



# Artificial intelligence: the evolution of financial advice



Altus  
Consulting

CLEAR THINKING FOR FINANCIAL SERVICES

# About us



Altus Consulting is a specialist provider of consultancy services to the Financial Services sector.

We help clients achieve propositional and operational excellence and improved returns via a combination of proven industry models, technology expertise and market insight.

For more details of these services please visit our website [altus.co.uk](http://altus.co.uk) or contact us on 01225 438 000.



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# The end of the world as we know it?

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Humans control the planet. Not because we're the strongest, the biggest, or the fastest, but because we're the most intelligent. But when we're no longer the smartest, and machines evolve quicker than we can – what then? And how long will it take before machines supersede human intelligence?

More progress has been achieved in developing artificial intelligence (AI) in the past five years than in the previous five decades.

Today, billions of US\$ are being invested as organisations realise that the 'winners' in AI will be the winners overall. And the rest will be 'losers', fighting for scraps.

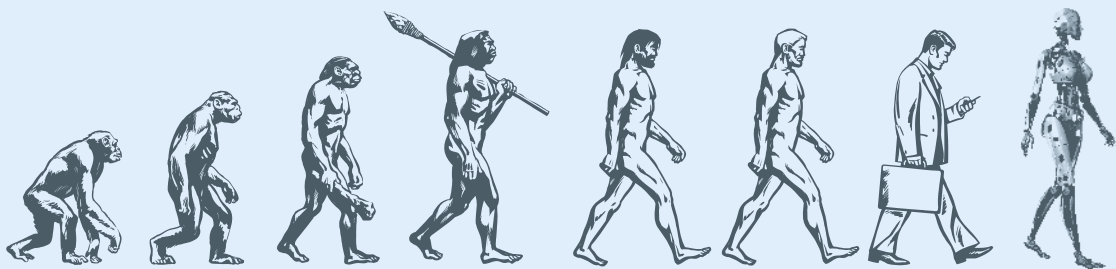
Yet while it's a topic being discussed around almost every boardroom table [and if it's not, perhaps it's time to replace the CEO?], there is also an extremely influential and powerful body warning us of the dangers.

Stephen Hawkins, the British physicist, cosmologist, author and a Director of Research at Cambridge University, is on record saying that while the potential benefits are huge, if AI develops on its own (super-intelligent AI), "humans, who are limited by slow biological evolution, couldn't compete, and would be superseded."<sup>1</sup>

And Elon Musk, the entrepreneur and CEO of Tesla, SpaceX and co-chair of OpenAI, who has personally invested US\$ millions on AI projects 'to keep an eye on what's going on', is a strong critic of unregulated AI, and argues that "if you're not concerned about AI safety, you should be".<sup>2</sup>

**"It is not the strongest species that survive, nor the most intelligent, but the ones most responsive to change."**

Leon C. Megginson, paraphrasing Charles Darwin, 1963



<sup>1</sup> Stephen Hawkins, BBC interview, December, 2014

<sup>2</sup> Elon Musk tweet, 12th August, 2017

Meanwhile, global experts<sup>3</sup> predict that AI will outperform people across a whole range of activities over the next 30 years or so:

- Translating languages (2024)
- Writing essays (2026)
- Driving a lorry (2027)
- Working in retail (2031)
- Writing a best-selling book (2049)
- Working as a surgeon (2053)

Whilst, in truth, no one knows this for certain, there is even a prediction that AI could outperform humans in all tasks and activities, and automate almost all human jobs, by 2040.

In this doomsday scenario, humans become increasingly irrelevant. The key, of course, is to ensure that before we reach this position, the goals of any super-intelligent AI are aligned to ours!

But. And it's a big but. There is a massive difference between Artificial *Narrow* Intelligence, where machines are designed to perform a narrow task (such as playing chess or recognising a face), and Artificial *General* Intelligence, where the machine would outperform humans at nearly every cognitive task.

Our view is that such a scenario is still many decades away. This paper sets out to separate the fact from the fiction, the reality from the hype, and address some of the key questions currently being asked by our retail and corporate clients:

- What *is* artificial intelligence?
- Is artificial intelligence an opportunity or a threat?
- Can artificial intelligence really deliver financial advice?
- What could the future look like?
- Who are the likely winners and losers?

Let's start with the terminology – what is artificial intelligence? – and a brief history from the early days of Alan Turing<sup>4</sup> to where we are today.

