

Changing technology and finance

Creating a vision for the future
Research emerging themes

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Creating a vision for the future

You can't see the future, but with the right insight you can prepare for it. We've created this briefing paper as part of a year-long, worldwide project to understand the future form and direction of the finance function.

Change is the new norm in many organisations – particularly within the finance function. Yet, because of this rapid evolution, there isn't a composite picture of the finance function of the future. It is this vision that we, at the Association of International Certified Professional Accountants, aim to create.

With 650,000 members and students in 179 countries, we are uniquely well-positioned to work with global stakeholders to investigate, analyse and document how the finance function is changing.

Using interviews, roundtables and surveys, this comprehensive global research project brings together different organisational views – to deliver insight into the process of change and to synthesise a picture of the finance function of the future.

Our project aims to answer the following questions for you:

- ▶ 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 prepare for these changes?

To do this, we conducted more than 300 interviews and 50 roundtable discussions on the future of finance and identified several common trends emerging across a range of topics. These trends provided our research team with a series of insights into the finance function of the future and this paper is the second of four that explore the key themes from our research. These themes are:

1. The changing role and mandate of finance
2. **Changing technology and finance**
3. The changing shape of the finance function
4. Changing competencies and mindsets

Theme 2:

Changing technology and finance

This briefing paper will:

- ▶ set out the current technological tools you need to be aware of that are disrupting the finance function
- ▶ focus on the impact that these tools, individually and in combination, are having on the finance function
- ▶ explore how technological automation is shifting the skills requirement of the finance professional
- ▶ profile the types of organisations that, typically, are early adopters of technology
- ▶ reintroduce the CGMA horizon scanner, a tool you can use to predict when new disrupting technologies will impact your organisation and its finance function.

Reading time: 30 minutes.

“The things we talk about when we set our strategic objectives for the year are money and how do we keep pace with technology?”

This is the stark reality for one US retailer – and it’s a common theme shared by many other interviewees. It’s true that advancements in technology are allowing us to do much more than we’ve been able to in the past. However, too many organisations are struggling with the pace of change, constantly having to react rather than lead with technological innovation. This is especially true within the finance function.

In our interviews, technology is seen as the key driver of change in the finance function. This ‘disrupter’ presents both an opportunity and a risk. It is transforming what we, as finance professionals, do and revolutionising how the finance function of the future will be deployed.

Up front, it is important to understand that technology is not a driver of change in a vacuum. The rapid technology innovation is itself driven by people. In this context, we are defining people as a combination of changing demography, which is increasingly tech savvy, and the rise of greater consumer empowerment. There are also two systemic

change drivers that are playing out in the supply chain environment, in reaction to all the technological innovation. These are globalisation and geopolitics. All the change drivers discussed in our interviews are not considered to be acting independently of each other. They are intertwined across a spider’s web, with technology at its centre as the most important disrupter impacting the finance function currently. As the finance function moves from working in isolation to working with others in an organisation, so the people driver of change will have a greater impact.

Artificial intelligence (AI) and machine learning are not new concepts. In fact, artificial intelligence has been around as an academic discipline since the 1950’s. Today, technological innovation is fundamentally changing the tasks and role of the finance function. What’s also different is that we are on the cusp of something new, where computer performance, through machine learning and algorithms, could outpace human performance. Opportunities in this new future will require human adaptability, through learning faster and governing more smartly when working with technology.

However, at this point in time, our interview research indicates that the adoption of new technology is not evenly distributed across all organisations, sectors and industries. In an interview with a Big Four accounting firm representative, they paraphrased words attributed to science fiction writer William Gibson: “The future ‘of finance’ is already here – it’s just not very evenly distributed”.ⁱ 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 is another organisation’s technological past. Yet, as organisations are neither talking with each other nor sharing their experiences widely, there is no composite picture or vision of the technological finance function of the future for practitioners to use as a benchmark.

