



Re-inventing finance for a digital world

The future of finance

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Executive summary

Moving from cost to value in a digital world

This white paper tells the story of the research underpinning our views on how new competencies are emerging in a digital world. It describes their implications for finance professionals, employers, academics and tuition providers, and regulators and policymakers.

Our objectives in undertaking this relevant and rigorous research have been:

- ▶ To understand the future needs of businesses and employers globally in a digital world
- ▶ To gain insight into the finance function in a digital world
- ▶ To understand how new competencies are emerging in a digital world
- ▶ To signpost the competency implications for finance professionals.

Our core finding is this – in a digital world, the focus of the finance function is shifting from being based on costs to being based on organisational value.

In other words, the finance function will no longer be evaluated purely on how costly it is to run, and be viewed as just another cost centre. Instead, the finance function will be judged on the added value it brings to the organisation and the wider community.

For anyone who practices management accounting, this shift highlights the prospect of a rewarding career in finance – a shift in which they can add real value to organisations and society as a whole.

Introduction

New competencies for a digital world

In 2016, a UK newspaper, the *Daily Mail* reported a speech by the Governor of the Bank of England under the headline: 'Robots to steal 15 million of your jobs says bank chief.'ⁱ

The article said that the bank '... predicted that entire professions, such as accountancy, could be pushed to the brink of extinction as developments in computers make roles redundant.'ⁱⁱ

CNN, also in 2016, cited a Bank of America report estimating a 90 percent or more risk of accountants being replaced by robots.ⁱⁱⁱ Even today, the same source is continually used by the media. As the London Evening Standard reported in May 2018: 'As AI develops, it's going to be replacing white-collar jobs in fields such as accounting, banking and legal services, which make up a disproportionately big part of our city's workforce.'^{iv}

The brink of extinction is quite a place to pull back from, and the claims certainly grabbed our attention.

The Earth has witnessed five periods of mass extinction to date (late Ordovician, late Devonian, late Permian, late Triassic and Cretaceous). So when the Bank of England and British national newspapers are reporting that accountants are about to form the sixth mass extinction of the Holocene epoch, the claims need verifying.

The data source behind these predictions that jobs could be automated within the next two decades, is a seminal 2013 research paper by Frey and Osborne.^v

Their report, 'The Future of Employment', is often misquoted in the media, leading to headline-grabbing scare stories about the percentage of jobs that robots will steal.^{vi} In the study, they scrutinised the computerisation of 'tasks' within jobs – not the jobs themselves.

In addition, they did not go on to capture how all this freed-up time could be used to perform new tasks within jobs.^{vii}

So the lesson is simple. Just because some of the tasks that an accountant currently undertakes are automated or are likely to disappear over the next two decades, this doesn't necessarily lead to the mass extinction of the finance profession.

Instead, elements of the research findings in this white paper back up the sentiment of the work of Frey and Osborne: that some tasks finance professionals currently do within their roles/jobs are at risk of computerisation or have already been automated.

However, we are also finding that the time this frees up, in combination with new technologies, is augmenting finance professionals' capabilities, to make them:

- ▶ faster
- ▶ more efficient
- ▶ more productive at new tasks.

This combination is adding new value to organisations.

Over the last year and a half, we have been researching the hypothesis as to whether technology disruption and automation will:

- ▶ eliminate more finance function jobs than the economy will create
- ▶ create new tasks that allow continued close to full employment for finance professionals.

Our objectives in undertaking this relevant and rigorous research have been:

- ▶ To understand the future needs of businesses and employers globally in a digital world
- ▶ To gain insight into the finance function in a digital world
- ▶ To understand how new competencies are emerging in a digital world
- ▶ To signpost the competency implications for finance professionals.

The pace of change

Even knowing that the answer to our research questions is largely positive, we are far from being complacent.

The digital world 'feels' different. Extraordinary economic changes are happening at such a fast pace. At a World Economic Forum meeting in Davos, Accenture Chairman and CEO Pierre Naterme said: 'Digital is the main reason just over half of the companies on the Fortune 500 have disappeared since the year 2000.'^{viii}

In this digital world, we have all become more connected. The world is flatter and more volatile. In a world of creating, storing, retrieving and synchronising data, where binary digits are king, the rules of engagement have changed thanks to a confluence of technology innovations and advances.

Those once familiar rules of business are in flux. It feels more difficult to find opportunities for competitive advantage.

First, technological connectedness is primarily leading to increasing levels of competition as informed consumers expect the same level of convenience from all the organisations they interact with, right across their ecosystems.

Second, technological connectedness is making communication easier and faster, leading to the increasing evolution and accelerated spreading of ideas. This in turn speeds up the process from ideas, to concepts, to final products. Crucially, in a connected ecosystem, others can instantly see your greatest ideas and quickly copy them for their own advantage.

Finally, technological connectedness is changing our relationships with those who were traditionally seen as competition. It's changing how new competitors enter the market and how we interface with customers and stakeholders in the business ecosystem.

Challenging outdated theories

Just over 100 years ago, in the First World War, Generals went to war on horses, carrying swords and lances. Their heads were full of 19th century warfare concepts and techniques. They failed to recognise that technology had changed warfare, that cavalry was no match for machine-guns, barbed-wire and artillery shells. It took four years of fighting to fully utilise the technological advancements available, shake off their outdated theories of war and bring the violence to a conclusion.^{ix}

Could it be that those companies that have disappeared since 2000, such as Blockbusters in 2010, and Kodak in 2012, were like the Generals at the outbreak of First World War? Were these company leaders armed with outdated, 20th century business thinking and concepts trying to build sustainable organisations in a 21st century digital world?

This white paper charts our 18-month research journey. It is divided into four stages that document the following:

- ▶ Challenges facing organisations in a digital world
- ▶ Performance required of the finance function to help meet the challenges facing organisations
- ▶ Types of mindset, skills and competencies finance professionals will need
- ▶ Research implications for the management accounting community.

There's a traditional saying: 'Old accountants never die. They just depreciate'. However, armed with this white paper, new competencies and a digital mindset, the value that finance professionals bring to their organisations, in a digital world, will now be fully appreciated.

1. Employability framework

Employability: linking management accounting practitioners with employers

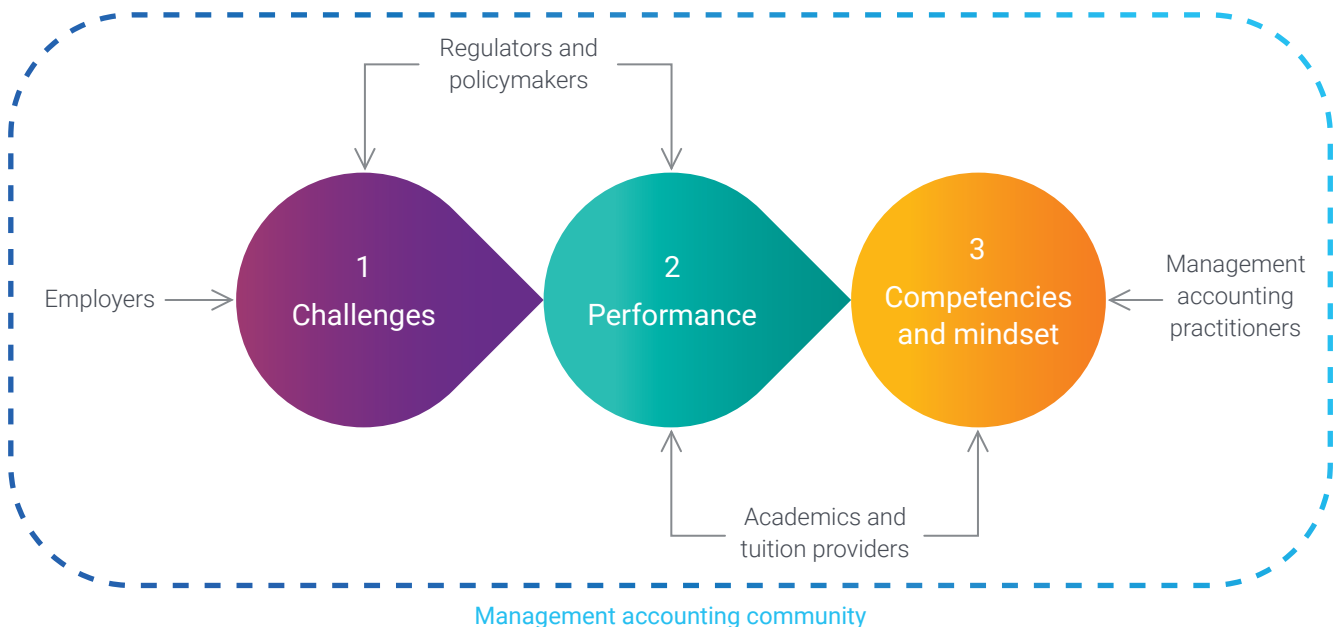
Our framework for our research is one of employability that connects employers to management accounting practitioners (Figure 1). This connects them in three ways:

1. The challenges organisations face that threaten their success and need to be addressed.
2. The performance required by the finance function to help organisations address those challenges.
3. The types of skills, competencies and mindset that finance professionals need to perform at the level required for organisations to address the challenges they face.

Our framework acknowledges that we don't work in isolation as a professional body. Regulators and policymakers, academics and tuition providers all also have roles to play in the community of practice. They too need to address the challenges organisations face, boosting performance and championing the re-skilling of individuals so they can play an active part in the digital world.

The research findings set out in this white paper, document our global work with employers, practitioners, academics and subject matter experts. We are using the findings to sustain a clear understanding of the roles finance professionals play in business, to identify the competencies and skills employers expect, and to record how these are changing in a digital world.

Figure 1. Employability: linking management accounting practitioners with employers



2. Research methodology

Ensuring rigour and reliability

We ran three phases of research (Table 1) to ensure the rigour and credibility of our findings.

The starting point for our global research was to gain an understanding of the management community's needs in a digital world. We asked more than 5,500 finance professionals from over 2,000 organisations in over 150 countries to answer the following questions:

- ▶ How will the future be different for your organisation?
- ▶ What are the drivers of change for your organisation?
- ▶ What are the implications for finance?
- ▶ How should finance professionals prepare for the changes?

We used a three-phased methodology to understand the finance function in a digital world:

- ▶ face-to-face interviews
- ▶ roundtables
- ▶ a global survey.

Throughout, the research engaged with individuals from all sizes of organisation, from the public and private sectors, and from a spread of countries that reflects the Association's global footprint.

The interviews provided qualitative data on the challenges organisations face. These then became scenarios for the roundtables to validate and expand upon. Finally, a global online survey, with questions based on the interviews and roundtable themes, used larger quantitative samples to confirm the initial findings. These delivered measurable data to formulate facts and uncover patterns in our research.

Table 1. Numbers from the three research phases

Interviews	Roundtables	Survey
<ul style="list-style-type: none">▶ 14 countries▶ 130 organisations▶ Over 300 people	<ul style="list-style-type: none">▶ 20 countries▶ 200 organisations▶ Over 500 people	<ul style="list-style-type: none">▶ Across the world▶ 57 questions▶ 4,700 respondents

Our scientific method

To achieve our research objectives, we applied the following concepts shown in Figure 2 to continually test our approach and validate the collected data.

Figure 2. Our conceptual approach to data validation



Insight into the future

Over the last 18 months, we have systematically collected individual personal and organisational 'rules-of-thumb' and built them into a composite picture of what the finance function in a digital world looks like. Through scientific study, the many rule-of-thumb working methods have been turned into laws, formulas and new ways of thinking. These changes are reflected in the competencies and mindset that employers will in future expect of a professionally qualified management accountant in the digital world. Findings from the research are now informing the development of:

- ▶ future thought leadership in the management accounting arena
- ▶ the CIMA Professional Qualification
- ▶ the CGMA Competency Framework
- ▶ Continuous Professional Development (CPD)
- ▶ the CGMA Practical Experience Requirements (PER).

3. The challenges organisations face

This section focuses on those challenges organisations face that will threaten their success.

Our research is telling us that the digital world in which organisations are already operating is changing rapidly and in unpredictable ways.

Organisations and individuals that fail to keep pace with these changes risk losing out and becoming irrelevant. For some, this ultimately means not being able to operate in that environment and possibly becoming extinct.

In this section, we:

- ▶ set out the main drivers of change
- ▶ explore the technologies that are transforming industries
- ▶ focus on how the impact of technology is increasing complexity
- ▶ profile different approaches to the challenges faced by organisations.

The main drivers of change

Our research findings show that technology is seen as the key driver of change for organisations and for their finance functions.

This chief disrupter presents an opportunity and a risk. It is transforming what organisations do and changing their business models. It is changing regulators' and policymakers' relationships with business, shifting how the two parties interact. Finally, it's transforming what finance professionals do, and revolutionising how the finance function is deployed.

It is very important to understand that technology is not a driver of change in a vacuum – many forces are at play (see Table 2).

