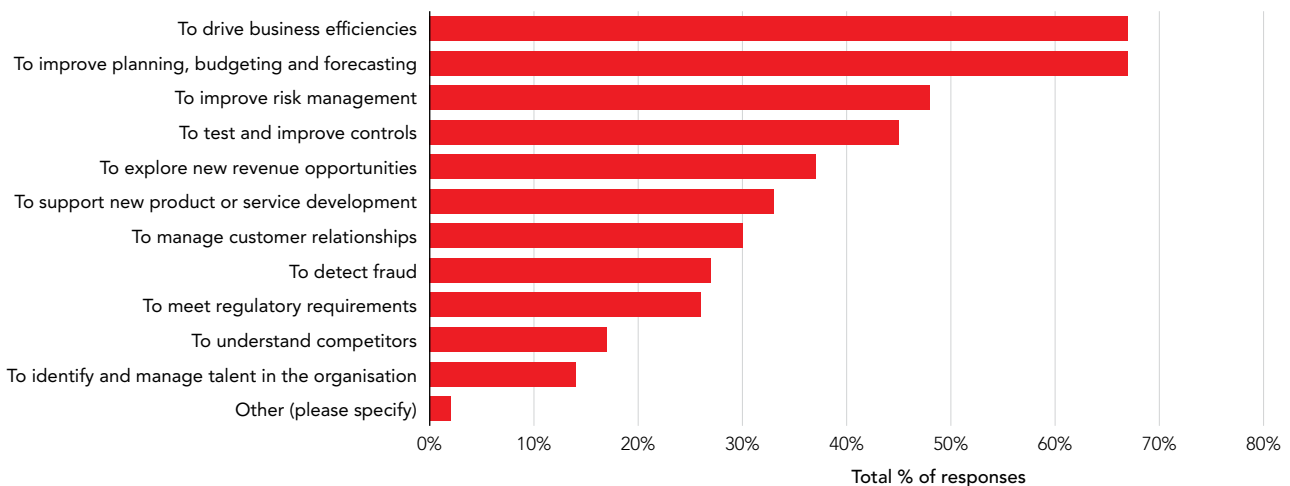

- Yes
- No
- Not sure

FIGURE 2.3: What do you think are the main reasons why your team is exploring or using data analytics?

The less-than-expected influence of the chief analytics officer (CAO) (5%) on implementing data analytics reflects the nascent stage of such roles and their inheritance of previously implemented analytical systems. This reflects the many ways in which organisations establish analytic functions. Whatever the structure, the responsibilities for governance and integrity need to be clear.

It should be noted that the audit partner scores only 15% as the survey responses include all respondents. When the responses to this question are broken down by respondents' industries, those in professional services score

49% for the audit partner, those in professional services leadership 81%, while those in finance roles score only 1%.

Figure 2.6 shows a further analysis of the respondents who identified themselves as working in small and medium-sized enterprises (ie having fewer than 250 employees) in comparison with all respondents. This shows that the CEO in a smaller enterprise has a greater role than the CFO. This suggests that the finance team is not as advanced in this area but, with the increased availability of Cloud-based applications developed for this market, the opportunity is there.

FIGURE 2.5: Who is currently responsible for taking the decision to implement data analytics across your organisation?
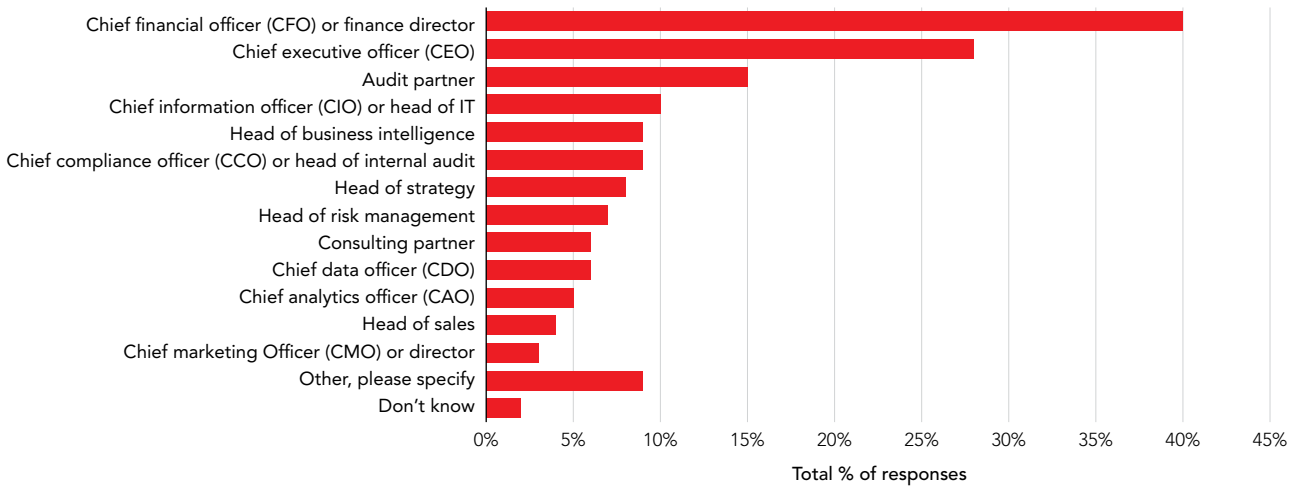

FIGURE 2.6: Who is currently responsible for taking the decision to implement data analytics across your organisation? SME respondents vs. all respondents

2.4 Responsibilities for implementing data analytics in the medium term

Over the period up to 2023–25 (Figure 2.7), the responsibility for implementing analytics across the organisation will lie with the CFO (40%) and CEO (34%). This picture is a natural evolution from the current situation, in which the same leadership roles drive analytics (Figure 2.5). Surprisingly, the role of chief data officer (8%) was expected to have greater responsibility than the chief marketing officer (CMO) (4%) in the future. The implementation involves not only the tools selection but the building and structuring of teams to enable insights from the data. The CFO role is pivotal in making data and analytics available across the organisation.

2.5 Skills needed to derive value from analytics

While analytics technology, process and data are essential ingredients for analytics projects, the need for analytics talent is a critical success factor. Both choosing a suitable method for an analytics project (eg CRISP-DM) and defining the right data and analysis method are human

tasks. CFOs and CEOs need to be flexible enough to re-engineer thinking and decisions to fit with the analysis and insights resulting from the business intelligence tools and visualisations. But analytical tools are lowering the barrier for the required level of statistical and data skills and providing existing talent with opportunities to expand beyond traditional financial and accountancy work.

Whatever the internal resources, generating insights will require recruiting external talent on occasions. Since this talent is uncommon and analysts with specific industry experience can be hard to find, talent sourcing practices need revising. This is certainly the view across several of the organisations consulted. An Eastern European CFO wants to have a champion in each team. Such champions not only work on problems but are also responsible for helping the other team members to develop their own analytic skills. For some, this builds on their existing experiences and knowledge of the organisation. Both ACCA and Chartered Accountants ANZ have mentoring programmes and following these processes builds on a proven track record of developing technical skills while maintaining oversight of soft skills relating to ethics and maintaining privacy.

FIGURE 2.7: Who is most likely to be responsible for taking the decision to implement data analytics in the next three to five years across your organisation?
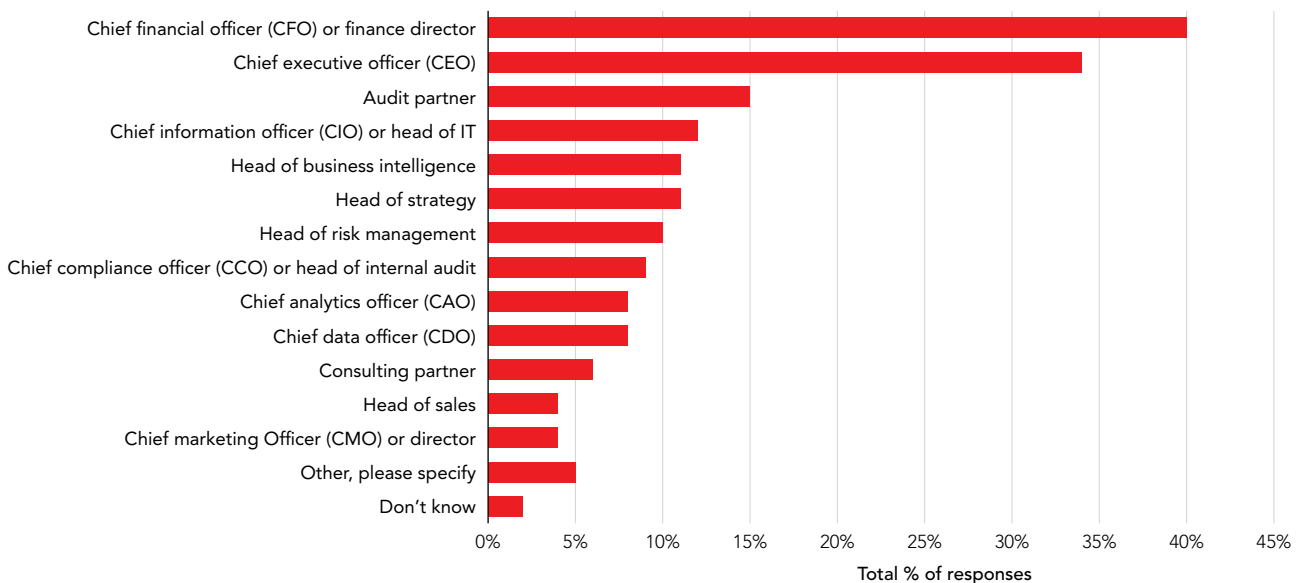
FIGURE 2.8: Skills needed to derive value from analytics

Finance and accountancy	Data literacy	Data extraction	Application knowledge	Problem solving and critical thinking	Visualisation	Storytelling

The skills required are a mix of softer skills and technical skills, as shown in summary in Figure 2.8 and discussed in the paragraphs below. The key ability is to be able to frame the problem and understand and interpret the results. Tools can help find patterns but always need interpretation and presentation.

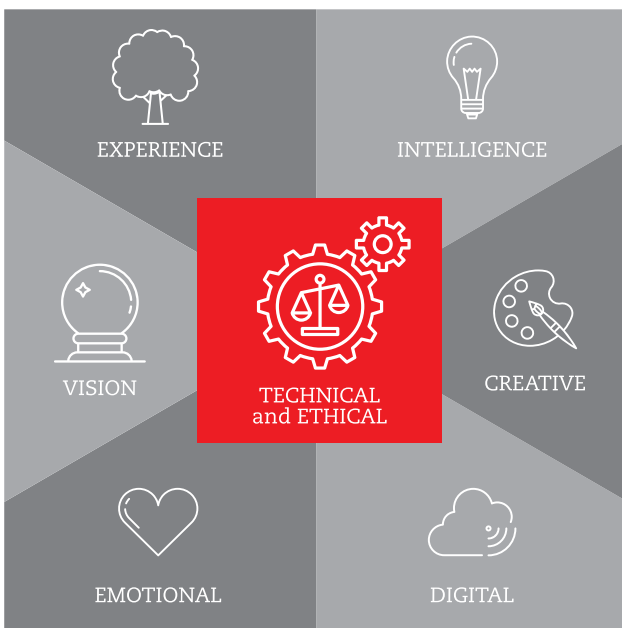### Core technical and softer skills

The combination of technical skills and ethical skills is supported by additional skills collectively making up the ACCA professional quotients (Figure 2.9a – as defined in *Professional Accountants – the Future: Drivers of Change and Future Skills* (ACCA 2016)) or Chartered Accountants ANZ's Capability Model (Chartered Accountants ANZ 2020) (Figure 2.9b). What is important for analytics is the use of the quotient when conducting the analysis and communicating the data story.