**“If you don’t have an AI strategy, you are going to die in the world that’s coming.”**

Devin Wenig, CEO, eBay



<sup>3</sup> Study conducted by the Future of Humanity Institute at the University of Oxford and the Department of Political Science at Yale University, May 2017

<sup>4</sup> Alan Turing, 1912-54, an English mathematician, logician, cryptanalyst, philosopher, and theoretical biologist, and now referred to as the founder of computer science

# What is artificial intelligence?

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## Terminology

Artificial intelligence is a branch of computer science that aims to create ‘intelligent’ machines that teach themselves. It is a broad topic, and has two notable sub-categories – machine learning and deep learning. The illustration below explains the simple relationship between each of these categories.

**Artificial intelligence** is a broad subject that covers any technique which enables technology to mimic human intelligence using logic<sup>5</sup>. Much of it involves a significant amount of ‘number crunching’ to make better predictions than a human, while some organisations stretch the definition to include

pre-canned decision trees (where there is no actual ‘intelligence’ – artificial or otherwise – involved).

Altus would argue that the ability to ‘learn’ is crucial, and this is the key element of the two sub-categories within AI, Machine learning and Deep learning.

**Machine learning** is a subset of AI that enables technology to improve tasks, such as making a prediction, based on experience (i.e. analysing the data). Rather than being ‘coded’ to do a task, the machine is ‘fed’ with a large data set and algorithms that give it “the ability to learn without being explicitly programmed”<sup>6</sup>.

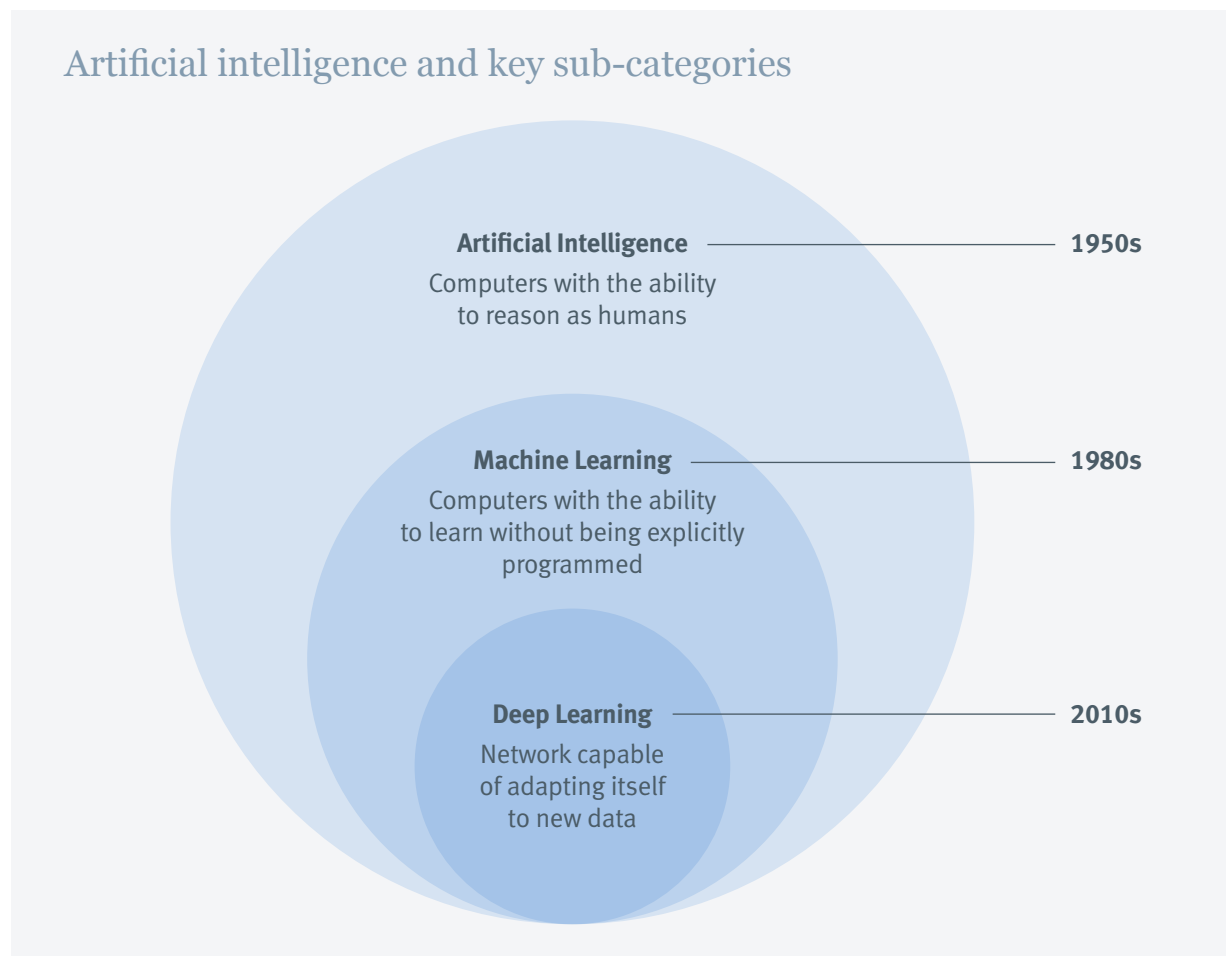


Figure 1: Source: Forbes, December, 2016

<sup>5</sup> According to Alan Turing, “artificial intelligence is usually defined as the science of making computers do things that require intelligence when done by humans,” (source: AlanTuring.net)