As part of our ongoing research into the future of finance, we aim to emphasise a harmonious approach and best practice so that practitioners, organisations and finance functions evolve to reap the benefits from disruptive technologies. This will be embodied in the changing skills and knowledge areas within our CGMA resources.ⁱⁱ

Finance function technology disruption

A 2016 Deloitte report into **Finance in a digital world**, based on interview research, focused on technology disruptions that finance functions were experiencing.ⁱⁱⁱ The report listed seven technologies that modern finance functions must have on their radar. Deloitte categorises these tools as either 'core modernisation' or 'exponentials'. Core modernisation tools are ones that focus specifically on updating financial systems and existing capability, whereas exponential tools concentrate on delivering new capabilities to the finance function.^{iv}

Core modernisation = mainstream

Cloud

Process robotics

Visualisation

Exponentials = early adopters

Advanced analytics

Cognitive computing

In-memory computing

Blockchain

Used in combination, Deloitte suggests the seven technologies are assisting organisations in improving performance and helping the finance function serve its customers more effectively. Underlying these tools, although not explicitly highlighted by Deloitte, is the Internet of Things, which is brought about by cheap and ubiquitous sensors embedded in everyday objects. These sensors are then enabled to send and receive data, via networked connections, that continually fuel both the modernisation and exponential tools with real-time information.

Our interview research reveals that the core modernisation tools are becoming mainstream features of many organisations' finance functions. The exponential technologies are emerging with innovator and early adopter organisations, but have yet to break into the mainstream.

Finance core modernisation tools

1. Cloud

This is the provision of shared computing services over the Internet, whether networks, storage or applications. 'A cloud is a colony of millions of computers that are braided together seamlessly to act as a single large computer.'^v Cloud solutions offer flexibility because organisations don't have to invest in IT architecture or costly updates and maintenance.

The music people listen to and the films people watch now live in clouds, which they rent rather than own. Cloud technologies are giving rise to the sharing economy, embodied in companies such as Spotify, Uber and AirBnB. These companies aren't built on traditional physical products; Uber doesn't own any taxis and AirBnB doesn't own any bedrooms. Consequently, when valuing their assets, the finance professional increasingly needs to focus on intangibles that aren't recorded on the balance sheet.

2. Process robotics

Automating processes and repetitive manual tasks, through technological solutions, reduces costs and improves efficiency. More importantly, by automating tasks such as data entry and report generation, it frees resource within the finance function to focus on real business value.

Within the finance function, repetitive manual tasks between systems are termed by some as 'swivel chair processes'. Normally this involves a complicated technical work-around, where an accountant manually enters data into one system, before then inputting the same data into another system. Without the swivel chair, the turning from one system to another would greatly impede the transfer of data. Process robotics already has the capacity for automating the combining data from different systems; swivel chair processing is heading toward extinction.

3. Visualisation

This is about using technology to turn increasing amounts of raw data into accessible insight for an organisation. Turning traditional spreadsheet metrics into pictures and infographics make important organisational stories easier to understand for the laymen who sit outside of the finance function. These tools can also help speed up processes when using data and exploring for prototyping and scenario planning.

Finance exponentials tools

1. Advanced analytics

Nichols has argued that technological advances and increasing amounts of data and information have not produced a new age of enlightenment. In fact, he articulates that the limitless supply of information is making us more dumb.^{vi} Here's where advanced analytical tools can help – by automating the examination of data to discover patterns, which the financial professional can turn into insight. Thiel highlights this collaborative working.

Computers can find patterns that elude humans, but they don't know how to compare patterns from different sources or how to interpret complex behaviours. Actionable insights can only come from a human analyst (or the kind of generalized artificial intelligence that exists only in science fiction).^{vii}

In tandem with the finance professional, these advanced analytic tools can greatly improve the effectiveness of planning and forecasting, leading to deeper business insight and better predictive modelling. As the finance function further embraces these tools and the algorithms that underpin them, it will blur the boundaries between the world of the data scientist and the management accountant.