Data and analytics skills needed

Even where BI Centres of Excellence have been implemented, interviewees want to upskill the finance team and bring analytic skills and use of the technology into the mainstream of the finance function. In some cases, CFOs argued that it is not unreasonable for team members to pick up some deeper programming skills in Microsoft Power BI or the Python programming language. The incentive for individuals to learn stems from understanding the rarity of people qualified in accounting who are tinkering in their own time with Python and machine learning. Such professionals will not come walking through the door.
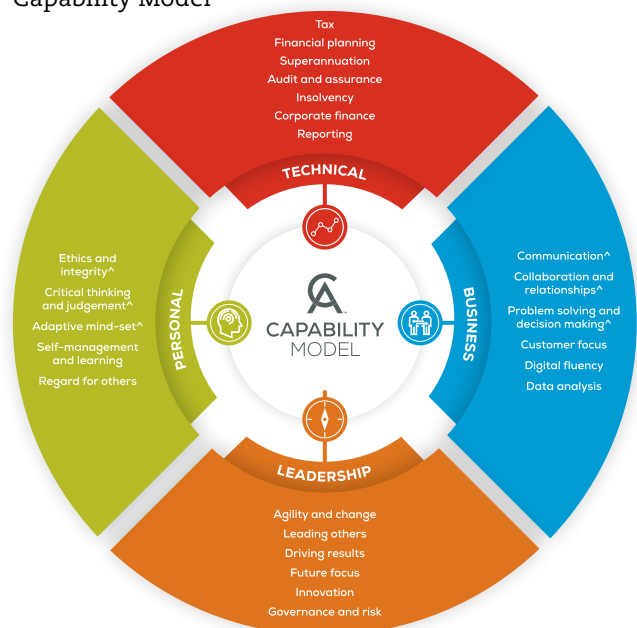
But the skills and knowledge must permeate the leadership. At the C-level, CFOs and CEOs understand what an 'analytics first' mindset brings. One North American CFO interviewee gained deep knowledge of

FIGURE 2.9a: ACCA Professional quotients

EXPERIENCE INTELLIGENCE

VISION TECHNICAL and ETHICAL CREATIVE

EMOTIONAL DIGITAL

Source: ACCA 2016

FIGURE 2.9b: Chartered Accountants ANZ Capability Model

Tax
Financial planning
Superannuation
Audit and assurance
Insolvency
Corporate finance
Reporting

TECHNICAL

Ethics and integrity^
Critical thinking and judgement^
Adaptive mind-set^
Self-management and learning
Regard for others

PERSONAL

CAPABILITY MODEL

BUSINESS

Communication^
Collaboration and relationships^
Problem solving and decision making^
Customer focus
Digital fluency
Data analysis

LEADERSHIP

Agility and change
Leading others
Driving results
Future focus
Innovation
Governance and risk

^ These are the six non-technical capabilities considered essential for future employability of a professional accountant irrespective of their level of work, career stage, location or job role. The other non-technical capabilities while critical, will vary in importance according the job role.

Source: Chartered Accountants ANZ 2020

analytics training by working as a data scientist before moving on to finance. While rare, this is not unknown among companies born data-centric and offers a broadening of the membership base of finance and accountancy bodies.

Whatever the level of data literacy of CFOs, attending training or 'teaser' workshops on contemporary technologies and tools is valuable for leaders and helps show the way to the existing workforce for participation in 'learning on the fly', as a UK CFO suggested. The leadership requirement is not for in-depth knowledge but for an understanding of the types of business ideas suitable for certain types of big data processing techniques, and knowledge of relevant technologies. This is sufficient for enabling an ability to question proposed analytics business cases and ensure their integrity, and not being seen as a 'soft touch' for approving such projects. In practice, there remains a question as to the extent to which finance and accountancy professionals need to become data scientists and understand the data collection approaches and even data structures. According to at least one CFO from Europe, the imperative must be continual learning to recognise the context in which all these digital skills, the analytics, the data, their governance and quality fit together. This helps ensure that the finance professional will remain relevant in tomorrow's business.

The UK head of an accountancy practice and software vendor tackles the skills challenge by putting data engineers through accountancy modules and finance training. Since CFOs and the finance team are making decisions on analytics and implementations, the benefit of taking such a transdisciplinary approach allows better conversations between data specialists and members of the finance team.

Taking this further for the finance team, analytics training needs to include how to access data sources, understand an application programming interface and extract data from, eg, sales into a finance system, so as to include forecasting and reporting. Much of this work of integrating systems on demand is made possible through 'low code', whereby the designer is not coding in traditional lines of computer code but instead draws on an understanding of the underpinning business processes. The low code environment converts the flow chart of the process and high-level abstractions of the data structures into an application. In fact, the Salesforce platform includes the low code Lightning platform. Finance team members conversant with spreadsheets benefit from this environment by being able to develop a program that reduces multiple spreadsheets into a single app.

So, this is not just a matter of acquiring technology skills, but is really about the finance team helping the business through the right data, right tools, and right skills to achieve the right partnership. For audit practice, the selection of tools needs to appeal to a large base of talent within the practice and among clients. This helps lower the learning hurdle.

An Australasian audit practice partner and manager helps constantly to improve the skills of employees, not only in the areas of reporting, control and analytics but more recently and explicitly in IT. Since the beginning of 2020, the audit practice has been optimising and automating a lot of the analytical procedures using advanced analytics in Excel, SAP, and robotic process automation.

The Australasian CEO of a software organisation servicing SMPs with SME customers operates a Microsoft Power BI 'boot camp' to familiarise participants with BI and visualisation techniques. DAX (Data Analysis Expressions) is the formula language used throughout Power BI and forms a key part of the boot camp. Dashboard champions attending the course gain access to pre-built templates driven through 'drag and drop' and pivot tables. Data champions focus on bringing external data sources into the system and possess DAX skills.

The skills shortage in analytics is further exacerbated by a lack of skills in spreadsheets available to organisations and finance teams. The situation is no different for SMEs or smaller accounting and advisory practices. The tools skills in short supply include Microsoft Power Pivot and Power Query and their supporting languages M and DAX. The capabilities of both these tools are available in Microsoft Power BI.

What should on-boarding for new talent include? A refresher for the latest spreadsheet versions and Microsoft Power BI is generally provided along with a basic training in finance and accountancy fundamentals. Beyond this, most companies consulted for this report ensure that each employee has access to a considerable number of educational resources (eg Lynda.com – now LinkedIn Learning). This micro learning, which takes place on the job or while working in between projects, helps the employees stay abreast of data technology and techniques. Some workplaces use this approach to Integrate learning into the overall employee experience. Thus, 'learning while doing' helps embed the relevant knowledge by connecting the analytics paradigm to work activities.

A new analytics model?

A UK CEO envisages entire organisations moving away from their traditional structures and establishing a new way of working in an analytics business model. This represents an ability to visualise and analyse data in new ways. To achieve this, a playbook of ideas and actions addressing data-centric work helps employees to establish a new way of working, leading not only to increased productivity but also to finding innovations from discoveries in data. This picture of the future of work helps address the impatient nature of the millennial workforce while promoting self-service analytics. Such a playbook well rewards the effort taken to produce it, especially for work on future business requirements that are data centric but may not be clearly understood and are ambiguous or lacking an in-depth briefing.

For the CEO of an Asian data specialist, soft skills are an essential part of the skills mix. Establishing a futures academy in-house and training at a rate of 50 staff per month helps build the firm's analytics capability. Attendance at public training sessions still takes place, ensuring that staff are taught the latest tools and knowledge. Two key skills essential for supporting analytics projects are visualisation techniques and being able to select the best visualisation method for different data sets or problems. Once the visualisation is available, storytelling skills are needed to create the right messaging and story for each client. Finance teams with an understanding of analytics represent the ideal people to present the data story.

Developing the skills

Several CFO interviewees from Europe, Asia and North America were pragmatic, realising that existing team members possess skills and knowledge of existing systems and processes. Combining the old with the new skills avoids the case of getting caught up with something new and shiny. Thus, the future skills are a hybrid of those necessary to do today's work and newer skills, including analytics. A hybridisation of old and new skills develops from upskilling the existing workforce as well as by filling gaps in analytic skills not available in-house but essential for the progression of analytics projects and thinking. Taking such an approach helps achieve competitive advantage while leveraging the existing talent within the organisation. A new breed of employee is grounded in a business domain but also has a breadth of analytical and personal skills.

Analytics starts with alignment of the business and the identification of relevant internal and external data sources. Three key characteristics help distinguish the ideal analytically competent employee from others:

- analytical skills – understanding data and its manipulation (including Excel pivot tables)

- ability to repurpose the business problem into an analytics workflow

- a curious mindset – curiosity helps drive problem-solving using data exploration, visualisation, and predictive models.

A data literacy programme helps drive insights from individual cases to wide application and enables people to be both confident about and willing to use data. No longer can organisations of any size drop analytics tools on users and hope for the best. Establishing a data culture that thrives on participation helps, but no data and analytics technology or process can function if people do not support the data initiatives. Getting people confident in using data is critical for adopting the use of BI tools. The clear solution is seen in: 'The emergence of data literacy programs. Data literacy is the ability to identify, locate, interpret and evaluate information and then communicate key insights effectively' (Australian Public Service Commission 2018). A 'Data Literacy for Everyone' type of programme covers a broad range of important business skills, including:

- the language of data

- understanding uncertainty (probabilities) and complexity, and

- the interpretation of relationships in data and visual representations.

The CFO and finance team are well positioned for coordinating a data literacy programme and have an opportunity to infuse the language of finance and operational data across the organisation. At the same time, a data literacy programme is essential to engaging the curiosity of individuals and thinking about what data is available in the business, what it represents and how it can be interpreted. Most importantly, the aim is to have more individuals in the workplace thinking about how that data can be applied to make better decisions, faster.

For organisations and individuals embarking upon developing a data literacy programme, the Data Literacy Project set up by Qlik, an analytics software supplier, includes founding partners Accenture, Cognizant, Experian, Pluralsight, the Chartered Institute of Marketing, and Data to the People, along with academics (Qlik 2020). It provides a library of resources for data literacy.

In 2020, owing to the importance of analytic tools, partnering with software vendors on the analytics journey is a distinct possibility. Combining software, education,

and support will help organisations move along the data literacy gradient. So, what does it mean to be a data literate individual? Such an individual is a professional who is not a data specialist but possesses the competence to turn data into useful knowledge and apply that knowledge to drive effective decision making. All finance and accountancy professionals need to be data literate in an automating and decision-focused workplace.

The CFOs consulted for the present research included the European CFO of a utility who uses a third-party provider to address a specific problem of specialised simulation modelling for future pricing in a regulated environment. Using third parties to address a specific analytics model or project is not uncommon. An alternative model used by an Asian CFO secures the capacity of additional but dedicated analytics talent from an onshore provider to provide an always available service smoothing the erratic demands. Whatever approach for obtaining the necessary talent, three key roles are essential for implementing large scale analytics projects (Table 2.1).

TABLE 2.1: Key roles for large scale analytics projects

ROLE	DESCRIPTION
Analytics team leader	Combines business leadership skills with technical analytic skills
Analytics model builder	Has analytical implementation and technical skills blended with industry domain expertise
Business analyst	Has business and analytics skills, including participation on projects

What did students learn?

Recognising that a key aspect of big data is non-financial information, the new Macquarie University course teaches students a new set of skills, enabling them to extract data from annual reports and government sources, including the Australian Bureau of Statistics (ABS), Austrade, the Bureau of Metrology and the Australian Tax Office.

This leads students to analyse unstructured data, including narratives in annual reports and such things as the press releases of agribusinesses. Students also extract patterns or insights from the data using Microsoft Power BI or Google Sheets, demonstrating to employers their sought-after skills in data analytics.

Lessons learned from the 2018 simulation, which will help other universities assimilate cutting-edge professional content into existing accounting curricula include the following.

1. Students learn how to extract data using machine learning techniques and to conduct automated analysis using a new generation of tools beyond the spreadsheet, including (but not limited to) Microsoft Power BI, Google Spreadsheet and Fusion Tables. Text analysis tools help pinpoint emotional signals from word patterns and phrases to determine any hint of insider trading. By providing access to different tools, students can determine which are best suited for, eg, controls testing or visualising fraudulent claims.

2. Being able to analyse non-financial large data sets is essential to developing big data accounting skills. Such data includes website data from Google Analytics and even video footage from a drone conducting an inventory of goods in one space. The data sets need not be big in the sense of having millions of rows of data – thousands of rows are adequate for teaching the concepts.

3. Students develop predictive data analytic skills through hands-on work, not only using tools and data to solve problems but also exploring large data sets to check first-hand for any useful discoveries among the data. For example, using big data instead of trend historical data and looking at each customer to predict whether the customer will pay or not is an ideal use case for introducing accountancy students to predictive analytics.