<sup>6</sup> Arthur Samuel, 1959, one of the pioneers of machine learning

## Adoption of technology in the US (1900 to the present)

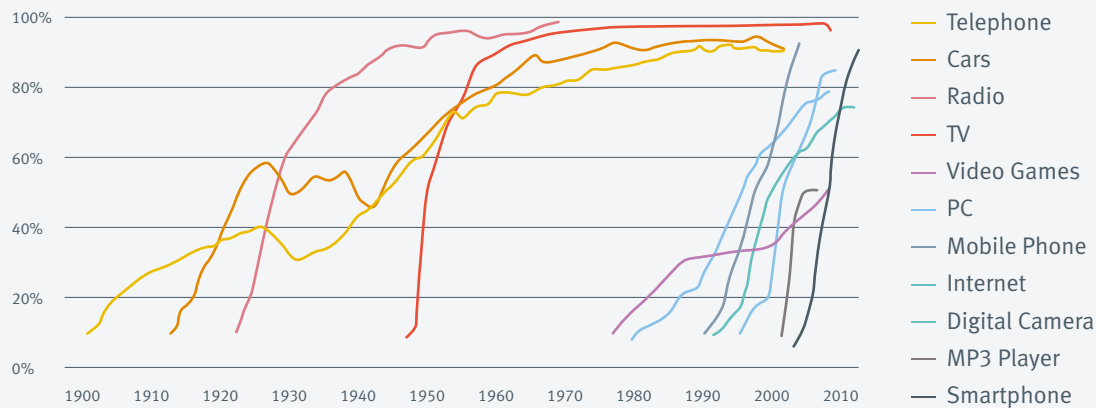


Figure 2: Source: Blackrock (adapted)

**Deep learning** is a subset of machine learning, which uses several layers of neural networks (algorithms that mimic the human brain). Here the computer software is able to ‘train’ itself to perform tasks based on classifying various data including images, sound and text. IBM Watson is the best-known example of this, while the latest developments in preventative healthcare and autonomous cars (e.g. for disease detection and collision avoidance) are all underpinned with deep-learning capabilities.

Many of the applications developed to date in AI and its subsets have concentrated in three core fields:

1. **Number crunching** – business intelligence, search recommendations, forecasting
2. **Vision** – collision avoidance, warehouse ‘pick and place’ robots, healthcare diagnostics
3. **Natural Language Processing** – chatbots, text analytics, media content creation, smart home voice interfaces such as Alexa.

Going forwards, it is the nations and the organisations which have machine learning and deep learning at the very core of their DNA which will be the winners.

## The speed of technology adoption

Significant developments over the past century or more (see Figure 2 above) illustrate that technological progress and adoption does not occur linearly but does so exponentially, and critically, the time to mass adoption is getting ever faster.

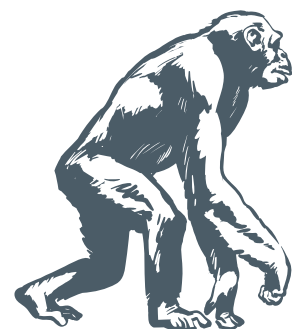
When we consider the development of AI, it has been over 60 years in the making but the emergence of AI as a real threat to the superiority of humans has only really happened in the past decade. The next decade will likely witness the greatest technological revolution in history.

Three factors are driving this power shift:

1. Progress with machine-learning algorithms and deep learning techniques and tools
2. Exponential increases in computing capacity at exponentially lower cost, and accessible through the cloud
3. The generation of huge amounts of variable data (e.g. text, images, videos) that can be used to ‘train’ machines.

**“The science of making computers do things that require intelligence when done by humans.”**

Alan Turing, the founder of computer science



# Global investment in artificial intelligence

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## China: the one to watch

AI-backed capabilities are being developed in preparation for roll-out in other markets around the world

## Exponential global AI investment and research driving success

Data Giants such as Microsoft, Google, Facebook, and Amazon in the US, and Alibaba, Tencent and Baidu in China, along with many others, are now spending \$multi-billions in AI research and investment; IBM alone has spent in excess of \$15 bn on Watson.