The problem of big data volumes is also a recurring challenge in our interviews. With too much data, organisations are struggling to gain real insight and spot new business opportunities. One interviewee confessed: "We have really powerful tools, lots of data, but we don't use either well."

2. Cognitive computing

This is an umbrella term that encompasses areas such as artificial intelligence, speech recognition and machine learning. The elements work together to provide automated insights into the increasing amounts of data we have access to. It is thanks to natural language processing innovations that we're able to generate real-time management reports in a personalised language that our organisations are used to.

Today we chuckle when we ask Amazon's Echo, Apple's Siri or Microsoft's Cortana to tell us a joke or recite some poetry and wait for their clunky response. In March 2016, Microsoft launched a chat-bot called Tay. The chat-bot was designed, using machine learning, to evolve and interact with humans through the medium of Twitter. Within 24 hours of launch, Tay's Twitter account was suspended by Microsoft. Why? Because a group of Twitter users began tweeting Tay with politically incorrect phrases. As Tay learned from the Twitter community, and used newly-acquired language skills, it became what **The Telegraph** described as, 'a fascist, misogynistic, racist, pornographic entity'.^{viii} A fascinating lesson about the power of AI technology.

AI has already entered the mainstream as a speech recognition technology. In a post-PC world, where most people are connected to the Internet via handheld devices, the usefulness of speech recognition will continue to evolve. Within a few years this could see the death of keyboards, as the finance professional talks to, questions and teaches their AI applications directly.

3. In-memory computing

This is the move away from working with data stored in complicated relational databases, to technical architecture storage solutions, where information sits in dedicated Random Access Memory (RAM) servers. Data transfer rates within RAM is thousands of times faster than on disc. It leads to the ability to handle and interrogate massive live data sets quickly and more efficiently. The future is the real-time detection of patterns and instant analysis of data that will enable faster decisions. As the price of memory decreases, the adoption of in-memory computing will increase across organisations.

4. Blockchain

Simplified, a blockchain is a digital platform that stores records of value transactions through a distributed, peer-to-peer network. The records on a blockchain are immutable, which means the ledger is verifiable and auditable. The bitcoin currency is the most cited example of a blockchain in action, but the future could bring smart, programmable contracts, revolutionise how music is shared and eliminate the need for third parties in peer-to-peer transfers of value.

In the last year, blockchain has scaled the Gartner Hype Cycle 'peak of inflated expectation', and is on the cusp of entering the 'trough of disillusionment'. Gartner predicts that blockchain technologies will achieve mainstream adoption within five to 10 years.^{ix} EVRY, a Norwegian information technology company, is heralding the technology as the fifth disruptive computing paradigm.^x Finally, the **Harvard Business Review** talks of blockchain being a foundational technology: 'it has the potential to create new foundations for our economic and social systems'.^{xi}

The buzz around blockchain technologies is reflected in our interviews. Interviewees have shared examples of how banks, regulators and governments are experimenting with tools, based upon blockchains, to change fundamentally banking and the corporate tax landscape. These visionaries are working towards a future where organisations are recording to their balance sheets in real time through transparent blockchains. Regulators and governmental tax administrations will then have open access to organisational financial transactions, and be able 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 in real time to an organisation's databases by regulators and stakeholders could make the activity of compiling corporate reporting redundant.

A key takeaway from our interview research is that this is a crucial technology to watch. In fact, in October 2017 the Association announced a new collaboration with the Wall Street Blockchain Alliance (WSBA). Together, this partnership will explore and define the impact of blockchain technology for the accounting profession.

