
ACCA
DIGITAL HORIZONS:
TECHNOLOGY, INNOVATION, AND THE FUTURE OF ACCOUNTING
Think Ahead

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Founded in 1904 to widen access to the accountancy profession, we've long championed inclusion and today proudly support a diverse community of over **247,000** members and **526,000** future members in **181** countries.

Our forward-looking qualifications, continuous learning and insights are respected and valued by employers in every sector. They equip individuals with the business and finance expertise and ethical judgment to create, protect, and report the sustainable value delivered by organisations and economies.

Guided by our purpose and values, our vision is to develop the accountancy profession the world needs. Partnering with policymakers, standard setters, the donor community, educators and other accountancy bodies, we're strengthening and building a profession that drives a sustainable future for all.

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This report intends to establish a foundation from which to explore this exciting future by first reflecting on how ACCA members are thinking about their future, and then addressing the role that technology is expected to play in this future landscape. In the summer of 2023, it is almost impossible to avert focus from the swell of interest and activity around artificial intelligence (AI), and generative AI more specifically. Therefore, the report will also discuss the impact of AI on the accountancy landscape while highlighting the crucial role of finance professionals in steering ethical and responsible adoption.

The *Digital Horizons* survey was conducted in March 2023 garnering 1,074 responses across ACCA's global membership. The survey was targeted at members currently employed across all regions and and sectors. Students were not included. Twelve roundtables were held with 81 participants across the Asia Pacific, UK & Europe, Africa, and North America.

Contents

Executive **summary**

The *Digital Horizons* report reveals a profession grappling with new technologies, different speeds of adoption and multiple challenges to streamlining delivery.

Yet the report also highlights new possibilities to drive value through digital implementation – and it's here that the right skills and mindset are crucial. Drawing on the survey results of over 1,000 ACCA members as well as 12 roundtables across the world, this report presents an initial assessment on the technology landscape current state of play.

Adoption of new technologies remains limited and uneven

When it comes to technology organisation size does in fact appear to matter. There is an obvious gap between larger organisations and small and medium-sized enterprises (SMEs) or small and medium-sized practitioners (SMPs). Larger corporates and the bigger accountancy firms are more likely to be implementing new technologies – critically they may also be more focused on gaining competitive advantage through digital transformation initiatives.

It is clear that there remains a great opportunity to expand the understanding of and engagement with some of the more widely applicable technologies such as AI and Machine Learning to realise the potential of these technologies across accountancy and finance.

Leading organisations see technology as value adding, not just efficiency enhancing

For the majority of respondents, digital adoption is viewed through the lens of efficiency, with efficiency, process optimisation and cost savings identified as the top three reasons why new technology is being adopted.

In fact, technology adoption is still primarily treated as an efficiency play by more than half of all survey respondents. Despite widespread optimism about the extent to which digital transformation, more broadly, can enhance things like flexibility / adaptability, quality of products or services, sustainability performance, transparency, and/or regulatory compliance, practical business constraints may typically enforce a focus on a narrower set of goals, at least initially.

But according to our survey leading organisations are increasingly attuned to the wider benefits digital adoption can bring. They are more likely to be focused on competitive advantage and enhancing customer / client insights as well as exhibiting stronger leadership and data governance processes to embed the technology successfully.

Widespread expectations around the potential for technology and digital transformation to enhance things like quality, compliance, and sustainability performance remain largely prospective.

Evolution or revolution: respondents are split on the potential value of AI

When it comes to artificial intelligence (AI), ACCA members are overwhelmingly positive about its potential to save them time, and half would be willing to use AI for business-critical tasks.

Indeed, there is general agreement that AI has the potential to make processes more efficient and more effective. On the other hand, there is less consensus about the purpose of pursuing efficiency gains and the extent to which AI can be used to take a more transformational approach.

Many see AI as not dissimilar to previous transitions, such as the move from Excel to Business Intelligence tools. But as the acceleration of business amplifies demands on finance teams it might be necessary to reconstruct tasks, realising the role that technology plays as an enabler of capabilities but also as a converter of value.

It's early days for Generative AI in accountancy and finance

Generative AI models are acclaimed for their ability to summarise or interpret large amounts of information quickly and produce novel or new content from this information. These technologies offer new possibilities in reporting, research, and risk assessment if used responsibly, yet risks prevail in their application. The potential for misuse is significant, where Generative AI models have not been specifically trained on and/or fine-tuned for a particular purpose or on the most relevant and recent data.

The model's inability to discern truth is a determining factor limiting uses to situations where:

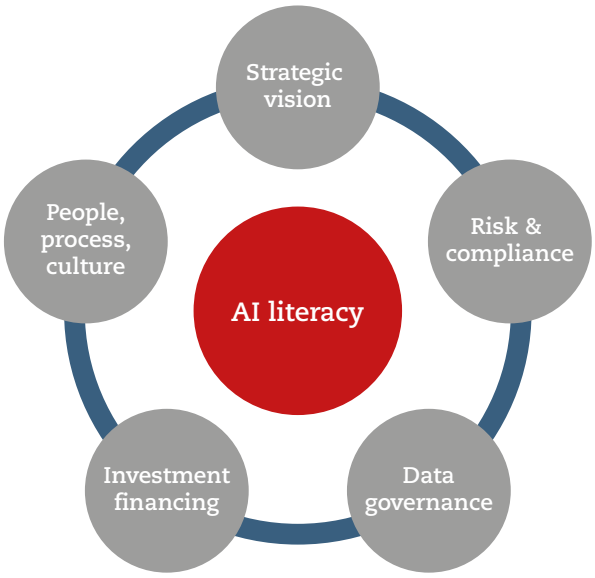
1. It is possible / relatively simple to check or correct outputs;
2. Where there is a clear source of truth such as within the training data or in original documents;
3. Where the generative capabilities are being used for creative or inspirational purposes.

FINANCE TEAMS HAVE A CRITICAL ROLE TO PLAY IN HELPING ENSURE THAT AI MODELS ARE USED ETHICALLY AND EFFECTIVELY ACROSS THE ORGANISATION.

AI adoption needs a circle of accountability

Accountancy and finance professionals should be pragmatic in their approach. Risks will evolve, and it's critical that accountants continually understand how risks can be assessed and mitigated with all technology adoption, but particularly AI.

Professional accountants and finance teams must collaborate on ethical and effective AI adoption across organisations. Our report suggests there is a circle of accountability that establishes the core practices required to ensure ethical adoption:



- **Strategic vision:** Aligning the capabilities of AI to the strategy of the organisation.
- **People, process, culture:** Sharing AI best practices across the organisation.
- **Risk and compliance:** Ensuring risk professionals collaborate with technology teams to govern AI.
- **Investment financing:** AI investment entails uncertainty; financial flexibility to support experimentation is key.
- **Data governance:** Data governance is key in ensuring the ethical use of AI and compliance with legal requirements.

Finance teams have a critical role to play in helping ensure that AI models are used ethically and effectively across the organisation. This requires that finance professionals keep up to date with the latest developments in AI technologies and, secondly, actively collaborate across the organisation with those teams who are driving innovative solutions around this emerging technology.

How will AI affect jobs in finance?

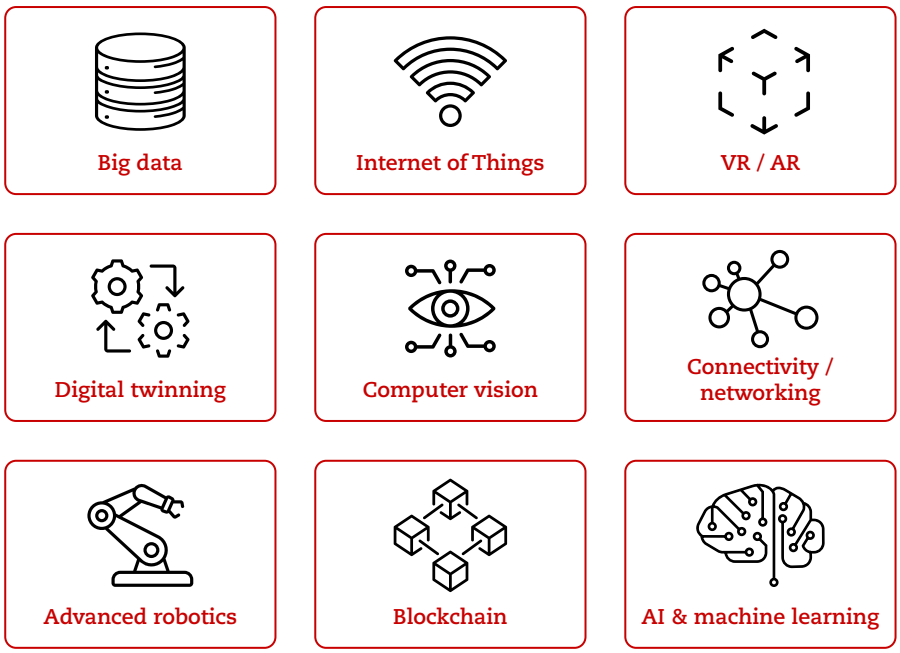
When it comes to the impact of new technologies on jobs, cautionary tales are relevant. Fears of increasing complexity, expressed by more than a third of survey respondents, should be a firm reminder that change requires effective management and a people-focused approach. Technical and cultural challenges tend to be intertwined.

However, an overly pessimistic account masks the fact that demand(s) on and for accountancy and finance professionals continue to grow. The adoption of AI increases rather than decreases the importance of experts – such as finance and/or risk professionals – to oversee critical processes and functions. AI may offer helpful support and productivity boosts, but it will not be able to replace the ability to think critically and consider a broad array of contextual factors when making decisions, even when made on the basis of AI-driven insights.

Moreover, while some tasks will inevitably be transformed by technology, new opportunities will also emerge in areas like sustainability reporting and algorithm audits. By proactively developing crucial new skills like AI literacy, enhanced data capabilities, and decision science frameworks, professionals can ensure they remain integral to steering their organisations and clients to a better future.

The digital horizon brings change but also new potential to add value. With the right skills and mindsets, professionals can advance their capabilities and their profession to meet the emerging challenges ahead.

FIGURE ES1: Key technologies transforming the landscape

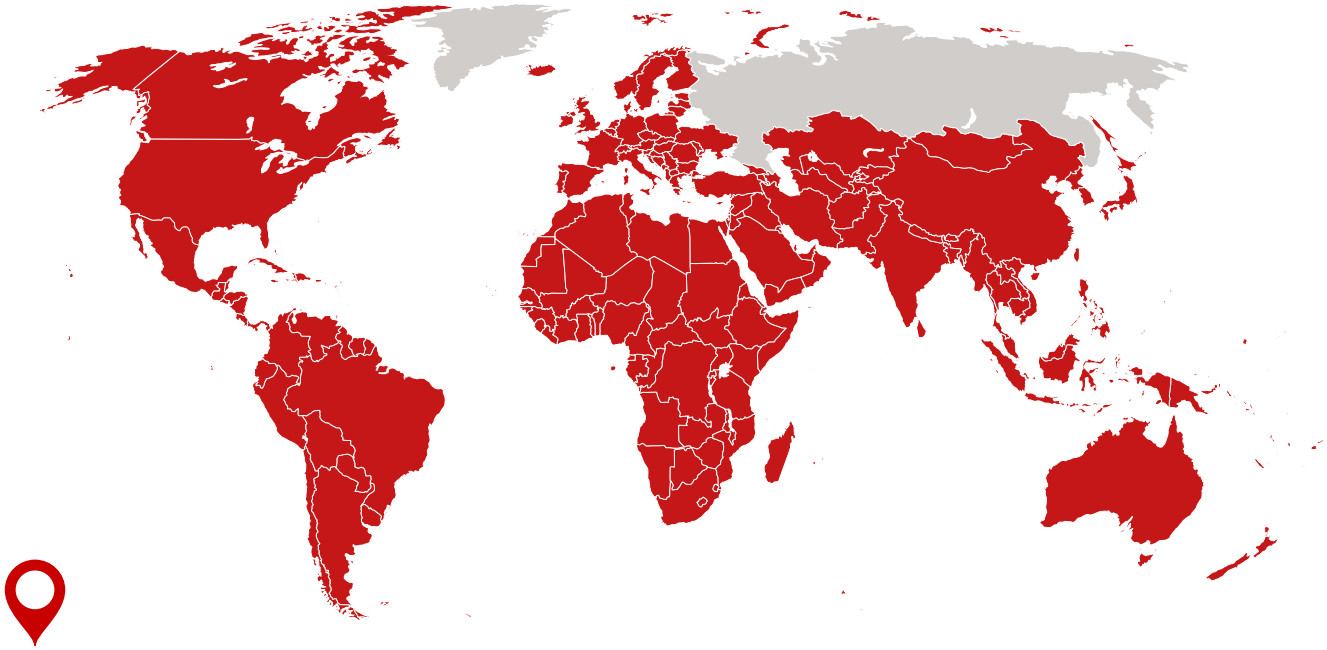


Click on each icon to read descriptions of the key technologies in Section 2

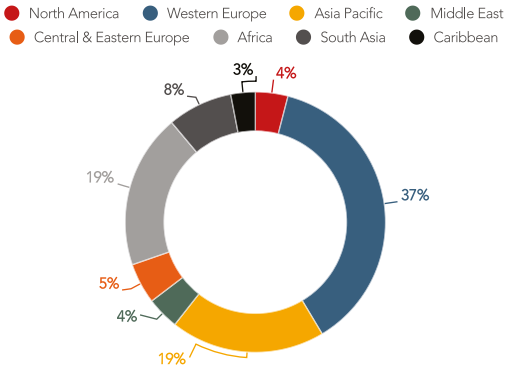
THE DIGITAL HORIZON BRINGS CHANGE BUT ALSO NEW POTENTIAL TO ADD VALUE. WITH THE RIGHT SKILLS AND MINDSETS, PROFESSIONALS CAN ADVANCE THEIR CAPABILITIES AND THEIR PROFESSION TO MEET THE EMERGING CHALLENGES AHEAD.