Skills for accountancy and finance professionals: Big data accounting course
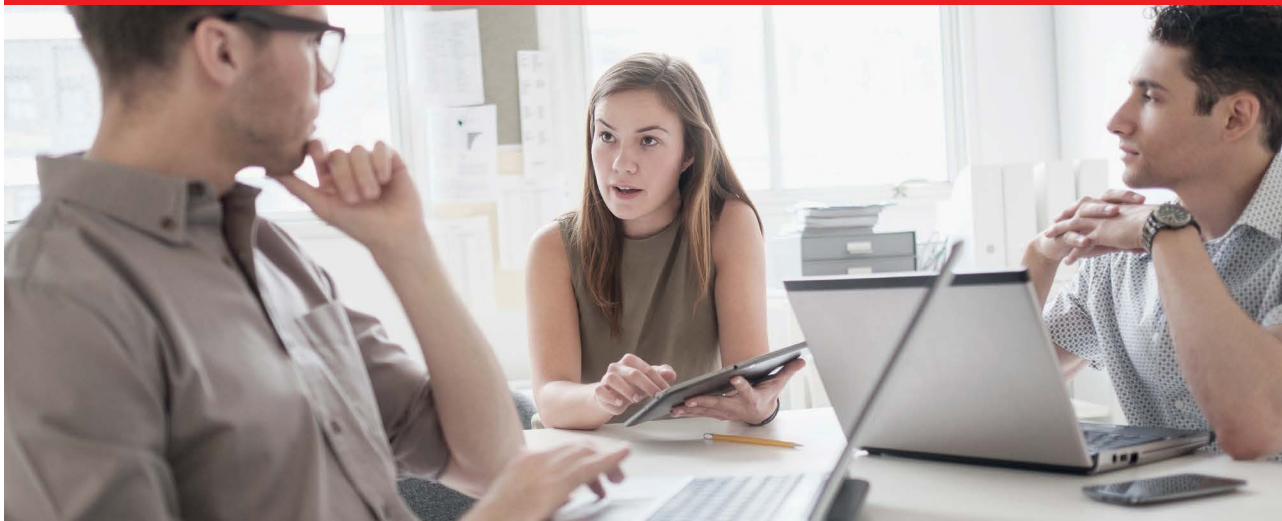
Macquarie University and Chartered Accountants ANZ developed and ran Australia's first university course module combining big data and accounting.

In brief

Employers are seeking students with big data and analytics skills. The course simulation and big data module is a collaboration between Macquarie University and Chartered Accountants ANZ.

Students will learn the skills of big data accounting, including non-financial reporting.

As the world grapples with an explosion of big data for business, finding workers with the right sets of skills is proving to be extremely challenging for industry. A new Macquarie University course trialled in 2017 to train accountancy students in big data analysis may help to fill the skills gap in Australia.

The Macquarie University course Accounting in Context (ACCG399), developed through a collaboration between Macquarie University and Chartered Accountants ANZ, is to teach students the skills of big data accounting. This new course is the last subject taught on the accounting degree before students enter the CA programme.

Combining material from the Chartered Accountants ANZ big data platform with a wide variety of public data sources, an initial course simulation project led to a real course during 2017, with two major cohorts of students participating in simulation and the subsequent assessment. This is believed to be the first university award course incorporating big data concepts directly into an accountancy curriculum.

Being conversant with big data, as well as gaining analytical skills, provides graduates with an edge in the job market for the foreseeable future as big data becomes central to accountancy and audit.

As Australian organisations struggle to keep up with an extraordinary rise in the volume of data, 77% of respondents to the PwC Big Data Cross Sector (PwC 2017b) Project survey report difficulty in finding staff to hire with relevant big data skills that are needed in their industry.

Accountants are going to be on the frontline among the professions that need to develop these skills, as big data becomes central to accounting and audit processes. If accountants are not trained in this field, the new roles of data scientists and data analysts will become custodians of business data and accountants will not be able to become fully involved with the key executives making strategic decisions.

In particular, managers of the future will need to be knowledgeable about data. A survey of US employers has found 59% of finance and accountancy managers believe data science and analytics skills will be required of all managers by 2020. The joint survey on investing in data analytics talent, by the Business-Higher Education Forum and PwC (PwC 2017a), says there is a current shortage of skills in this area, which cannot be met by business-as-usual strategies.

Hence there is a need for greater access to business analytics courses to accommodate a data industry that is expected to provide almost three million jobs in the US by 2020, according to a report by IBM (Columbus 2017). ■

The two most important skills cited by respondents for using analytics to the fullest extent are deep knowledge and understanding of the business (66%) and the need for creativity in using analytics to solve problems (63%). The technical finance and accounting skills (47%) are pretty much on par with the data visualisation skills (46%). Applying scepticism (41%) ranks more importantly than data storytelling skills (35%). Interestingly, programming and coding skills (28%) are seen to be slightly more important than ethics (22%).

FIGURE 2.10: What skills are most important in your team in order to deliver value from using analytics?

Total % of responses

Transforming an ETL (extract, transform, load) model to ELT (extract, load, transform) technology

ETL framework

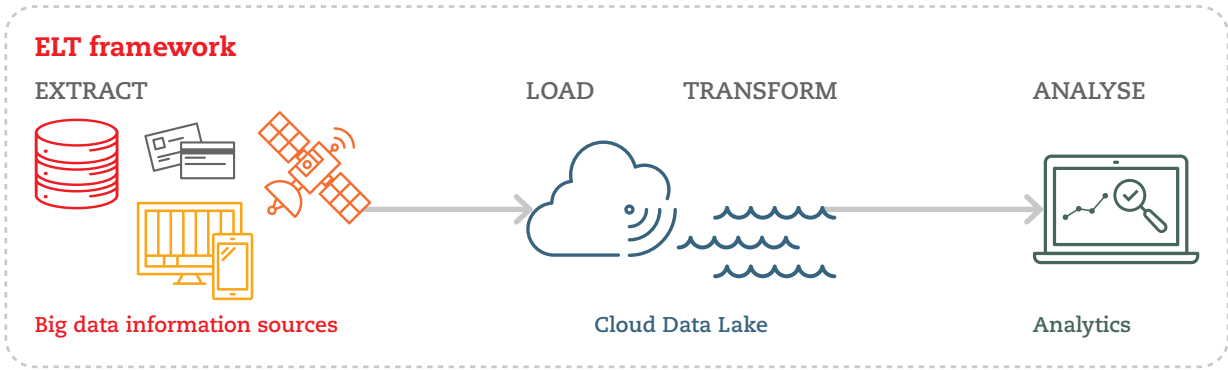| EXTRACT	TRANSFORM	LOAD	ANALYSE
Source databases	Staging area	Data warehouse	Analytics
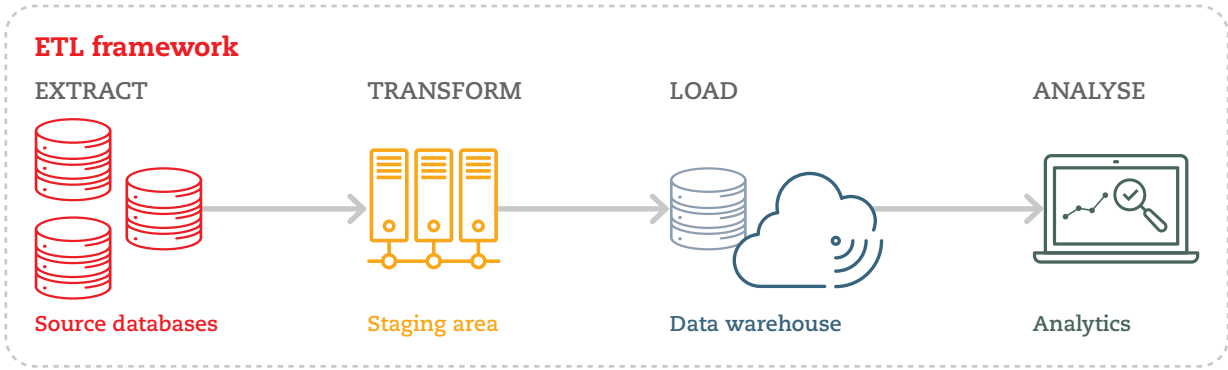
An ETL (extract, transform and load) tool and framework for analytics helps bring data from multiple sources into a central database or 'data lake'. ETL tools first appeared in the 1970s, when they were used for extracting data, transforming it into a destination format and loading it into the target database. In 2020, a vastly different landscape in operational data exists. The big data available within organisations large and small comes from highly diverse sources, ranging from external social media, log files, sensors, GPS, RFID tags, and CCTV video to text documents. The big data sources continue to grow in both variety and volume of data. ETL tools can combine sources of both unstructured and structured data. Further, the tool can help maintain data quality as well as the data lineage derived from the metadata. The metadata is critical for data modelling and reporting as well as modelling business processes.

With organisations making use of the Cloud, the 21st-century ETL model is switching to one in which loading is done earlier, post extraction: hence, ELT (extract, load, transform). This does not mean the traditional ETL is no longer required or 'dead' (Mintz 2017) but different use cases merit different approaches. ETL may be ideally suited for on-premises work. ELT, as suggested by the name, extracts data from source, loads it unchanged into the target platform on the Cloud and transforms it (ie the platform applies business rules, handles missing values, or enforces consistency in currencies) afterwards. This approach offers immediate benefits, including that once it is accessible, data can be audited and any transformation benefits from the processing on the Cloud analytics platform. With the advent of a data lake the desire is to extract and load the data sources. In this instance, the reporting comes later, and the type of transformation required is decided closer to the point of use.

Open-source ETL/ELT tools provide lower-cost options but have a downside in that they require much support and in some cases the tools cannot handle the complexity of big data. ELT tools include Apache Airflow (developed by Airbnb) and Luigi (a Spotify development). Open source ETL tools include Apache Kafka and Apache NiFi. ■
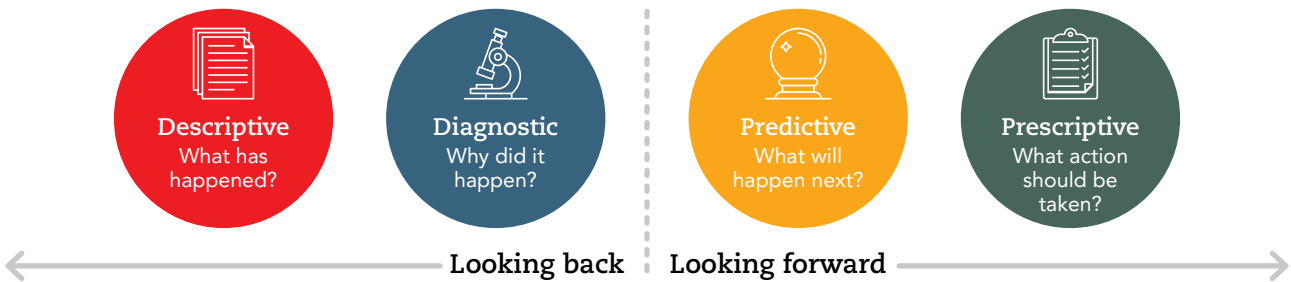
ELT framework

EXTRACT	LOAD	TRANSFORM	ANALYSE
Big data information sources	Cloud Data Lake		Analytics

3. **Types** and **uses** of analytics

3.1 Four types of analytics

To date, the approach taken to making sense of the different types of analytics available to an organisation is a maturity model (Zych 2017) (see Figure 3.1). Expectations are moving from use of analytics for descriptive purposes to diagnostic, predictive and prescriptive uses. This requires users to move through the different phases of analytics use, learning to benefit from each type of analytics in turn: hence, the 'maturity model'. But there is the possibility of moving straight from descriptive to prescriptive stages, bypassing the intermediate stages. Increasingly, the BI tools are expanding well beyond the limitations of descriptive analytics. Accounting systems and specialist finance applications from major vendors such as SAP and Oracle are providing capabilities for predictive modelling (Webb 2020). The opportunities for moving along the analytics progression rapidly are now here. But first we will consider the different types of analytics available.

FIGURE 3.1: The four types of analytics a maturity model

| Descriptive | Diagnostic | Predictive | Prescriptive |
| What has happened? | Why did it happen? | What will happen next? | What action should be taken? |

Looking back   **Looking forward**

There are several variations of the model referenced by various authors, as shown in Table 3.1.

TABLE 3.1: Different types of analytics by literature source

VESSET (2018)[6]	DAVENPORT (2013)	KART ET AL. (2015)	BAHGA AND MADISETTI (2019)
Planning analytics: *What is our plan?*			
Descriptive analytics: *What has happened?*	Descriptive	Descriptive	Descriptive
Diagnostic analytics: *Why did it happen?*		Diagnostic	Diagnostic
Predictive analytics: *What will happen next?*	Predictive	Predictive	Predictive
Prescriptive analytics: *What action should be taken?*	Prescriptive	Prescriptive	Prescriptive

6   This is the definition and types of analytics featuring in the ACCA/ Chartered Accountants ANZ *Business Data Insights Playbook* (forthcoming 2020).

An overview of the techniques in each of the steps in given in Figure 3.2 below.

Figure 3.3 shows the types of analytics that the survey respondents said were being used by their teams. There is a heavy bias towards techniques that look back rather than those looking forward.

In the following sections each of the types of analytics is explored in more detail.