Impact of technology on the finance function

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 future, the technical capabilities of robotics and algorithms combines with the creativity and empathy of the human accountants. Technology is augmenting finance professionals' capabilities to make them faster, more efficient and more productive. It's no longer human versus machine, because new technologies can learn from the accountant and be customised to fit the specific needs of your finance function. In what has been termed the 'Fourth Industrial Revolution', or 'Industry 4.0', where cyber and physical systems fuse, the role of the finance professional remains important.^{xii}

For those involved in manufacturing industries, the intelligence augmentation model will be nothing new. You'll have witnessed the adoption of computer and robotic automation to the production assembly line, and how it has changed workers' relationships with technology. Baldwin underlines the impact of Computer-Integrated Manufacturing (CIM):

It has already produced a tectonic shift in manufacturing in high-wage nations – moving manufacturing from a situation where machines helped workers make things, to a situation where workers help machines make things.^{xiii}

This will lead to a point in the future where computer performance outpaces human performance. When this happens with technologies employed within the finance function, so the finance professionals' relationship and focus will change. They will then be judged on how well they work with, and complement, robotic process automation (RPA) and algorithms.

1. Automation

Technology automation within the finance function is already witnessing the end of certain tasks. Take the writing of monthly management information as an example. Computer software packages are now available that can produce management information at the press of a button, in real time, with personalised language and terminology that suits your organisation.^{xiv} The role of the finance professional, therefore, shifts from one of knowledge collection and creation, to the interpretation of meaning and curating the information outputs produced by the software solution. In this situation, the use of Twyman's law must be liberally used: 'Any figure that looks interesting or different is usually wrong.'^{xv}

Technological applications are amazing at providing solutions and assigning a number, but these are abstractions. Real value is only achieved once the abstractions have context and human story re-attached to them by the finance professional. 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.

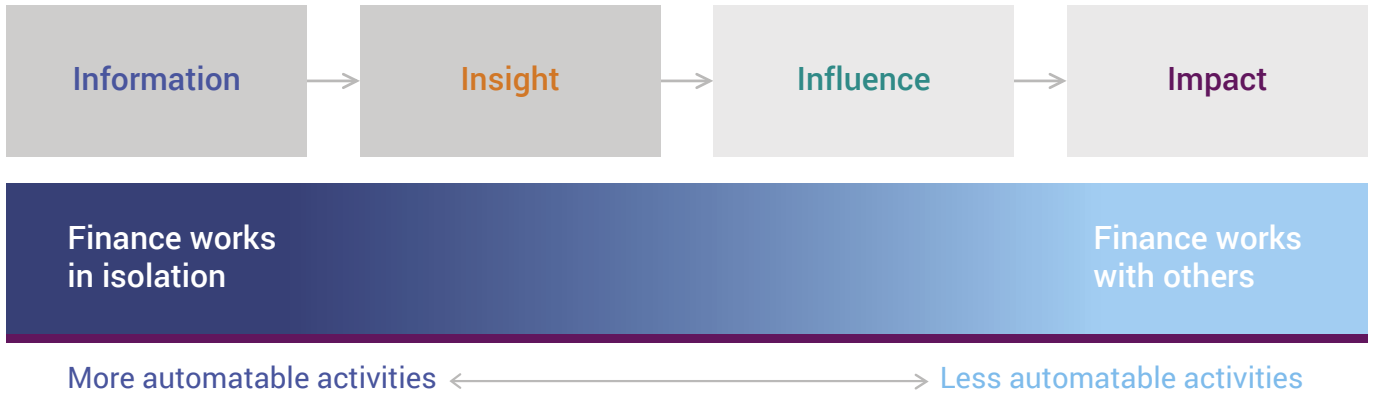
For the finance professional, the automation of repetitive tasks will free up their time to concentrate on creating and preserving business value. This shift in skills sets from 'knowledge' to 'meaning' is self-evident in a 2017 McKinsey report into automation.^{xvi} McKinsey's research examined groups of occupational activities and ranked them according to their susceptibility to automation. Work activities at risk of automation include data collection, data processing and predictable physical work. Less automatable activities include managing others, applying expertise, stakeholder interactions and unpredictable physical work. McKinsey's forecast is that: 'while few occupations are fully automatable, 60 percent of all occupations have at least 30 percent technically automatable activities.'^{xvii}

When McKinsey's estimations of automation are overlaid with the basic finance activities explored in our first emerging themes briefing paper, it becomes clear that activities carried out in isolation in the finance function are at risk.^{xviii}

Figure 1: The potential for automation of the basic finance activities



Estimates of extent to which different types of roles could be automated; Source: McKinsey



It reveals that the opportunity for the finance professional lies at the management end, rather than the accounting side of the basic function activities. This heralds a move away from the more automatable activities of assembling data to provide information and turning data analysis into insight, to areas that current technology is unable to automate. These include advising through stakeholder interaction and applying expertise to help with impactful decision-making.