Survey **demographics**

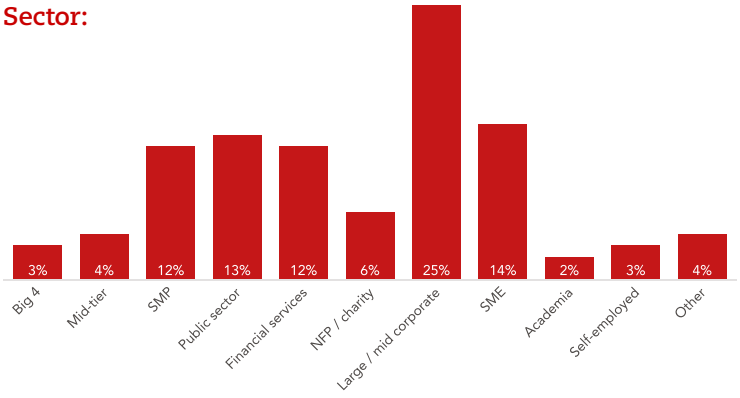
The ACCA would like to express our deepest thanks to all members who participated in the survey and the roundtables in support of this research.



Location of survey respondents:



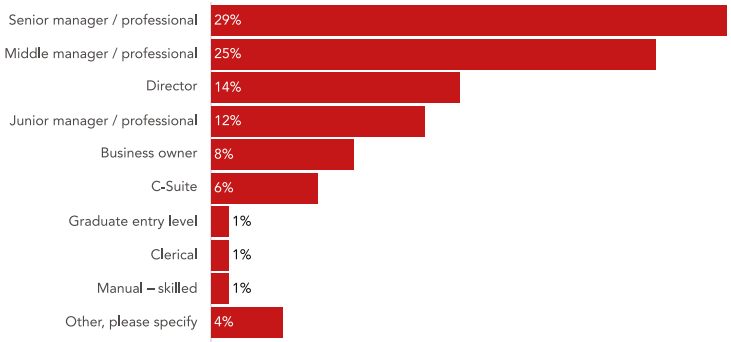
Sector:



Location of roundtable participants:

North America	13%
Western Europe	21%
Asia Pacific	18%
Middle East	14%
Central & Eastern Europe	5%
Africa	14%
South Asia	9%
Caribbean	2%
China & Hong Kong SAR	4%

Job role:



1. Introduction

The digital horizon serves as a compelling metaphor when contemplating the future of accountancy and finance. First and foremost, it alludes to the imminent advancements in technologies, charting a course towards an ever-evolving landscape of automation, artificial intelligence, and other technologies.

More than just tools and technologies, however, it also hints at the vast expanses of data that are products of our increasingly digital interactions and that serve as critical inputs for future developments. As such, it also draws attention to the ways in which our digital comprehension might be challenged. As we sail towards the horizon, we are confronted with new paradigms that threaten to make our domains of expertise less familiar. Finally, the metaphor is apt as it symbolises the convergence of the physical and digital domains. In the context of accountancy, this could refer to present situations where digital ledgers, virtual financial interactions, and more traditional practices seamlessly intertwine. But it also looks to the extension of those circumstances and captures our move towards a blurring of the lines between the physical and digital worlds. With advancements like IoT, cyber-physical systems, and augmented reality, the information from the digital world influences and drives actions in the physical world and vice versa. This seamless integration allows for real-time feedback loops and automation that were previously unthinkable. As such, the digital horizon offers a useful means for considering how accountancy and finance professionals can anticipate and adapt to the transformative shifts on the brink of realisation.

The *Digital Horizons* report intends to establish a foundation from which to explore this exciting future by first reflecting on how ACCA members are thinking about their future, and then addressing the role that technology is expected to play in this future landscape. In the summer of 2023, it is almost impossible to avert focus from the swell of interest and activity around artificial intelligence (AI), and generative AI more specifically. Therefore, the report will also discuss the impact of AI on the accountancy landscape while highlighting the crucial role of finance professionals in steering ethical and responsible adoption.

THE DIGITAL HORIZON OFFERS A USEFUL MEANS FOR CONSIDERING HOW ACCOUNTANCY AND FINANCE PROFESSIONALS CAN ANTICIPATE AND ADAPT TO THE TRANSFORMATIVE SHIFTS ON THE BRINK OF REALISATION.

Innovation cycles

Since the 1960s, diffusion theories have sought to understand and explain the ways in which innovation occurs (Rogers 1962). Taking inspiration from research on complex systems such as biology and population science, diffusion theories have been widely applied to other complex systems related to social, economic and international systems. What unites these various applications is the idea of the sigmoid curve (s-curve), which represents the rate of diffusion or growth of a particular variable over time.

Terminology derived from these studies has seeped into the public conscious. Talk of early versus later adopters, for example, a ubiquitous phrase amongst technology observers, stems directly from Rogers' *Diffusion of Innovations* written in 1962. The s-curve has also proven to be a widely useful representation of how several processes typically work, including around the spread of innovation, rates of adoption, phases of adaptation, and performance improvement. Of course, in dealing with complex systems what these studies tend to lack is the ability to address all the critical factors distinguishing one s-curve from another or even what drives the trajectory of a particular innovation. But they do provide useful illustrative models that point towards particular phases during which different variables and considerations are likely to come into play.

It can be argued, for example, that each major industrial revolution has been defined by a group of technologies following S-curves of performance improvement. In this sense, s-curves are generally indicative of how technologies propel innovation over time. When considered in in a solitary fashion, an s-curve might demonstrate the way in which one technology matures and its development levels off over time.

While initial progress may be slow, as knowledge increases the rate of improvement follows a steep upward trend until practical and economic constraints limit further advancement. When an established technology nears this performance limit, it often creates opportunities for new technologies to emerge and follow a new S-curve trajectory. In some ways, s-curves can also reflect the way in which technologies are adopted over time.

Industrial revolutions

Thus, over a longer period, s-curves reflect an element of cyclicality by following repetitive cycles of emergence, improvement, peak, decline and replacement. New technologies build on old ones to continue economic and social advancements (Figure 1.1).

This element of cyclicality leads directly into our conceptualisation of industrial revolutions (Figure 1.2).

For example, the first industrial revolution was driven by steam power and mechanisation.

The second industrial revolution was catalysed by electricity generation and use. Electrical technologies such as motors, lighting and appliances led to more widespread automation in factories.

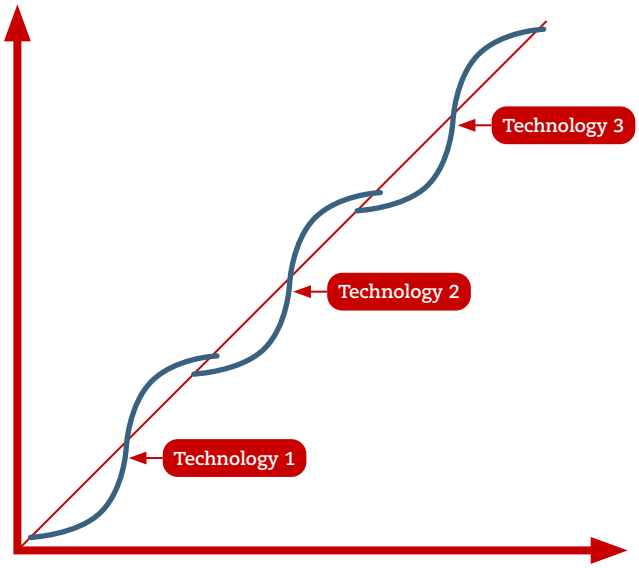
The third revolution was powered by electronics and computing, with transistors, microchips and software improving dramatically, enabling more advanced forms of automation, communication and analysis.

During this period, the limits of paper-based bookkeeping were also reached as the amount of data became unmanageable. Basic accounting software such as VisiCalc emerged in the 1970s and '80s, allowing for improved efficiency, accuracy and analysis compared with manual methods, but these early programs quickly reached limits in areas such as reporting, data sharing and workflow.

The development of enterprise-wide accounting systems such as SAP and Oracle in the 1980s and '90s moved accountancy to a client/server model, enabling faster reporting, improved data security and consolidated views across departments and locations. Challenges then emerged from system speed, connectivity and cost.

The rise of cloud-based accounting and software as a service (SaaS) such as QuickBooks Online and Xero in the 2000s signified the next phase of development. Benefits for personnel included increased mobility, collaboration and automation but also gave rise to concerns about data security, privacy and reliance on internet connectivity.

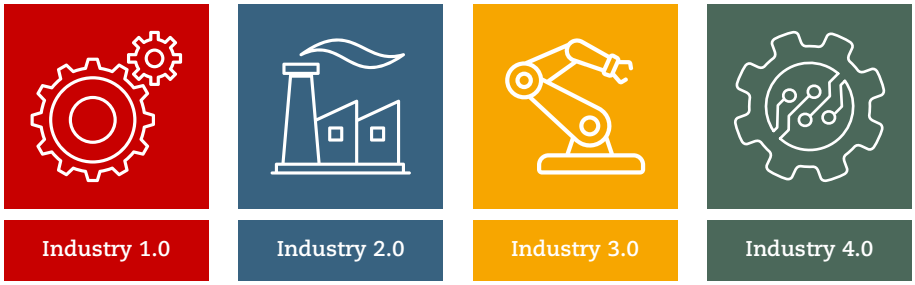
FIGURE 1.1: The S curve of technological innovation



The fourth industrial revolution is being propelled by digital technologies, including AI, sensors, robotics, and networks. As these technologies improve, they are disrupting previous economic and industrial models. This phase has coincided with the wider adoption of automation into accounting processes, with 'bots' that can handle repetitive, rules-based tasks such as data entry and report generation alongside advanced analytics for faster insights derived from massive datasets.

Inflection points, where one S-curve peaks and another takes off, drive the enormous shifts we call industrial revolutions. Understanding S-curves helps explain the constant cycle of disruption and transformation.

FIGURE 1.2: The progression of industrial revolutions



Industry 1.0	Industry 2.0	Industry 3.0	Industry 4.0
Mechanisation and the introduction of steam and water-power	Mass production assembly lines using electrical power	Automated production, computers, IT systems and robotics	Smart factory, autonomous systems, IoT, machine learning

AS THESE TECHNOLOGIES IMPROVE, THEY ARE DISRUPTING PREVIOUS ECONOMIC AND INDUSTRIAL MODELS.

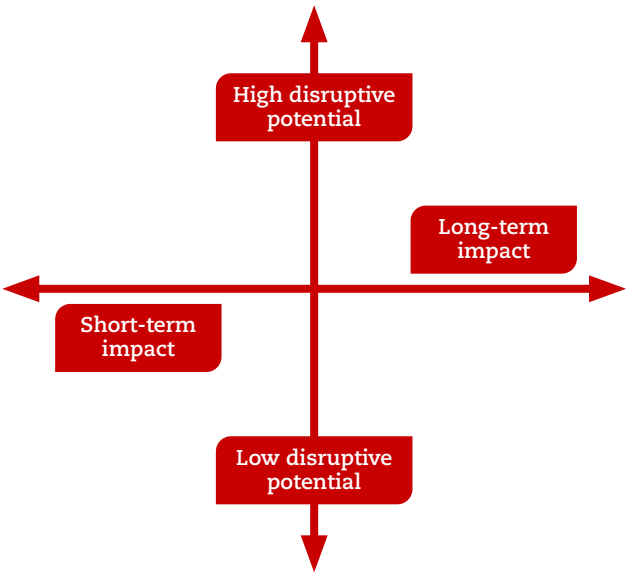
Within the field of AI this dynamic is also playing out. As earlier statistical and rules-based AI approaches reached their limits, new techniques such as deep learning kicked off an exponential climb in capabilities.

The current wave of AI advancement is still on a steep upward trajectory, as larger datasets, more advanced neural network architectures, streamlined frameworks and specialised hardware unlock rapid gains across language, image recognition, decision-making, and other domains.

Just as internal combustion engines and integrated circuits sparked new S-curves to sustain growth when previous technologies peaked, advancements in deep learning and neural networks are carrying the baton of innovation forward. Looking ahead, emerging fields such as multimodal learning, causal inference and trustworthy AI may soon branch off their own curves, sustaining AI's open-ended progress.

This is an exciting but also challenging context for business leaders and finance professionals, who are often looked to for a clear assessment of the potential that any technology holds for their organisation and a widening range of stakeholders. Finding the right balance between potential long-term value and the associated level of disruption is an overarching objective mediated by the complexity of existing processes, legacy considerations, employee needs, customer expectations, environmental and societal impact, and more (Figure 1.3).