Descriptive analytics

Not unsurprisingly, the commonest type of analytics CFOs and finance team members consider and use is descriptive analytics. These analytics methods are intended to provide a concise representation of past and present data. They use statistical functions, including counts, maximum, minimum, mean, top-N and percentage. These statistical functions are readily available in spreadsheets. Descriptive analytics has long been used to generate business intelligence (not to be confused with the broad-ranging

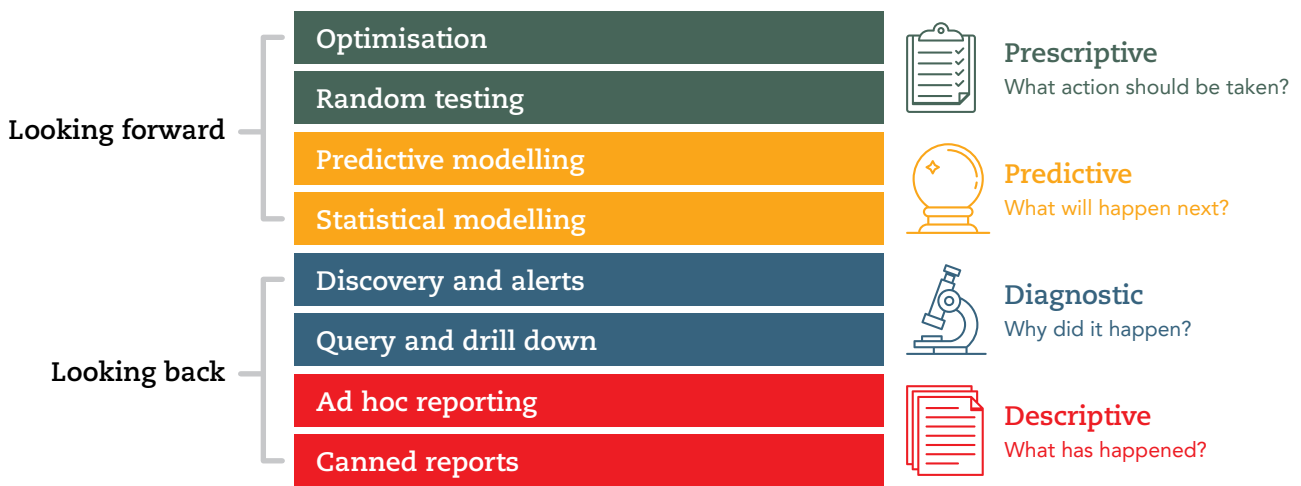**FIGURE 3.2:** Overview of the steps in each of the four types of analytics

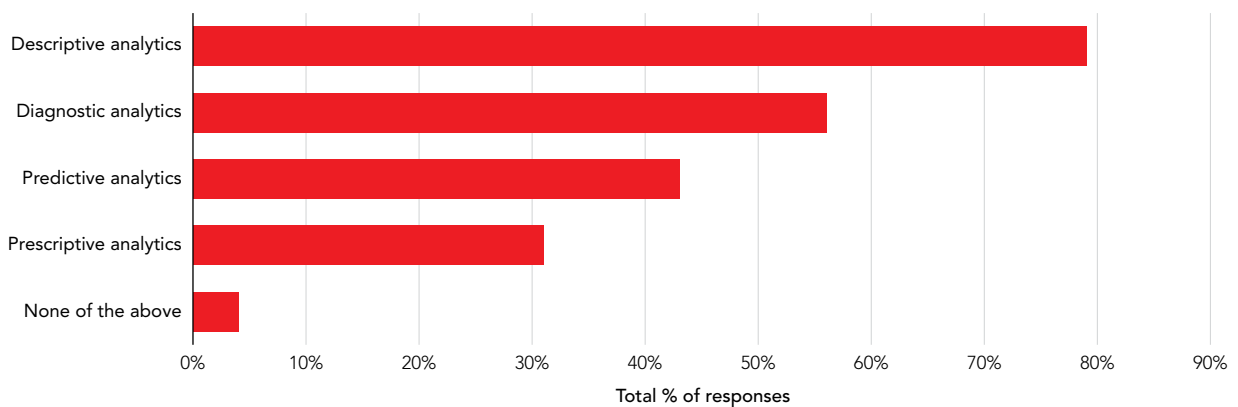**FIGURE 3.3:** What types of analytics are being undertaken by your team?

TABLE 3.2: Differences between dashboards, reports and querying data using Microsoft Power BI as an example

FEATURE	DASHBOARD	REPORT
Pages	Single page	One or more
Data sources/sets	Multiple reports, multiple data sets on a single dashboard	Each report generated from a single data set
Natural language query	Available from dashboard	Not available for a report
Visualisation type changes	Change in visualisation of a report does not reflect a change in dashboard	Change in visualisation reflects in report
Customisation	Many elements of dashboard and titles are customisable, and tiles can be moved around	Edit view allows changes
Alerts	Available via email or can be set on mobile for alerting	Not relevant
Filter	Not available	Variety of options
Featured on opening	A dashboard can be set as featured and opens as the first dashboard available	Not applicable to reports

capabilities of BI tools and software, including predictive analytics). Examples are business snapshots created using reports, dashboards and an ability to query past data. This type of analytics does not tell us anything about the patterns in the data but attempts to illuminate the past: 'What has happened?'

Diagnostic analytics

For the European CFOs working in utilities, retail and manufacturing, diagnostic analytics is predominately used for analysing the sensor data from machines to obtain patterns from a history of previous faults, which allows predictions of failures. Diagnostics helps answer the question: 'Why did it happen?'

Predictive analytics

Predictive analytics leverages the existing data to build statistical models to help make predictions about future events or values. Quite simply, the question predictive analytics helps answer is 'What is going to happen?' We should caution that the past cannot predict the future.

In discussions with audit partners and managers from a Big Four office in Australasia, it emerged that the use of predictive analytics in engagements is increasing and improves not only the overall audit quality, but also its efficiency. More specifically, the predictive audit helps uncover risks and detect frauds (Earley 2015).

Prescriptive analytics

The key signature of prescriptive analytics, which distinguishes it from the other types of analytics, is the output of a suggested course of action (Hare et al. 2016) from a set of available options. This is the ideal form of analytics to support decision making: rather than a statistical or mathematical output, it creates a decision as an output. The output of prescriptive analytics can move directly to automating a process, rather than maintaining a human in the decision-making loop. Prescriptive analytics supports the full spectrum of decision making from operational to strategic. Building on predictive analytics, the prescriptive analytics approach combines predictive models, business rules, linear programming, scoring and optimisation techniques. The combination allows for the handling of optimisation problems or predictions with rules. Hence the breadth of use cases is wide, covering cross-selling, customer churn, optimal route planning for warehouse delivery and optimisation of supply chain and logistics. Prescriptive analytics answers the question: 'What can we do to make it happen?'

While use of prescriptive analytics is rare among the CFOs and finance teams consulted for this research, government policy advisers and the CEO of an impact investing organisation are moving towards this type of analytics. Here, the desire underlying the use of data and stories (lived experiences of people) is the creation of actionable insights building on descriptive and diagnostic analytics.

Tips, tools and techniques of the predictive practice

Four key pillars inform the development of the predictive practice and help reconfigure today's accounting work for an online world:

1. proactive behaviour
2. predictive models
3. use of big data
4. providing online professional services.

Proactive behaviour

In his classic book, *The 7 Habits of Highly Effective People*, Stephen Covey (Covey 1989) calls the first habit 'being proactive'. Unsurprisingly, for the predictive practice to achieve success, participating professionals must maintain proactive behaviour. A proactive personality has been said to be a prime predictor of entrepreneurial success. This can be a useful asset for the practice with goal- or plan-driven future-focusing actions directly affecting clients.

The predictive practice not only services SMEs but includes service centres in major corporates or institutions fulfilling the demands of a financial function and adding value to different business areas. Opportunities exist in a predictive practice through shifting attention from being reactive and waiting to act, towards developing an approach to predicting customer scenarios before they occur. This helps to maximise opportunities, limit risks and proactively advise clients about matters of business and finance. For example, such advice would include warning clients in advance about tying up working capital in debtors and inventory, and identifying abnormal transactions or doubtful debts owing to seasonality.

Predictive models

Looking beyond these situations, predictive applications perfectly complement proactive behaviour. In fact, the examples from different industries have immediate applicability and can be repurposed as predictive models for use in the practice. These applications use the KNIME open-source platform. Other equally powerful and free tools include Orange, NLTK, Rapidminer, R-programming and Weka. All these tools are capable of handling big data in the form of unstructured information, extracting the data and transforming it into a useful output for predictive analytics and decision making. The hard part is determining the ensuing action to take from the insights derived from the analytics.

Use of big data

Setting aside these scenarios, the predictive practice needs to achieve mastery of new tools and techniques, including big data and analytics. A natural starting point is using Google and its well over 1.2 trillion searches a year (approximately 59,596 per second) to help your clients evaluate opportunities for new customers in new markets. Google Trends provides online capability for understanding the purchasing intent of people by showing the search volume of a term relative to the total number of searches globally. Let's say we have a plumbing client. This client is considering expansion of business out of Sydney into other parts of Australia,

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Tips, tools and techniques of the predictive practice

and New Zealand. Search Google Trends for 'plumbing' and similar words with 'Region' set to either Australia or New Zealand. Further, we can review the locations making up the search volumes and select relevant city locations on the basis of the volume of querying taking place. This data from Google Trends is available as a CSV file and can be used alongside existing financial information as non-financial information (termed NFI) helping us to discern any future trends.

In this manner, we use the search term as a proxy for the growth of consumers and businesses seeking plumbers. Remarkably, in spite of the enormous volume of data, Google Trends provides information on searches that have taken place over the past hour in Australia and New Zealand. To get some idea of the number of people in each location with an interest in 'plumbing', Facebook advertisement placement provides details of the estimated reach of people who click 'like' for '#plumbing'. Complementing this research, SimilarWeb and Alexa (an Amazon company) provide competitive intelligence on sources of traffic, upstream sites, and keywords for search as well as audience demographics.

Free versions of these services are available on these companies' websites. At this stage, we have generated sufficient data and using relevant search terms generate the report. Presenting the report to the client in a proactive fashion, combining it with your own knowledge of similar businesses as well as additional open data sources, eg National Map in Australia and data.govt.nz, unleashes tremendous value for you and your client as a catalyst for conversations on business growth.

Professional services online

Perhaps the best way to deliver this proactively driven work to a client is online as a data story using a new generation of online storytelling apps, including Storify or Sway. The expectation for the predictive practice is that 50% of the business will be done online by 2020. If you think this is unlikely, think again, as the interactions between professionals and clients online will soon enter a new stage of growth. While Fiverr and Freelancer might have been early to the talent-sourcing marketplace, LinkedIn has launched the Profinder Service (https://www.linkedin.com/profinder) connecting service providers with customers seeking inputs for a freelance project or a long-term professional service.

As a B2B social network, LinkedIn appears ideally positioned for the creation of a global marketplace of professional service providers. The practice or professional without a solid online presence is about to find challenges generating new sales opportunities. There is no better time than the present to start selling predictive practice service capability online, breaking out of a local niche and serving a global marketplace. ■

THE EXPECTATION FOR THE PREDICTIVE PRACTICE IS THAT 50% OF THE BUSINESS WILL BE DONE ONLINE BY 2020.

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3.2 The future of analytics

The future of analytics in decision making will see the combining of all the types of analytics to arrive at a decision. For example, a discussion with a finance team member about forecasting automotive parts for ordering follows a decision-making framework. Initially, diagnostic analytics helps establish the current situation, predictive modelling helps establish the returns, a three-month forecast is very accurate and connects directly with customer data and a further degree of accuracy is achievable beyond three months through collaborative efforts with sales and marketing.

Interestingly, most CFOs interviewed did not have predictive models in operation. If finance is to play a significant role in enabling decisions across organisations, the use of predictive analytics must grow dramatically. An ability to predict or smartly second guess decisions that will be needed in the future is an extremely attractive proposition well before any impacts on financial statements. Competitive advantage can arise from reducing the time to market. Paraphrasing a European CFO, those who react after an event are losing while those who can act in advance are winning.

For smaller practices, automation and the availability of prescriptive analytics could even offer a chance to allow them to compete better with larger practices, with Cloud services allowing access to products, services and automated processes that will enable them to do more with less.

Consistent with the focus on using Excel for analytics, the type of analytics being undertaken is descriptive (used by 79% of respondents). Diagnostic analytics (56%) is ahead of the use of predictive analytics (43%), while prescriptive analytics (31%) is used least. This may well be the optimistic view of those responsible for implementing analytics within the organisation: 62% of the survey respondents have clear responsibility for implementing data analytics.

CASE STUDY: The challenges of analytics in reality

Our organisation has a legacy accounting and manufacturing system that operates on the AS/400 platform. As part of the core application we have a portal that enables us to download data into Excel.

The system itself has quite a lot of good reports covering areas such as sales and controlling that we can use, but they are not comprehensive. You can use these to identify when there are issues and you know when something is not right, such as a mismatch in logistics. That is quite good to a point.

The application is maintained centrally and if we want any changes to a report or additional reports these must be requested from the global IT department, which is located in a different European country. It takes time for them to be able to react and help. In some instances, we need to use our Excel skills to create reports and manipulate data. Some of our team are more proficient at this than others.

