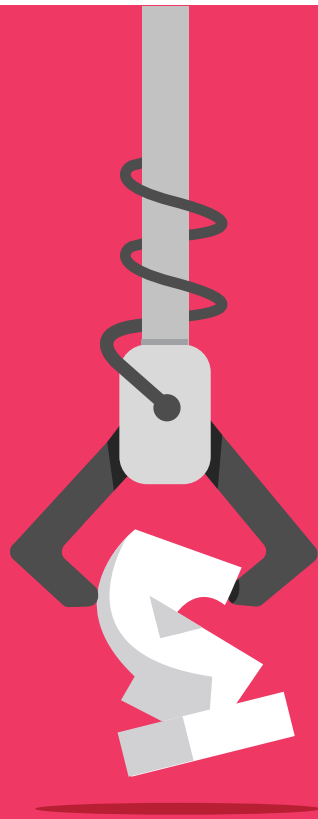# Confidence in the future

Human and machine collaboration in the audit

pwc

In 1997, the unthinkable happened. In the first defeat of its kind, reigning world chess champion Garry Kasparov was beaten by IBM's supercomputer Deep Blue. The defeat stunned the world – a machine had displayed intelligence rivalling the human brain and the game was forever changed. The idea of smart machines that could outperform us became a reality.

Twenty years later, organisations are exploring widespread uses of artificial intelligence (AI) and audit faces a game-changing moment of its own. Technology has already improved insights and audit quality. Now, smart machines give us the potential to completely redefine the audit.

That's a good thing. To remain useful, audit has to evolve so investors and other stakeholders can look to it for confidence. When companies fail, confidence takes a knock and stakeholders question whether the audit is fit for purpose. To address these concerns, stakeholders are calling for an audit which gives more meaningful insight beyond the historic 'pass/fail' provided within the auditor's report. By embracing emerging technology, auditors can address this.
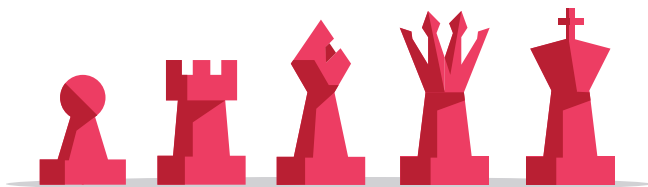
Four decades ago the extent of human and machine collaboration in the audit was confined to the use of calculators. Future uses of technology in the audit promise to be transformative. Experts speak of a time when AI will be capable of auditing 100% of a company's financial transactions.

This would go a long way to addressing the expectation gap in the audit, providing reassurance far beyond sample-based testing. Or the day when technology enables auditing that is a continuous and real-time process, not a prolonged 'look back' requiring large teams of auditors.

So what role do we see technology playing in the audit of the future? And will humans become superfluous to the audit process, replaced by intelligent machines?

We tackle these questions in this, the first in our *Confidence in the future* series. We'll look at how auditors are experimenting with automation today before looking ahead to imagine how emerging technologies will enhance the audit in the next few years. And finally, we'll explain what role we play in delivering the audit of the future.

Advances in automation

Machines, robots and AI-powered systems are rapidly learning to carry out tasks traditionally done by people across a range of industries, with recent projections indicating a more rapid pace of change over the next decade.

Our recent analysis suggests that up to 30% of UK jobs could be at high risk of automation by the early 2030s, with the risks highest in sectors such as transportation and storage (56%), manufacturing (46%) and wholesale and retail (44%)[1].

Robots offer massive savings on manual labour costs and time spent training staff. They can work longer hours whilst requiring minimal supervision. Their margin for error is also significantly lower, increasing efficiency and reducing waste.

The professions aren't immune to this disruption. A 'robo-lawyer' recently overturned 160,000 parking tickets, and is now providing advice to asylum seekers. And late last year, the world's first robotic operation inside the eye was conducted.

Surgeons used a joystick and touchscreen outside the eye to control the robot whilst monitoring progress through an operating microscope, and were able to remove a membrane growing on the surface of the patient's retina only 100th of a millimetre thick. Impressive stuff, and far beyond the physiological limits of the human hand alone.