FIGURE 1.3: Possible relationships between disruption caused by new technologies and their impacts



Bumpy road of adoption

So, it goes without saying that the adoption of new technologies is challenging, often requiring significant change management and, at times, a steep learning curve. Even once new technologies are adopted, professionals must learn new tactics to employ them, transforming traditional practices. The mixture of practical adoption challenges and overcoming these learning curves tends to determine the pace and extent to which different organisations, sectors and/or economies adapt, as well as whether a particular technology is likely to be widely useful.

Blockchain is a good example. It is a technology that has garnered significant attention for its potential to revolutionise accounting (and beyond). Its adoption for financial transactions, however, has been hampered by transparency issues and data privacy concerns. Despite the hype, blockchain technology has yet to gain widespread trust and acceptance in the accounting field. Current debates about the feasibility and desirability of using blockchain for bookkeeping reflect the complexities and uncertainties associated with new technologies.

'There are many people talking about blockchain replacing bookkeepers. I have been working in the blockchain industry since 2017. The tech is just not there yet for people to actually trust blockchain to do bookkeeping and at the same time ensure that the data can be kept private. For example, if you put your data on Ethereum, everyone can read it. For many companies, this is just unacceptable. But if you go to a private blockchain, there are just a few computers running the blockchain. So actually it is not the same. It is the dilemma for the blockchain application in the finance industry.'

Asia Pacific Roundtable participant

THE ADOPTION OF NEW TECHNOLOGIES IS CHALLENGING, OFTEN REQUIRING SIGNIFICANT CHANGE MANAGEMENT AND, AT TIMES, A STEEP LEARNING CURVE.

How do we navigate our digital horizon?

This *Digital Horizons* report sets a foundation for an exploration of developments that are likely to change the near to medium-term future of accountancy and finance. This is intended to generate further discussion and debate as well as establish a basis from which we, as a profession, can responsibly lead the way on innovation, especially pertaining to the adoption of AI. When it comes to the latter, we should be mindful of the relationship between data and decision-making, how this is evolving with new capabilities and what it might mean for new and existing roles.

Drawing on findings derived from survey research and a series of roundtables, the report has three related, but distinct objectives:

- First, to understand the landscape of evolving technologies within the context of ongoing digital transformation and technology adoption amongst members.
- Second, to explore one set of technologies – artificial intelligence – in greater depth to understand member attitudes, potential uses and considerations around adaptation of existing practices.
- And third, to consider new opportunities as well as how competencies and skills might be enhanced to enable wider adoption of artificial intelligence and machine learning capabilities.

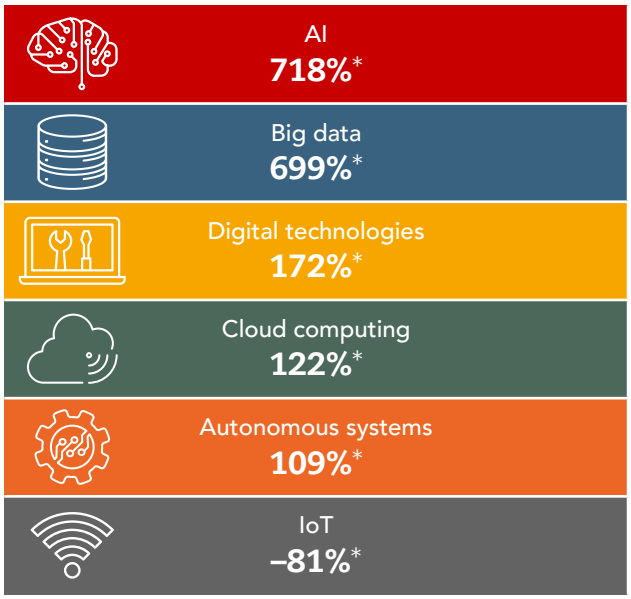
THIS *DIGITAL HORIZONS* REPORT SETS A FOUNDATION FOR AN EXPLORATION OF DEVELOPMENTS THAT ARE LIKELY TO CHANGE THE NEAR TO MEDIUM-TERM FUTURE OF ACCOUNTANCY AND FINANCE.

2. The technologies of the 'digital horizon'

Technology landscape

Patents are a good indicator of where major developments are not only occurring, but where commercial and other applications are being developed (Table 2.1). AI and big data have seen an enormous increase in activity over recent years. Other digital technologies, such as connectivity and storage facilities as provided by cloud computing have received substantial interest, as have autonomous systems such as robots and self-driving cars. The Internet of Things (IoT), on the other hand, has witnessed some fall-off in activity coinciding with divestments from some large telecommunications companies such as Vodafone and Ericsson over the last three years. This may be partially reflective of current challenges in scalability and cost, but it could also be linked simply to the relative level of maturity of the technology, which would be expected to lead to a reduction in activity. Nonetheless, the IoT remains a crucial part of our technological future, including being part of other developments, such as 'digital twins' (discussed below).

TABLE 2.1: The growth of various digital technologies, 2016–2020, measured by patents issued



*Growth of technologies as percentage of total patents' average growth, 2016–2020 (WIPO 2022)

Big data

The ability to examine large, diverse sets of data to uncover hidden patterns, correlations, and insights means that big data will continue to be important. Its significance lies in its ability to provide businesses with valuable information that can be used to identify new opportunities, improve efficiency, and make informed decisions. In the accountancy profession, big data analytics is the basis of anomaly detection, identifying inconsistencies in financial statements, predicting future revenue trends, or evaluating risk factors for audits. For example, by analysing customer transaction data, an accountancy firm can identify patterns or trends that may suggest fraudulent activity.

Internet of Things

The term 'IoT' refers to a network of physical devices that communicate and interact with each other via the internet. Its significance lies in its ability to generate and collect vast amounts of data from various sources. IoT is a mature technology, but its applications continue to grow with advancements in connectivity and sensor technology. In accountancy, IoT can provide real-time data for improved decision-making. For instance, in asset management, IoT devices can track the use and condition of assets, providing accurate data for depreciation and maintenance expenses.

VR / AR

Virtual and/or augmented reality (VR/AR) provide a simulated experience (VR) or an overlay of digital information on the real world (AR). They are significant for their potential to enhance user experiences, for example in providing immersive training and visualising complex data. VR/AR is advancing rapidly, with growing commercial and consumer use. In accountancy, these technologies could revolutionise the way financial data is visualised and interacted with. For example, an auditor could use AR to overlay financial data on physical assets during an audit.

Digital twinning

A digital twin is a virtual replica of a physical system, used for simulation and analysis. This technology is crucial as it allows companies to analyse the performance of systems, predict failures, and simulate scenarios. Digital twinning is advancing and is being introduced in industries such as manufacturing and logistics. In accountancy, digital twins could be used to model a company's financial systems, allowing for scenario analysis and improved financial planning. For example, a digital twin of a company's supply chain could help accountants understand the financial impact of potential disruptions.

Computer vision

Computer vision is a sub-field of AI that enables computers to interpret and understand visual data. Its significance lies in its ability to automate tasks that require visual understanding. It's a maturing technology, finding increased use in sectors such as autonomous vehicles and healthcare. In accountancy, computer vision could automate such tasks as receipt or invoice scanning, reducing manual data entry. For instance, it can be used to read and categorise paper receipts, aiding in expense management.

Connectivity / networking

Connectivity/network technologies (eg, 5G) are the backbone of communication systems, ensuring fast, reliable and secure data transmission. They are essential for the functioning of an increasingly digital and interconnected world. Currently, 5G is being rolled out worldwide, offering significant improvements over previous generations. In accountancy, improved connectivity can enable faster data access and analysis, support remote work, and enhance the use of cloud-based accounting systems. For example, 5G could support real-time inventory tracking for accurate, up-to-date financial reporting.

Advanced robotics

The term 'advanced robotics' refers to robots capable of performing complex tasks autonomously or semi-autonomously. These robots are significant for their potential to automate tasks, increase productivity, and perform tasks beyond human capabilities. The technology is advancing rapidly, with increased use in industries such as manufacturing, healthcare and logistics. These advanced forms of machinery are different from robotic process automation (RPA) software used in accountancy, to automate manual tasks such as data entry and reconciliation including the process of closing books at the end of a financial period. By contrast, advanced robotics as used in a manufacturing process can vastly increase flows of data (such as diagnostics) and enhance operational efficiencies through regular monitoring and improvement.

Blockchain

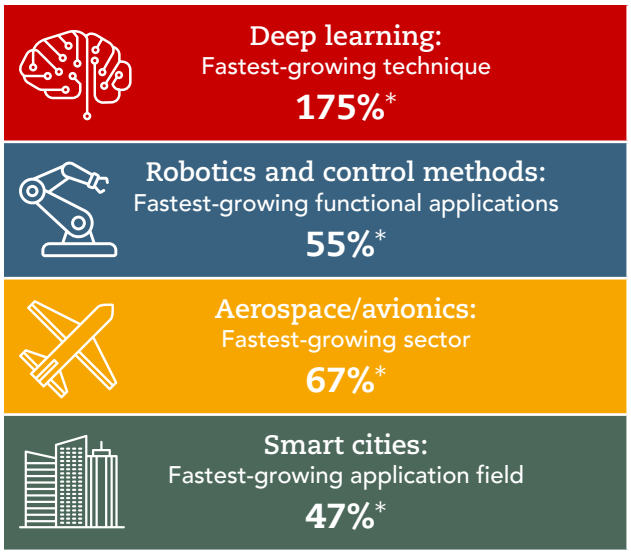
Blockchain is a type of digital ledger technology that records transactions across multiple computers in a secure and transparent manner. Its significance lies in its ability to improve the security, transparency and efficiency of transactions. It's an evolving technology with growing adoption in areas such as finance and supply chain management. In accountancy, blockchain could revolutionise auditing by providing a verifiable and tamper-proof record of transactions. For example, a blockchain-based system could be used to track the provenance of assets, providing auditors with undeniable proof of ownership and transaction history.

Artificial intelligence & machine learning

AI and machine learning (ML) encompass systems that are capable of learning from data, making decisions, and improving over time with a level of autonomy. They are significant because they can automate complex tasks, make predictions, and provide insights based on vast amounts of data. These technologies are advanced but are still developing, with new models and methods being introduced regularly. Indeed, according to Stanford University's Artificial Intelligence Index Report 2022, global AI private investment doubled between 2020 and 2021 totalling US$93.5bn in the latter year (Stanford 2022). AI and ML are a suite of technologies, enabled by adaptive predictive power that advance our ability to recognise and detect patterns, anticipate and forecast future scenarios, create rules to optimise outcomes, and make good decisions by applying rules. For instance, AI and ML can be used to automate invoice processing or to predict a company's performance using a range of structured and unstructured data.

Again, the growth in the number of patents issued is a proxy for growth in technological developments (Table 2.2).

TABLE 2.2: Categories of AI patent



*Average annual growth rates, 2013–2016 (WIPO 2022)

What's the fuss about AI?

Not all technologies are equal in their potential for impact. Given the relative explosion of major announcements and public interest, a passive observer might be forgiven for assuming that AI is a new sensation. On the contrary, AI has had a long and bumpy trajectory. Tremendous conceptual and mathematical progress has been made each decade since Alan Turing proposed that machines could be programmed to think, use information and reason to solve problems. Early advances were in large part limited by lack of computing power, and the ability to store information and commands, as well as cost.

This stands in contrast to many of the other, much more recent, technologies that are cited in publications (Figure 2.1). Aside from longevity, another thing that distinguishes AI from most other technologies is the way in which it has already contributed, and will continue to contribute, to innovation in many other areas. And this impact is likely to grow with recent developments in generative AI. The potential for AI to become a general-purpose technology (GPT), enhancing productivity more broadly and, potentially, serving as a platform for future activities is a distinct possibility, according to major economists (Baily et al. 2023). Of course, major risks and obstacles persist, but in certain ways AI is special in its ability to facilitate other technological innovations, and this is in part why it should be considered as the vehicle of the digital horizon. Indeed, AI is tied to many other technologies that will have varying implications for business, and for accountancy and finance professionals in the future.

Most of the applications of AI fall outside areas that will have a direct impact on accountancy and finance as a profession. But the indirect impact may be just as significant. There has been a great deal of discussion about how AI can support drug discovery, but another significant area is in software development, where AI is likely to accelerate the pace of activity. Given that most accountants and finance professionals who currently or will interact with AI will do so via pre-packaged software applications, this is likely to present an exciting but also challenging prospect of sorting through new updates, alternative vendors, and incremental improvements.

The new kid on the block: Generative AI

OpenAI's ChatGPT is the fastest-growing technology product ever. It only took five days for it to reach a million users, surpassing all previous benchmarks by a significant margin (Figure 2.2).