The rapid development of technology is driven by people. By this we mean a combination of changing demographics (social change), which is increasingly tech-savvy, and the rise of greater consumer empowerment (market change).

For the first time in history, six generations are living together, and more than half of the human race resides in urban areas.

While the six generations are connected and talk to each other, the generations exhibit clearly different patterns of behaviour when buying things and in the way they access technology.

There are also drivers of systemic change such as globalisation, geopolitics and regulation playing out in the supply-chain environment as a reaction to technological innovation.

At a national level, as the economic balance of power continues to move south and east, countries are investing heavily in artificial intelligence (AI) and data to stay ahead of the international competition.

This is driving a new 'space race' that manifests itself in trade wars, over-regulation or exploitation of regulation loopholes, cyber-attacks and the use of AI to cause societal disruption in competitor countries.

Our findings show that all the change drivers – institutional and systemic, social, market or technological – are not considered to be acting independently of one another. Rather, they are intertwined across a global spider's web, with technology at its centre as the most important disrupter that's currently impacting organisations.

Technologies transforming industries

In a digital world, the sheer pace of technological change is the main challenge facing organisations. The increasing use of interconnected devices and the Internet of Things (IoT) is having a huge impact on organisations and disrupting their traditional business models. As Daugherty and Wilson have written:

'In a hyper-networked world where mobile phones, speakers, thermostats, and even exercise clothes are connected to the internet and potentially each other, brands have to learn to play well with each other or give up a certain amount of control to those that own the most popular interfaces. For better or for worse, the power is in the portal.'^x

The 'Internet of Things' has been brought about by cheap and ubiquitous sensors being embedded in everyday objects. These sensors are then enabled via networked connections to send and receive data that continually fuels organisations and finance functions with real-time information on their products, services and financial position.

This innovation alone, alongside access to real-time data, blows a hole in the long-held assumption of the value inherent in finance reporting cycles. In a digital world, stakeholders are demanding more frequent performance information. Organisations will consequently need to review their communication relationships, not only with their customers but also with regulators and policymakers.^{xi}

The technology driving most conversations within organisations is AI. Daugherty and Wilson define AI as 'systems that extend human capability by sensing, comprehending, acting and learning.'^{xii}

Artificial Intelligence

AI, an umbrella term that includes machine learning, deep learning, speech recognition and cognitive computing, is not a new concept. In fact, AI has been around as an academic discipline since the 1950s. The elements of AI work together to discover complex patterns and provide automated insights drawn from the increasing amounts of data to which organisations have access. AI, and the underlying algorithms that are accelerating its development, is changing the way organisations:

- ▶ engage with their customers
- ▶ optimise their operations
- ▶ research, design and launch their products
- ▶ enable the productivity of their employees.

Within the AI space, the main debate across organisations from all sectors and industries is this: will the technology lead to augmented human intelligence, or will it lead to the rise of autonomous intelligence and machine automation?

One area of technology that is already transforming the digital world is social media and platforms. The use of social media and access to open data means that organisations now have to be more transparent within a 'real' multi-stakeholder environment.

In the past, some stakeholders were largely powerless, enabling organisations to focus on more powerful groups, such as shareholders, in what was essentially a 'unity' stakeholder environment.

The new transparency created by social media means that anything and everything an organisation does can be seen in the public domain. Stakeholders can today hold organisations to account, because the costs of searching for and disseminating information have reduced drastically. Customers can also compare prices across products, and read other customers' product reviews or ratings in a matter of seconds through platforms on their connected devices.

As Tom Malone writes:

'When consumers get used to how easy it is to buy books on Amazon, they may expect the same level of convenience when buying back surgery from their doctor. If the consumers don't get what they want from their current doctors' offices, they're likely to go to other superminds in the market for medical services.'^{xiii}

Customer empowerment is a key trend in the digital world that is causing organisations to rethink their business models. Customers are:

- ▶ moving from products and services to experiences
- ▶ demanding hyper-personalisation
- ▶ moving from ownership to access.

Table 2. The drivers of change in a digital world

Institutional and systemic	Social	Market	Technology
<ul style="list-style-type: none"> ▶ Globalisation ▶ Geopolitics ▶ Regulation 	<ul style="list-style-type: none"> ▶ Demography 	<ul style="list-style-type: none"> ▶ Consumer empowerment 	<ul style="list-style-type: none"> ▶ Digital technology ▶ Automation

In the past it was easier for organisations to force people to agree with them, because they could simply deny access to information. Now, in the information-oriented world where we all have access, the 'one storyline' approach used traditionally by organisations no longer holds. Nichols points out:

'We have come full circle from a premodern age, in which folk wisdom filled unavoidable gaps in human knowledge, through a period of rapid development based heavily on specialization (sic) and expertise, and now to a post-industrial, information-oriented world where all citizens believe themselves to be experts on everything.'^{xiv}

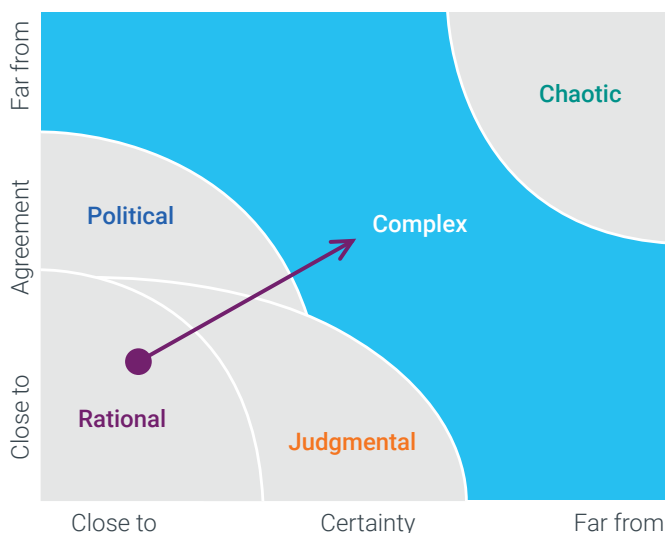
With so many different multi-stakeholder perspectives for organisations to consider, the potential for disagreement increases. This in turn leads to future uncertainty and complexity.

Increasing complexity

Extraordinary economic change is happening at an increasingly fast pace globally. Its impact is being felt across all types of industry and service sectors. The digital world has become flatter. It is more volatile, and it is more difficult to find opportunities of competitive advantage. Consequently, in an increasingly complex environment, it is crucial that organisations have high-quality decision-making capabilities if they are to be among the successful sustainable businesses of the future.

The Stacey Matrix shown in Figure 3 is a model for dealing with complexity, proposed by Ralph Stacey. Developed in 1996, it was conceived to highlight the relationship between change context and decision-making/control modes.

Figure 3. The Stacey Matrix: the relationship between change context and decision-making/control modes^{xv}



The vertical y-axis is Agreement. This measures the level of agreement about an issue or decision within the group, team or organisation. The degree of agreement on what should be done is an important factor in determining success.

The horizontal x-axis is Certainty. When an issue or decision is 'close to certainty', it is because cause and effect linkages can be determined. This is usually the case when a very similar issue or decision has been made in the past, meaning that you can use past experience to predict the outcome with a good degree of certainty.

The other end of the certainty continuum is 'far from certainty'. This is when the situation is unique (or at least new to the decision-makers). The cause and effect linkages are not clear. Using past experience is not a good method for predicting outcomes in the far-from-certainty range.

Our research findings, in the context of the Stacey Matrix, reveal that:

- ▶ The current focus of most organisations and finance functions is in the rational space. In the digital world, however, their focus must move to the areas of complexity and chaos.
- ▶ The skills of the finance professional also currently support the rational space. In the digital world, their skills must be able to support decision-making in the areas of complexity and chaos.

The rational zone is an area that is naturally comfortable to us. It is where our assumption of a state of stable equilibrium plays out. Here we use models of past experience to forecast the future and use monitoring as a form of control. We use techniques which gather data from the past, and use it to predict the future. We plan specific paths of action to achieve outcomes and monitor the actual behaviour by comparing it against these plans.

This is sound management practice for issues and decisions that fall in this area. The goal is to repeat what works to improve efficiency and effectiveness. In a digital world, however, this is not enough for organisations to remain sustainable for the long term.

Where tradition doesn't work

Stacey calls the large blue area on the diagram, lying between the anarchy region and regions of the traditional management approaches, the 'zone of complexity'. Others call it the edge of chaos.

Traditional management approaches are not effective in the zone of complexity. Here finance professionals need high levels of creativity and innovation. They must embrace technological possibilities to create new modes of operating.

Instead of looking for cause and effect linear relationships, they must move towards non-linear thinking, looking for patterns and their systemic implications. This means focusing on what is odd, contradictory and paradoxical. It means understanding how random connections between people and simple decision rules lead to complex, global patterns of behaviour.

It is also increasingly likely that, as technology evolves, algorithms will be deployed to carry out the simple rational decision-making processes. This can already be seen in credit scoring and loan applications, where algorithms are used to approve simple requests or flag complex cases to human beings for further investigation.

New approaches for emerging challenges in a digital world

The digital world calls for different approaches to managing successful organisations. In 'The Age of Agile', Denning writes about the traditional rational approach as follows:

'Trying to exploit technology and data with the management practices that are still pervasive in many big corporations today is like driving a horse and buggy on the freeway.'^{xvi}

Rather than using 'the one-size-fits-all' method of traditional management theory, organisations must think and analyse differently depending on the situation they face. In the Cynefin (the Welsh word for habitat) framework, this means being able to identify whether issues faced are complex, complicated, simple or chaotic and then being able to apply the right practice.^{xvii}

In a digital world, employers, finance functions, regulators and policymakers, academics and tuition providers, and management accounting practitioners have a role to play in supporting and understanding new approaches that facilitate the resolution of the complex problems organisations face.

For the finance function and the finance professional, this will require continuous collaboration and interaction with internal and external stakeholders across their organisations.

4. Changing finance function performance to meet the challenges

This section focuses on the performance required by finance functions to help their organisations create and preserve value in the face of such unprecedented and disruptive change in a digital world.

Here we will explore:

- ▶ the role of the finance function and its primary activities
- ▶ the tools and techniques that are increasingly important to finance functions
- ▶ how finance functions are adopting technology
- ▶ how and why the shape of the finance function is changing
- ▶ how service areas within the finance function are evolving.

Historically, the finance function's focus has been around promoting organisational efficiencies and reducing operational costs. In many organisations, this focus has heralded lean operational processes – and now there is no fat left to trim.

Technology is also at a point where machines can monitor process-costing and highlight patterns of efficiency on their own. This is allowing the finance function to refocus its energy on revenue and value creation.

The role and key activities of finance

In our research, we are hearing that the finance function plays three roles. If it plays these roles effectively, then finance professionals are valuable to organisations.

A finance function:

- ▶ **Enables** an organisation to create and preserve value
- ▶ **Shapes how** an organisation creates and preserves value
- ▶ **Narrates how** an organisation creates and preserves value.

In the narration of value role, the finance function communicates with stakeholders that are both internal and external to their organisation. This involves considering the societal impact that organisations have in building their sustainable business models.

In the CIMA Professional Qualification, the 'Enables' element is encompassed in the Enterprise pillar; the 'Shapes How' piece is covered in the Performance pillar; and 'Narrates How' is part of the Financial pillar.

Basic finance activities: from information to impact

As explored in an earlier emerging theme paper (The Changing Role and Mandate of Finance: Creating a Vision for the Future) peel back the layers of the finance function and at its heart you will find its basic activities – the function’s DNA.^{xviii}

Whether you are assessing finance risk, reconciling accounts or compiling management information reports, the process activities remain constant.

The finance function’s basic activities as shown in Figure 4 are:

Assembling information: the finance function assembles data from a range of sources – collecting, cleaning and connecting data into assembled information. As well as preparing accounts and returns in prescribed formats for external reporting, the function prepares management information in accessible formats for managers.

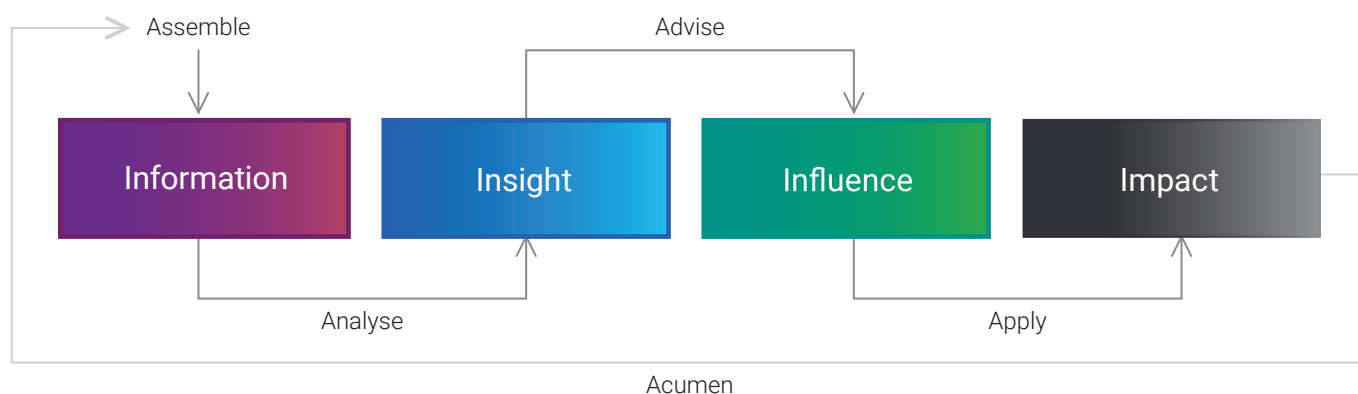
Analysing for insights: the finance function analyses both financial and non-financial information to draw out patterns and relevant insights for its customers.