Looking East to Asia, China is now the second-largest investor in AI enterprises after the US and has ambitions to be the global leader in the field by 2030. The Chinese government announced a scheme in July 2017 to surpass all Western nations and shape the future of AI, and to build an AI industry worth \$150 bn.<sup>7</sup> While acknowledging that the US currently has better scientists doing AI research, Chan Ka-keung, adjunct professor of finance at the Hong Kong University of Science and Technology, believes that in the union of AI and fintech “China is leading the way and will continue to do so in the future.”<sup>8</sup>

## UK: AI leader or AI laggard?

Despite the ambitious plans from global powers, the UK has also set out its vision to become the best place in the world for businesses developing and deploying AI to start, grow and thrive. In October 2017, the UK government released an independent report<sup>9</sup> on the potential of AI, explaining how government, industry and academia should work together to keep the UK among the world leaders in AI, and stating that “increased use of Artificial Intelligence (AI) can bring major social and economic benefits to the UK.”

The report concludes that “AI offers massive gains in efficiency and performance to most or all industry sectors, from drug discovery to logistics... [and estimates] that AI could add an additional USD \$814 billion (£630bn) to the UK economy by 2035, increasing the annual growth rate of GVA<sup>10</sup> from 2.5 to 3.9%,” helping to offset the impact that demographic effects such as ageing and falling birth rates will have on labour supply, productivity growth and sustainable economic growth.

## Outsmarting the humans

Although AI is currently ‘narrow’ or specialised in what it can do, it does so with an expertise and proficiency that outsmarts most humans. Well-known successes from IBM’s investment include Deep Blue defeating the world chess champion in 1997, IBM Watson beating two human contestants on a tv quiz show in 2011, and more recently, Google Deepmind’s AlphaGo beating the South Korean Go Grand Master, Lee Sedol, in 2016, and the Chinese Go world number one, Ke Jie, in 2017, having taught itself how to play the game by playing thousands of practice games against versions of itself. The key insight here is that AlphaGo not only knew how to play the game as well as the very best humans, but it moved beyond that to a unique way of playing.

<sup>7</sup> Source: MIT Technology Review, 21st July, 2017

<sup>8</sup> Source: South China Morning Post, 28th October, 2017

<sup>9</sup> ‘Growing the artificial intelligence industry in the UK’, by Professor Dame Wendy Hall and Jérôme Pesenti

<sup>10</sup> GVA - Gross value added is a productivity metric that measures the contribution to an economy, producer, sector or region. Gross value added provides a dollar value for the amount of goods and services that have been produced, less the cost of all inputs and raw materials that are directly attributable to that.



**“No computer will ever beat me.”**

Gary Kasparov, World Chess Champion, 1985

In 2017, AlphaGo Zero took this a step further and learned to play Go from scratch, without any human training data whatsoever... and beat the original

version of AlphaGo! And towards the end of the year, a further version of the algorithm – AlphaZero – not only mastered Go, but also chess and shogi, “making moves that surprised even the most experienced Go players, motivating players to learn from AlphaGo and adjusting their own play style accordingly.”<sup>11</sup>

Now imagine a similar AI initiative outsmarting the best tax experts, accountants, or financial advisers and planners?

### The Ultimate Go Challenge – 26 May 2017



AlphaGo 🏆

vs



Team China

**Result: W + Res**

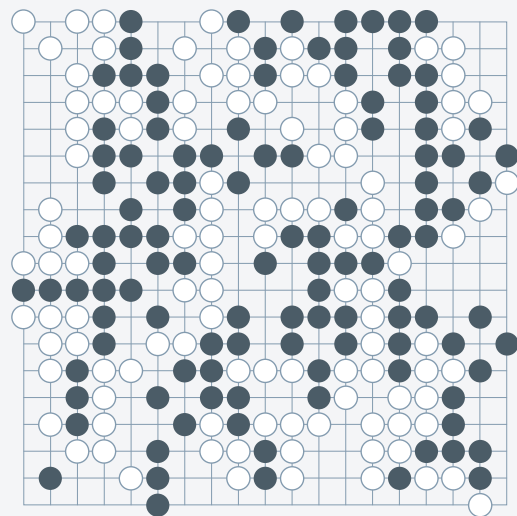


Figure 3: DeepMind’s AlphaGo system outsmarting the humans



<sup>11</sup> Source: WildML, Denny Britz, 31st December, 2017

# Financial services: joining the party

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## Disruption through innovation

In the broader financial services sector we are already witnessing an increasing number of examples of demonstrable AI activity and success:

- JP Morgan has replaced lawyers with an AI-based system COIN (Contract Intelligence) to review commercial loan agreements, saving 360,000 human hours each year, while its bots now handle 1.7m access requests, doing the work of 140 people
- Lemonade (the GI disruptor) can settle insurance claims in seconds via its claims bot, AI Jim, supporting the human claims team
- American Express' latest version of its chatbot for Facebook Messenger can help customers choose which credit card to apply for
- Bank of America's Erica chatbot is being trained to provide recommendations to help customers save more or pay down debt
- RegTech providers (such as Model Office UK) are helping organisations reduce the army of governance individuals covering compliance, risk, audit, and legal.