FIGURE 2.1: Prevalence of mentions of various technologies in academic articles on Google Scholar

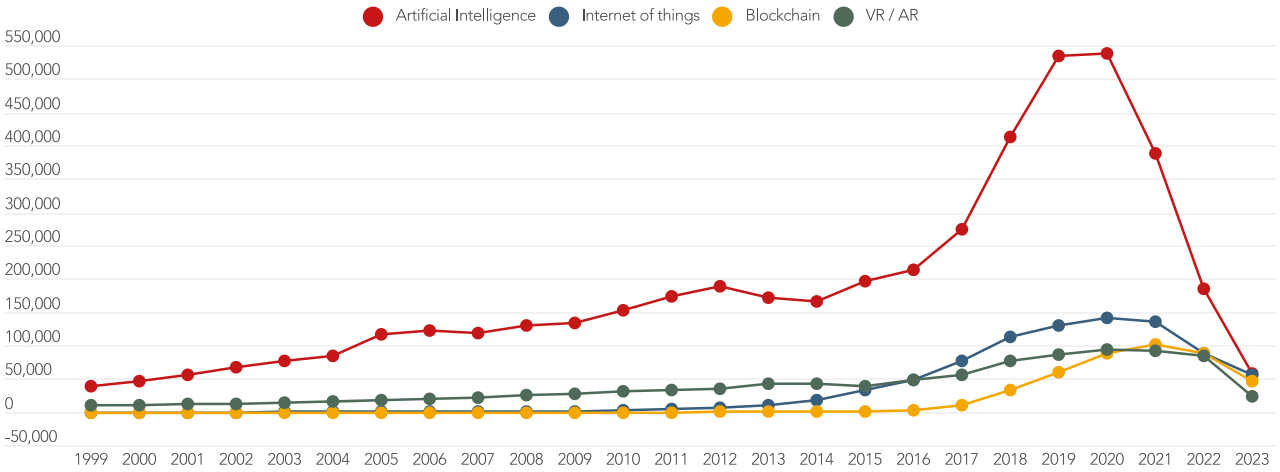
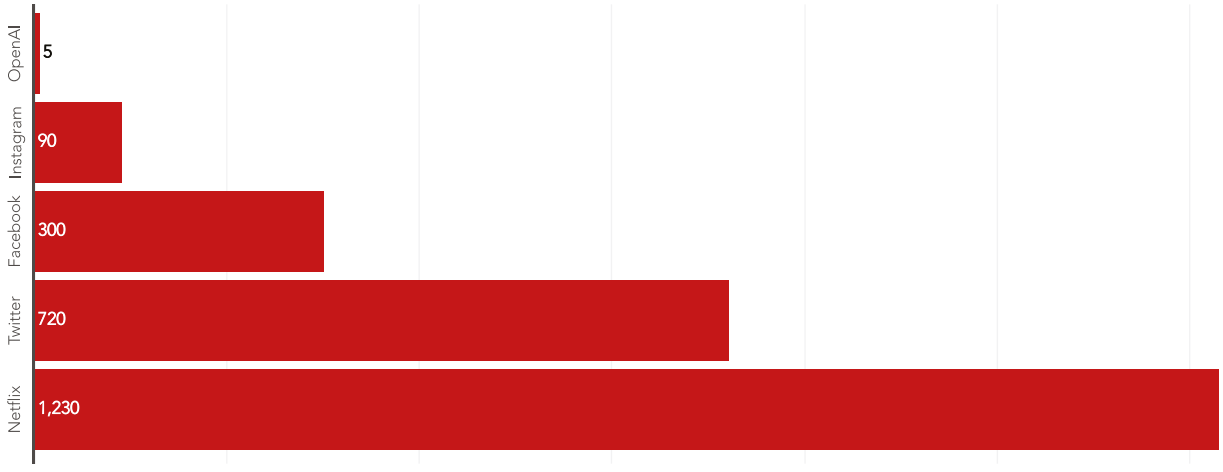


FIGURE 2.2: Time in days that various platforms took to reach one million users (approximately)



Using the Gartner Hype Cycle as a guide (Gartner n.d., Figure 2.3), within about eight weeks we observed the Technology Trigger, marked by the highly publicised release of ChatGPT on 30 November 2022, rapidly transition into the peak of expectations. The culmination of this was arguably marked by two significant sets of events related to OpenAI. The first event was OpenAI's renewed collaboration with Microsoft, depicted in a press release as a 'multiyear, multibillion-dollar investment'. The second was a series of papers announcing that ChatGPT was exceeding average human performance across a range of professional exams.

While generative AI is not an entirely new technology, the very rapid progress made in a relatively short span of time has been undeniable. Certainly, compared to the metaverse, generative AI received quicker attention from academic circles following major announcements – Facebooks initial turn to the Metaverse in 2021 vs. the public release of ChatGPT by OpenAI in 2023 (Figure 2.4).

It would be hard to argue against the observation that we have ridden to the peak of the wildest expectations in record time. Even so, there are at least a couple of complicating factors that make it more difficult to judge the speed with which it might develop from here. When compared to the more contentious metaverse, generative AI may benefit from a higher level of maturity, ease of use, and potential applicability.

One factor is that generative AI is built upon a very long-standing field of research and development. The success of generative AI is as much to do with the development of more efficient hardware and cost-effective computing power as it is with the specific learning techniques and underlying model architecture. On top of this, generative AI was released for public consumption very early on.

> *'In the tech industry, we have a concept called the networking effect. That means, the more users, the more powerful the effect. So that when we talk about hype, it means there's a lot of excitement but no users. But for generative AI we can see millions of users using this every day. So I don't think it's hype.'*
>
> **Asia Pacific Roundtable participant**

This has not only massively expanded the training data available to OpenAI, but it has also led to an explosion of start-ups and experimentation with generative AI applications. Indeed, chatbots aimed directly at the audit market and tax professionals are already popping up.

FIGURE 2.3: Typical pattern of changing attitudes after a new technology has been launched

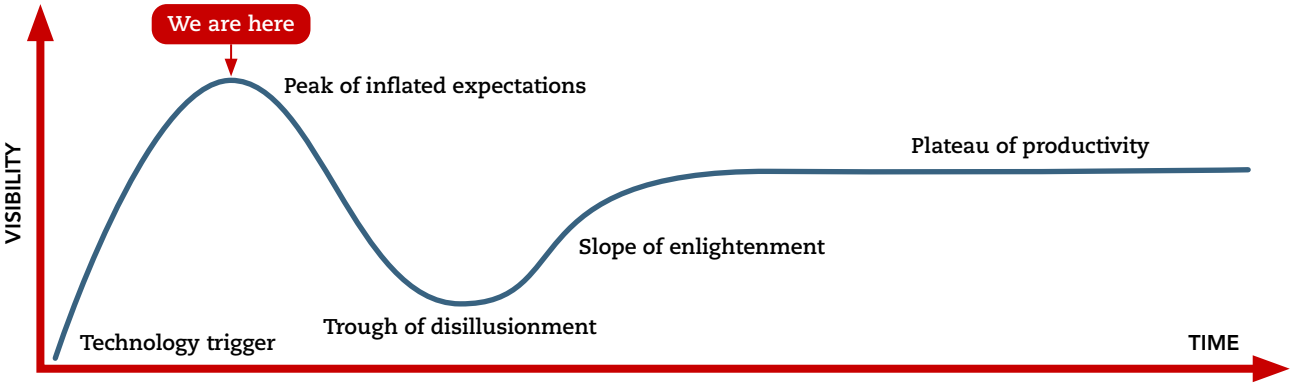
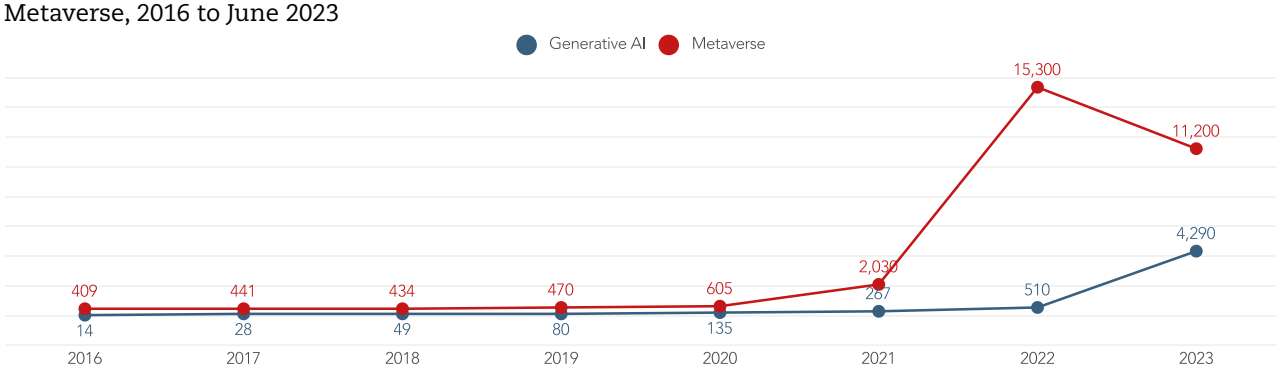
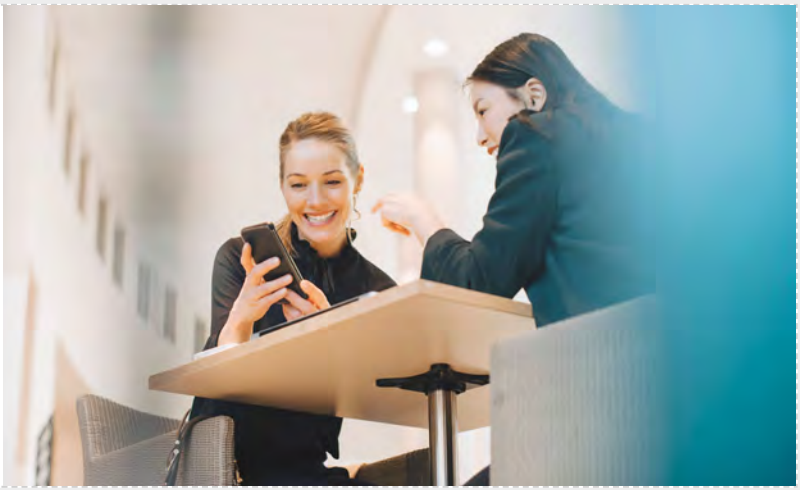


FIGURE 2.4: Comparison of number of academic articles in Google Scholar citing generative AI and the Metaverse, 2016 to June 2023



TaxGPT

For example, OpenAI has developed a specialised model, TaxGPT, embedded within the fourth iteration of its chatbot. The model was finely tuned and trained on the intricacies of US tax law. It has shown remarkable proficiency in handling tax-related queries and even producing data for tax returns. The model showcases its prowess by calculating tax deductions in highly complex scenarios with very high levels of accuracy. Variations of TaxGPT trained on local tax laws are popping up across the world.



'Big Four' developments

The Big Four accountancy firms are also investing heavily in AI to revolutionise their audit and tax offerings.

- In April 2023, PricewaterhouseCoopers (PwC) announced a US$1bn investment over a three-year period to expand its AI offerings by building its relationship with Microsoft and OpenAI. The investment was made under the firm's New Equation strategy, focusing on the application of next-generation technologies to help solve complex challenges. Internally, it also announced the development of its own fine-tuned chatbot – ChatPwC.
- In 2023, KPMG also announced an expanded partnership with Microsoft as part of a US$2bn investment in AI and cloud services over the following five years. The firm projects that this investment has the potential to produce up to US$12 bn in revenue.
- KPMG plans to employ generative AI to support tax professionals in meeting new mandates for tax obligation disclosure by country and has provided its clients with a 'virtual assistant', powered by ChatGPT, to aid in gathering tax data, conducting analyses, and drafting reports on global tax obligations. This AI tool operates securely within KPMG's firewall, ensuring that access to client data is both restricted and safeguarded. The company's professionals are undergoing training to maximise the benefits of this innovative technology. In addition, KPMG is experimenting with the use of AI in the realm of auditing, focusing on tasks such as contract summarisation and audit committee presentation preparation. The firm is being cautious and meticulous in its adoption of AI for audit purposes, ensuring the results are certified, validated and contribute to improved audit quality.
- Deloitte and EY are likewise initiating pilot projects and services to leverage generative AI. Significant investments are being made to upgrade their tax and audit services, as well as to instruct their accountants in effective AI tool use.
- Deloitte has made some strategic acquisitions – including of HashedIn Technologies and Intellify – to bolster its AI capabilities. This is alongside established partnerships with technology behemoths such as Amazon Web Services, Google, and NVIDIA to deliver cloud and AI-based services.
- EY has welcomed use of OpenAI tools by its global tax workforce and has established an advisory council to direct its AI use. With significant partnerships including ServiceNow, Adobe and NVIDIA, the firm remains a leader in AI-powered applications.

Smaller firms are also being urged to integrate AI technology into their operations. AI can be employed for straightforward tasks such as drafting emails that are devoid of client data or confidential information. As the technology progresses, it will enable accountants to extract information more rapidly, transforming their work practices and enhancing their expertise.

Of course, the adoption of generative AI does come with some risks. Firms must take care not to exaggerate AI's capabilities and must ensure that their tools receive adequate training in various countries and functions. Despite these challenges, the potential advantages of AI in tax and audit services, such as enhanced efficiency and efficacy, make the investment justifiable for firms striving to stay ahead in a fast-paced industry. Chapter four will return to questions of adoption and the risks associated with AI.

DESPITE THESE CHALLENGES, THE POTENTIAL ADVANTAGES OF AI IN TAX AND AUDIT SERVICES, SUCH AS ENHANCED EFFICIENCY AND EFFICACY, MAKE THE INVESTMENT JUSTIFIABLE FOR FIRMS STRIVING TO STAY AHEAD IN A FAST-PACED INDUSTRY.

Hype and expectations

The rapid pace of technological development can lead to high expectations. Breakthroughs in areas such as AI, analytics, the IoT, and blockchain are predicted to reshape industries rapidly, promising unprecedented efficiency and capabilities. Nonetheless, practical implementation can be a complex process requiring significant investment in hardware and software, as well as training staff and reconfiguring business processes. Regulatory constraints, data security and legacy systems also pose challenges.