1 PwC UK Economic Outlook March 2017

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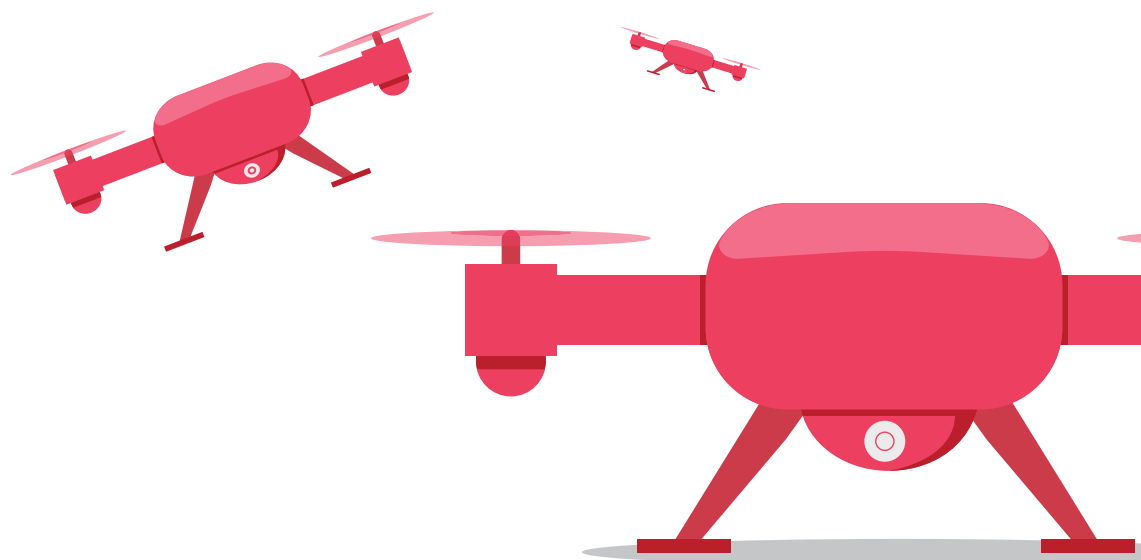
What does this mean for audit?

In the audit profession automation is making audits faster, smarter and reducing the risk of error.

PwC's Aura auditing system is a good example. Aura is used by every auditor in PwC's network to capture and integrate audit activities. It provides a single source of information for each of our audits and ensures that everyone works to the same methodology. It facilitates central monitoring of progress and quality in real time, driving improvements in audit quality.

Detailed transaction testing is another area where automation has been a game-changer. In the past, to audit the millions of entries on the purchase ledger of a large company, an auditor would start by choosing a statistically valid sample (let's say that's 60). For each of those 60 transactions, they'd have to check whether that purchase was properly authorised, whether the cash actually went out of the bank account (so that's 60 copies of bank statements to find), and check that whatever was bought actually arrived – so they'd also be looking for 60 different goods received notes. That'd have been two weeks' work, minimum, to examine a tiny slice of the transactions on the ledger.

Our big data analysis tool, Halo, allows us to move away from a sample testing approach to an evaluation of an entire population of transactions. Halo can check the characteristics of millions of entries in an instant, immediately flagging any exceptions. It then lets us visualise the data in lots of different ways – by supplier, by transaction date, by amount for example – increasing the chance that the auditor will spot unusual items or trends. All of that takes a fraction of the time spent previously – much more assurance, much less human effort.

The use of drones in the audit is also bringing efficiencies. We're exploring the use of drones in stock counts of capital assets to save our auditors having to physically travel to locations. But this is only the beginning. Drones can be applied to a number of industries, such as mining. Open-cast mines can cover several square kilometres, and auditors may need to assess the physical state of the mines. In a similar fashion to how they check stock counts, drones can be used to quickly map the area, make reports, monitor work progress and so on. And all without having to travel into the mine, saving time and avoiding safety hazards.

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Assurance and emerging technologies

Let's look at a few more emerging technologies and their potential to impact the audit.