Advising to influence: the finance function then communicates these insights and contributes an objective, responsible perspective to influence decision-making.

Applying for impact: to guide actions and help ensure organisations achieve the required impact, the finance function enables and uses control systems such as strategic planning, budgeting, performance measures and performance reviews.

Acumen: the finance function ensures it assembles valuable information to inform the consideration of subsequent proposals. This information can range from reports to analysis of the outcomes achieved or experiences gained from relevant initiatives.

Figure 4. Basic finance activities – from information to impact



Accounting

Management

Time spent on basic finance activities

Respondents to our survey were asked to rate the percentage of the time they actually spend, and the time they would like to spend, across the four areas (information, insight, influence and impact). This revealed a real gap between the current and the desired state of affairs.

The findings in Figure 5 show that respondents want to provide more 'influence' and 'impact' than they do currently. These areas are seen to provide more organisational value.

They are also the areas at least risk of technological automation, when compared to information and insight activities. As more of the tasks involved with information are automated, finance professionals will be released to move to their desired activities of influence and impact. Out of the respondents in our survey, 82 percent believe they will spend less time on information tasks; 74 percent believe they will be investing more time in impact activities.

From three Ds to four Ds of automation

These reflect trends for AI and technology to take on the 'three Ds' of automation: Dull, Dangerous and Dirty tasks. In his book 'The Fourth Age', Reese goes further with the four Ds: 'Disliked, Demeaning, Draining, and Detestable'.^{xix} In the digital world, tedious and repetitive tasks that once took up most finance professionals' time will quite happily be handed over to technology and robots.

It is interesting to note here how people with different roles in the finance function currently spend, and desire to spend, their time. Respondents who label themselves as holding Entry Level and Accountant roles showed the greatest interest in information and insight activities compared to all others surveyed. Financial Controllers showed the greatest shift away from information, with 89 percent expecting to spend less time in these tasks. They also showed the greatest shift in favour of spending more time on influence and impact activities (81 percent).

Figure 5. Basic finance activities – percentage of time currently spent on activities vs desired

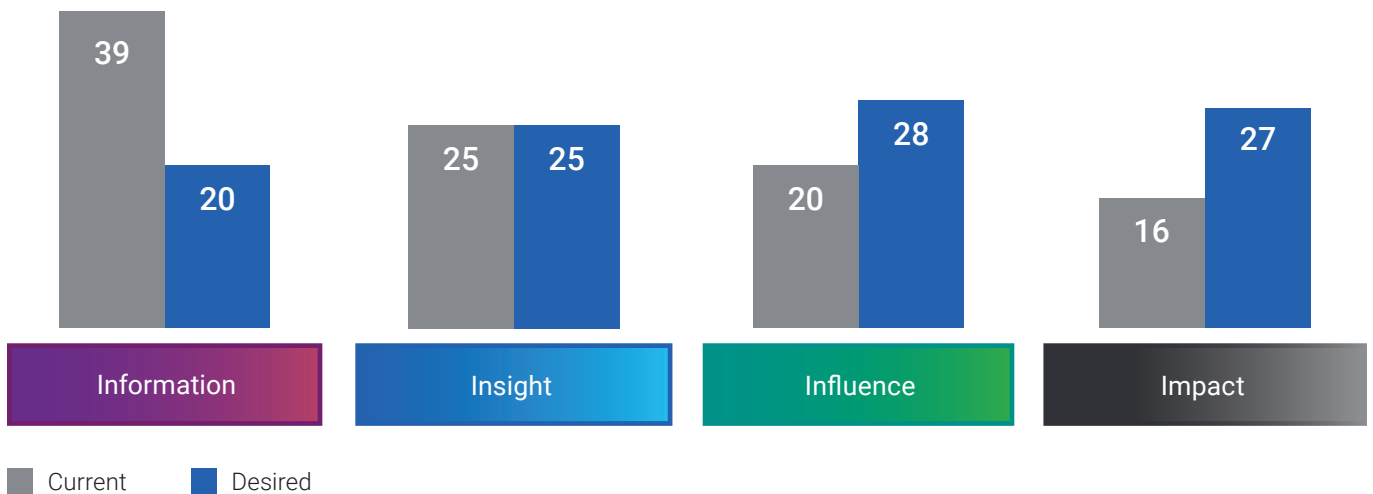
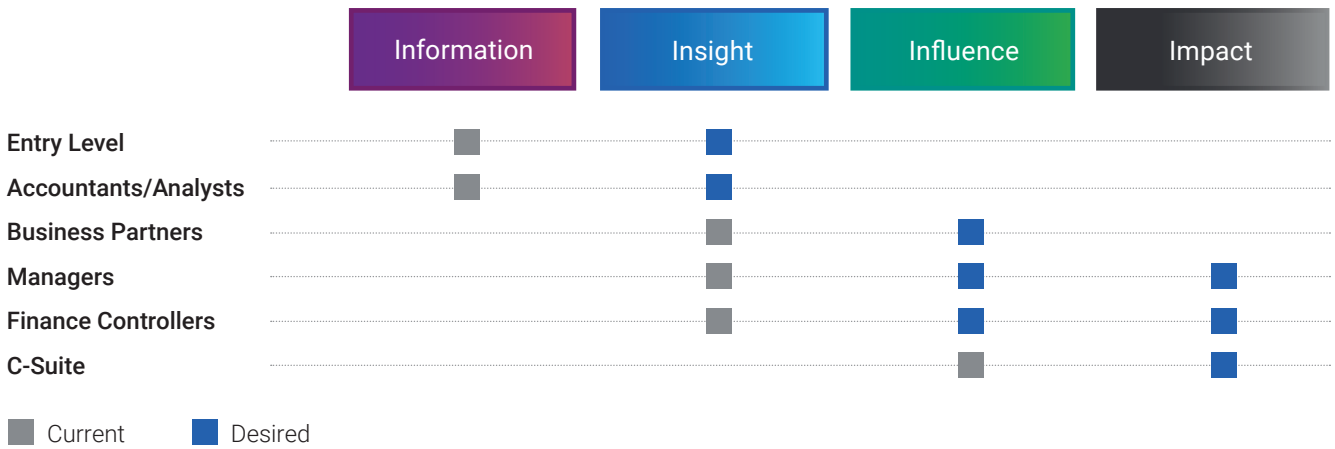


Figure 6. Basic finance activities – time currently spent on activities vs desired, by finance function role



Our research reveals that finance functions are in the process of refocusing their energies to the right-hand side of the basic finance activities (Figure 6). This, in turn, is moving them from working in isolation (accounting) to working in partnership with others across the organisation (management).

The finance function value matrix

The Global Management Accounting Principles define management accounting as ‘the sourcing, analysis, communication and use of decision-relevant financial and non-financial information to generate and preserve value for organisations.’^{xx}

This links directly to the changing role of the finance function, which has the role and mandate to define, enable, shape and tell the stories of how an organisation creates and preserves value.

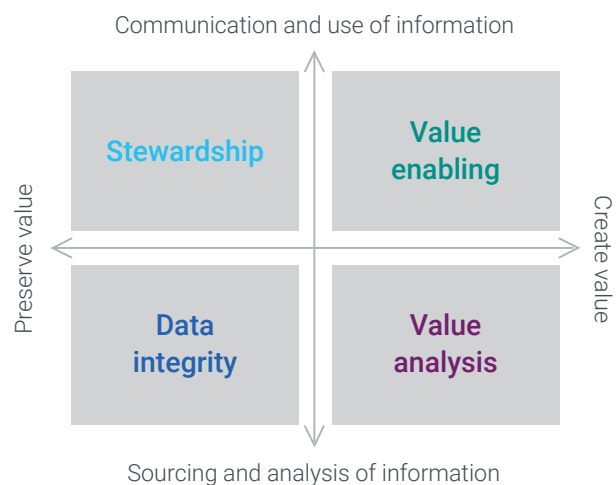
The ‘sourcing and analysis of information’ and the ‘communication and use of information’ on the y-axis represent what finance functions do. On the x-axis, ‘preserve value’ and ‘create value’ represent why finance functions undertake activities.

We have labelled this focus in Figure 7 the ‘value matrix’, where finance acts:

- ▶ as a trusted source of the management information, provides **data integrity**
- ▶ as a commercial **analyst**, providing insights into the drivers of organisational value
- ▶ as the subject matter expert and **steward**, contributes to strategic decision-making, including defining objectives with regard to developing the business model
- ▶ through partnering, uses insights to address performance issues and **enables** solutions to create **value**.

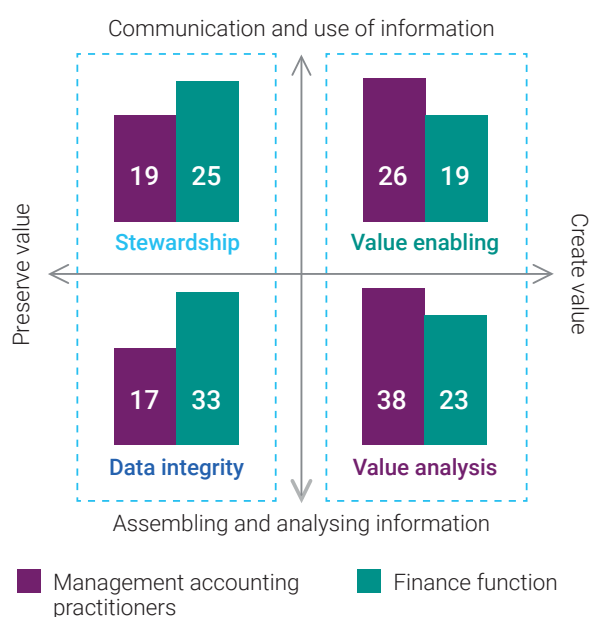
As part of our research, we asked individuals to pick a category that best described their role within the finance function and rate the relative focus of their finance team across the value matrix.

Figure 7. The finance function value matrix



Our findings in Figure 8 indicate that management accounting practitioners have a stronger 'create value' focus, with 64 percent of their roles being in the 'value analysis' and 'value enabling' quadrants. The general finance teams' focus is more aligned to 'preserve value', with 58 percent of the focus being in the 'stewardship' and 'data integrity' quadrants.

Figure 8. The finance function value matrix – by management accounting practitioner and finance team focus (percentage)



The value finance brings to an organisation

We asked participants to tell us about the value the finance function brings to an organisation. We then boiled down what we were told into nine subject area statements and asked respondents to rank them by how strongly they agreed with them. The top five are:

1. **Reporting accuracy:** a balanced approach between effort, accuracy and relevance.
2. **Partnering and decision support:** become a better partner with the business to make better business decisions.
3. **Controllershship and risk:** known for having robust controls embedded across your core financial processes, providing surety over your numbers.
4. **Enterprise-wide cost management:** sponsoring and leading initiatives to provide cost transparency and enable the organisation to identify and act on opportunities to reduce costs.
5. **Analysis and insight:** increase the level and quality of insight delivered to the business.

It is no surprise that reporting accuracy came out on top. If the rest of an organisation has no faith in the numbers the finance function is reporting, the level of organisational debate can only focus on challenging reported numbers.

Once an organisation has faith in the reported numbers, the internal debate can move to focus on organisational insights and solutions to the issues they highlight.

It is also interesting to note that those respondents who characterised their organisations as high performing rank the subject areas differently, reflecting where they are on their finance function maturity journeys.

For example, high-performing organisations that have experienced high levels of disruption in the past two years are more likely to place controllership and risk at number one. High-performing organisations that are experiencing high levels of competition in their industry sector place more importance on analysis and insight. These respondents also promote the value of analysis and insight into third place.

Cost efficiency is ranked last in ninth place. This used to be a high priority for finance functions. But as discussed earlier, technology is at a point where machines can be left to monitor process-costing and highlight patterns of efficiency. This also explains why partnering and decision support now ranks so highly, as technology is allowing organisations to focus on revenue and value creation.

Technological adoption by the finance function

In our 'Changing Technology and Finance' emerging themes paper, we focused upon the seven technologies that Deloitte highlighted as impacting finance functions.^{xxi} Deloitte categorises these tools as either 'core modernisation' or 'exponentials'.

Core modernisation tools are those that focus specifically on updating financial systems and existing capability. Exponential tools concentrate on delivering new capabilities to the finance function. As part of our survey, we asked respondents to rate their understanding and impact of these tools on their finance functions (Table 3).