Therefore, while the potential of these technologies may be significant, their real-world implementation may not live up to the hype.

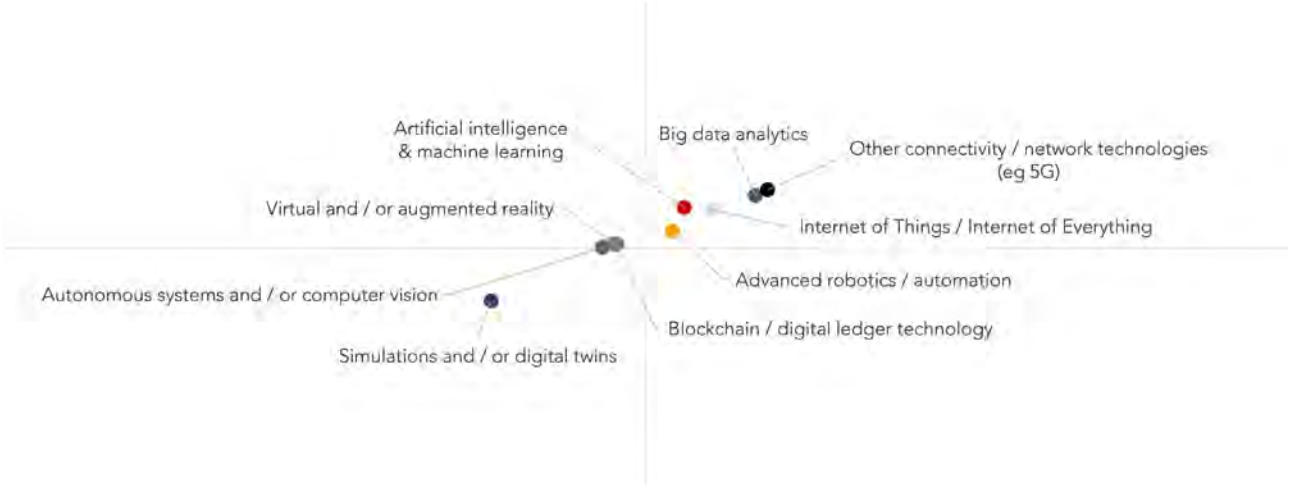
Our snapshot of ACCA members' perceptions reveals a varied landscape. While some technologies, such as big data analytics, are viewed as relatively commonplace, others, such as AI and ML, are recognised but are fighting through implementation challenges. Still others, such as more recent innovations in digital-twinning technologies, remain largely unrecognised.

There is notable variation in the perceived visibility and development of different technologies among ACCA members in our survey (Figure 2.5).

Big data analytics shows a certain level of maturity and acceptance within the field, reflected in its high visibility and development scores. This technology scores highly in both visibility and development. The high visibility suggests that ACCA members are well aware of big data analytics, its potential uses, and its implications for the accountancy profession. The moderate level of development indicates that many organisations have begun to implement big data analytics, reflecting its growing importance in data-driven decision making.

AI and ML, despite a robust visibility score, show a relatively low level of perceived development, suggesting that while the technology's potential is recognised, its readiness for implementation within organisations may not be as advanced. Moreover, this suggests that while ACCA members are aware of AI and ML and their potential impact on the profession, their organisations may still be in the early stages of adopting these technologies.

FIGURE 2.5: Relative level of visibility among respondents (vertical position) versus level of development (horizontal position) of AI technologies

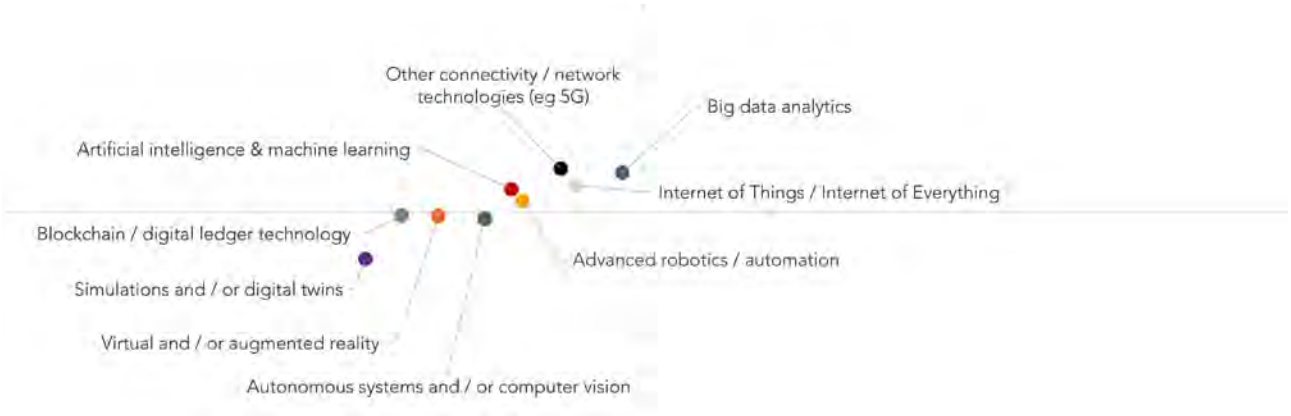


Technologies in the upper left quadrant: These are technologies that have high visibility but low development. These could be considered emerging or hyped technologies that are widely known about but not yet fully developed or widely implemented.	**Technologies in the upper right quadrant:** These are technologies that have both high visibility and high development. These could be considered mature technologies that are well-known and widely implemented.
Technologies in the lower left quadrant: These are technologies that have both low visibility and low development. These might be early-stage or fringe technologies that aren't widely known about or widely used.	**Technologies in the lower right quadrant:** These are technologies that have low visibility but high development. These might be niche or proprietary technologies that aren't widely known about but are well-developed and may be widely used in specific sectors or applications.

This illustrates the challenge of translating awareness into implementation. Even for technologies such as AI and ML, which have high visibility, the level of development lags slightly behind their level of visibility.

The findings highlight the need for further education and training for ACCA members in emerging technologies coupled with practical exposure and experience to fully realise the potential benefits of these technologies.

FIGURE 2.6: Relative degree of perception (vertical position) versus degree of implementation (horizontal position)



The perception–implementation gap

This can be visualised as a perception-implementation gap – the difference between how common and well-developed a technology is perceived to be compared to the extent to which it is being implemented by individuals and/or organisations (Figure 2.7).

AI and ML show a significant disparity between perception and implementation among respondents, which may relate to various challenges from return on investment, technical capabilities, skills or identifying relevant uses.

Simulation/digital twin technology demonstrates both the lowest perception and implementation scores, indicating it is both less recognised and less implemented by the surveyed members.

These perception–implementation gaps reflect the challenges in adopting and implementing new technologies within organisations, even when their value and potential impact are widely discussed.

FIGURE 2.7: The gaps between perception of various technologies and implementation among ACCA members

THIS CAN BE VISUALISED AS A PERCEPTION-IMPLEMENTATION GAP – THE DIFFERENCE BETWEEN HOW COMMON AND WELLDEVELOPED A TECHNOLOGY IS PERCEIVED TO BE COMPARED TO THE EXTENT TO WHICH IT IS BEING IMPLEMENTED BY INDIVIDUALS AND/OR ORGANISATIONS.

AS THE TECHNOLOGICAL LANDSCAPE CONTINUES TO EVOLVE, ACCA MEMBERS WILL NEED TO EQUIP THEMSELVES WITH THE KNOWLEDGE AND SKILLS TO LEVERAGE THESE TECHNOLOGIES EFFECTIVELY.

3. Digital transformation and technology adoption

Digital transformation refers to the adoption of digital technologies by organisations to improve and optimise their operations, products and services, and engagement with customers and stakeholders (Vial, 2019).

For example, this could include transitioning from legacy IT systems to modern digital platforms like cloud computing, digitising business processes and workflows, developing digital products, services and business models to serve changing customer needs, using analytics and insights to make more informed decisions, changing organisational culture and leadership style to be more agile and collaborative, reskilling and upskilling, and collaborating digitally with partners, suppliers and stakeholders through tools like APIs, cloud platforms, etc. In other words, digital transformation consists of a range of objectives and is supported by a number of existing and developing technologies.

Technology state of play

There is notable activity amongst ACCA members when it comes to these technologies (Figure 3.1), however it is also clear that there remains a great opportunity to expand the use of some of the more widely applicable technologies such as AI and ML to enhance activities.

In particular, there is an obvious gap between larger organisations – eg big four and mid-tier accountancies and large corporates – and small and medium-sized enterprises (SMEs) and small and medium-sized practitioners (SMPs) (Figure 3.2). As we discuss challenges further, it will be worth considering whether there is not only a resources difference but also different skills challenges.

FIGURE 3.1: ACCA member respondents who have implemented various new technologies, % of total

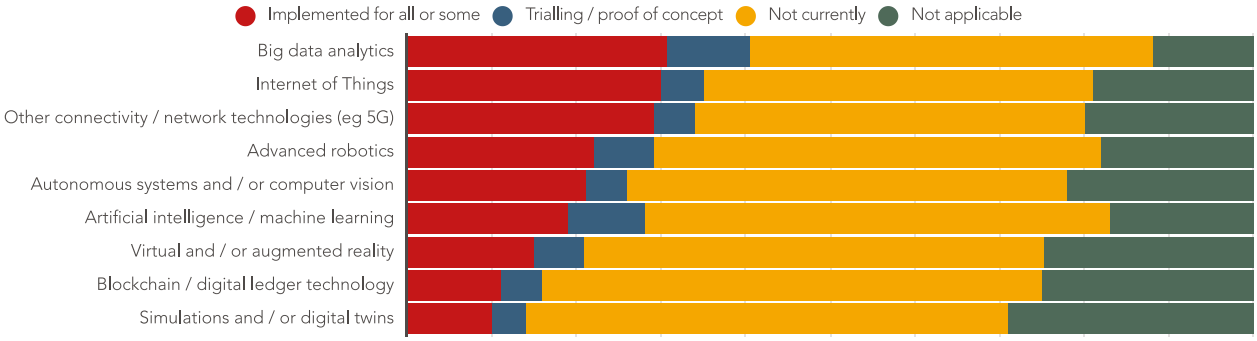
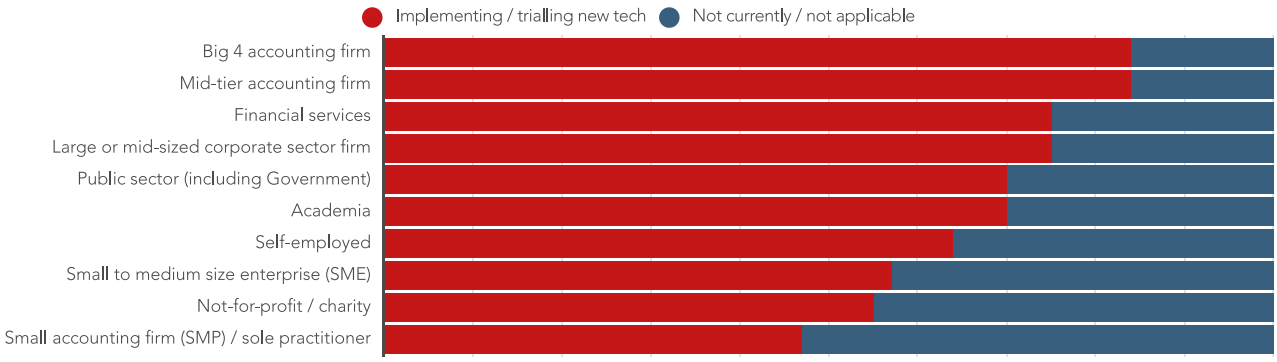


FIGURE 3.2: ACCA member respondents who have implemented various new technologies, % by sector



Financial services companies have long been at the forefront of adopting new technologies, so it is not a surprise to see relatively high levels of implementation in this sector. By contrast, not-for-profits and charities are much less likely to have the capacity to undertake such transformation.

As the technological landscape continues to evolve, ACCA members will need to equip themselves with the knowledge and skills to leverage these technologies effectively. This will not only enhance their own professional capabilities, but also enable them to drive innovation within their organisations.

Technology adoption: organisational and personal objectives

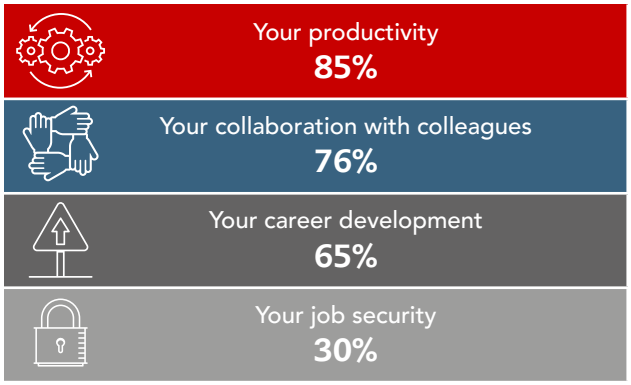
It is clear from the *Digital Horizons* survey that there is a strong sense of optimism among ACCA members about digital transformation. The benefit of digital transformation on organisational objectives, in particular, from instilling greater flexibility to improving transparency, all receive resoundingly positive responses (Table 3.1).