All of this can create a sense of frustration at the management level. The directors get the information that they need but to achieve this it is a combination of downloading several reports and combining, manipulating, and analysing the data in Excel. This can be a very time-consuming process and one that is not very efficient for anybody. Any additional follow-up requires deeper investigation which again takes time. It is frustrating. ■

Three in one financial analysis system

We adopt a 'Three-in-One' financial analysis system. Through the integration of the basic data and information of different types of business, a set of managerial accounting reports are prepared.

Through analysis from three dimensions, financial analysis can form both regular and special reports, serve for both business and finance needs, support us in making both strategic and operational decisions. It works in this manner.

'Three' refers to constructing the financial analysis framework in three dimensions: hierarchy, finance function, and timeline.

- **Hierarchy:** from company level, to division level, and even smallest units (such as representative offices/ product lines/projects). Since the data analysis is carried out from the perspective at all levels, we can manage and use the data from top to bottom and from bottom to top. The data analysis can further support strategic analysis, industry analysis, predictive performance analysis, diagnostic project implementation analysis, and descriptive operational indicator analysis.

- **Finance function:** In-depth analysis is carried out to identify risks from the perspective of different finance functions, including performance management, accounts receivable, budget, inventory, and taxation.

- **Timeline:** Data analysis help us investigate the past, the present and the future. When we look at the current data, it is like 'side-mirror'. We must learn from the past and let the past become our experience. When we look at the historical data, it is like the 'dashboard', which enable us to be aware of the current situation and keep on the track. When we investigate the future, say the medium and long term, it is like a "navigator", that predicts the way ahead to support the future of the sustainable business.

'One' means to there is only one set of managerial accounting reports. We do not have two stories, one in the business language and the other in the finance language. ■
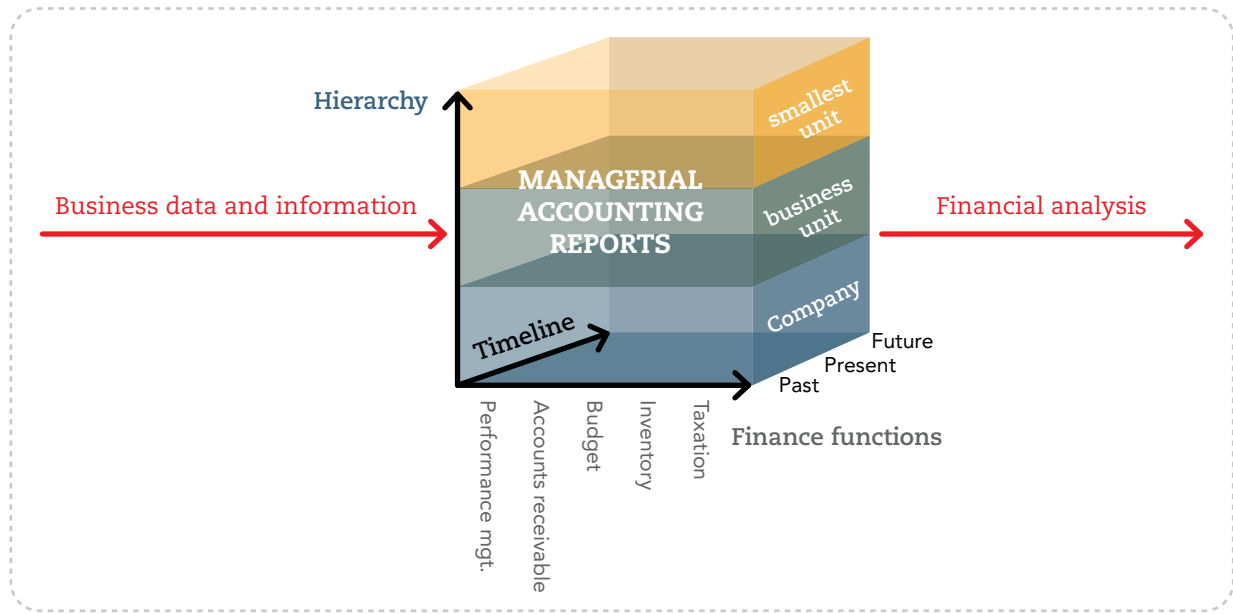
4. **Leveraging** analytics in **your business**

4.1 The business case

Companies interviewed for this study all have different stories to share on the imperatives of developing a business case. On the one hand, companies did not seek specific goals in the business case other than a positive return and the major concern was how quickly this could be achieved. 'Producing a business case for adopting new technology traditionally involves evaluating hundreds of criteria. Producing such a case for analytics tends to be more straightforward. This applies not only to BI and analytics software but the more abstract concept of data governance.

The common thread among successful business cases is the use case. For the data governance scenario, the use case is actually the cost of choosing not to treat data as an asset. Here, respondents were unanimous that the best argument is given by examples of bad or even calamitous decisions based on the poor quality of the information.

One CFO went so far as to say that the shortest business cases comprise a history of mishaps caused by incorrect financial formulas, bad macros in spreadsheets and poor-quality data. Another approach is to use an 'issues log' capturing the major issues frustrating users and finance team members. Such a case is sometimes self-evident, where bad data rather than a careless mistake results in, say, billing a deceased user of services. Here, the case is not necessarily the cost savings but rather the non-financial benefit of avoiding reputational damage and even future problems not yet understood. No matter what application is considered, a one-page infographics highlighting costs and benefits is a useful artefact complementing the business case templates.

For the head of analytics of one financial services provider, the initial thinking and business case for analytics emerged from a Digital Transformation project. The initial problem related to maintaining the retention rate of customers. Normally for analytics, a pilot is run first and if this is

successful on a walk-through session with a steering committee comprising the CEO, COO and CFO, the project is extended across the organisation.

For SMEs, according to the SMP experts consulted, the business case revolves around savings in time. This applies to Microsoft Power BI and consultants able to help businesses create efficiencies through time savings. A threshold of two hours of savings in a month seems to be sufficient for a decision to enter a consulting or contractual arrangement.

In many cases the business case is tailored to use of specific tools, as organisations select a tools-led approach to analytics. The business case follows the flow: 'I have a problem and need a tool'. Funding support for analytics, tool-led or not, emerges from multiple sources and often from the functional area and in line with the priority the function puts on analytics. While not a rule, the greater the organisation's maturity in using analytics, the more prevalent an overall enterprise funding and resourcing model tends to be. Here, the business case needs to underscore the strategic value that analytics generates for the entire organisation. With the availability of software as a service for many of the analytics tools, and services, a consumption model resulting in a small charge internally may well be suitable for recouping the costs of service delivery for central resourcing. As modes of use and their returns become clearer, flexibility in the funding model can be adjusted to suit the specific circumstance.

For a big data audit, testing of an entire population of revenue transactions leads to a more risk-focused audit by identifying all 'high-risk' transactions for further testing and verification. This more comprehensive testing of transactions gives the auditor better understanding of the client and their business, providing a greater level of assurance than would have been achieved by sample testing alone. This also benefits the client.

Steps for implementation

With challenges in sourcing analytics talent, relevant data, appropriate technology and techniques, there is no single way for an organisation to support analytics projects. The interviewees' organisations reflect every type of organisational design and the challenges they each face are all different. The centre of excellence model faces a variety of challenges across the companies interviewed, with interviewees expressing similar major concerns about response and delivery times.

TABLE 4.1: Organisational models supporting analytics

TYPE OF ORGANISATION SUPPORTING ANALYTICS	ANALYTICS RESOURCE MODEL
Decentralised	Analytics resources allocated only to projects within functions or business units with little or no coordination across the organisation.
Centralised	Strong management of resources from a central pool working on projects across the organisation. For SAP and Oracle, financial central resources handle analytics.
Centre of excellence	Includes lean teams for improvement and optimisation initiatives. Analysts coordinated from centre. Prevalent in large multinational companies.
Consulting	Analysts work together in a central group but act as internal consultants charging in-house clients for service. Specialists resources are external third parties. Sometimes includes transformation teams.
Hub and spoke	Central group of analysts with strategic deployment to initiatives across the organisation.
Functional	Analysts are in the functional areas where the most activity takes place. Business partners, champions and mentors are available in the functional areas. Information partners provide direct support to the home location on data issues. Finance team helps across the organisation and helps translate requirements. Supports analytic decision making. Chief data officer or head of analytics often reports into CFO.

FIGURE 4.1: Thinking about the following activities across the entire 'data analytics' process, how much effort is currently involved from your team?
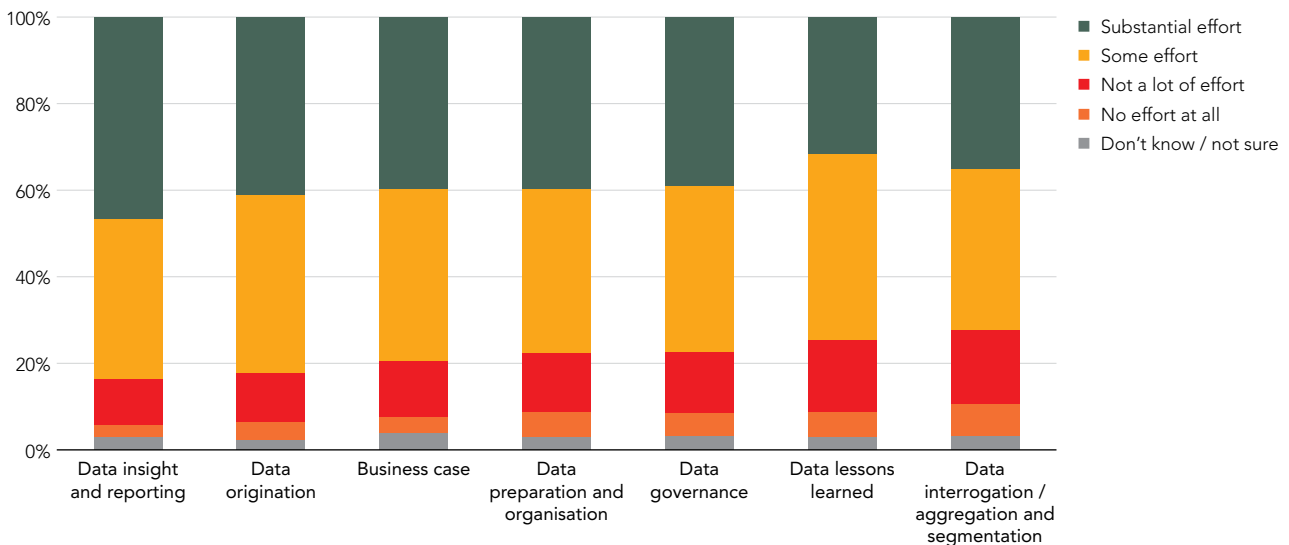
CASE STUDY: Hub and spoke model – the role of the centre of excellence

As a manager in a financial sector organisation's analytics centre of excellence, we engaged with several consultancy organisations on the best way for us to organise and structure our analytics capability within the group.

Due to the large size of the group, about 10,000 employees, a decision was made to set up a group data office function that operates using the hub and spoke model. This basically means we operate as a central 'hub' team for data and analytics, focused on enterprise-wide strategic analytics initiatives, linked to 'spokes' – analytics teams embedded in individual business units responsible for the design, development and delivery of analytics solutions. Our aim is to democratise data and analytics within the group.

The central hub team is responsible for developing and executing the enterprise-wide analytics strategy as well as identifying appropriate frameworks, tools and standards to enable the organisation to become analytics-driven. This gives us consistency in how the different data and analytics tools and data sources are managed across such a large organisation. The hub consists of a number of lightweight, agile and innovative analytics teams. My team is focused on advanced analytics and we take on projects that are strategic in nature, outside the remit of the spoke analytics teams.

We work through a team of business partners linked with all areas of the group. Finance is one of those groups. We operate alongside business partners to design and deliver data and analytics solutions for a wide range

of key stakeholders, democratising data and analytics while focusing on developing data literacy. We have an enterprise data warehouse which enables ad hoc and operational reporting for the group. We have recently implemented an enterprise data lake to support analytics at scale. The demand for resources to solve business problems using data and analytics is high among our business teams. We manage this demand through a fair and transparent, value-based prioritisation process which helps direct analytics talent towards identifying opportunities and solving problems that drive commercial outcomes. This enables us to realise measurable business value from investments in analytics infrastructure and data assets.

One of the key things that we do, as a centre of excellence, is to partner with different divisions and stakeholders, enabling them to be derive insights from data to support informed decisions. We provide the necessary training to enable stakeholders to interact with visual analytics tools and go beyond using traditional tools such as Excel. It means that stakeholders that are not technically minded can interact with and explore the data in order to derive insights and meaning. The data has been cleansed with appropriate governance measures taken in order to ensure the right data is available to the right people. ■

CASE STUDY: A decentralised model

Our initial approach was to establish a centre of excellence (CoE) to facilitate data analytics for the organisation. This initiative was very much driven by the Senior Management, in the early 2000s, for greater adoption of analytics in marketing and financial management.