Our early interview research had indicated that the adoption of new technology was not evenly distributed across all organisations, sectors and industries. However, the results from our survey are still a surprise. An assumption coming out of the interview phase is that core modernisation had become a mainstream feature of many organisations' finance functions.

Table 3. Core modernisation and exponential tools impacting the finance function

	Core modernisation				Exponential		
	Cloud	Process robotics	Visualisation	Advanced analytics	Cognitive computing	In-memory computing	Blockchain
Are you aware of?	91%	50%	44%	68%	33%	23%	48%
Does your finance team use now?	54%	11%	18%	25%	5%	7%	2%
Does your finance team plan to invest in during next 12 months?	29%	15%	14%	26%	7%	5%	5%
Does your finance team plan to invest in during next 3-5 years?	23%	17%	13%	24%	10%	8%	9%

Yet, of the core modernisation tools, only cloud technologies have, to date, become a mainstream feature. When plotted onto a Roger's adoption bell curve (Figure 9), process robotics is in the 'early adopters' stage of the curve. 'Visualisation' tools have just moved into the 'early majority' stage.

It was no surprise that most of the exponential technologies are emerging with innovator and early adopter organisations only, and have yet to break into the mainstream.

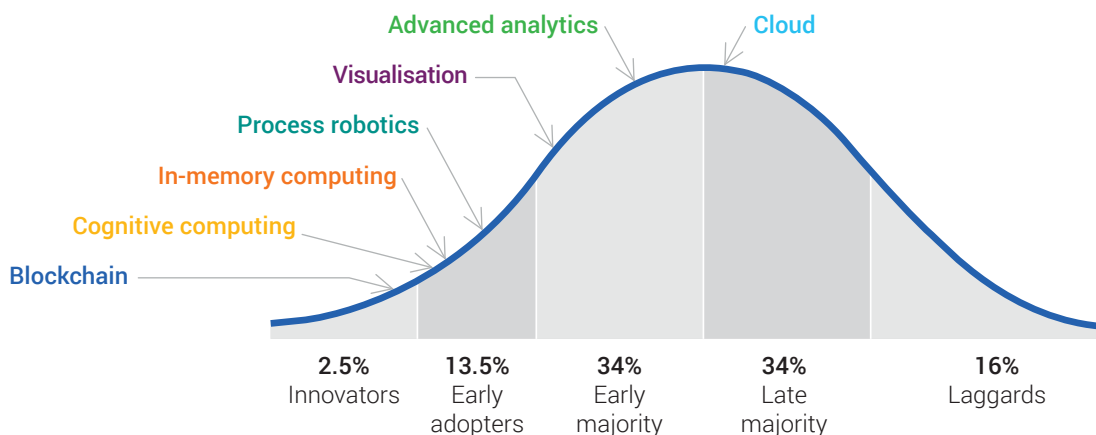
The exception is advanced analytics, which is quickly rising to the peak of the 'early majority' stage of the curve. It is interesting that this is ahead of process robotics, which Deloitte had classified as a core tool.

In our findings, advanced analytics tools are also seen as the most critical to business success and transforming organisations. Cloud came in at number two, and process robotics as the third most critical to business success.

However, some words of warning when thinking about technology and 'what will technology do to us?' According to Christian Madsbjerg:

'And that's not the right question. Technology is a tool. That is true whether it's a hammer or a deep neural network. Tools don't decide what happens to people. We decide. The lesson we've learned from studying thousands of companies over our careers is that while technology creates options, success depends on how people take advantage of these options. The success of a venture almost never turns on how much technology it can access, but on how its people use that technology, and on what values they imbue in the organization.'^{xxii}

Figure 9. Finance function adoption curve of core modernisation and exponential tools



Tools and techniques

For finance functions to meet the challenges their organisations face in a digital world, they must use different tools and techniques. In our research, many tools and techniques were talked about, but four very clearly stood out as more important:

- ▶ Data
- ▶ Value
- ▶ Costing
- ▶ Business model.

All four are in need of refreshing. Regulators and policymakers, and academics and tuition providers all have a part to play in their evolution and promotion to organisations. Finance functions and management accounting practitioners need to continually update their mastery over these key tools and techniques to apply them in the digital world.

4.1 Data

In terms of data, the first key message from our research findings is that finance professionals should move away beyond just collecting and processing data to start actually using it. This is mainly because machines and automation can do the processing and collection of data much more effectively and much more efficiently than humans. Rather than collecting and processing, the focus of the finance function and finance professional must be one of ensuring the integrity of data and using it in different ways.

In our survey, we asked respondents to categorise their methods of getting value from financial and non-financial data. Within the finance comfort zone, data is used here to:

- ▶ make decisions
- ▶ enhance operational efficiency.

Outside the finance comfort zone, data is used here to:

- ▶ understand customers
- ▶ develop customer value propositions
- ▶ monetise data.

This is backed up by the assertion of Madsbjerg, who notes the effect of data usage on senior levels of major corporations:

‘They have lost touch with the humanity of their customers and their constituents and, as a result, they mistake numerical representations and models for real life.’^{xviii}

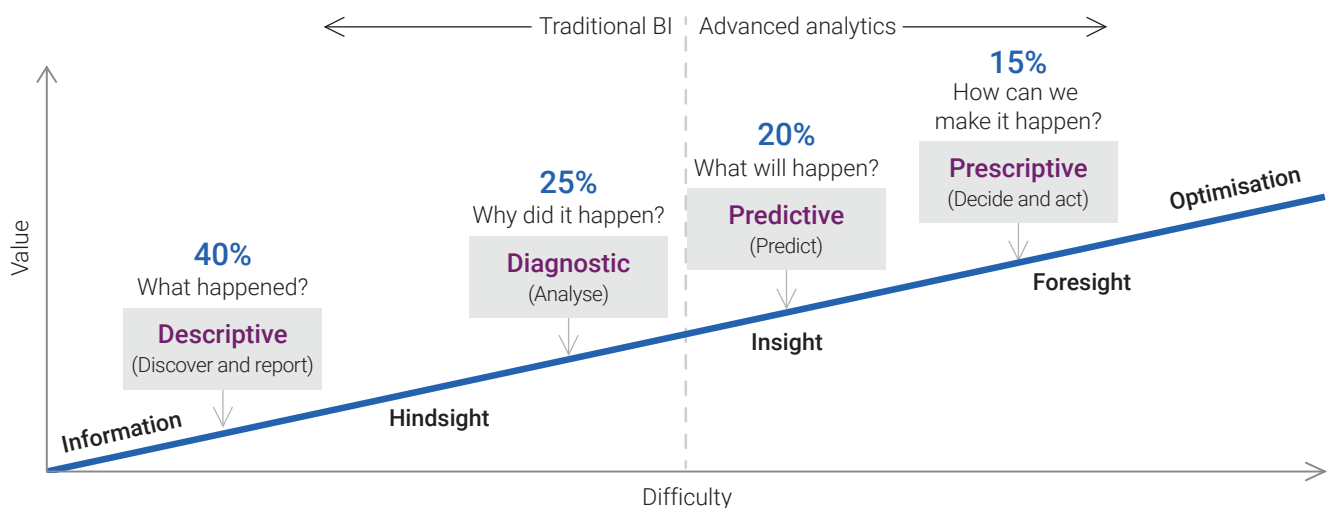
He suggests that we make the time to wander and explore the mess of real-world data, understanding the important questions first rather than jumping straight into problem-solving management processes.

The second key data message here is that communicating data is not the same as reporting it. It goes much deeper and further. In 2012, Gartner developed the ‘Analytic Ascendancy Model’ to understand how Business Intelligence (BI) approaches were being used in the analysis of structured data and context to provide insight. A key finding at the time was that:

‘Business leaders are realizing that predictive and prescriptive analytics provide greater value than traditional hindsight-orientated business intelligence.’^{xviiii}

We followed up the Gartner findings in our research survey by asking individuals to rate the analytic value content in their finance function reports (Figure 10).

Figure 10. The Gartner Analytic Ascendancy Model and finance function reporting focus^{xxv}



Our findings show that most finance function reporting is still to be found in the traditional business intelligence arena. Hindsight reporting, through descriptive and diagnostic methods, still makes up 65 percent of a finance team's report outputs. The realisation around predictive and prescriptive analytics that Gartner identified back in 2012 has yet to become a mainstream reality in many finance functions.

This result is also authenticated by the number of finance teams currently using advanced analytics tools within their function. Only 25 percent of respondents to our survey are using advanced analytics to optimise their reporting capability.^{xxvi}

However, it is encouraging to see that 35 percent of the reporting focus of finance functions has moved into the advanced analytics arena, aided by technological advancements. This capability trend is likely to increase rapidly over the next three to five years. Our survey results reveal that advanced analytics tools is the top technological area for planned investment by finance functions in this period.

Encouragingly, advanced analytics is also rated as the top technology that will be critical in helping respondents transform their organisations.

The automation of reporting

Another trend of note is that much of the descriptive analytics and hindsight reporting is becoming an automated process. Out of the respondents, 63 percent indicated that their descriptive processes were either fully or somewhat automated. This investment in automation is likely to drive released resource into the predictive and prescriptive activities that are of higher organisational value.

Finally, the advancements in technological and human capability since 2012 necessitate that the Gartner model should now include an additional box. To the right end of the advanced analytics arena, close to optimisation, a new box should highlight the trend of 'Cognitive' capabilities. This is where machine learning and humans can reason, understand and learn together in the quest of 'what can we discover?'

It is clear that, in a digital world, the finance function will have to think not only about changing data usage but also data governance. It is likely that finance professionals will take on the task of managing company data, to ensure that high data quality exists throughout its lifecycle. This will include data integrity, accuracy, consistency, availability, usability, security and privacy.

4.2 Costing

Despite the significant change in the operating context for organisations in a digital world, costing systems have not changed dramatically.

Many organisations continue to use Activity Based Costing (ABC) and Activity Based Management (ABM). Those that are innovating in the area of costing are not doing so on a consistent and coherent basis. However, there are emerging outlines of what one might call 'digital costing'. This looks at:

- ▶ the different structures, behaviours and drivers of digital assets
- ▶ how costing is done in a digital environment.

The challenge ahead is to develop and systematise this costing approach more fully when existing methods are no longer appropriate.

4.3 Value

According to Mariana Mazzucato:

'If we cannot define what we mean by value, we cannot be sure to produce it, nor to share it fairly, nor to sustain economic growth. The understanding of value, then, is critical to all other conversations we need to have about where our economy is going and how to change its course.'^{xxvii}

Value can be split into tangible and intangible. Since the 1990s many of the major value drivers for organisations have shifted away from tangibles, such as property, machinery, inventories and plant, to intangibles such as brands, trust, patents and human resources. Since intangibles are treated differently by accountants, they are often missing from companies' balance sheets. As Lev and Gu write:

'The constant rise in the importance of intangibles in companies' performance and value creation, yet suppressed by accounting and reporting practices, renders financial information increasingly irrelevant.'^{xxviii}

As intangibles have become more important to an organisation's success, measurement conventions that ignore intangible value need to change. Haskel and Westlake describe the current situation as 'trying to measure capitalism without counting all the capital.'^{xxxix}

Another basic economic property of intangibles that finance professionals need to appreciate is that organisations and economies that are rich in intangibles behave differently from those more traditionally focused on tangibles.^{xxx} Consequently, finance people need to be able to understand how to calculate intangible value and to understand its drivers. Finance professionals who can do that in a digital world will be in high demand.