TABLE 3.1: Degree to which ACCA member respondents agree that technology supports organisational objectives

Net positive responses

In part, this may reflect a widespread sense of technological optimism, a firm belief that technology is more likely to improve human lives. Indeed, optimism bias is a well-founded phenomenon in the behavioural sciences and is often linked to areas of innovation. This bias points to the tendency of individuals to overestimate the probability of positive outcomes over negative outcomes. In practice, when confronted with more specific applications of technology in areas that directly affect individuals, this sense of optimism can be challenged.

TABLE 3.2: Degree to which ACCA member respondents agree that technology supports personal objectives



Net Positive Response

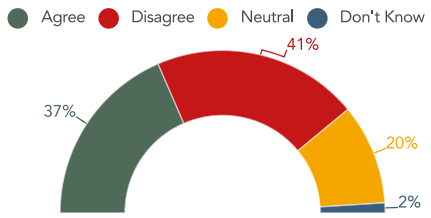
While sentiment is still broadly positive towards personal goals (Table 3.2), there is less certainty on these matters than for organisational goals. The impact on career development remains very positive, with many roundtable discussions revolving around access to learning and more flexible opportunities.

Technology adoption and personal insecurity

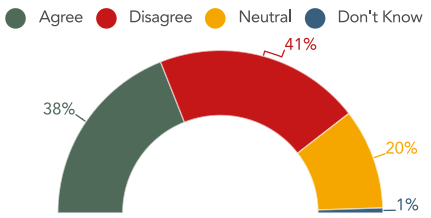
Attitudes to job security, while still showing a net positive response, have a greater disparity among respondents. To some extent, this should not be surprising when their range of roles and seniority levels is considered, each subject to different changes in expectation, availability, upskilling and complexity in relation to innovation. Nonetheless, there does appear to be a consistent degree of insecurity around the impact of technology on job prospects, a finding that was also reflected across career levels in the ACCA's *Global Talent Trends 2023* survey and report (Lyon 2023). Despite the recognition that technology has the potential to empower employees, this report emphasises the widespread nature of this concern as well as demand for more training related to new technologies in order to counter-act those fears.

Personal productivity and job security, while not being diametrically opposed, certainly reside on different ends of the spectrum, highlighting an important point about the relationship between 1) how we justify and prioritise technology initiatives and 2) the impact on the individual. It is only logical to expect that as individuals experience aspects of their job becoming easier and tasks being reduced or taken away, their next thought may be about their own value, the transmutability of their skills, and the security of their role (Figure 3.3).

FIGURE 3.3: Respondents' concerns about the impact of technology on their jobs



Ongoing digitalisation and technology evolution will increase the complexity of accounting processes



I am concerned about the potential loss of jobs in the accountancy profession due to tech evolution

The risk of greater complexity also appears to underlie some of the concern about adopting new technologies, and perhaps about change more widely. More than one-third of respondents agreed that 'ongoing digitalisation and technology evolution will increase the complexity of accounting processes'.

Indeed, innovation often raises new requirements, which can increase complexity at least in the short term as practices and knowledge adapt. Cloud computing, for example, is now fairly widespread and often touted as essential to the implementation of more advanced applications, especially for greater analytics and intelligence capabilities. While it has made data access and storage easier, accounting for cloud-related expenses can be complex and confusing, even for seasoned accountants.

> *'Nowadays, everyone is basically using cloud, and the accounting for cloud-related expenses is extremely complicated, even confusing to accountants. So if they just have the numbers from AWS, Alibaba cloud, etc. it is very hard to understand what those numbers really mean.'*
>
> **Asia Pacific Roundtable participant**

These uncertainties are inevitable by-products of being open to innovation, but they can cause trepidation among individuals and contribute to varying levels of discomfort with upskilling and learning. Technology presents an almost paradoxical situation whereby a task can be made easier for the individual, but also more complex while one lacks the technical understanding of how a new system operates. But what this also points to – and the roundtable participant attests – is the need for domain experts who are able to interpret regulations to ensure that continually changing practices remain compliant.

In addition to this are fears for job security: 38% of survey respondents expressed concern about the 'potential loss of jobs in the accountancy profession due to tech evolution', although a similar proportion (41%) disagreed that this was a concern. Again, this reflects a certain level of uncertainty in the face of change, which can lead individuals to make broad assumptions about evolving circumstances because information is limited and predicting the future impact is difficult.

While these concerns differ in significant respects, they are connected by an imperative to adapt. This same imperative is driving change at all levels, not least amongst CFOs who are experiencing a distinct change in expectations and responsibilities, as explored in the ACCA-BDO report *Chief Value Officer: the important evolution of the CFO* (Webb 2023). This report highlights the extent to which the boundaries of the role are blurring as business demands evolve in line with a more value-driven agenda posing myriad challenges from individual mindset through to specific capabilities.

Complexity can be viewed as a short-term phenomenon – following a learning curve – or a longer-term phenomenon requiring a more fundamental change of skills and availability of roles. In the latter case, the potential mistake is to associate value with a set of existing practices or processes rather than overarching competencies and objectives.

> *'Having led so many change projects [I have seen] that instant closeted reaction whenever somebody says "oh, we're going to have a systems implementation". That's what I see when we talk about AI: "oh we're going to have more efficiencies, well that means that my job is gone. Therefore, I'm going to resist it and challenge it and not support it". But actually, it's just going to be about things being done differently and we can still, as accountants, add value.'*
>
> **UK Roundtable participant**

Resistance to change is rarely ill-intentioned, it merely reflects a heightened level of concern about how existing and trusted methods will be supplanted. It should come as no surprise that studies have shown that uncertainty is detrimental to human performance and creativity (de Berker et al, 2016). While there will always be a level of uncertainty involved in any process of transformation, however, there are means to mitigate its effects. A culture of innovation requires trust as a crucial ingredient, and this is built on transparency and effective communication. These challenges ultimately stress the importance of effective communication from the leadership to help mitigate the 'human-machine' dilemma, which places the two at odds with each other (Cleavinger and Munyon 2013).

Why adopt new technologies?

The purpose of technology should be to enhance human efficiency and effectiveness, such as improved compliance, enhanced insights, better reporting outcomes, or entirely new capabilities. The ultimate goal should be the outcome, not the mere implementation and use of technology.

'I think sometimes people do use the term "technology as the enabler", but in practice they sometimes look at it as the ends. The enabler is, you're either enhancing something that's already done by a human, or doing something that they couldn't do before by utilising the technology. And the end is the output, that outcome as opposed to just the implementation and use of technology.'

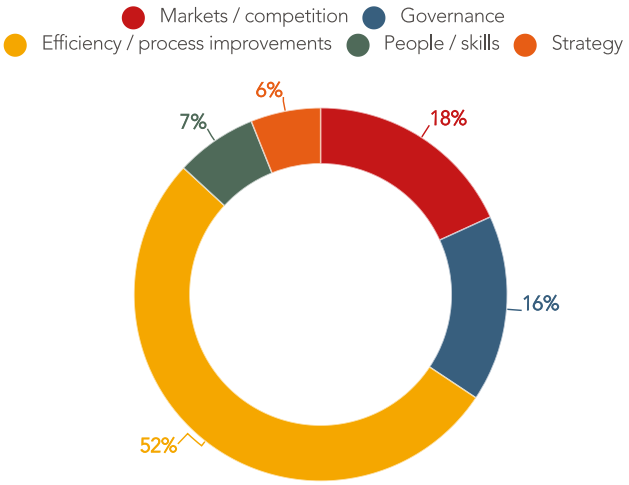
UK Roundtable participant

Still primarily an efficiency play

At the same time, technology adoption is still primarily treated as an efficiency play by more than half of all survey respondents. Thus despite widespread optimism about the extent to which digital transformation, more broadly, can enhance things like flexibility / adaptability, quality of products or services, sustainability performance, transparency, and/or regulatory compliance, practical business constraints typically require a focus on a narrower set of goals, at least initially (Figure 3.4).

Only 18% included competition-related reasons, such as responding to customer demands, enhancing market insights, introducing 24/7 capabilities, or maintaining competitive advantage.

FIGURE 3.4: The main technology-related objectives reported by ACCA respondents



Governance reasons ranked in the top three for 16% of respondents, including data governance and regulation / compliance. People/skills-related reasons – including responding to employee needs or enhancing training – and strategic reasons – such as avoiding future vulnerabilities or improving collaboration with partners – were only ranked in the top three by 7% and 6% of respondents, respectively. All the rankings are shown in Table 3.3.

TABLE 3.3: The overall rankings of various objectives for ACCA respondents using new technology

OBJECTIVE	RANK
Efficiency of task(s)	1
Internal process optimisation	2
Cost savings	3
Data governance / management	4
Regulation / compliance	5
Maintaining competitive advantage	6
Responding to customer demands	7
Better process / asset visibility	8
Enhancing training / skills development	9
Improving collaboration with partners	10
Enhancing market / customer insights	11
Avoiding future strategic vulnerabilities	12
Responding to employee needs	13
Introducing 24/7 capability	14

NARROW OR LIMITED OBJECTIVES CAN ALSO LIMIT THE SUCCESS OR IMPACT OF A NEW INITIATIVE. SO IT IS INTERESTING TO SEE THAT A SIGNIFICANT PROPORTION OF MEMBERS VIEW TECHNOLOGIES SUCH AS AUTOMATION PRIMARILY THROUGH THE LENS OF EFFICIENCY GAINS.

These patterns broadly held true across sectors (Figure 3.5) and regions (Figure 3.6).

The dominance of efficiency as a driving narrative behind technology adoption was further demonstrated in the open responses provided by survey respondents to the question: 'what does digital transformation mean to you?'

Using sentiment analysis – a form of natural language processing that uses ML to identify and extract subjective information from source materials – it is possible to get a sense of the attitudes and emotions of a respondent.

In the context of open responses to a survey, sentiment analysis can be particularly valuable. It can automatically analyse the text responses to identify whether the sentiment expressed is positive, negative or neutral. By doing so, it provides a quantitative measure of the respondents' attitudes, opinions and perceptions, which might not be captured by closed-ended questions. Although not all entries could be categorised according to use and context, 583 unique responses were received. Word fragments – morphemes – were used to allow for closely related words, eg 'efficien' for 'efficiency' and 'efficient' (Table 3.4).

TABLE 3.4: What does 'digital transformation' mean to you? Sentiment analysis and top 20 morphemes

POSITIVE	MORPHEME	NEGATIVE
	efficien	
	process	
	auto	
	data	
	Technol	
	future	
	innovat	
	cost	
	fast	
	intel	
	operat	
	info	
	Learn	
	human	
	robot	
	decis	
	risk	
	real	
	job	
	over	

FIGURE 3.5: Technology-related objectives of ACCA respondents, grouped by sector

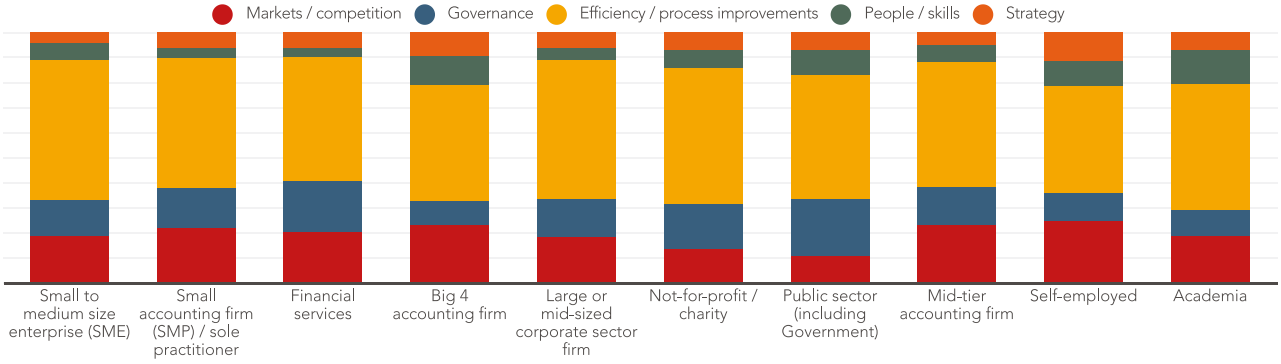
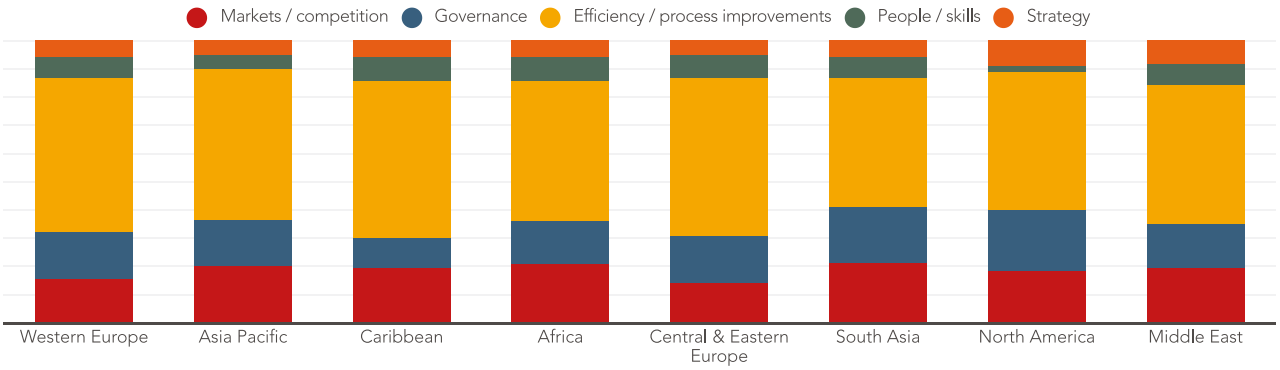


FIGURE 3.6: Technology-related objectives of ACCA respondents, grouped by geographic region



Following on from the closed-response question on technology objectives, efficiency/efficient once again proved to be the most frequent entry, with mentions almost wholly positive (92%). Similarly, allusions to words associated with process, auto and data were also frequently mentioned and overwhelmingly in a positive manner.