In one interview with a multinational bank, the employee explained, “transactional processes and tasks are being automated and the savings redeployed into getting people to do other things that improve their productivity.” For this organisation, the freed resource is being reassigned to finance business partnering.

Dr Kevin Kelly, founding executive editor of Wired magazine, and the futurist advisor on the 2002 Spielberg science fiction film, *Minority Report*, explains that technological advancements will take away the activities that resemble drudgery; the ones nobody really wants to do.

Robots will do jobs we have been doing, and do them much better. They will do jobs we can't do at all. They will do jobs we never imagined even needed to be done. And they will help us discover new jobs for ourselves, new tasks that expand who we are. They will let us focus on becoming more human than we were.^{xix}

2. Modernisation and exponential tool patterns

Our interviews have revealed patterns of how these tools are being used in combination by organisations to improve their basic finance activities. Organisations that are already using cloud and process robotics with their finance functions find that the combination leads to unmanageable amounts of data. Big data is nothing new, however, and can provide new sources of insight that might be applied in performance management.

But organisations have found themselves drowning in what's termed a 'data lake'. At its most basic, a data lake is a description of any large raw data pool. This includes structured, semi-structured and unstructured data that is stored in one place until required.

To enable mining of their new data lakes for maximum insight, organisations we spoke with are having to invest in exponential tools. They are investing in advanced analytics and in-memory computing to assemble information more quickly, while simultaneously using cognitive computing solutions to query the data lake, to provide automated insight.

It is only through a combination of core modernisation and exponential tools that finance functions are beginning to change their organisational landscape. Influential and impactful reporting is then achieved by combining the technology with the technical expertise of the finance professional. A 2016 World Economic Forum / Accenture white paper forecasts that 'these types of technologies will reduce the costs of the finance function by 40 percent.'^{xx}

Technology adoption

Our research is uncovering patterns in the area of technology adoption. It's allowing us to understand which types of organisations are already experiencing and embracing the finance function of the future, and what's motivating their technological adoption.

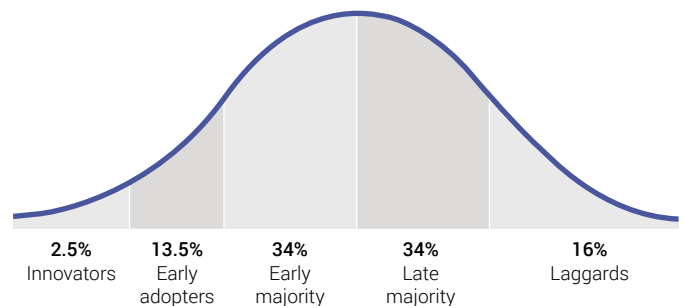
1. Innovators and laggards

The data reveals that the innovators and early adopters implementing disruptive technologies into their finance functions tend to be either:

- ▶ multinational or transnational organisations
- ▶ national organisations (normally in competition with multinational or transnational organisations)
- ▶ specific sectors such as:
 - financial services
 - telecommunications
 - private
 - FinTech (financial technology); or
- ▶ start-ups run by young entrepreneurs.

These types of organisations typically represent the first 16 percent of a technology adoption bell curve. Roger's adoption bell curve (Figure 2) was first published in 1962 as part of his research into the 'Diffusion of Innovations' theory. He proposed that the adopters of innovation could be categorised into five group characteristics: innovators, early adopters, early majority, late majority and laggards.