4.4 Business model

'A business model shows how an organisation defines, creates, delivers and captures value for its customers, investors, other stakeholders and itself.'^{xxxxi}

The business model brings together different sub-units of the organisation in how it:

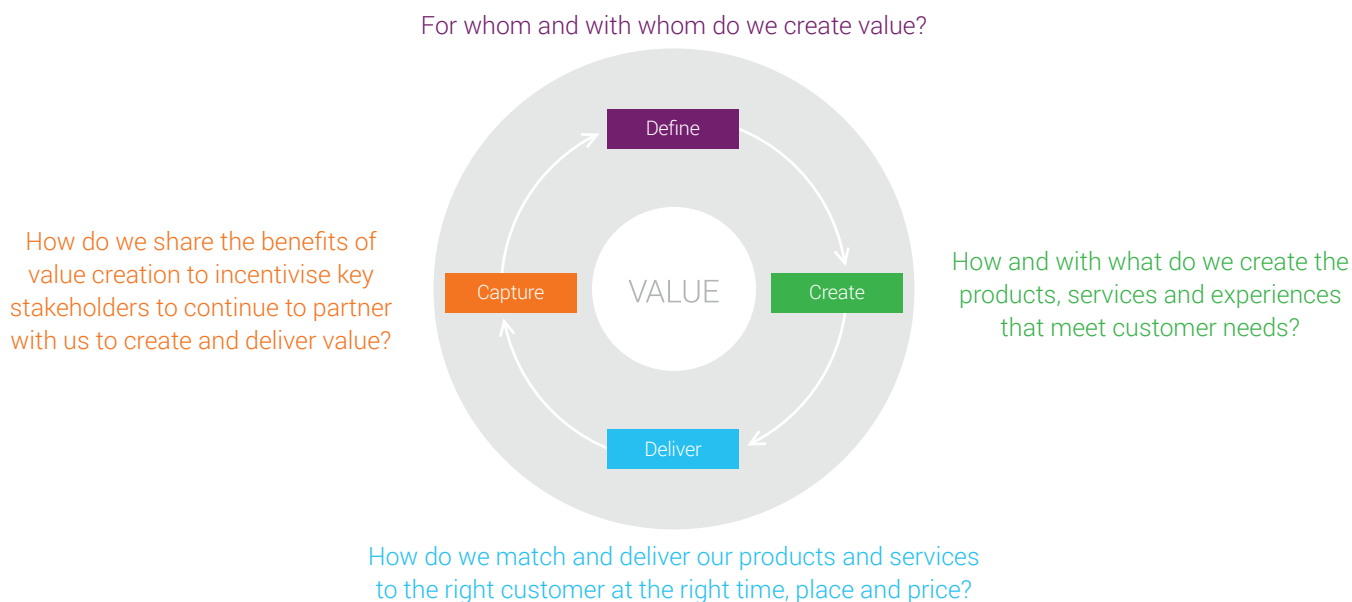
- ▶ defines value
- ▶ creates value
- ▶ delivers value
- ▶ captures and shares the value among its various stakeholders.

It also connects the organisation and its evolving environment with new emerging ecosystems, enabled by technology.

Our research reveals that finance professionals must be able to use the business model to understand the end-to-end view of the organisation and the interactions of the organisation with its environmental ecosystem.

This end-to-end organisational view enables the organisation to create and preserve value, shapes how it creates and preserves value, and narrates how it creates and preserves value. To this end, we developed the CGMA Business Model Framework in Figure 11.

Figure 11. The CGMA Business Model Framework^{xxxii}

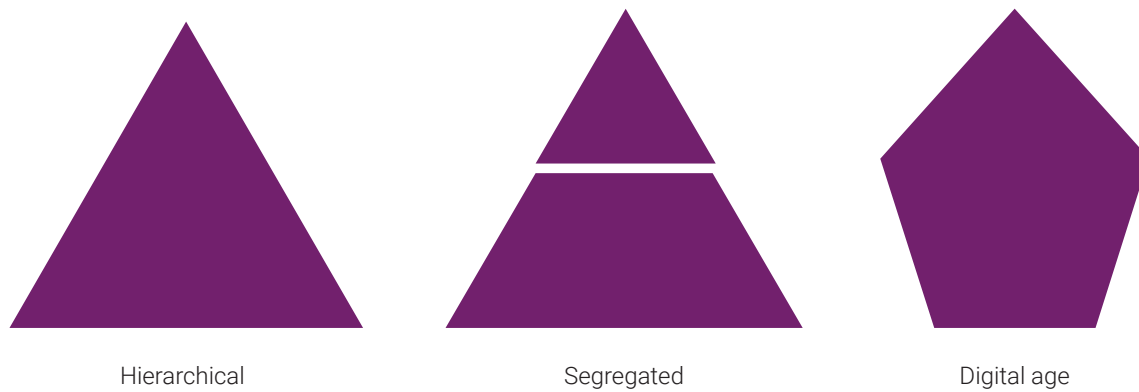


Shape and structure of the finance function

Traditionally, the shape of the finance function was a hierarchical triangle with a broad base and fewer roles at senior levels. Over the past two decades, the shape then evolved into a segregated triangle, which was driven by globalisation and advances in information and communications technology. This change allowed routine processes to be migrated to shared service centres – the bottom section of the segregated triangle represents the finance function activities carried out within shared service centres.

The shape of the digital age shows the impact of technological automation as it continues to erode the traditional triangular base. This erosion has implications for succession planning; those basic finance activities, which are now automated, had provided the traditional training ground for finance professionals (Figure 12).

Figure 12. The evolution of the finance function shape

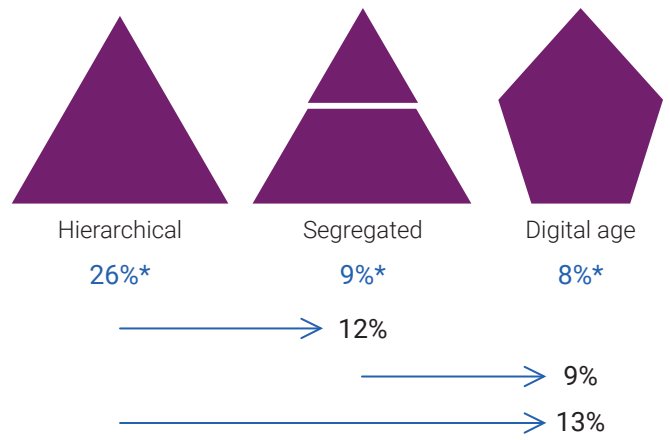


Our survey asked respondents to select a shape that best described their current finance function, and one that represented its evolution (Table 4). The hierarchical version is the one most frequently recognised as the current shape of the function, with 57 percent identifying with it (Figure 13). When asked to pick the shape that their finance function was evolving into, 32 percent believed that the future will still be hierarchical. This was closely followed by those who saw the shape evolving to a pentagonal one: 30 percent of respondents identified with it.

Indicators as to the evolving shape that the respondents chose included the impact of technology and the current automation levels individuals were experiencing within their organisations.

Those respondents who think finance work will be highly automated over the next three years, and those whose current diagnostic processes are somewhat or fully automated, were more likely to see their function evolving to a segregated or pentagonal shape. This increasing evolution towards the pentagonal shape could within three years make it as common as the hierarchical finance function structure.

Table 4. The change of shape of the finance function



*Does not think the finance function will change

Figure 13. The current and evolving shape of the finance function (percentage)

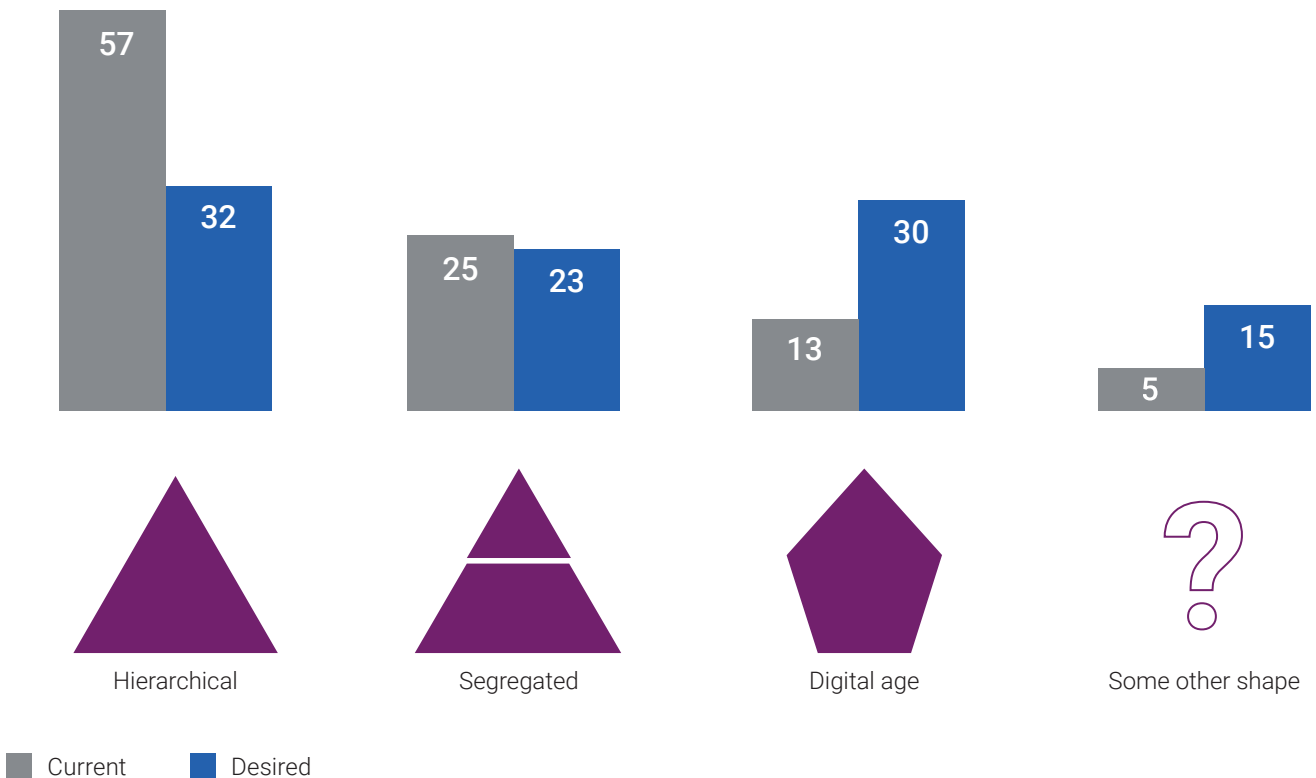
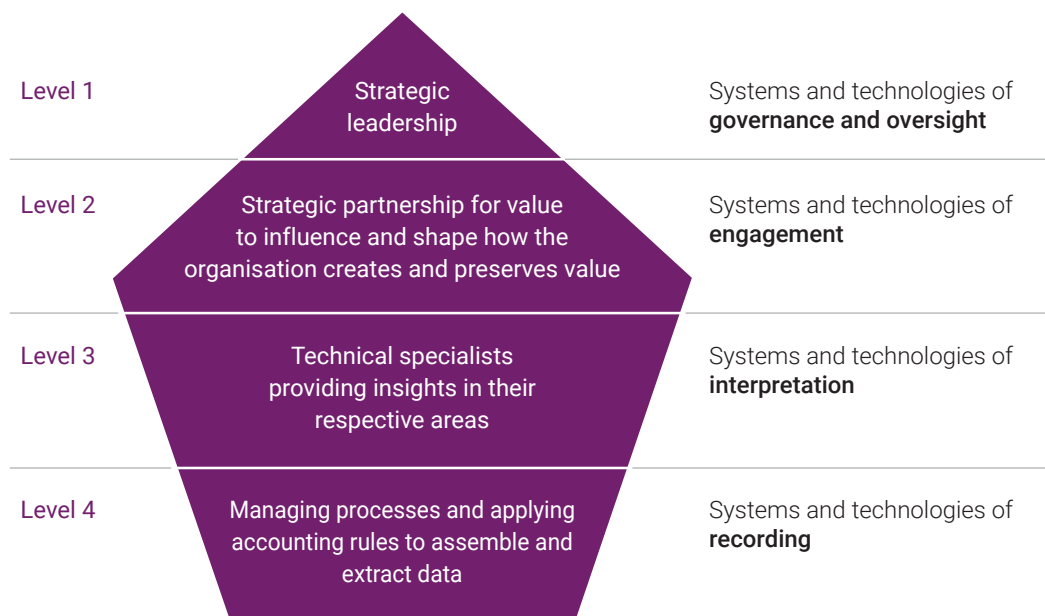


Figure 14. The shape of the finance function in the digital world



The digital age finance function

So, our research findings show that the shape of the finance function is evolving into a pentagonal structure.

The levels within this emerging structure do not mirror a traditional hierarchical triangle (where broader populations of workers report directly upwards to a series of ever-narrower management bands).

In the pentagonal structure (Figure 14), each level has its own layers of management bands. However, expert teams across the levels collaborate as equals to achieve shared corporate objectives. Here, finance professionals increasingly work in multidisciplinary teams, assembled in skills combinations that support the business.

The responsibilities of each level and their corresponding technological systems are as follows:

► Level 4: Assembling and extracting data

Here, individuals and teams apply accounting rules, policies and standards to the collecting, cleaning and connection of data. They are essentially operating systems and technologies of recording. The information and extracted data they provide become the foundations of the work of finance professionals.

► Level 3: Generating insights in areas of specialism

These are technical specialists who provide insight derived from the information that has been handed over to them in their specialist areas. They analyse the

information to create insights which they communicate through periodic reports. Essentially, they operate systems of sense-making and interpretation in order to provide insight. Their insights create the building blocks of the organisation's value-creation story.

► Level 2: Strategic partnership for value

Insights that level 3 provides are then passed on to finance professionals working as strategic partners. Partnering with the organisation for value, they provide insight through interaction with both internal and external stakeholders. They interpret and use financial statements, together with other data, to generate and communicate further insight.

This is used to influence decision-making, to control operations, and in carrying out the implementation of decisions. Essentially, they work with technological systems of engagement and interaction. Their influence enables stakeholders, inside and outside the organisation, to commit to the creation and preservation of value.

► Level 1: Leading the finance function

These finance professionals lead and manage the finance function. Their main focus is to provide strategic leadership, through applying their expert technical skills and formulating strategy (including financial strategy). The technological systems in which they operate are the systems of governance and oversight.