**Change – or disruption –  
in business tends to come  
from the outside.**

Meanwhile, in the investment space, AI – and more specifically, machine learning – is also transforming how investment decisions are made:

- the hedge funds Renaissance Technologies, WorldQuant and Man Group all use AI to outsmart the market and deliver better returns to investors
- Blackrock laid off a number of portfolio managers and stock managers in 2017, replacing them with robotic stock pickers
- many digital ('robo') advisers across the globe use algorithms to drive investment decisions and reduce costs, while some (such as Wealth Wizards in the UK) are now focussed on the actual financial advice process.

## A winning formula

The industries that have benefitted the most from machine learning have not succeeded by dipping a cautious toe in the water, aiming to make small, incremental efficiency gains; they have succeeded by re-imagining key elements of the value chain and how different services can be delivered. Think of Amazon's 'robot' warehouses or new retail 'self-serve' shopping experiences, or Tesla, Google and others developing autonomous vehicles.

Change – or disruption – in business tends to come from the outside, and it is scientists, mathematicians and technologists, as well as the innovators, the creatives and the artists, who have the ambitions to disrupt the financial services sector.

# Machine learning: opportunity or threat?

Imagine being a financial planner aided by machine-learning algorithms that equal the intellectual brainpower of 1,000 or more Oxbridge graduates?

## AI today – hype or reality?

The reality today is that while an increasing number of websites and online propositions now offer the customer the opportunity to chat with a ‘customer support representative’, in many cases this is a rudimentary AI that amounts to little more than a pre-programmed automated ‘bot responder’, and certainly not the equivalent of an Oxbridge graduate able to respond to any question! This can be hugely frustrating for the customer, and actually does more harm than good to the brand – it certainly doesn’t pass the Turing Test<sup>12</sup>.

## A tepid response: a scarcity of AI specialists

In UK financial services to date, and in particular in private banking, retail wealth, life and pensions, and corporate employee benefits, uptake and development of AI solutions has been tepid at best. Many reasons can be put forward: a focus on MiFID2, GDPR and other critical regulatory demands; the lack of time to define a strategy for AI adoption; the difficult integration with legacy systems; even a ‘wait and see’ approach to identify where success (and failure) is most likely.

Most significant though is the cross-industry lack of required skills and knowledge to work with this new technology, or understand how best to use it. Because although AI dates back to the 1950s, machine learning has only recently become a mainstream computer science topic, meaning that globally (let alone the UK) there is only a finite (and relatively small) number of experts in the field<sup>13</sup>.

**“If I had asked people what they wanted, they would have said faster horses.”**

Attributed to Henry Ford

Very few people have the imagination to ‘invent’ the future, which is why consumer research can only take us so far. Even the big tech companies don’t have all the ‘brain power’ in the AI space, though they are all agreed that machine learning is the future; which is why – over the past 5 years – the top 10 tech companies in the US by market cap have invested in 80 AI startups, and acquired 50 AI businesses, including those based in the UK (e.g. Google’s acquisition of UK start-up DeepMind in 2014 for £440m<sup>14</sup>), as well as raiding academia for the brightest AI brains.

Securing the best talent – data scientists, engineers, machine learning specialists, as well as roles not yet even thought of – and retraining existing employees will become the battleground of the best organisations over the next decade.

And in the wider marketplace, businesses will seek the support of third party experts to help select between technology vendors, while others will fail to harness the benefits that machine learning could bring them by significantly underestimating both the expertise and time it takes to properly engage and deploy.

<sup>12</sup> Turing Test – developed by Alan Turing in 1950 in his paper ‘Computing Machinery and Intelligence’, this is a test of a machine’s ability to generate human-like responses, such that a human cannot reliably distinguish between human and machine responses using text on a computer screen.

<sup>13</sup> Source: Element AI, an independent lab in Montreal, which believes that in the entire world, fewer than 10,000 people have the skills necessary to tackle serious artificial intelligence research.