We set up a data warehouse and started exploring things like predictive analysis and predictive marketing. However, there initial efforts were very much concentrated on financial analysis, while non-financial analyses had a slow start.

In those early days, expectations on the CoE were exceedingly high due to a burst of interest from our internal stakeholders. The CoE was simply overwhelmed with so many requests for analytics on products, services, customer demographics, complexities etc., in a such a short period of time.

The negative feedback that ensued made us realise that we needed a different approach – a decentralized model. This model proved far more successful, especially for a large organization as ours. However, to ensure that the decentralized activities did not result in working to different standards and quality, we initiated several committees to address this.

One such committee was on data governance, covering both financial and non-financial data. We invested significantly in building this data governance model, with

policies, processes and databases that catered for about 70 to 80% of data. The remaining 20% still required interventions to ensure the completeness of information coming in as a lot of information continued to be captured manually outside the core processes. We needed to bring that information into the databases and platforms, to make it accessible to users undertaking their analyses.

In additional to having a common platform and reliable data to be accessed by users, other ancillary initiatives that made this decentralized model successful were the training and communication programmes that was conducted simultaneously on data analytics for all key stakeholders.

While this model certainly allowed us to move the pace of implementation of analytics-based insights and meet the huge demand for it, we won't rule out that as we go forward, a different model may be required. As we continue to get better that this, we will not rule out the possibility of bringing all these people together into another centre at some point in time for efficiency purposes. A much bigger one. ■

4.2 Data insight and reporting

The democratisation of data and analytics is occurring in most of the organisations consulted. The use of visualisation tools, including Tableau, with an ability to leverage data from different systems, permits non-technical users to interact with charts and graphs, using dashboards, on a regular basis. To leverage this democratisation fully, the CFO of a European organisation argued that the leadership team needs to be more discerning when considering requests for data analytics. They need to look beyond the request for a specific output to determining the ultimate desired outcome. Over time, this will see analytics move to the core of business strategy: driving a sales increase, reducing costs, avoiding regulatory penalties, connecting with customers, or increasing net promoter score (i.e. customer loyalty). From a reporting perspective, the desire of most organisations is to automate the reporting processes so that much more time is available to spend on analysing the insights from the data and determining potential actions. Reporting is expected to include non-financial information: not only on environmental, social and governance issues but also information from customers. The voice of the customer is expressed in social media, which also presents the opportunity to address any grievances or accentuate positive customer commentary to an online audience.

4.3 Developing analytics capability in the finance team

Building analytics capability requires development beyond the existing organisational structures; the organisation must acquire talent and access to technology and the right data. All the CFOs interviewed considered that 'capability' here means the ability to use data to produce insights that facilitate better decisions. Further, several of the CFOs commented that confidence is essential when using data to make decisions.

Data collection is the first step for any analytics application. Before the data can be analysed, it must be collected and ingested into a big data stack. The choice of tools and frameworks for data collection depends on the source and type of data being ingested. For data collection, various types of connector can be used, such as publish–subscribe messaging frameworks, messaging queues, source–sink connectors, database connectors and custom connectors.

For analytic capability building, improving data collection processes (54%) and staff training (54%) are of equal and highest importance. The introduction of new technologies (41%) ranks with new data visualisation techniques for analysis and reporting (41%), linking new technology with new analytic techniques. Lesser importance is accorded to the use of unstructured data (29%), external data (27%) and recruiting data analytic skills (25%). The lowest priority is given to transitioning data to the Cloud (21%) and engaging external consultancies (16%).

FIGURE 4.2: Which activities have your team adopted for building their analytics capability?

CASE STUDY: Towards predictive analytics – automating and provisioning a frictionless data driven service for members

Our organisation was established in 1954 to provide cost-effective private health insurance for union members and their families.

The opportunity exists to provide a data-driven digital service for members moving away from existing manual processes. The vision we have is using digital analytics provide digital customers with a superior experience, much like e-commerce. A big expectation exists from customers wanting insurance providers to match up to online consumer services with claims being paid out almost instantaneously in a frictionless manner. Organisations cannot survive if they stay the same.

Our initial work includes regulatory reporting generated through an automated process. We are completing the build of the foundation for data and analytics using a Microsoft Cloud and Power BI infrastructure. As this finished, the claims investigation process will move from a manual approach to a reimagined automated solution using predictive analytics. Data privacy is a significant challenge being in the health insurance arena. All the frameworks are hard to navigate, and in an ideal world, we would be able to follow the best practice.

A Community of Practice and Analytics hub exists with the participation of analysts from each division. Analysts and managers are being upskilled on an organisation-wide basis beyond finance, and our entire C-level takes part. Upskilling is difficult, especially for people not involved with analytics daily. Hence conduct upskilling through lunch and learn sessions and creating proof of concepts to embed continuous learning ecosystem in the organisation. The steering committee is vital with a six-person group comprising CEO, COO, CMO, CIO, CTRO & CFO. They provide sponsorship as well as endorsement and oversee the roll-out plan.

If you want buy-in for new analytics projects, I probably think the best way forward is to consult Individual teams and present a tailored approach. The approach should include a 101 session with the C-suite providing a Q&A session and feedback. It's really about ensuring we have the support of everyone. Sharing learning is essential for transparency, and I have found best not to be overwhelmed with everything going on in the field of analytics. We don't need to go chase after the next shiny new thing no matter the promise of the technology. The main reason to hold back a little is that if an analytics project fails, it impacts culture and people adversely. ■

5. **Ethical** and **legal** considerations

5.1 Ethical considerations

The perspective from at least one audit partner interviewed moved beyond regulatory concerns, recognising that the data belonging to the organisation undergoing audit needs to be treated with care and respect within the context of an ethical framework. But the challenge for the CFOs remains ensuring the ethical use of the data.

Nonetheless, when survey respondents were asked: 'What skills are most important in your team in order to deliver value from using analytics?', they considered ethics (22%) to be close to least important, only slightly ahead of influence over decision makers (18%). This is not to say that ethics is neither of considerable importance nor a major challenge from the client or consumer perspective, as this is core to the reason for service delivery by accountancy and finance professionals, including auditing, quarterly briefings and tax returns, to mention but a few. In these situations, a blurring of regulation, legal requirements and ethics becomes difficult to decouple. This demonstrates that while the professional abides by a code of conduct, the situation for analytics in finance is viewed somewhat differently, even by the professionals themselves. The ethics perspective is almost a given, owing to the involvement of accountancy and finance professionals, but this underlines the need for a fundamental rethink of ethics and analytics to make a direct linkage between the two. The certification of data sets by the finance function, much as an auditor's confirmation that transactions have been recorded accurately or an accountancy professional's signing off accounts, creates a direct link with ethics not previously seen in the handling of data. Such a sign-off can go so far as including the location of the data and security level, ensuring that the data is not readily subject to manipulation. Given that for most organisations data represents a major asset, the involvement of the CFO and finance team communicates the value of the data and therefore of the analytics applied to the data. Indeed, the ethical aspect is further reinforced as this might provide an ideal foundation for determining returns from investments in analytics projects. By focusing

on ethics and data from the outset, if any decisions made using the analytic insights create risk, that risk can be understood and managed. But it is the use of the analytics that causes the greatest concern and the public need to trust that any use of their data is ethical and will not impinge on the civil rights of individuals. Governments have begun to signpost the possibilities. The Algorithm Charter for Aotearoa New Zealand (New Zealand Government 2020) demonstrates the ethical use of data in government departments. Other governments are following different approaches with similar outcomes.

But in digging deeper into data, managers should be 'informed sceptics' (Shah et al. 2012) with an ability to make good decisions through listening to other opinions, superior analytic skills and balancing judgement and analysis. Yet only 38% of employees and 50% of managers are sceptics (Shah et al. 2012). CFOs and audit partners consulted agreed that there is a need for scepticism in

> BY FOCUSING ON ETHICS AND DATA FROM THE OUTSET, IF ANY DECISIONS MADE USING THE ANALYTIC INSIGHTS CREATE RISK, THAT RISK CAN BE UNDERSTOOD AND MANAGED.

data analytics and that this reinforces the finance team's involvement when introducing new data sources, BI tools for analysis and data literacy education. For the CFO and finance team, the application of professional scepticism is essential in understanding changes to financial statements, potential risks or errors. For the auditor, data scepticism or data curiosity (Davis 2014) is a key foundation and prompts questions to ask about the origin of data, and how it is collected. And what might be missing? What alternative data should we review? For the data scientist and data analyst, professional scepticism training is a helpful adjunct to using the BI tools and data technology infrastructure, especially as the complexity of algorithms increases with the use of predictive and prescriptive analytics. Treating the analytic computations as black boxes will not be acceptable, least of all when gaining sign off on the audit. As an Australasian audit partner familiar with big audits commented, tools have to be approved for use with identified information flows, and a combination of data specialists and finance teams have to work together to use the tools and identify insights in the context of multiple client situations and core processes.

Unless finance professionals learn to work like this, other advisers, including data scientists, who can leverage data and analytics, may reduce the advisory capacity of accountants and other financial specialists. If that happens, the rules these other advisers set for businesses about what data to collect and how to interpret it may not align with appropriate accounting principles, knowledge and fundamental ethical requirements.

5.2 Data governance

One Asian-based CFO drew attention to his team and organisation's certification of data sets. This presents a more sensible approach to governance than clamping down on the variety of spreadsheet uses. But other organisations do see the benefit of an information committee that keeps track of the various uses of data beyond financial analytics. Not one of them claimed that their organisation fully controlled data governance, with most having a sense they are 70%–80% of the way, with more effort needed to tie up loose ends, including the completion or creation of central data lakes. But data governance is much more a matter of data stewardship and ensuring both the protection and correct use of data assets, according to the UK CEO of a telecommunications service provider. Effective data stewardship is a critical success factor in extending analytics projects across an organisation. The CFO of a European financial services provider is investing in technology that enhances the quality of the data while maintaining data lineage. This will help answer such questions as: 'What happens if I change this data?' or 'Why isn't this report up to date?'

Some organisations maintain a business partnership team centrally under the auspices of IT while others decentralise, with information partners looking after the care and supply of data. These individuals directly support the analytics projects from a functional perspective, with access to knowledge and data sources across the entire organisation. But the final word on data governance must go to a UK specialist who understands first-hand the benefit of investing in the foundations before handling analytics projects. Failure to do so gets in the way of projects and, very importantly, decision making is impeded when you have to ask 'Is this data right?' The data specialist maintains an issues log of data quality and provides an important input for the success of any organisation embarking on self-service analytics. Data governance helps bring about data trust, a critical success factor for analytics in finance and beyond.

5.3 Privacy

Privacy is seen as a major challenge across industries. Everyone consulted globally found the regulatory regime applicable in their locality difficult to follow and lacking in guidance on best practice. An Asian CFO foresaw a time when mining social media will become exceedingly difficult if not impossible, especially as an awareness of European privacy standards emerges in Asia. Other CFOs see the use of big data as ethical but what each organisation does with analytics and data is subject to much scrutiny. This is especially true where individual behaviours combine with third-party data. A bank CFO saw an opportunity for tapping into online services data such as Spotify, Netflix or Amazon and making offers for certain bank products depending upon the streaming service being used by the consumer. Audience age segments vary according to the service offering: people streaming music tend to be aged up to 30 whereas audiences for movies are generally aged 30 – 51. So, the offer is made without intruding on individual privacy, opening up a conversation with the bank that allows the latter to demonstrate that it knows enough about the customer's requirements to deliver something of value. But for an electricity utility, challenges abound. With the launch of electric vehicles, the utility requires knowledge of the type of battery a customer uses, and the locations, dates and times of charging. Such information could, at least in theory, help criminals recreate the trajectories of journeys and target individual drivers. Similarly, smart meters help the utility monitor devices on a household basis and if the utility so desires it can send signals to individual devices and even switch them off in order to use predictive maintenance capabilities. Privacy practices to secure this utility information are paramount. Anonymisation can only go so far. It is hoped that such potential problems can be overcome through a 'privacy

by design' approach based on foundational principles established in the 1990s (Cavoukian 2011) and which is well suited to dealing with the challenges of the smart grid and analytics confronting utilities.

5.4 GDPR and other regulations

Whether working in a telecoms company, bank, retail or utility, under the EU's General Data Protection Regulation (GDPR),[7] the CFO must ensure that the organisation manages sensitive personal information in a responsible manner. The finance teams consulted in this research take very seriously the need to protect individual data. This is especially true if a potential breach gives perpetrators sufficient information to take over the identities of consumers or steal money. Under the GDPR regulation, the burden of maintaining the security of personal information shifts from being the responsibility of the individual to that of the organisation holding it. Questions of analytics and intrusion on customer privacy require further scrutiny, as increasing data collection takes place within organisations and falls under the purview of the CFO and finance team.