The following Table 5 reflects our research findings and the detail for each level. It explores the changing roles, tasks and focus within the finance function levels. Here, we also consider how the digital world impacts upon finance professionals' use of technologies. Finally, the table maps where the CIMA Professional Qualification and the CGMA Competency Framework cut across these levels.

Table 5. The attributes of each level within the pentagonal structure

Attribute	Data extraction (Level 4)	Insight generation (Level 3)	Value partnering (Level 2)	Finance leadership (Level 1)
Type of system	Recording	Interpretation (or sense-making)	Engagement (or interaction)	Governance and oversight
Outcome	Hindsight	Insight	Foresight	Oversight
Gartner model	Descriptive	Diagnostic	Diagnostic; predictive; prescriptive	Predictive; prescriptive and cognitive
Technology	OCR; RPA; early stages of BI system	AI; NLP; middle stages of BI system	AI; visualisation; final stages of BI system	AI; prediction tools; all stages of BI system
Role of accounting	Gathering information for narrating; and narrating how organisation creates and preserves value	Narrating in greater detail; beginning to shape how organisations create and preserve value	Shaping how value is created (through interaction); enabling how value is created	Enabling value creation by ensuring oversight, governance, and by allocation and provision of resources
Focus	Quality and integrity of data; training machines to do a better job; efficiency	Compliance (interpreting rules); quality of analysis; telling machines what to do; effectiveness	Quality of decision-making; judgement; trade-offs and learning	Quality of strategic decision-making; risk management; capital and resource optimisation
Main competencies	Technical accounting	Technical accounting; business skills	Business skills; people skills	Business skills; people skills and leadership skills
CIMA Professional Qualification/CGMA	Operational level	Management level	Strategic Level CPD/CPE	CPD/CPE

OCR – Optical Character Recognition, RPA – Robotic Process Automation, NLP – Natural Language Processing, BI – Business Intelligence, AI – Artificial Intelligence, CPD – Continuing Professional Development, CPE – Continuing Professional Education

Characteristics of high-performing organisations

Our research exposes the fact that the adoption of new technology is not evenly distributed across all organisations, sectors and industries.

In an interview with a representative of a Big Four accounting firm, they paraphrased words attributed to science fiction writer William Gibson:

'The future of finance is already here – it's just not very evenly distributed.'^{xxxiii}

This shouldn't be surprising. It reflects different organisations' journeys, in multiple ecosystems, to their goal of creating the most efficient and effective business model that delivers value to their stakeholders. What's clear is that one organisation's current technology adoption and capability is another organisation's technological past.

By segmenting this research data, we can explore the organisations that are further ahead on their journeys to meet the challenges faced in a digital world.

As part of our survey, we asked respondents to rate:

- ▶ their organisations' performance in relation to their market/industry competition
- ▶ the levels of disruption facing their organisations over the last two years.

The findings have allowed us to create a composite picture of the characteristics of high-performing organisations, in the face of high competition and/or high disruption (Figure 15):

- ▶ Multinational organisations make up 70 percent of respondents who rate their company performance as high in relation to their competitors and peers.
- ▶ High-performing organisations are more comfortable using non-financial data to understand customers and develop customer value propositions.
- ▶ The technological journeys of high-performing organisations are further advanced. Their use of process robotics, visualisation and advanced analytics is on average 10 percentage points higher than low-performing organisations. This is also reflected in their plans to invest in technology over the next 12 months, which on average is also 10 percentage points higher (Figure 16).
- ▶ High-performing organisations are more aware of cognitive computing and blockchain technologies.
- ▶ The diagnostic processes of high performing organisations are more likely to be 'somewhat automated' than those of low-performing organisations.
- ▶ Higher-performing organisations have a stronger belief that their current finance competencies will need to change significantly over the next three years.

Figure 15. Awareness of technologies viewed as critical for transforming business

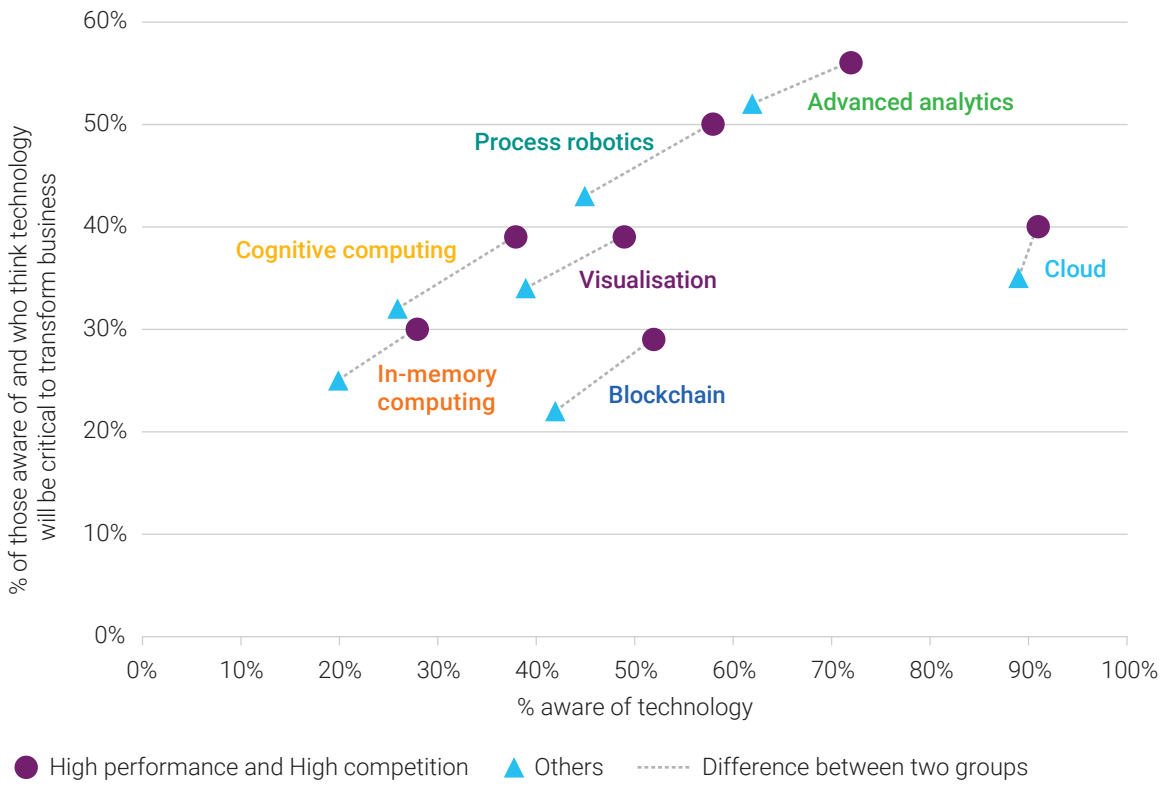
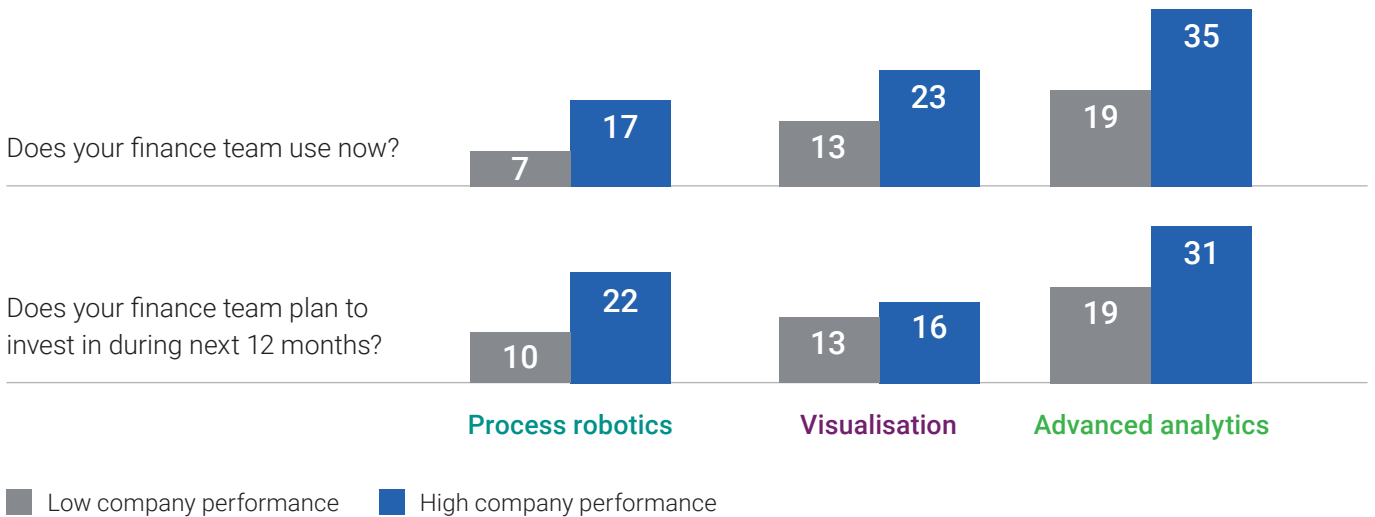


Figure 16. Technology usage and future investment by low/high-performing organisations



What these trends are revealing is a changing capability that is enabling the inversion of the finance function focus pyramid (Figure 17).

Traditionally, compliance has been the overriding focus of the finance function. However, as compliance is always associated with cost, this focus leads to a strategic behaviour of cost minimisation. When cost is an overriding objective, it can restrict the use of the full accounting discipline. In a digital world, it is the compliance area that currently has the most potential for technological automation.

Experimenting with blockchain

During our interview and roundtable research, respondents from the banking sector, regulators and governments shared examples of how they are experimenting with blockchain-based tools to fundamentally change banking and the corporate tax landscape.

These visionaries are working towards a future where organisations record to their balance sheets in real time through transparent blockchains. Regulators and governmental tax administrations will then have open access to organisational financial transactions, enabling them to calculate and deduct tax automatically in real time.

The prospect of regulators and shareholders gaining direct access into organisations' future financial blockchain ledgers also has major implications for corporate reporting. Direct access by regulators and stakeholders in real time to an organisation's databases could make the activity of compiling corporate reporting redundant.

Maximising organisational value

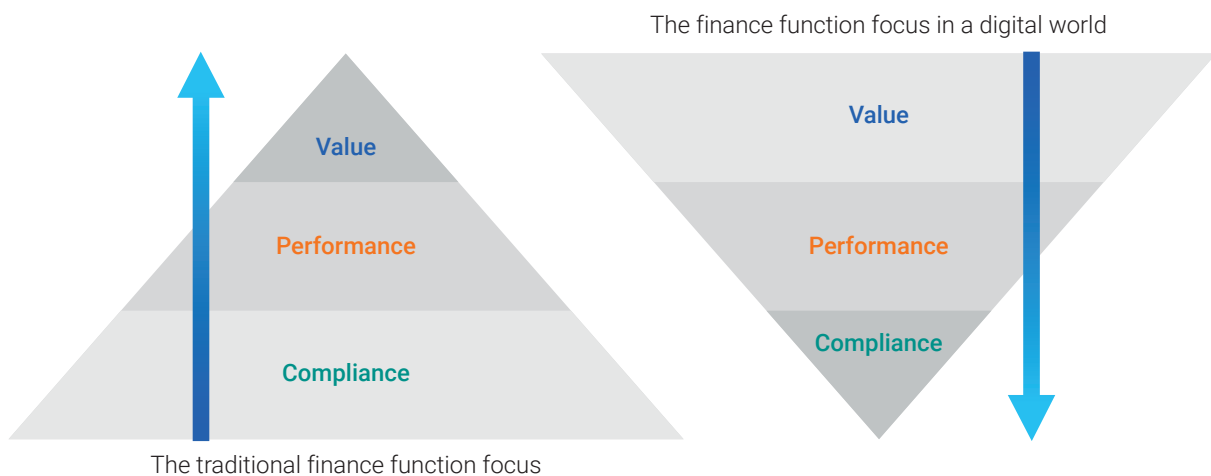
As the compliance focus diminishes, it is allowing finance functions to shift their strategic focus onto maximising organisational revenues and value. It also has roots in the increase in customer empowerment, heightened by social media, where internal systems and processes are being reprioritised to focus on delivering value to the customer.

For some organisations, this journey can be a struggle, as Denning states:

'Aligning the finance function with the Law of the Customer is a key priority. In public corporations, there is often a life-threatening struggle to liberate the firm from the pressures of rampaging short-termism from the stock market.'^{xxxiv}

Whatever the struggle to invert the finance pyramid, the move to a focus on strategic value uses more of the skills of the finance professional. This impacts the types of skills, competencies and mindset that are required of finance professionals in this environment. These are considered in the next section.

Figure 17. Inverting the finance focus pyramid for a digital world



5. Changing competencies and mindset to ensure performance

This section focuses on the skills, competencies and mindset that finance professionals need in order to perform at the level required to address the challenges organisations face.