<sup>14</sup> Source: BBC News, 27th January, 2014

## Impact of automation

While investment in machine learning brings many undoubted advantages, one of the greatest concerns is not the disaster movie ‘Terminator scenario’, or even AI super-intelligence, it’s simply the very real threat to people’s jobs and livelihoods, impacting the lives of billions of people.

Nearly all occupations will be affected by automation. Warehouse work, service jobs and general office work are already being transformed by AI, while in offices, for example, machine learning can now automate customer service, work through legal documents, write marketing copy, determine a person’s eligibility for a loan, even reduce the CEO’s data analytics workload. Front-end automation in restaurants and fast food retailers (like McDonalds) and self-pay cash desks (in supermarkets) are increasingly being introduced, while automation in factories has been the norm for decades. In 2016, Foxconn – the largest manufacturer of iPhones – laid off 60,000 employees, replacing them with industrial robots<sup>15</sup>.

But while some talk of termination – even Bank of England Chief Economist Andy Haldane talks of “up to 15 million jobs could be at risk of automation” in the UK alone<sup>16</sup> – the evidence from a number of organisations indicates that at least in the short term, robots will collaborate with humans rather than simply replace them. For example, Amazon already uses 45,000 robots in its warehouses, but has also created thousands of new jobs for humans across its business<sup>17</sup>. In service centres, workers who were formerly answering standard, conventional questions are now being redeployed to handle more complex issues and questions.

Despite the predictions of job losses, Altus research<sup>18</sup> found that only around 25% of people admitted to fearing they might lose their job in the wake of technological advancements. A generally positive outlook, or perhaps a lack of knowledge to make an informed opinion?

To develop AI and become a global leader, the UK will need a larger workforce with deep machine learning expertise, and more development of lower level skills to work with AI. Machine learning talent will be in high demand as corporations, large and small, compete for the best talent, and this demand will grow as machine learning is integrated into every industry.

Retraining employees to be able to meet the needs of an increasingly digital and AI-based workplace will become critical if businesses are to survive and prosper. Such complex transitions for workers will, of course, be unavoidable, as certain occupations diminish while others will grow, and different knowledge and skillsets will be required.

Wages will come under pressure where AI and automation can be readily adopted. The Institute for Public Policy Research (IPPR)<sup>19</sup> has warned that lower-skilled jobs are much more likely to be phased out in the coming decades, and only higher-skilled workers (who are capable of using advanced machines) and those with human skills which are difficult to automate – strategic planning, innovation and creativity, design, and story-telling – will be able to command better wages. In the absence of policy intervention, the report warns, “the most likely outcome of automation is an increase in the inequalities of wealth, income and power.”

<sup>15</sup> Source: BBC news, 25th May, 2016

<sup>16</sup> Speech to the TUC, November, 2015

<sup>17</sup> Source: Business Insider, 3rd January, 2017

<sup>18</sup> Altus consumer market research conducted by OnePoll, Q4 2017 (1000 adults, age bands from 24+, across socio-economic bands A, B, C1, C2)

<sup>19</sup> IPPR report, ‘Managing automation: Employment, inequality, and ethics in the digital age’, 28th December, 2017

A trustworthy brand and cyber security go hand-in-hand – over 80% of consumers stated they were ‘concerned’ about online security

## Trust issues, ethics and the cyber threat

But of course, not all AI challenges are skills and resources related. The UK government’s recent budget included a £75 million investment in both developing AI and managing the challenges around it. This investment will establish a new Centre for Data Ethics and Innovation to support safe and ethical innovation with AI, and facilitate data access through ‘data trusts’. Similar initiatives are being implemented in other countries, including Australia, France, China and the United States<sup>20</sup>.

Meanwhile, the ODI<sup>21</sup> is calling for an open approach to enable AI innovation in the UK to flourish; this includes open data, open source code and open culture. The ODI believes this is essential “because algorithms in autonomous and machine learning systems need large quantities of high-quality data to perform well. We must focus on making data openly available where possible, and in formats that are machine-readable. Increasing access to data is key to creating a competitive and equitable AI market, where innovation can flourish.”

While better access to data maximises its use and value, we must also implement controls that protect the privacy, interests and security of people, organisations and even nations. Not surprisingly over 80% of consumers expressed concern about cyber security<sup>22</sup>; most consumers realise that well-funded cybercriminals will never stop looking to exploit vulnerabilities in any new technology. As the number of connected devices continues to grow exponentially, so too does the potential opportunity for networks and systems to be breached, ransomware to be planted, or data to be stolen and abused. The constant enhancement of cybersecurity will be a never-ending task<sup>23</sup>, and machine-learning itself can have a role to play in this.