AI-enhanced machine learning

Artificial intelligence is an area that's exploded in interest over the past few years. The current form of AI is often described as 'narrow AI', created to focus on a narrow task within certain programmable parameters. Narrow AI is used in predictive analytics, to analyse large data sets and in recommendation engines like Google to assess past searches and websites visited to make your results more useful to you.

The hope is that one day we'll be able to create AI that's on a par with our own minds – able to think for itself, display emotional intelligence, even, perhaps have a sense of humour.

The AI-enhanced audit

Although in its infancy, AI is already being used to make the audit process better. We're using AI to spot patterns and anomalies in large bodies of structured data. Any problems identified are recognised and remembered by the machine, which then 'learns' from its experiences and applies the learning to the next set of data.

Our colleagues in the US have just developed a great application for this. Say we're auditing company A, and we need to do an analytical review of its performance. A machine searches the web and generates a peer group of companies for company A. It then calculates and plots a series of ratios over time for company A and the peer group – for example, asset turnover, debtors days and so on.
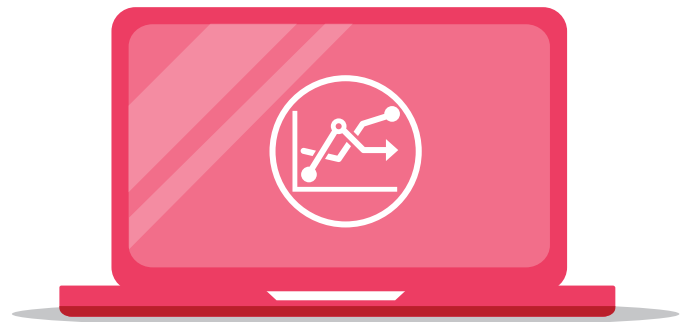
The machine is then pre-programmed to identify unusual trends, for example if company A was way out of line with the peer group benchmarks on a particular point. This data is then shared with the audit team, who can decide whether that variance is really an anomaly and if so, what caused it.

The team's decision about the anomaly and its cause is then fed back to the machine, which is 'taught' how to respond to similar relationships in future. And the more this exercise is carried out, the better the machine will get at spotting real anomalies – meaning we'll be better able to identify unusual patterns and anomalies in huge amounts of data in an instant. This could help tackle the expectation gap that surrounds the auditor's ability to detect fraud.

Auditors have limited, clearly defined responsibilities for detecting fraud. Yet public reaction to high profile corporate fraud shows that expectations of auditors extend beyond this. There can be huge disappointment in the minds of the general public, whenever there's any kind of fraudulent activity – where were the auditors?

With new methods of data analysis, you can easily imagine teaching a machine to look out for accounting fraud, beginning by showing it large data sets where fraud had been committed and therefore helping it learn what patterns to spot. However, just as AI is constantly evolving, so are the methods used to commit fraud. We must ensure that the technology we use does not fall behind.

Natural language generation and processing

In the past, a big advantage that humans had over machines rested on our ability to speak and read "natural language". That was way too complex for any machine to do at the level of even a young child. That's changing. Intelligent machines can now analyse and translate a vast amount of structured data into a plain English summary.

The technology is already used in financial services firms to analyse emails to spot illegal activity. It could be applied to corporate reporting: a machine could take general ledgers, sub-ledgers and other accounting records to write a summary that gives a balanced view of a company's performance. Right now auditors need to consider whether narrative reporting is "fair, balanced and understandable", but perhaps in the future we'll embrace the neutral commentary produced by an unbiased machine.

We're also using natural language processing technology to help analyse complex and lengthy contracts. A machine can scan a 100 page contract in seconds, looking for words and phrases that might indicate a difficult revenue recognition decision, for example. In the past, a human auditor with a very quick reading speed would have taken at least 4 hours to complete the same exercise.

Virtual reality

Virtual Reality (VR), amongst other popular uses such as in the growing video game industry, is used by the military to prepare troops for combat situations. Undeniably less hair raising, but why couldn't VR also be used to train auditors by dropping them into a simulation of day-to-day audit situations, maybe a stock count highlighting potential red flags?