This section will:

- ▶ explore whether automation presents a risk or opportunity to finance professionals
- ▶ focus on the re-skilling of finance professionals in the face of automation
- ▶ profile new digital skills and a mindset that finance professionals need to succeed in a digital world.

Automation: risk or opportunity?

One of the key factors we are hearing about in our research is the rise of technology and automation, both as a driver and an enabler of change.

For many people, technology could represent a threat. However, our view is that technology doesn't need to represent a threat – it can also present opportunity. The following example, told to us in our research interviews, demonstrates how.

Using technology to improve forecasting

In the course of our research, we talked to a multinational company whose finance department was trying to improve its revenue forecasting. Their goals were to improve the accuracy and frequency of finance forecasts. They hoped to provide a stronger, unbiased baseline forecast, on a more frequent basis, that would enable the finance function to respond more swiftly to business issues.

As it was a technology company, the CFO was able to connect with the vice president of machine learning. Together they came up with a technological concept to help improve the accuracy of finance function forecasts.

Massive reductions in time and effort

Before the concept of machine-learning revenue forecasting was introduced and tested, revenue forecasting was a complex affair using spreadsheets involving 800 analysts across many business channels. It could take up to three weeks to process and generate a quarterly forecast.

Over seven revenue-forecasting quarters, the new machine-learning system was run in parallel with the traditional, human-compiled CFO forecast. The new trial system reduced the process from three weeks and 800 analysts, to just two days involving the input of just two people.

By the end of the trial, the machine-learning system had also significantly improved forecasting accuracy. In addition, it had reduced the human input into a quarterly forecast from 16,000 to just four work days in a year.

The machine-learning system now provides global analysts with an accurate forecasting benchmark that is comparable to internal human-generated forecasts. It has given the company more confidence in the forward-looking revenue ranges they provide to external stakeholders.

Freeing time to add value

Of course, the introduction of machine-learning revenue forecasting led to the displacement of tasks – but it did not lead to the displacement of people from the company. The time saved is now being used to enable the finance function to respond to the key issues that add more value to the company.

So our research findings demonstrate that the displacement of tasks should not necessarily lead to the displacement of people from their jobs. Half of our survey respondents expect to spend less time doing data processing tasks and more time in analysing non-financial data to assist decision making, moving from a focus on information to one on influence and impact. If these people are given new and relevant skills and competencies, they can undertake higher value tasks that create more value to their organisation.

This requires re-skilling and ensuring that in a digital world, finance professionals have the right mindset and competencies to meet the challenges organisations face. According to Daugherty and Wilson:

‘The simple truth is that machines are not taking over the world, nor are they obviating the need for humans in the workplace. In this current era of business process transformation, AI systems are not wholesale replacing us, rather, they are amplifying our skills and collaborating with us to achieve productivity gains that have previously not been possible.’^{xxxv}

Over 50 percent of respondents to our survey agreed that current finance competencies will need to change significantly over the next three years.

Automation: re-skilling people

Our thinking around the relationship between finance professionals and automation in the digital world is based upon Daugherty and Wilson’s vision of human-machine dynamics. Here (Figure 18), three types of relationships are envisaged:

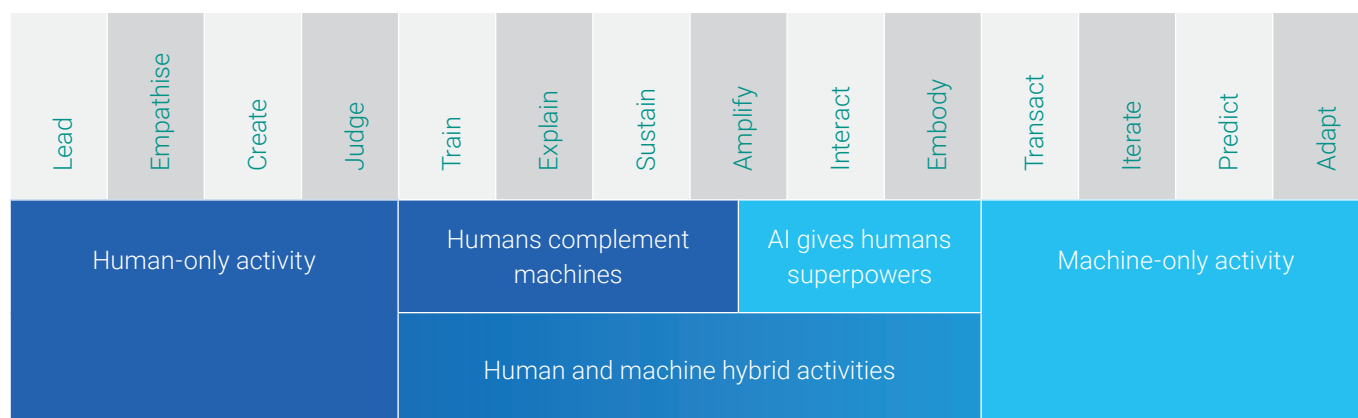
- ▶ Machine-only activity
- ▶ Human-only activity
- ▶ Human and machine hybrid activities.

It is important to point out that, when we talk about machines in the finance function, we are talking about algorithms, artificial intelligence and coding lines that cannot be physically seen. This is different to machines that are given a body, like robots, which help human beings succeed in other ways.

Daugherty and Wilson’s book (‘Human + Machine: Reimagining Work in the Age of AI’) details companies that are already reimagining business processes to increase performance through human-machine collaboration:

‘They think of AI as an investment in human talent first and technology second. They value workers who are adaptable, entrepreneurial, and open to retraining. Then these companies provide support to ensure that their workers and AI systems can succeed together. In doing so, they lay the foundation for adaptable, robust business processes capable of withstanding economic shocks and increasing the rate of technology change.’^{xxxvii}

Figure 18. The missing middle – reimagining processes with AI^{xxxvi}



Machine-only activities

Where machines are good at doing some things and will always outperform human beings, these are classified as 'machine-only activities'.

These involve transaction processing and predictions, tasks that involve iterations and adaptations to new environments. In our research, we are seeing that it is best to let machines do these machine-appropriate activities.

However, this doesn't mean that finance professionals should not understand what is happening. Finance professionals need to have an awareness of what machines can do and an understanding of what machines are doing. Only then, according to David Sumpter, will they be able to interface with the machines properly:

'Understanding algorithms allows us to understand future scenarios a little better. If you can understand how algorithms work today, then it is easier to judge which scenarios are realistic and which are not.'^{xxxviii}

Sometimes, the predictions and answers machines provide are wrong. Finance professionals need to be able to understand and challenge the root causes of inaccurate predictions.

Finally, it should be remembered that technological applications are amazing at providing solutions and assigning a number, but these are only abstractions. Real value is only achieved once a finance professional has re-attached context and a human story to these abstractions. In a world that is rarely black and white or rational, the accountant can work with ambiguity and facilitate organisational debate when faced with key decision-making situations.

Human-only activities

There are certain things that only human beings can do. These are tasks that machines are either not very good at or cannot do at all. These involve providing leadership, empathising, some aspects of creativity, making judgments, and areas relating to ethics and professionalism.

To make sure that finance professionals are fully skilled in these areas we have incorporated them into the CGMA Competency Framework, CIMA Professional Qualification and CPD. We believe this is important because their time is then freed from mundane tasks and can be redeployed to tasks that add real value to organisations.

An example of human-only activity is applying knowledge across different tasks and finding common patterns of interest. Sumpter again:

'Humans are really good at reusing what we learn in doing one task for a different related task; our current state-of-the-art algorithms are terrible in this.'^{xxxix}

Another type of human-only activity falls out of the increases in machine predictions. Rational predictions that are close to certainty and agreement are likely to be automated. However, complex machine predictions, which are far from certainty and agreement, will require a greater level of judgement from humans. As Agrawal, Gains and Goldfarb write:

'With better prediction come more opportunities to consider the rewards of various actions – in other words, more opportunities for judgement. And that means that better, faster, and cheaper prediction will give more decisions to make.'^{xi}

Human and machine hybrid activities

We believe, based on our research, that the use of technology in the finance function is creating a model of intelligence augmentation, where technology augments human intelligence. In the finance function of the digital world, the technical capabilities of robotics and algorithms combine with the creativity and empathy of the human accountants. This augmentation is making finance professionals faster, more efficient and more productive.

It's no longer human versus machine. Now, new technologies can learn from the accountant and be customised to fit the specific needs of your finance function.

There is, therefore, a third set of skills that finance professionals need, where machines and humans work together. These human and machine 'hybrid' activities can be broken down into two areas:

- ▶ Humans complement machines: human beings bring value to machines by training them, by explaining to those programming the machines how to code them properly, and then by maintaining the machines.
- ▶ Machines give humans superpowers: machines increase the productivity of human beings by working in partnership with them. This amplifies the work that human beings do when interacting with other human beings.

According to Daugherty and Wilson:

'Machines amplify human insight and intuition by leveraging data and analytics, they interact with humans at scale using novel interfaces, and embody physical attributes that essentially extend a person's capabilities.'^{xii}

In all three categories, finance professionals will need to ensure they:

- ▶ understand and are aware of what only machines can do
- ▶ are highly skilled in what only humans can do (leadership, empathy, creativity and judgement)
- ▶ are highly skilled in situations where machines and human beings work together.

Digital skills and mindset

To succeed in a digital world, human beings need digital skills and a digital mindset. Our research indicates that three key areas of digital skills and mindset will keep finance professionals relevant in an ever-evolving technological world:

- ▶ **Basic digital literacy:** to work in a digital environment, an individual needs to have confidence and capability in using digital technology to complete tasks. This means knowing how to create digital content, how to ensure there is privacy when using data, and how to communicate using digital channels.
- ▶ **Technology know-how:** this relates to the finance professional's technical knowledge, specifically where a deeper level of expertise is required. Examples include cloud computing and cybersecurity, in relation to how they impact on the finance function. They also need an understanding of how digital technology can disrupt an organisation's business model, and the ability to scan the horizon for possible future disruptions. When finance professionals have a deep technological expertise, it enables them to work in such a way that brings value to an organisation.
- ▶ **Mindset and behaviours:** there is a mindset that finance professionals need to operate in a digital environment. The mindset is a fusion of the abilities to confront complexity, to work in an agile and creative manner, and to harness curiosity in order to continually learn. The adoption of this mindset drives greater motivation and achievement.

The nature of change that is taking place is unpredictable and its pace is very fast. The result is much complexity – and being able to deal with complexity is important for finance professionals.

As more finance professionals move into strategic partnership for value tasks, and move from working in isolation to working across an organisation, the ability to work in a creative and agile way becomes key. This becomes even more important if an individual ends up working on multiple short-term projects or is part of the gig economy.

Finally, the pace of change is shortening the shelf life of learned knowledge. This means that finance professionals must devote themselves to lifelong learning. Careers become a cycle of learning. And when your knowledge becomes irrelevant, you unlearn it to provide capacity to learn the relevant new things that have replaced them.

To succeed in a digital environment, says Mariana Mazzucato, the finance professional needs '*the willing to explore, experiment, make mistakes and to learn from those mistakes.*'^{xiii}

Table 6. The key digital skills and mindset for a digital world^{xliii}

Basic digital literacy	Technology know-how	Mindset and behaviours
<p>To work in a digital environment</p> <ul style="list-style-type: none"> ▶ Information treatment ▶ Digital communication ▶ Digital content creation ▶ Safety ▶ Problem-solving 	<p>Where deeper expertise is required</p> <ul style="list-style-type: none"> ▶ Cloud computing ▶ Privacy and security ▶ Data analytics ▶ New business models 	<p>To succeed in a digital environment</p> <ul style="list-style-type: none"> ▶ Dealing with complexity ▶ Working in an agile way ▶ Creativity and imagination ▶ Lifelong learning (learn, unlearn and relearn)

Changing competencies for a digital world

Our research findings reveal that the human-machine hybrid situation requires new skills and competencies, in addition to maintaining existing ones. These are the digital skills in Table 6. For example, one cannot now study strategy without paying attention to digital strategy – the strategy to achieve digital transformation and to enable the organisation to operate with a digital mindset.

Throughout, there is still a need for finance professionals to have technical skills and to be able to apply them within a business context. Similarly, they need to use people skills to influence people and leadership skills to continue to lead organisations. All of these things must be underpinned by ethics, integrity and professionalism (Figure 19). Finance professionals will need to use their competencies to learn how to manage the finance function in a digital world. This will require a deeper understanding of the technologies, algorithms, data and organisational structures that are emerging in the digital age.

As part of the survey, we asked respondents to consider how future skills and competencies will be spread across roles in a digital world.