**“This job replacement is happening now, and it’s happening in a true, complete decimation.”**

Kai-Fu Lee, former head of Google research in China and top tech investor



<sup>20</sup> Olivier Thereaux, Head of Technology, Open Data Institute (ODI)

<sup>21</sup> The ODI – The Open Data Institute - an independent, non-profit, non-partisan company co-founded in 2012 by the inventor of the web Sir Tim Berners-Lee and AI expert Sir Nigel Shadbolt to address today’s global challenges using the web of data

<sup>22</sup> Altus consumer market research conducted by OnePoll, Q4 2017 (1000 adults, age bands from 24+, across socio-economic bands A, B, C1, C2)

<sup>23</sup> Source: Axis Communications, ‘The 10 technology trends that will shape 2018’, December 2017

## AI bias: “computer says no”

Another concern is the possibility that AI could make incorrect decisions that could have a real impact on people’s lives. Currently it is often almost impossible to determine *how* a neural network detects patterns or comes to any kind of decision. This means that bias may (unintentionally) exist, potentially impacting or even excluding different groups or segments of people, for instance based on socio-economics, demographics, and the like.

Or, as the ODI puts it, “the risk that blind faith in the superiority and efficiency of AI will end up crystallising data about the past and the present into future systemic unfairness by way of blatant logical fallacies”<sup>24</sup>.

**“The system will not only be able to give advice, but also clearly explain why it made the choices it did.”**

Wealth Wizards’ AI turo system

**Wealth Wizards**  
SMART PLATFORM

As banks and wealth firms start using machine learning for better customer insights, they will need to “train” their models on historical data. In the UK, for example, that legacy data is likely to be dominated by male, white, middle class investors, and any biases in that data set will potentially be reflected in the new AI models. This will lead to the wrong answers when current minority investing groups start representing an increasing proportion of new business. Specific machine learning capabilities will need to address this bias.

There are now a number of interesting efforts to design AI systems that are able to “explain” their inner working – in the same way as humans are able to explain their decisions – but in many cases these may take years to conclude, if ever.

The ground-breaking work that Wealth Wizards are now doing with turo, whereby the system will not only be able to give advice, but also clearly explain *why* it made the choices it did, is particularly exciting<sup>25</sup>.

<sup>24</sup> Source: The ODI, 20th December, 2017, referring to the views of Maciej Ceglowski, a Polish-American web developer, entrepreneur, speaker, and social critic, based in San Francisco, California

<sup>25</sup> Source: Altus interview with Peet Denny, Chief Technology Officer, Wealth Wizards, December, 2017

Meanwhile, the ODI has put forward two suggestions to capture the benefits of AI while mitigating the risks<sup>26</sup>:

1. Better access to data (i.e. making it as open as possible while protecting people's privacy, commercial confidentiality and national security) will unlock the potential of data-hungry machine learning systems, and is also a way to ensure that the systems we create are safe.

While progress will be tempered somewhat by GDPR, at least initially, the ODI ambition is clear, though note also the significant time and resource challenge of data labelling (some businesses outsource data labelling or use open source or crowdsourced pre-labelled data in order to train and tune the algorithm).

2. Create a data economy where rights and responsibilities are adequately distributed, and where more control over the usage and sharing of data is given to the individual. The challenge here is that algorithms often tend to use personal data as training sets.

The ability of AI algorithms to spot patterns also makes them very effective at re-identifying personal data in "anonymised" data sets, causing significant concerns about individual and group privacy.

More work is needed in this area to enable safe and effective access to personal data, including anonymisation and de-identification, and making data more accessible in a way that protects privacy while creating a fair market.



<sup>26</sup>The ODI, 'Using artificial intelligence and open data for innovation and accountability', December 2017



# AI-driven financial advice: fact or fiction?

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Imagine collecting the aggregate knowledge of the best 1000 financial planners in the world and programming it into a ‘digital adviser’. The combined super-knowledge and analytical capability would mean there was always an answer, regardless of how difficult or complex the problem – the AI would simply ‘work it out’.

Developing such a system – out of reach today – is now the dream of many organisations who have realised that those who are able to harness the power of machine learning will win.

Each financial services sector is applying AI differently, but each has the ambition of gaining competitive advantage in their specific market:

- insurance providers use AI in claims processing to streamline process flows and fight fraud
- banks use chatbots to improve customer experience
- wealth management digital (‘robo’) advisers are increasingly adopting rudimentary (and occasionally more complex) AI solutions.