Figure 2: Roger's adoption bell curve



Of course, there are risks in being the first to implement technology, just as there are risks associated with turning up to the party too late and being left behind. It's an age-old dilemma, as Haskel and Westlake remind us, 'People often observe that while the early bird catches the worm, it is the second mouse that gets the cheese.'^{xxi} And this must be contrasted against McAfee and Brynjolfsson's early 1900's electrification revolution example:

We also know that not all factories were able to electrify intelligently. Some companies and their leaders saw the potential of unit drive and embraced it, while others debated the matter for decades. For all these reasons, it seems likely that the early-adopting factories contributed directly to the deaths of many old industrial trusts.^{xxii}

Whether you are an innovator or part of the late majority, knowing where you sit on the adoption bell curve will inform your organisation's risk appetite around disruptive technologies.

2. Social demand in supply chain factor

A 2017 McKinsey paper on automation, employment and productivity highlights factors affecting the pace and extent of automation.^{xxiii} The report sets out five factors that are influencing the extent and pace of automation around work activities for organisations. These are:

- ▶ Technical feasibility
- ▶ Cost of developing and deploying solutions
- ▶ Labour market dynamics
- ▶ Economic benefits
- ▶ Regulatory and social acceptance.

Our research brings to light a sixth factor that's influencing the pace of automation within organisations. The missing factor is that of social demand in the ecosystem. When

others in an organisation's supply chain implement a disruptive technology, this speeds up adoption of similar technologies across the ecosystem. This missing component is linked to what Haskel and Westlake term 'dynamic clusters.'^{xxiv} Dynamic clusters are 'places where innovative businesses and people are more likely to come together and share ideas.'^{xxv}

In one interview with a representative from a FinTech company, a discussion on the topic of blockchain arose. The individual disclosed that their organisation was investing in blockchain technology primarily because the rest of the sector was doing the same. The organisation did not yet fully understand the benefits that a blockchain solution could bring them. However, the fear of being left behind was driving their investment.

Other interviews reveal that geography isn't playing a part in the investment or deployment of technology. In fact, multinational organisations will take their preferred technologies and deploy them around the world wherever they have a footprint. Where transnational or national organisations compete with multinationals, they will try to match the technological investment and deployment exhibited by the competition.

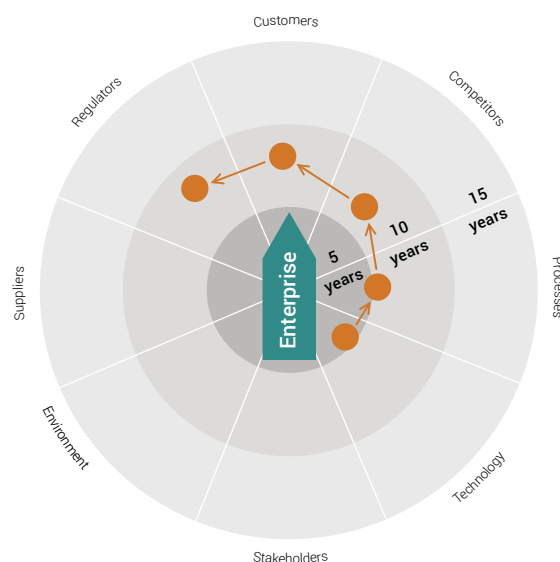
It is interesting to note McKinsey's view on automotive technology adoption. From their review of previous technological adoptions, 'the time from commercial availability to 90 percent adoption ranges from approximately eight to 28 years.'^{xxvi} However, as our research suggests, social demand and activity by supply chain partners in the ecosystem is another important hygiene factor. This factor alone will continue to drive down the time gap between innovators, early adopters and laggards on the innovation adoption curve.

3. Where's your finance function on the technology adoption journey?

Management accountants have a critical role to play in developing the digital strategy that will be essential to the ongoing success of their organisation. The first step in the process is to fully understand where your finance function is in the technology adoption journey and what the most likely disrupting technologies are for your business.