Mentioned less frequently were words associated with 'learning', 'human', 'risk' and 'jobs'. But while these words were less common, they also had higher levels of negative sentiment associated with them. This once again confirms the view that existing fears are largely associated with the impact of technology on individuals, as opposed to the resoundingly positive effects expected for organisations.

Successful technology adoption is not just about implementing new systems but also about enabling people to use these systems effectively and to realise their personal benefits. Hands-on experience and training are important, as is, where possible, the ability to experiment and innovate to improve existing task loads.

'We started with the word enablement and the focus was… [on] technology: how does technology enable us to do anything? But where there's the gap is when the technologies in place are to drive efficiencies, while the people need to be enabled to use the technology. All the enablement focuses on the technology. People are the essential enablers of the outcome, whereas the technology is the enabler of that process.'
UK Roundtable participant

While risk appeared relatively infrequently in the text responses, comments reflected the fact that digital transformation poses potential advancements in the ability to monitor and manage risk as well as presenting new risks that need to be considered.

'Every piece of enhancement comes with risk as well, right? Crypto has its own set of risks. Social media has its own set of risks. AI has its own set of risks, right? So we need to … think about efficiency and effectiveness and also risk in tandem.'
North American Roundtable participant

A focus on efficiency is pervasive. It is an obvious and relatively quantifiable benefit of implementing a new system or technology, whereas other benefits may be more difficult to measure or more diffuse.

On the other hand, when considering new technology, thinking in a purely linear fashion carries distinct risks of its own and may limit understanding of potential impact. Even a simple 'point solution' intended to speed up a particular task can have more wide-ranging effects if not properly considered.

SUCCESSFUL TECHNOLOGY ADOPTION IS NOT JUST ABOUT IMPLEMENTING NEW SYSTEMS BUT ALSO ABOUT ENABLING PEOPLE TO USE THESE SYSTEMS EFFECTIVELY AND TO REALISE THEIR PERSONAL BENEFITS.

Challenges to adoption

The challenges posed by technology adoption are more diffuse than the objectives they are intended to achieve (Figure 3.7 and Table 3.5). Even so, it is clear that organisational culture remains a critical factor in the successful adoption of technology: 26% of respondents highlighted related issues among their top three technology-related challenges. This category includes employee resistance to adoption, lack of technical leadership and poor clarity on process ownership and accountability.

Employee resistance to adoption was particularly significant, garnering the second-highest response rate for an individual issue, while lack of technical leadership remains a significant challenge itself, ranking as the sixth most cited issue.

FIGURE 3.7: ACCA respondents' ranking of technology-related challenges, by category

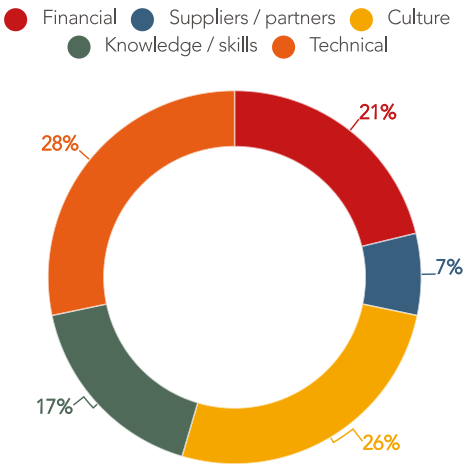


TABLE 3.5: Ranking of challenges faced by ACCA respondents when introducing new technology

CHALLENGES	RANK
High costs	1
Employee resistance to adoption	2
Data quality / migration concerns	3
Poor IT legacy systems making implementation difficult	4
Understanding how to combine with other technologies	5
Lack of technical leadership	6
Return on investment / payback	7
Identification of the processes most suited to new technology	8
Poor clarity on process ownership and accountability	9
Poor IT security to govern implementation	10
Risk of proliferation of non-standard and silo processes and weakening of controls	11
Identifying suitable partners	12
Suppliers hesitant to integrate into their client's systems	13
Lack of knowledge of the benefits of the technology	13
Vendor lock-in / fear of vendor lock-in	15
Other (respondents were asked to specify)	16
There are no challenges	17

As opposed to objectives, these challenges varied slightly by sector (Figure 3.8) and region (Figure 3.9). SMEs and SMPs, as we have previously seen, are less likely to be implementing new technologies. They are also more likely to report challenges related to knowledge / skills. While the full range of challenges is quite diverse, this is a notable distinction alongside the less surprising fact that financial constraints can also pose a challenge for these organisations. Technical and culture-related challenges are evidently widespread across a range of sectors.

Cost considerations feature significantly, and this is especially pronounced for those implementing IoT applications, where scalability and cost have long been limitations on wider adoption. By contrast, slightly fewer members implementing analytics, AI and advanced robotics reference cost as the foremost challenge. For these technologies, employee resistance tends to match or exceed cost concerns.

Future research may need to examine the components and understanding of costs in relation to technology initiatives in greater depth. As discussed in *Transformational Journeys: Finance and the agile organisation* (Webb 2021), value is an ongoing process that requires agility and flexibility beyond traditional evaluation measures such as Net Present Value or Internal Rate of Return. Indeed, the survey data shows a complex situation whereby initial high costs are presented as a significant challenge, whereas ROI/payback is less of an immediate concern. Presumably, however, payback cannot occur without costs being recouped. As such, the problem may revolve around explaining the value case including how those initial costs are worth the spend or the ability to secure funding in the first instance. This could also feed into limitations around technical know-how and perhaps cultural challenges which also feature prominently.

Overcoming these challenges requires a strategic approach that addresses these potential challenges as part of a phased implementation to manage the transition. This incorporates employee education and training as well as support for collaboration and cross-fertilisation of teams to enhance skillsets and share best practices.

FIGURE 3.8: Technology-related challenges perceived by ACCA respondents, grouped by sector

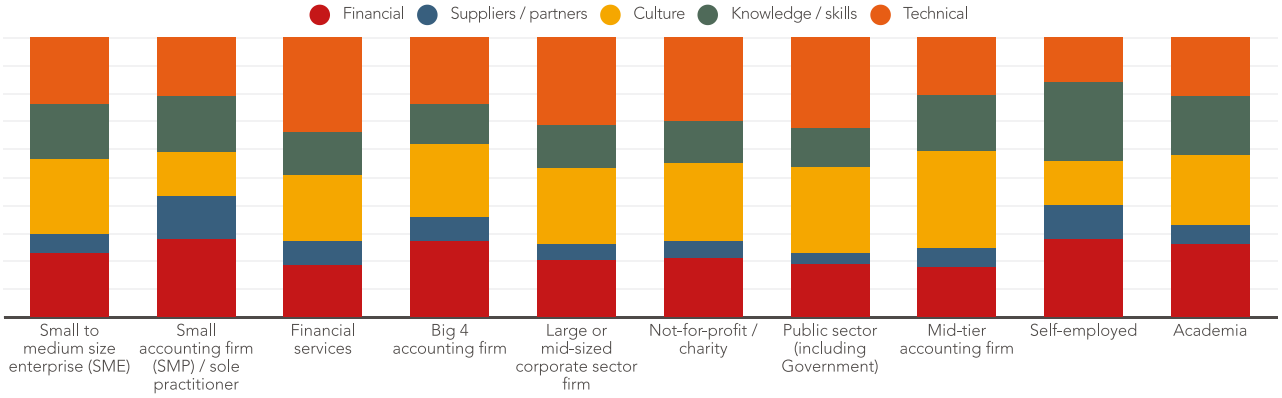
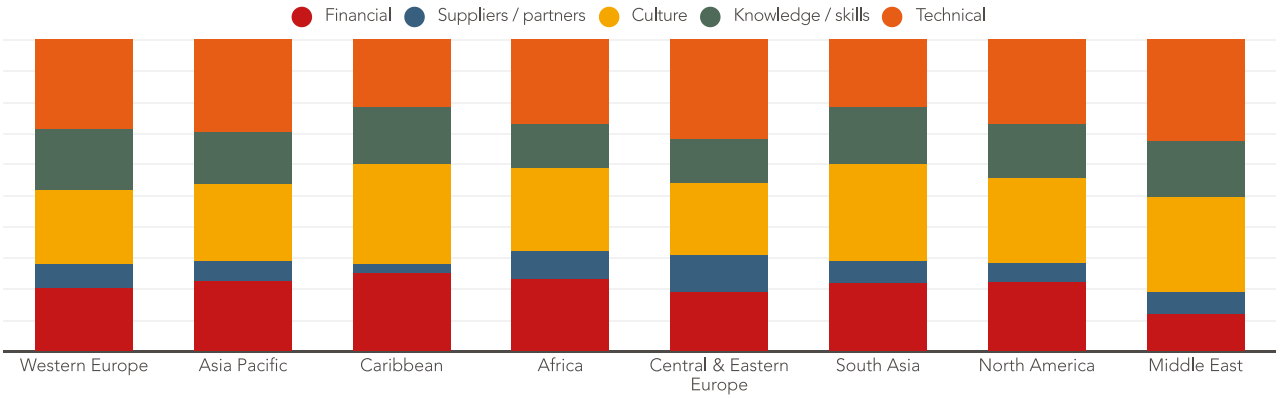


FIGURE 3.9: Technology-related challenges perceived by ACCA respondents, grouped by geographic region



Identifying potential innovator traits: commerciality, leadership, pragmatism

Digging in a bit further, our survey reveals some additional traits that distinguish innovators from those less likely to be involved in implementing new technologies. In particular, five key areas stand out:

1. Confidence in leadership and data governance also tend to coincide with the implementation of new technologies
2. Leading implementers are more likely to focus on competitive advantage as a key objective
3. Effective data governance principles and leadership, however, remain works in progress
4. Implementers are more likely to balance internal, efficiency goals with competition-driven and transformative goals
5. Strong correlation between organisational leadership and individual confidence

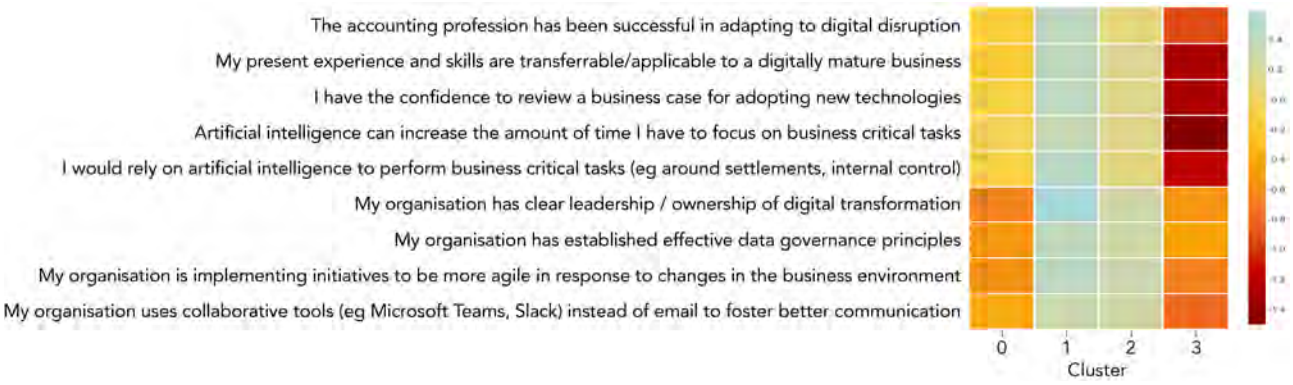
While, on average, attitudes to and expectations of new technologies are broadly positive, there are interesting variations and correlations that may help identify distinct traits that are more likely to be linked with innovative practices.

Each vertical cluster represents a group of respondents according to characteristics identified based on their responses. For ease of discussion, the clusters are named according to distinguishing characteristics:

- Cautious appraisers (Cluster 0)
- Digital optimists (Cluster 1)
- Modest adopters (Cluster 2)
- Digital sceptics (Cluster 3)

Each cluster relates to the likelihood of involvement in technology initiatives.

FIGURE 3.10: Result of applying K-means cluster analysis to Likert-scale data to identify clusters



K-means cluster analysis is a popular technique used in various fields, including market research, for categorising data into distinct characteristics-based groups. When applied to survey data (using Likert scales), K-means cluster analysis provides a powerful method for understanding and analysing the responses in a more detailed manner. For example, regarding the statements all respondents were asked to respond on a scale from 'Strongly agree' to 'Strongly disagree'. In terms of the level of involvement in technology initiatives, respondents were equally asked to respond on a five-point scale indicating the extent to which technologies have been implemented or not at all.