Figure 19. The 2019 CGMA Competency Framework

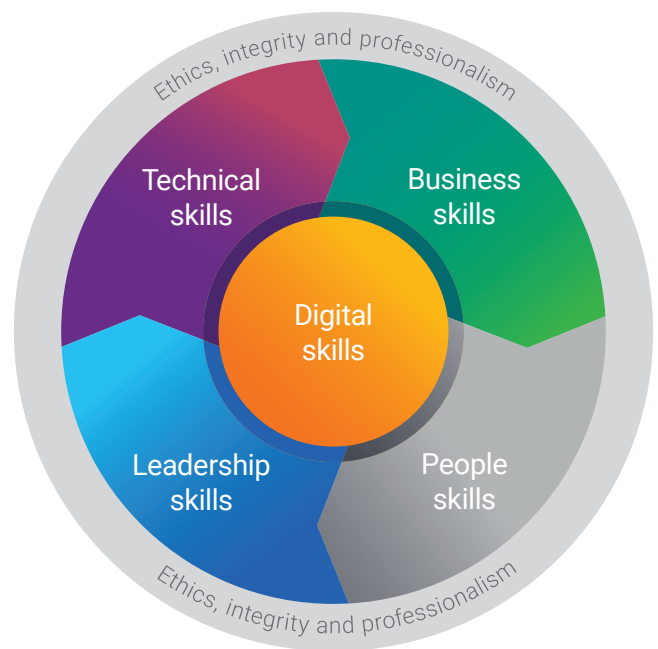
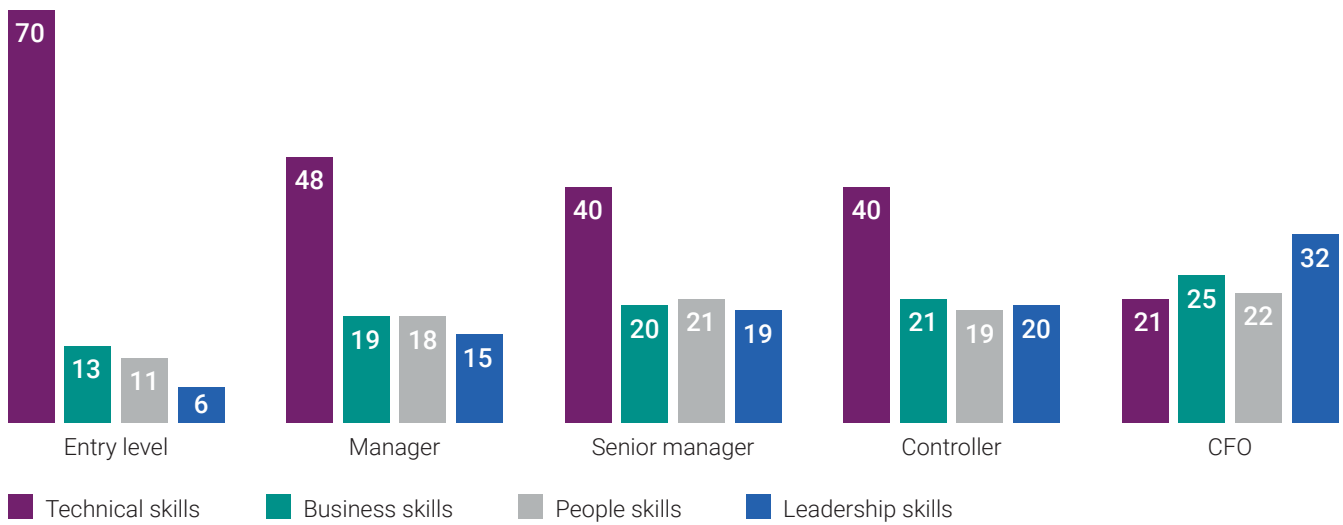


Figure 20. Competencies and skills focus for a digital world (percentage)



The results reveal that as a finance professional progresses through their career, the competency focus moves from pure technical skills to people and leadership skills (Figure 20). This move from left to right is likely to speed up as technology automates process-driven tasks and the finance function moves from working in isolation to working with others in the organisation. This shift is also emphasised in the skills gaps employers and finance functions are experiencing.

Top three skills gaps

Our survey asked respondents to think about the biggest gaps that exist in terms of the skills and talent required to address the challenges organisations face in a digital world. The top three skills gaps are:

1. **Business partners** (business acumen, behavioural, leadership)
2. **Data and analytics** (data modelling, data science)
3. **Business solutions architect** (integrating functional and IT solutions).

Interestingly, these are skills that are found in the expanding part of the finance function pentagonal shape, referred to earlier, especially:

- ▶ **Level 2:** Strategic partnership for value
- ▶ **Level 3:** Generating insights in areas of specialism.

In summary, the digital world calls for changes to the skill sets of the finance professionals if they are to remain relevant and perform at the required level to address the challenges organisations face.

The next section considers how the many stakeholders in the management accounting community can make a difference. Collectively, we can shape competent and confident management accounting professionals who guide their finance functions and their organisations to sustainable success in a digital world.

6. Engaging the management accounting community with the digital world

We also recognise that, as a global professional body, we don't work in isolation. Within the management accounting community, employers, regulators and policymakers, academics and tuition providers, and management accounting practitioners all have roles to play in addressing the challenges we all face in a digital world.

This section will:

- ▶ explore how the management accounting community can re-invent itself for a digital world
- ▶ profile the actions stakeholders should consider in light of this white paper
- ▶ explain what we are doing next, in light of the research.

Re-inventing ourselves

A starting position, for all community stakeholders, is at the very least to revisit their relationships with technology. Once that is done, the Susskinds then point to three areas of focus in which we need to continually re-invent ourselves, in what they term 'a technology-based internet society':^{xiv}

- ▶ Optimisation
- ▶ Diversification
- ▶ Transformation.

Optimisation means doing what we already do, but doing it better. With a **diversification** focus, we look outside our structural boundaries and add more to what we already do. This can be achieved by embracing technologies to provide a holistic approach to the challenges we face. Finally, **transformation** looks to paradigm shifts, caused by change, to create innovative new business models, ways of working and ways of interacting in the community.

There are matters that members of each stakeholder group in the management accounting community can think about and action in light of this white paper.

▶ Employers

- Understand and review how digital technology is disrupting your organisation's business model. Research the technology solutions that your supply-chain partners and others in your industry ecosystem have implemented.
- Think about how you can build and retain the skills and talents of your finance professional employees.
- Build the capacity, competence and credibility into your finance functions that are the characteristics of high-performing organisations.
- Make sure your finance functions have, in Denning's words, 'a clear line of sight to the ultimate customer and continually adapt their systems and processes to enhance their contribution to the outcome for the ultimate customer.'^{xiv}

▶ Regulators and policymakers

- Understand how technology is changing the business relationship between regulators and organisations.
- Build cross-industry and policymaker collaboration using digital technologies.
- Think about how reporting practices can be enhanced to measure intangible value.
- Support, champion and even incentivise the re-skilling of labour for a digital world. (This could mean rethinking education, and moving to a lifelong learning philosophy in order to anticipate future skill requirements.)

► Academics and tuition providers

- Work and collaborate with organisations to document best practice around the changing nature of finance in case studies and research papers.
- Help evolve, refresh and teach the tools and techniques that are critical for finance professionals to master in the digital world.
- Support, champion and even incentivise the re-skilling of labour for a digital world. (This could mean rethinking education and moving to a lifelong learning philosophy in order to anticipate future skill requirements.)

► Management accounting practitioners

- Review your work activities according to which are most and least susceptible to automation. Consider enhancing your skills around empathy, judgement and social and emotional intelligence. (Currently these are underused and difficult to replicate in technology solutions.)
- Start developing your own Continuing Professional Development (CPD) plan to reflect the challenges in a digital world.
- In your lifelong learning, keep your subject areas broad. In a digital world, ironically, the more you specialise in an ever smaller domain, the easier it is for a machine to replace you.^{xlvi}

What we're doing in light of our research

For the digital age we have introduced an updated CGMA Competency Framework that defines the knowledge and skills needed for people within organisations.

We have also updated the CIMA Professional Qualification and our Continuous Professional Development (CPD).

The changes made to both our competency framework and professional qualification, based on this relevant and rigorous research will:

- enhance the employability of management accounting practitioners, and
- create high demand by employers for their relevant skills in tackling the challenges the digital world brings.

For more information on the 2019 CGMA Competency Framework and CIMA Professional Qualification visit cimaglobal.com/future.

Summary and conclusions

Employability: linking management accounting practitioners with employers

This white paper tells the story about the research that has underpinned our views on how new competencies are emerging in a digital world. It describes their implications for finance professionals, employers, academics and tuition providers, regulators and policymakers. Our research has:

- ▶ set out a vision for a digital world in which organisations are located
- ▶ detailed the challenges organisations face in a digital world
- ▶ described the implications for the finance function and the performance required to meet organisational challenges
- ▶ profiled the changing competencies and mindset that finance professionals must adopt to ensure they can address the challenges organisations face
- ▶ highlighted some of the implications of a digital world for the management accounting community.

Our research reveals that the focus of the finance function in a digital world is shifting from being one based on cost to one based on organisational value. Finance will no longer be evaluated purely on how costly it is to run, but on the added value finance brings to the organisation and the wider community.

For management accounting practitioners, this shift represents the prospect of a rewarding career in finance, in which they add real value to organisations.

Life after the digital world

A major assumption of life in a digital world is the narrow application of AI tools and technologies. At the moment, most AI applications can only perform very specific tasks. Sumpter expands on this:

‘The truth behind current algorithms is often much simpler and more banal than the term “artificial intelligence” implies. When I looked at the algorithms that try to classify us, I found they were statistical representations of more or less the same things we already know about ourselves. When I had looked at algorithms that tried to influence us, I found out that they were exploiting some very simple aspects of our behaviour to decide what search information to show us and what to try to sell us. Neural networks have cracked a few games, but we can’t yet see a way up the next mountain.’^{xlvii}

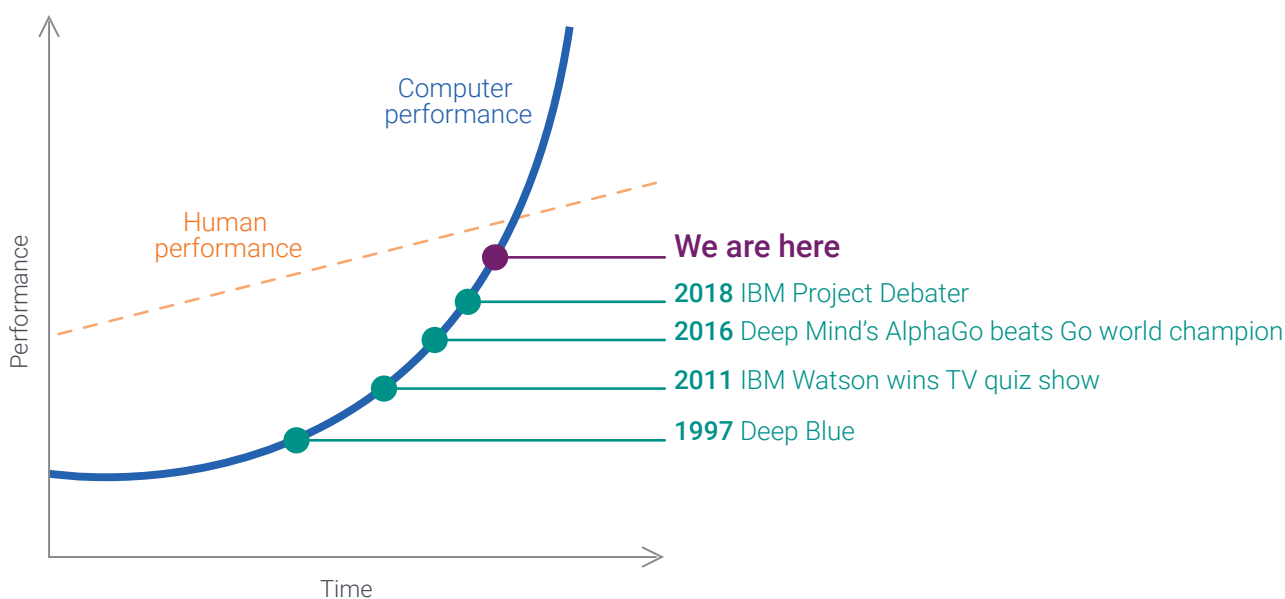
Commentators talk about, in the future, building of artificial general intelligence (AGI) or an 'AI singularity'.^{xlviii} This is the point at which computer performance, through machine learning and algorithms, outpaces human performance (Figure 21).

At present, there is no consensus as to when an AGI will surpass the abilities and performance of the human brain. Estimates range from 10 to 50 years hence. However, we are already seeing an increasing number of milestones being passed on the continuing journey to AGI, and a short timescale between these achievements. (Figure 21 notes just a few of them.)

The consequence of this narrowing gap between human and computer is that our rigorous research into the finance function's future doesn't stop here. Today's digital world is tomorrow's world of quantum computing or, eventually, an AI singularity.

We will continue to monitor and report on the evolving nature of the finance function as the technological landscape changes.

Figure 21. The point of AI singularity



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Report author:

Dr Martin Farrar

Associate Technical Director,
Research and Development –
Management Accounting

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