The data from our interviews is highlighting patterns of technology adoption. Similar industries' and sectors' adoption journeys are mirroring supply chain partner activity. By using the Gartner Hype Cycle and Innovation Adoption Curve, it is possible to predict when new disrupting technologies will impact a particular industry or sector. Once an organisation has prioritised its potential technological disruptors, the CGMA horizon scanner is a tool that can help a business put these challenges into context.^{xxvii} The tool can frame organisational conversations about the impact of future technology in the ecosystem, adding a time dimension and an integrated view.

Figure 3: The CGMA horizon scanner



The CGMA horizon scanner (Figure 3) acts like a time-based PESTEL analysis (political, economic, social, technological, environmental and legal) that considers impact over the short, medium and long term. For example: customers might be concerned about blockchain technology; regulators might already be embracing it; investors or stakeholders might need assurance that the business is prepared; and competitors might be responding faster. Its value lies in emphasising the connectivity between customers, competitors, processes, technology, stakeholders, environment, suppliers and regulators.

Kelly carried out his own horizon-scanning exercise of embedded artificial intelligence. This led him to conclude that AI will fundamentally change the nature of science.

Really intelligent instruments will speed and alter our measurements; really huge sets of constant real-time data will speed and alter our model making; really smart documents will speed and alter our acceptance of when we "know" something. The scientific method is a way of knowing, but it has been based on how humans know. Once we add a new kind of intelligence into this method, science will have to know, and progress, according to the criteria of new minds.^{xxviii}

Kelly's conclusions will apply equally to the way we practice the science of management accounting in the future.

The future of finance: join us on our journey

Our briefings on these emerging themes will enable us to discuss a new delivery model for modern finance, with certain key features. Ultimately, all organisations face the same obstacle of building capacity, competence and credibility within their future finance functions.

The difference is that some organisations are innovators on the journey to the future, while others are lagging behind.

With this research, we want to help more organisations lead from the front.

The keys to transformation

Based on our interviews, it appears that an organisation's top priorities to transform its finance function should be to:

- ▶ make use of the latest technologies to release the full capacity of the finance function
- ▶ widen the remit of finance to cover a broader range of management information, generating new insights and business solutions
- ▶ provide and empower finance professionals with new competencies and growth mindsets to help your organisations create and preserve value.

That's what this project is all about.

So, armed with this briefing, why not start a conversation on the future of finance in your organisation? Read one or all of our briefing papers on emerging themes and share them within your network.

You can then ask yourself:

- ▶ How do the emerging themes resonate in your organisation?
- ▶ Where are you and your organisation on the journey to realising the finance function of the future?
- ▶ How, in the light of these themes, will you reconsider your strategies to meet the future finance function's innovative mandate?

Five things you can do in light of this briefing

1. **Begin by reviewing your work activities against the McKinsey research rankings, according to which are highly and least susceptible to automation.** It'll also be valuable to start building people, leadership and empathy skills into your continuing professional development or education programmes.

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(McKinsey Quarterly, July 2016).

F Plaschke, I Seth & R Whiteman.

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(McKinsey Quarterly, January 2018).

2. **To gain critical insight, invest time in researching the technology solutions that your supply chain**

partners and others in your industry ecosystem have implemented. You can use the CGMA horizon scanner tool to plan your finance function future technology journey. However, in doing this remember that the future is not a fixed destination, and so your journey should always reflect multiple, evolving scenarios.

CGMA.

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3. **Provide yourself with the opportunity to spend time understanding the world of algorithms and how they operate.** For those with more of an interest, it's likely you'll benefit by learning some basic coding.

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4. **Consider deepening your knowledge by reading up on blockchain technology.** This will help you understand if or when blockchain technology is likely to impact your industry or sector. But in focusing on the impact of blockchain, don't forget to also pay attention to future big picture trends.

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5. **To help us develop a knowledge-sharing community, please do get in touch and share your experiences, observations and opinions with me.**

Dr Martin Farrar

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