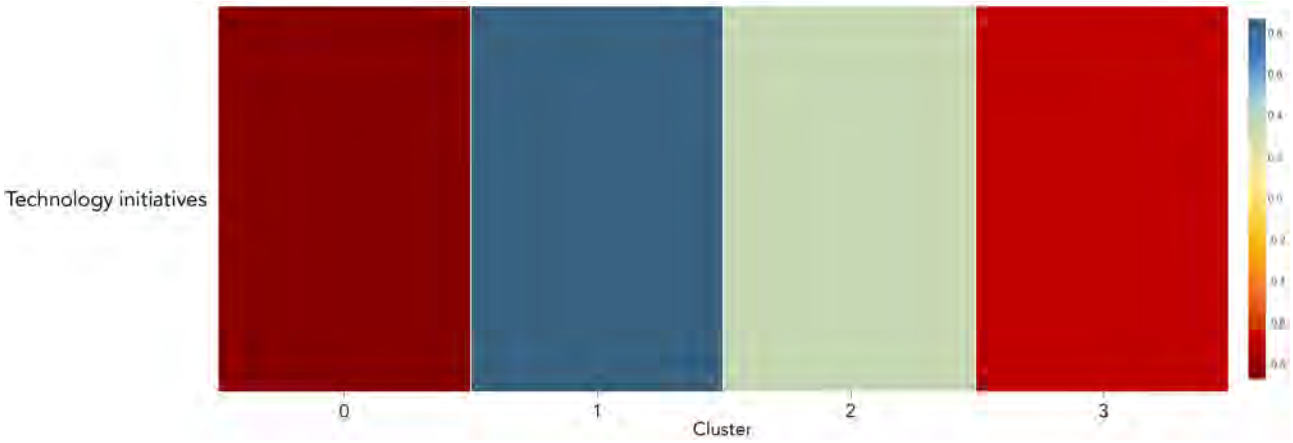
When applying K-means cluster analysis to Likert-scale data, the aim is to partition the responses into a pre-specified number of groups. Each cluster comprises responses that are alike, implying respondents within the same cluster share similar attitudes or perceptions. From this it is possible to produce profiles that enable a better understanding of the significance of different variables and, potentially, devise more targeted methods for overcoming major differences.

It is, of course, important to note that this analysis deals with a limited sample and any relationships between variables show only correlations between responses. They are not causal factors, and we cannot make any determinative statements on this basis. The value of this analysis lies in identifying patterns to provoke further investigation, corroborate other findings, and/or generate discussion.

The analysis identified four distinct clusters (0–3) which can be seen in five 'heatmaps' (Figures 3.10, 3.11, 3.15, 3.16, and 3.17). Note that the charts show only selected variables and technologies to simplify the visual presentation.

The heatmaps range from deep blue (positive correlation) to deep red (negative correlation) with clusters shown vertically and variables presented horizontally. For example, on Figure 3.10, blue indicates a higher likelihood of agreement, whereas red indicates a lower likelihood of agreement with the statement(s).

FIGURE 3.11: Involvement in New Technology Initiatives



Cautious appraisers and digital sceptics are both extremely unlikely to be involved, at present, with a technology initiative related to AI and ML, Big Data, IoT, VR/AR, Simulations / Digital Twins, Autonomous systems / computer vision, advanced robotics, Blockchain, or Other connectivity / network technologies.

Digital Optimists are the most likely to have implemented such technologies and modest adopters are likely to be in the process of implementing or trialling new technologies.

In general, digital optimists and digital sceptics reflect the most divergent groups, where levels of trust, implementation and confidence are at opposing ends of the scale.

Leadership is paramount

Like digital sceptics, cautious appraisers represent a group of respondents that are significantly less likely to be involved in technology initiatives. What distinguishes this group is more likely to be a lack of organisational leadership and governance around digital and data. Modest adopters, by contrast, are more likely to express confidence in the levels of leadership at their organisation.

Digital optimists, on the other hand, are the most likely to agree that the accountancy profession has successfully adapted to digital disruption and that they have confidence in reviewing a business case for adopting new technologies. On top of having the highest level of involvement in technology initiatives, respondents within this cluster are more likely than average to believe that their organisation has clear digital leadership, effective data governance, and to reflect a sense of personal confidence in their own competency and skills. The fact that agreement across these variables coincides with a much higher likelihood of having implemented technology initiatives is also significant. While none of these factors can be presented as necessary prerequisites to innovation they can reasonably be considered as important features when comparing clusters.

Both digital sceptics and cautious appraisers express low levels of confidence on both fronts. Digital sceptics present a directly opposing perspective. These respondents have low levels of organisational involvement in technology initiatives low levels of both personal confidence as well as confidence in their organisation's leadership and data governance capabilities. They are significantly less likely to agree that artificial intelligence offers some benefits or demonstrate a level of trust in these technologies.

This group represents a preference towards business-as-usual. While they do not display heightened levels of concern related to the impact of technologies on the complexity of accounting processes or on job security, their position is defined by a broad sense of pessimism towards the benefits of data or new tech capabilities. The question for this group is the extent to which there might be a relationship between the low levels of personal confidence and the low levels of organisational leadership and governance around data and digital transformation.

Cautious appraisers are also the most likely to identify concerns around a lack of technical leadership (Figure 3.10) highlighting the importance of technical capabilities alongside more general leadership skills.

Indeed, in roundtable discussions and in the survey results, the subject of leadership proved to be significant. But while leadership is generally considered to be a cornerstone of successful innovation it remains quite amorphous as a concept when applied to digital transformation.

At its core, discussions around digital leadership revolved around fostering a culture of innovation, encouraging continuous learning, and being open to change. As such, alongside ownership it is a diffused practice that unites different teams and roles under an overarching strategic vision. This can inspire the confidence to embrace new tools and methodologies, such as AI and advanced analytics, which can dramatically transform processes.

Proficiency with new technologies may be a boon but not necessarily a pre-requisite.

Perhaps most importantly, digital leadership means recognising that technology is not just a matter of systems and processes, but also requires empowering teams to develop skills and adapt to new ways of working.

Almost half of our survey respondents believe that their organisation has clear leadership / ownership of digital transformation initiatives. The same number either disagree or are neutral on the statement, suggesting that there remains room for clarity and improvement within members' organisations (Figure 3.12).

Slightly more respondents agree that their organisation has established effective data governance principles, which are an important step towards proper risk management, compliance and responsible use (Figure 3.12).

As the cluster analysis demonstrates, it also turns out that these are highly significant features of innovative organisations, demonstrated by the correlation between these statements and members that are involved in the implementation of a new technology.

It is also interesting to note the significant number of respondents who believe that their organisation has clear leadership / ownership of digital transformation but do not report undertaking any initiatives. There may be a few explanations here. On the one hand, respondents may be involved in other initiatives related to unreferenced technologies. On the other hand, this may also reflect the ambiguity of terms associated with digital transformation and leadership. Digital transformation is itself an extremely broad topic that can denote a wide range of activities from digitisation to more transformative undertakings. Thus it may not always entail or require the adoption of the most advanced technologies and techniques. This observation likely also holds true for the establishment of data governance principles.

At the same time, it is clear from these charts (Figures 3.13 and 3.14) that, even for innovative organisations, data governance and leadership are still works in progress for a substantial proportion of respondents. While involvement in technology initiatives tends to coincide with higher levels of confidence on these organisational traits, it is not clear whether they precede or follow such activities. In practice, they most likely form necessary components of adoption plans.

FIGURE 3.12: Respondents' views on leadership and data governance in their organisations

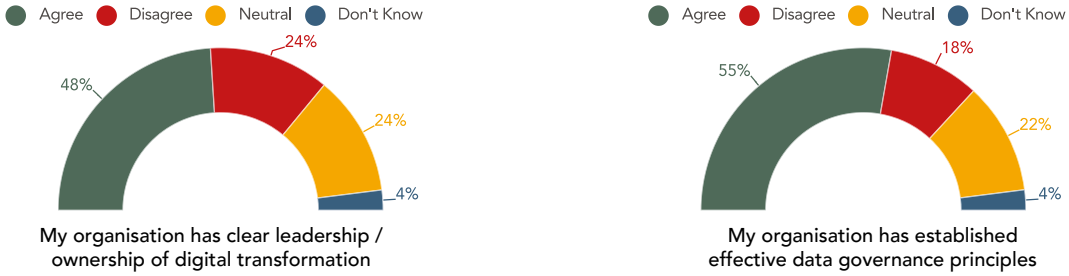


FIGURE 3.13: Agreement that 'my organisation has clear leadership/ownership of digital transformation', respondents split according to involvement in technology initiatives

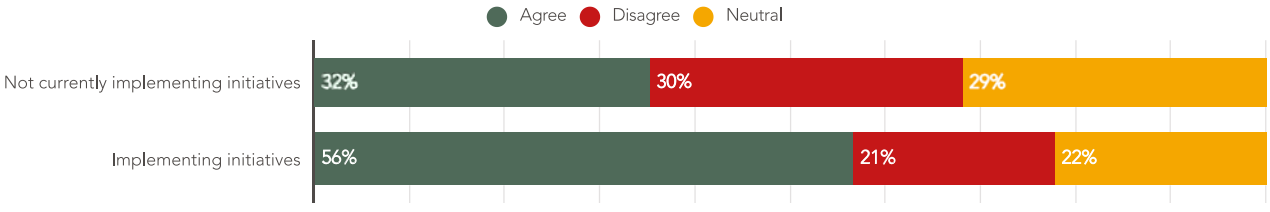
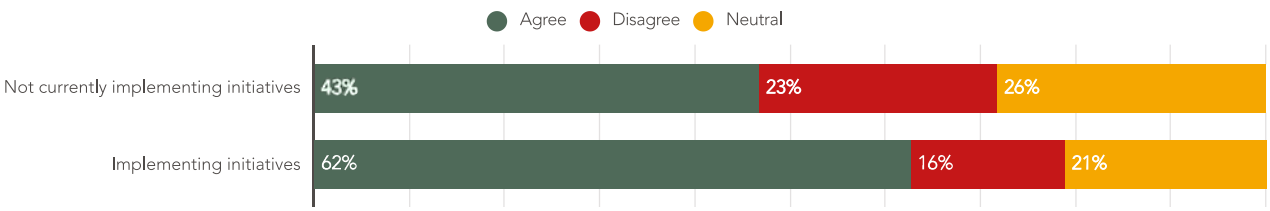


FIGURE 3.14: Agreement that 'my organisation has established effective data governance principles', respondents split according to involvement in technology initiatives



Looking towards the competitive environment

Moving back to the cluster analysis, it is notable that the two clusters most heavily involved in technology initiatives are also the most likely to link these directly to their competitive environment. Maintaining competitive advantage ranked sixth in the top technology-related objectives across the entire sample, but it appears to be much more significant for these two clusters (also Figure 3.15).

'AI – you can use it to improve your operations, but you could also change your business model and if you're not doing either and the rest of the landscape is, then suddenly you become non-competitive. You can't compete, because you're falling behind. It's so much more sensitive now than ever, I believe, to the external environment as opposed to internal efficiencies.'
UK Roundtable participant

In addition, modest adopters are much more likely to be looking at new technologies associated with enhancing customer and market insights. Both digital optimists and modest adopters display a more outward looking perspective on the benefits of technology potentially enabling a more strategic and wider set of uses. Nonetheless, that does not come at the expense of internal considerations. For example, cost savings are also highlighted as a key objective for modest adopters alongside skills development.

Naturally, this will exclude some groups for whom competitive pressures are less significant including those working in the public sector and academia. These respondents, where they are involved in technology initiatives may be more likely to prioritise alternative objectives such as better process / asset visibility, enhancing training / skills development, and/or cost savings.

FIGURE 3.15: Objectives for technology adoption according to different clusters

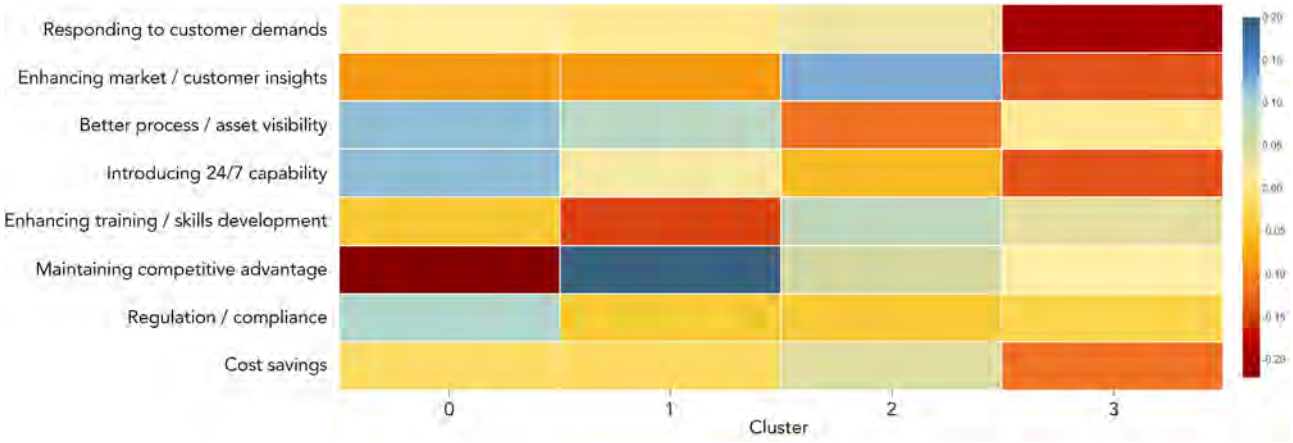


FIGURE 3.16: Maintaining competitive advantage as a top three objective when adopting technology, respondents split according to involvement in technology initiatives