5.5 Security – cyber and other threats

While improvements in cybersecurity[8] analytics help organisations address security issues, the continuous monitoring of operational systems has been informed by methods and techniques used by auditors in forensic accounting investigations (Nigrini 2011) and using signals to indicate anomalies or large-scale differences. The monitoring platforms provide multiple outputs of reporting, visualisation, and predictive analytics with specific applications for utilities, retail and other industries. The importance of these systems and their origination from audit processes should garner greater interest from CFOs and finance teams if only to understand the landscape of cybersecurity risk being faced by organisations.

For cyber audit purposes, these systems provide an array of logs and post-incident reporting for improving detection of future attacks. Machine learning algorithms are used as a way to interpret patterns and detect or predict cyber attacks, the audit of cybersecurity provides a natural extension of work for the audit professional. This is not a financial statement audit but affords the ability to assist a client to improve their defences and competence in cybersecurity-related areas. The link between cybersecurity and the CFO may seem tenuous, until you consider the importance to the organisation of investors' demand for reassurance about its treatment of cybersecurity attacks and breaches. While this research focuses on analytics in finance, a few of the interviewees argued that an understanding of cybersecurity for finance and accountancy professionals directly supports organisations' ability to exhibit resilience. This is especially true with regard to the new move to working from home. Identifying information security issues in the home ensures cyber-readiness among the newly experienced distributed environments of remote working stemming from COVID-19. In this scenario, a CFO and finance team may consider assimilating a point person (a data privacy officer) to handle issues relating to GDPR and cybersecurity. Placing such a role under any other department has problems and could even cause conflicts.

ACCA suggests finance and accountancy teams work more closely with cybersecurity professionals. ISACA (the Information Systems Audit and Control Association) helps partner ACCA members with cybersecurity professionals. For members in practice, this creates a further opportunity not only to support their clients' businesses but also to extend their ability to use analytics skills in forensic accounting, alongside a cybersecurity professional, to investigate the economic damage stemming from a security breach.

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7   Adopted by the EU 14 April 2016, enforceable from 25 May 2018.
8   The risks posed from cyber threats to the organisation and the responsibility of the finance function are discussed in *Cyber and the CFO* (ACCA / CA ANZ / Macquarie University / Optus 2019)

IDENTIFYING INFORMATION SECURITY ISSUES IN THE HOME ENSURES CYBER-READINESS AMONG THE NEWLY EXPERIENCED DISTRIBUTED ENVIRONMENTS OF REMOTE WORKING STEMMING FROM COVID-19.

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6. **Lessons** learned

It is a given that data is a valuable asset and good data leads to useful analytics usage. Still, failure to address employees, managers, and executives will result in failing to make the best possible use of analytics.

Addressing analytics concerns and opportunities takes place at all levels of an organisation addressing employee engagement, enabling the tech-savvy manager and effectively influencing C-level executives. Working directly with these stakeholders is a reminder of the diverse backgrounds and varying levels of data literacy within an organisation. Furthermore, through engagement at all these levels, misunderstandings between what they need, versus what they say or think they need concerning solving problems using analytics techniques, tools or technology can be clarified.

Focusing on the people challenges is probably the single most important factor next to technical skills. Having staff who want to participate actively in analytics projects is seen by a European CFO as more important than having access to a lot of available data. The importance of engaging and motivating employees is the common theme expressed by CFOs in Europe and Asia. They are willing to place employee engagement ahead of access to good data.

Managers and where possible C-level executives should establish a do it yourself mentality rather than dependence on business analysts or other staff to help generate insights from the analysis of reports. Being able to create your own reports and extract the necessary information eliminates the time lag to gaining access to insights and actions. To foster better decision making, planning and forecasting the need for real-time data becomes an attractive proposition. The more diverse the sources of data while moving to real-time according to a European CFO, you can see how your business is developing, and potential exists to see in a short period of time how your decision directly affects the business. At the same time,

analytics should help people to focus on the data itself versus the time spent on the preparation of the data.

An Australasian head of analytics comments that to win commitment for new analytics projects it is probably best to consult individual teams and present a uniquely tailored approach for each function or business unit. These analytics workshops include not only introductory sessions but advanced analytics talks with the C-suite providing a Q&A opportunity and allowing for feedback from each function of the business. In this fashion, you can navigate the political landscape and promote analytics within your entire organisation. This approach emphasises the importance of having a deep enough level of understanding of what your stakeholders need. At times, you will have to move from a consultative approach to an advisory role and guide the future of enterprise analytics. Often, you will be conducting your stakeholder sessions through a process of solving problems with an analytics mindset and approach. This type of workshop requires focusing on generating impact with data, and neither the tools nor applications at this stage of collaborating.

Spreadsheets historically form the key tool for ad hoc analysis, and this has been especially true during the COVID-19 pandemic, even if the central financial systems such Oracle or SAP data is downloaded directly and manipulated to achieve the necessary output. According to a European CFO, on some occasions, requests made via a central team for specific reports to become available through the financial system did not turn out to provide timely and immediately actionable information. No substitute exists for the ability of senior management to access reports and analyse and interpret the data themselves.

The principles of agile development, as expressed in the Agile Manifesto (Agile Alliance 2001–19), apply to business analytics as well as to general software development. For convenience, we restate the 12 principles[9] (slightly paraphrased for business analytics).

1. Appreciate the variety of data possibilities

2. Data quality is not easy

3. As analytics capability develops be strategic

4. Clients (internal) need to agree to the use of data

5. Processes are challenging

6. Commence analytics with standard and repeatable core processes such as revenue and order processing

These principles compare with advice from a UK CEO:

1. Everything exists – technology, Cloud, and data scientists

2. Do it properly and consistently

3. Focus on decision making

4. Next best offer

5. Ensure you have an overall data architecture

6. Build from the top down

The last word as far as lessons learnt goes to the European CFO recognising data analytics, machine learning and artificial intelligence combine as a game-changer revolutionising most organisations shifting them from where they are to become a world-class organisation.

9   The original list of 12 principles are contained in the Agile Manifesto (Agile Alliance 2001-2019)

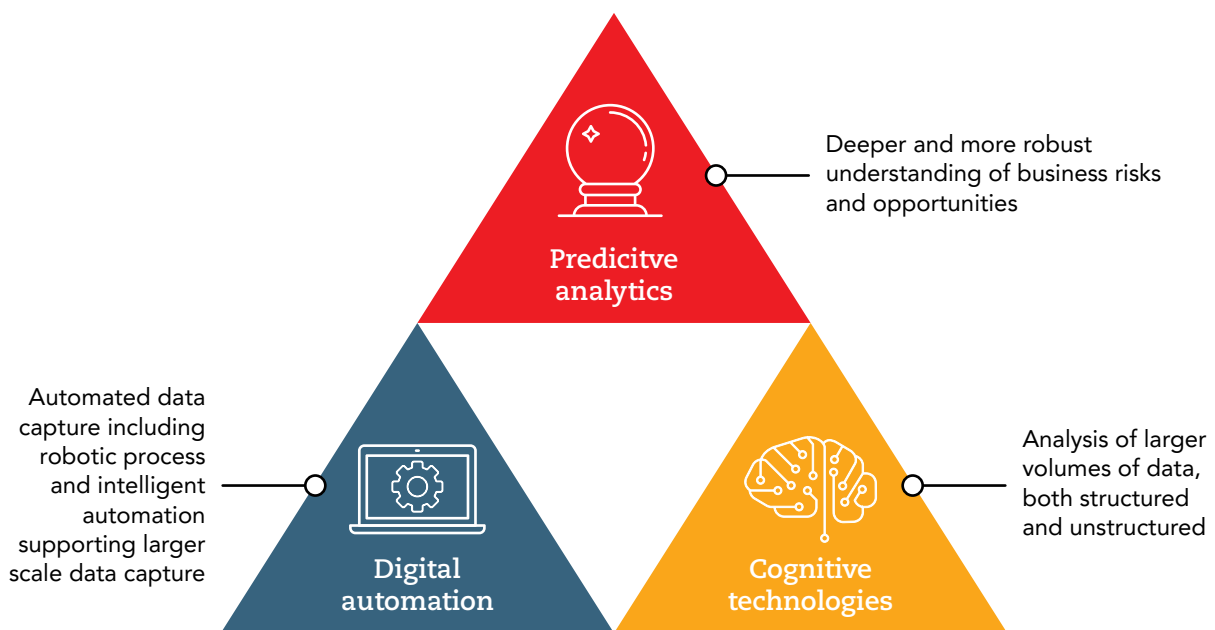# 7. **Emerging trends** in analytics

7.1 Integrated technology framework

Multiple trends in analytics are occurring simultaneously and provide an opportunity to harness the technologies individually or together. The key trends are Robotic Process Automation (see ACCA/Chartered Accountants ANZ/KPMG (2018)), access to big data (this includes unstructured and structured data), Artificial intelligence (AI) and Machine Learning (ML). The combination of these technologies as trends taken together provides an opportunity to reimagine the future business through efficient data capture and improved analysis (Figure 7.1) |as is explored in the sections below.

7.2 Unstructured and structured data in the future

Discussions with the CFOs and finance teams suggests that in future they expect to use more operational data, in addition to financial data. Since such operational data sources will have variations in data formats and the data will be fragmented, new tools and approaches will be required to support the use of this big data. Inevitably, future versions of BI software are being pushed to move beyond the initial uses for which they were originally intended. A further requirement is the ability to handle large amounts of data held in unstructured formats within documents such as pdf files.

FIGURE 7.1: Predictive analytics and other technologies

Deeper and more robust understanding of business risks and opportunities

Automated data capture including robotic process and intelligent automation supporting larger scale data capture

Predicitve analytics

Digital automation

Cognitive technologies

Analysis of larger volumes of data, both structured and unstructured
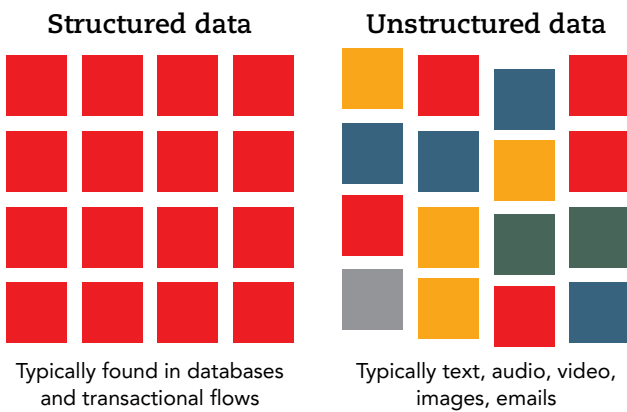
'Traditional' structured data such as operating statistics and transactional data for sales and accounts payable is relatively easy to log, capture and analyse, potentially providing direct insights into business performance and trends.

Unstructured data, such as email, logs of internet activity, phone calls and social media posts, can be vast and diverse. Using tools to analyse this data can provide an understanding of wider concerns relating to a business, including customer demand and external market factors.

FIGURE 7.2: Structured vs unstructured data

Typically found in databases and transactional flows

Typically text, audio, video, images, emails

A large majority of the respondents (76%) (Figure 7.3) recognise that in the future analytics will use more non-financial or operational data than financial data. Over half (54%) said that external data will also play a part in the future of analytic activities while 50% reckon that the amount of unstructured data will exceed that of structured data. Over one-third (34%) of respondents are confident of this structured/unstructured divide.

7.3 Big data mindset

The growing awareness of and focus on operational data, unstructured and external data sources reflects big data's impact on finance professionals. Working with big data requires a different mindset from using data collected under more tightly controlled conditions. Big data that arises naturally in businesses and the environment cannot be controlled at the source. In light of this, the best approach is to think less about scientific method and hypotheses and focus on making discoveries from the data. Value creation takes place by combining accounting information with big data, including that from public information sources, and making discoveries from the data using pattern recognition and a curious mind. Furthermore, big data requires a paradigm shift from the mindset needed to deal with a scarcity of data and behaving accordingly to one that can respond to having access to infinite amounts of data. There should be no confusion here with concerns about security and sensitivity of data containing personally identifiable information (PII) that can be linked to an individual. Little or none of the work performed from an accounting perspective is expected to include PII. Exceptions to this includes forensic accounting or money laundering investigations. Methods and software ensuring privacy protection involve data anonymisation. Tools are available to anonymise data should the situation merit it; this forms an entirely separate subject of study.