Using the vast amounts of data we capture in the audit process, we could then use VR to help companies visualise the data in new, more illuminating ways. There may come a time when auditors can walk businesses through a virtual map of company data, manipulating it Minority Report-style as they go.
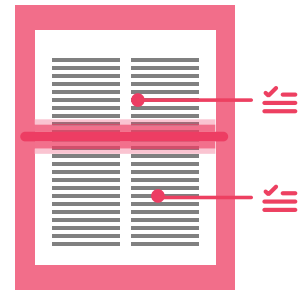
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Augment or replace?

Cheaper to employ, never tiring, rarely (if ever) making mistakes. By operating within a clear set of programmable parameters and relying on logic, machines give much greater comfort when processing data. But someone will always be needed to programme the machine, guide the AI and offer experience as the basis from which they can learn.

Human auditors won't be replaced by machines, but they will be enhanced by them. If machines can do jobs faster, and better, let's use them. Let's allow them to carry out the time consuming, lower judgement, repeatable elements of the audit, the data extraction and analysis of financial information which used to take weeks, recognising that the machines will deliver a higher quality and quicker analysis of high volumes of data.

The human auditor can then bring his or her creativity and experience to interpreting the data, presenting deeper insight to businesses and their key stakeholders. And of course, taking advantage of machine learning, these new insights can be fed back to the machine, meaning that the machine-led analysis will be even stronger next time.

It sounds straightforward but we mustn't oversimplify. Audit is more than analysing and validating the financials – it's also about being embedded within a company, understanding the culture, drawing on experience and instinct to identify areas of concern. This intuitive element of the audit is an essential human factor, and brings us to the next point – judgement.
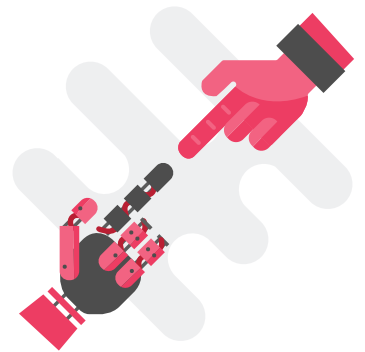
Human auditors won't be replaced by machines, they will be enhanced by them.

Human judgement

Nobody can argue that the benefits of a quicker technology-enabled audit with less margin for error have their appeal. Nevertheless, the assurance auditors provide goes way beyond that provided by detailed testing and analysis. It comes from thought and judgement based on the results of that testing and analysis.

When anomalies are identified, someone needs to decide the consequence – a systemic issue or a one-off? Corporate reporting is an art, not a science – how should the intricacies of a company's performance be properly reflected in an Annual Report? The debates which resolve these questions can be stressful, and the answers are rarely obvious. Tough conversations may be needed and finely balanced judgements taken about "how much is enough?". An auditor needs to be able to identify these issues – but also raise and resolve them in the right way, using all of their emotional intelligence in the process.

The capital markets don't need a strictly-AI auditor to distribute binary conclusions in real-time with no thought about context or consequences – there could be investor panic, a run on shares, or even corporate failure.

We still need people in the audit because we need judgement, intuition, constructive dialogue and courage. As long as our machine friends are unable to replicate these, auditors will be needed.

The auditor of the future

Auditors shouldn't stay still when the prize for all, brought about by technology, is an altogether better audit. Human judgement and responsibility will and must remain at its heart. But just as we have abandoned our calculators, we must expect to adapt for a future where we no longer spend time analysing financial data and performing detailed tests of transactions. Instead we will need to check the algorithms and parameters set for the artificially intelligent machines responsible for that work, and use intuition and judgment to reach conclusions.

Dealing with all this emerging tech will require training and a new set of skills. Where audit firms have traditionally employed people from a financial analysis background, now we'll also need data technicians and AI engineering skills, and perhaps also psychologists and behavioural specialists.

The auditor of the future will still be a person – but supported by colleagues and machines with a whole new range of capabilities. The audit is changing and we must too.

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