Exploring the integration of big data into all aspects of accountancy and even audit has the potential for making the information content used in accounting and financial reporting significantly more valuable, well beyond today's use for reporting on just the general ledger (GL), accounts payable (AP) and accounts receivable (AR). Linking to or enriching the traditional accounting measures extends

FIGURE 7.3: As part of your analytics activities in future, do you expect to increase the use of unstructured data more than use of structured data?
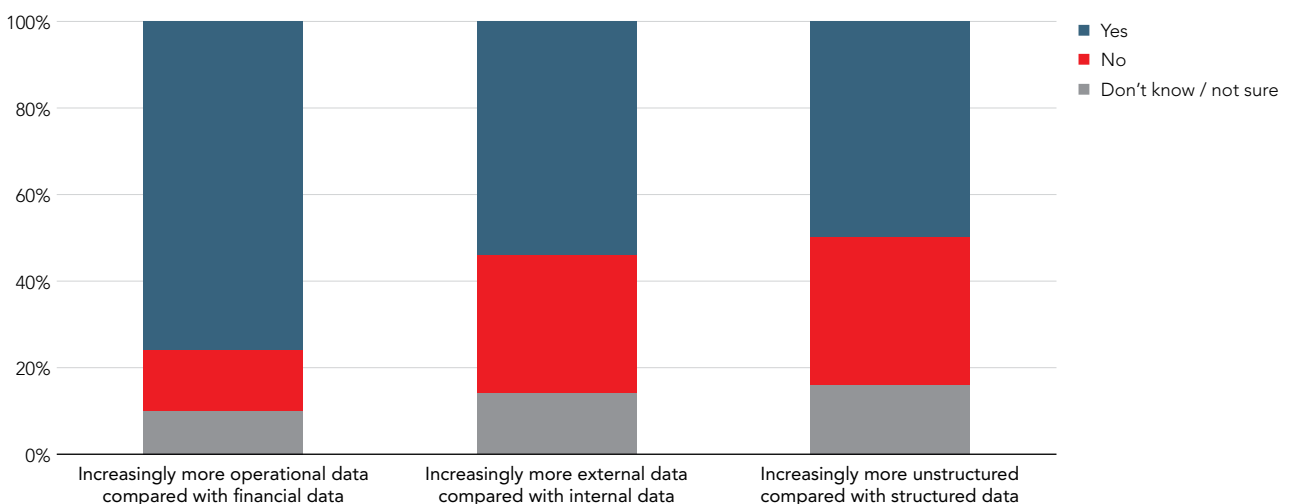
the area of accounting, with some areas benefiting substantially. For example, bad debt provisioning normally follows historical trends. Big data has potential for bringing the bad debt amount closer to true value on the basis of the state of the economy, the state of debtors, the ability to collect and historic rates.

7.4 Artificial intelligence (AI), machine learning and tools

A big data mindset requires tools with an ability to support this thinking. In 2020, AI and machine learning are key capabilities available when accessing the most basic tools for data analysis and processing, including spreadsheets, data visualisation and business intelligence. Examples include Google Sheets and Microsoft Power BI.

At the most fundamental level, AI[10] represents the ability for machines to mimic the cognitive functions of human minds while leveraging better, faster and cheaper processing power, memory, high-speed internet and handling of big data. The technologies available include Computer Vision (CV), natural language query (NLQ), natural language processing (NLP), machine learning (ML) and language translation, which are all available to achieve useful outcomes with your business data. Some of these capabilities will remain invisible or provide an unobtrusive approach to accessing AI (Figure 7.4). The Power BI service makes use of NLQ through allowing plain English queries (Q&A) to interrogate the dataset concerned, while ML automatically reveals patterns in data, highlighting insights (Quick Insights). Google Sheets provides similar capability with its 'explore' function.

FIGURE 7.4: Artificial Intelligence capabilities (invisible) available from Microsoft and Google
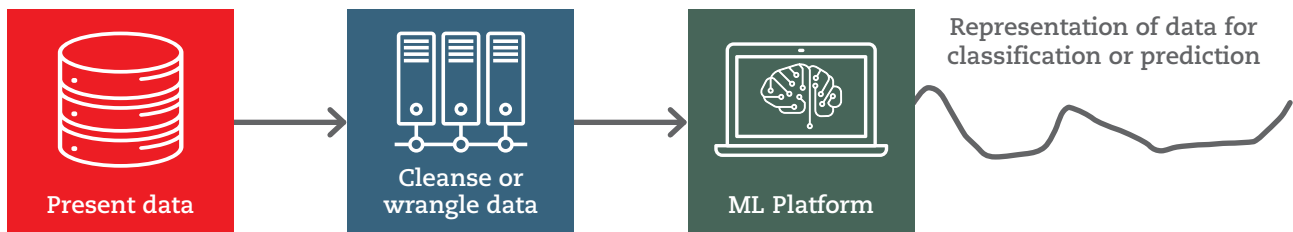

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10 For an explanation of the concepts of artificial intelligence and machine learning see *Machine Learning: More Science Than Fiction* (ACCA 2019).

Presenting data to an ML environment such as Microsoft Power BI or Google Sheets allows the prediction of data points at a future point of time or filling in missing historical data. Alternatively, the ML environment can provide a classification of data suitable for seeking out misclassified data or fraudulent transactions. The process for achieving these results requires the data to be presented to the system, within which it is cleansed or 'wrangled' before being processed, leading to the output of code representative of the data. This in turn helps make the prediction or classification.

A Forbes Study (Press 2016) reminds us that businesses spend 80% of their time acquiring and cleaning data and only 20% using the data. Given the availability of the tools at relatively low, or no, cost, you are encouraged to adapt the process (Figure 7.5) and use the ML platform to help flag any erroneous data to speed up the cleansing or wrangling process. In some cases, the data may appear incomplete but if this is their naturally occurring condition the ML will take this into account. Trial and experimentation with the platform may be a better use of time, allowing business insights to be gleaned from the data quickly rather than spending considerable time and resources on data preparation. In fact, this suggests that it may be quickest to use an automated process to extract insights from the data, while a person then determines suitable actions in response'. The actual work, turning insights into action, begins once the insights have been uncovered. This is a bit like opening the fridge door and finding three eggs. This is the insight; the work of cooking a Spanish omelette is yet to begin, let alone thinking about other recipes.

FIGURE 7.5: Process for data and machine learning

Present data → Cleanse or wrangle data → ML Platform → Representation of data for classification or prediction

8. **Actions** to **consider**

Through consolidating insights from the interviews supporting this study and the analytics in finance survey, five key areas of focus and action emerge as stimulating the creation of truly data-centric analytics-driven organisations in 2020 and beyond.

Respondents from all participating companies foresee they are on a multi-year journey with organisation-wide analytics. starting now with the expectation of achieving a major milestone over the three years to 2023. These are the companies and finance teams racing to achieve competitive, advantage and positions of superiority by using analytics for their organisations in the decade ahead. The trends are scalable and have applicability not only across different sectors but for small businesses and large enterprises alike, whether a small five-person team or an entire global team of accountancy and finance professionals.

The five areas of: big data reality, governance and data management, hybridisation of talent, decision-making enablement and predictive/prescriptive analytics promise a fundamental extension of the scope of the CFO and finance team to transcend the finance boundary and take a lead in analytics in their organisations. The pay-off for focusing on the areas identified and taking action is an improvement in financial and operational decisions. In addition, driving analytics across the organisation will lead to a lower cost of analytics software and services and ultimately better decisions, made faster and more cheaply.

8.1 Governance and data management

The analogy of data as the new oil creates a false belief. Unlike many other commodities, data is not a physical substance and is normally associated with an event. Hence, data can help answer questions but is worthless if it does not help answer questions relating to the business. The recommended actions emerging from governance issues for the CFO and finance team are:

- align data collection with business needs for data-driven insights and avoid collecting data for which no users exist

- minimise security risks by avoiding use of personally identifiable information (PII – personal, sensitive information) in analysis

- ensure that data cleaning and preparation does not remove anything that could be used to identify outliers and anomalies

- lead the development, in conjunction with other functions and teams, of a playbook for the correct use of data.

FIGURE 8.1: Five areas of focus and action for the future development of analytics in finance teams

| Governance and data management | Big data is a reality | Hybridisation of talent | Decision-making enablement | Predictive and prescriptive analytics |

8.2 Big data is a reality

Using big data is now a real possibility for CFOs and finance teams. What this means is not only that a vast amount of data is available to them but also that the ability to deal with a wide variety of different types of data is now essential for finance. Combining financial and operational data helps provide insights not previously considered and affords an opportunity to improve decisions and processes. Gaining access to a wide variety of data gives the finance function a distinct advantage as it allows wider non-financial reporting of diversity, environmental, social, governance and sustainability issues. BI tools such as Microsoft Power BI and Tableau allow the reading and importing of both structured and unstructured data from whatever source, with further advances in connectors, data extractors and natural language processing making accessible an even greater variety of data, including audio and video. Information that was previously non-quantifiable and unstructured can be imported to help support decision making.

Perspectives from external audit professionals and finance teams within organisations align perfectly. On the audit side, a North American manager with the Big Four sees big data as a key turning point. A great variety of data is used, such as unstructured data from social media, Excel spreadsheets and even pictures extracted when cleaning pdf files. Big data helps provide audit evidence for the numbers presented and supporting evidence for the financial statements, even though it is not an absolute guarantee that they lack material errors or fraud. An Australasian audit partner views external data as 'gold' in a variety of situations. For example, the industries selling consumer services such as utilities can use public data for insight and to obtain a quality perspective.

The actions emerging from big data for the CFO and finance team are summarised in the recommendations below.

- Generate a catalogue of certified external data sources complementing internal data, refreshing on a regular basis to ensure that new sources are captured. Finance should own the catalogue and update process, as the use of external data leads to direct impacts on financial decisions and beyond.

- Ensure that analytics projects support accessibility to more diverse data, both structured and unstructured.

- Help the rest of the organisation adopt analytics in areas where BI techniques have not been suitable or relevant in the past' for decision making.

8.3 Hybridisation of talent

Helping nurture employees and team members who understand the business and analytics is extremely valuable. Rather than just hunting for analytics star talent, upskill staff to use predictive and prescriptive analytics. Beyond this, the CFO and finance team can take the following actions towards hybridisation of talent.

- Help roll out a data literacy programme for everyone, using examples from improvements made in in-house financial decision making and automation of activities by any other areas of the organisation.

- Extend analytic capabilities to a wider group of users, choosing those who require little additional training.

- Curate self-service resources for the organisation, including podcasts and communities.

- Host regular educational events, hackathons and an analytics book club alternating between external guest speakers and those from different teams in the organisation.

- Encourage transdisciplinary analytics crossing traditional boundaries, eg finance, analytics and cybersecurity.

- Use tools such as LinkedIn's online learning platform.

GAINING ACCESS TO A WIDE VARIETY OF DATA GIVES THE FINANCE FUNCTION A DISTINCT ADVANTAGE AS IT ALLOWS WIDER NON-FINANCIAL REPORTING OF DIVERSITY, ENVIRONMENTAL, SOCIAL, GOVERNANCE AND SUSTAINABILITY ISSUES.

8.4 Decision-making enablement

The challenge analytics brings can often create confusion. Sometimes the meaning of the term "analytics" relates to using analytics to solve a problem, or from use of a particular analytics application or BI tool. The key question is how to use analytics for better and faster decision making? This theme emerged from both the in-depth interviews and the survey. Prescriptive analytics is the key type of analytics that can be used to suggest a possible decision. But any advance towards using analytics as part of decision making in finance and more widely in organisations is a significant improvement over thinking about improvements in the analytics tool itself. Considering this, the recommended actions emerging from decision-making enablement for the CFO and finance team are as follows.

- Ready the finance team to help enable better and faster decision-making across the entire organisation by developing a model of decision making using actual data.

- Categorise decision making according to the organisational level at which it should occur: strategic (C-level), managerial (functional), operational (business process), development (new product or service); and differentiation (external customers).

- Devise templates for the decision-making model for use in Excel to help operationalise thinking about decision making with or without big data.

- Revise the business-case documentation for investment to reward decision-making projects that focus on predictive and, ideally, prescriptive analytics.

- Keep track of any disruptive innovations to help achieve better, faster decision making.

8.5 Predictive and prescriptive analytics

To move beyond a focus on business efficiency measures and improving forecasts, the advanced analytics with predictive and prescriptive facilities can assist with helping uncover new revenue streams and new customers as well as improving business processes. Recommended actions for CFOs and finance teams that are emerging from ability to use predictive and prescriptive analytics across the organisation are as follows.

- Standardise upon the master data (ie the most valuable information shared across departments) in the organisation.

- Start by continuously identifying outliers across the organisation as potential early warnings of emerging problems or opportunities.

- Explore the potential of using open-source components for the entire analytics value chain: SQL database, machine learning and end-to-end processes. This is especially important if you are providing analytics software and services, either as a business serving practices and SMEs or a BI Competency Centre servicing clients.

- Pilot collaboration between experts and business users using open-source RapidMiner or KNIME.

DRIVING ANALYTICS ACROSS THE ORGANISATION WILL LEAD TO A LOWER COST OF ANALYTICS SOFTWARE AND SERVICES AND ULTIMATELY BETTER DECISIONS, MADE FASTER AND MORE CHEAPLY.

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