## Getting personal – the race to win

Why the race to win? As well as crunching data, AI can also identify patterns in a user’s browsing and purchasing histories and proactively customise a solution – or package of solutions – to suit a customer’s needs perfectly (the ‘next best offer’). Deliver such personalisation, truly resonate with them, make them feel special, and you create not just a happy customer, but a loyal and retained customer who will recommend you to others. All while reducing costs.

## The Chinese Way

In China consumers are enthusiastically embracing new technology and are happy to share their personal data with trusted service partners. Ant Financial Services, which now runs the largest money fund – Ya’eobao – in the world, has made AI-powered technologies a key driver for expanding its businesses, improving customer service, detecting fraud and anticipating issues, while Tencent’s smart-connected and increasingly integrated digital platform, WeChat (see figure 4), is a good example of a platform-style marketplace proposition being adopted by millions of users.

Platform-style propositions – offering an increasingly personalised customer experience – are now also being developed in the UK. For example, Starling Bank’s new platform ‘marketplace’<sup>27</sup>, while still in its infancy, aims to benefit its customers with all that PSD2, Open Banking and smart-connectivity has to offer, as well as offering a really slick on-boarding process that takes just 5 minutes and incorporates clever use of biometrics to create a frictionless process.

Elsewhere collaboration between incumbents and innovative fintech disruptors is becoming increasingly commonplace – HSBC’s relationship with Bud (under the First Direct brand), Santander with online lender Kabbage, Experian with Runpath, Aviva with Wealthify and Blackrock with Scalable Capital are just a few examples amongst many others.

Successful adoption of innovative fintech – and machine learning specifically – in the UK Financial Services sector will of course significantly enhance performance, just as other industries have experienced transformation.

<sup>27</sup> Source: [Starlingbank.com/marketplace](https://starlingbank.com/marketplace)



## The WeChat platform universe - examples

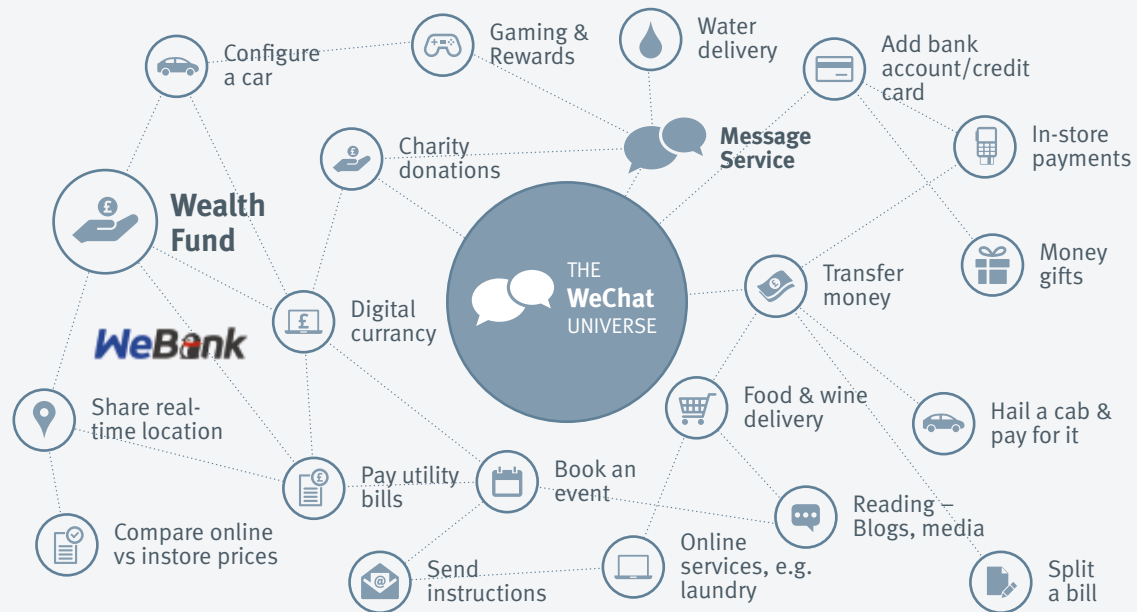
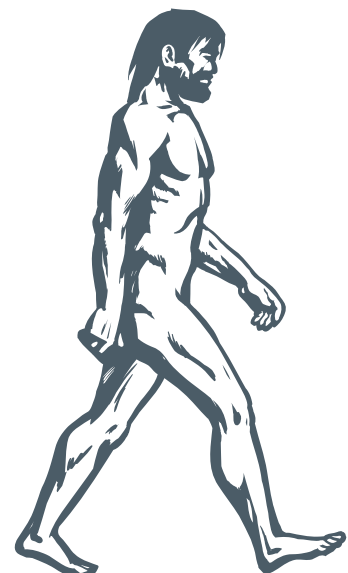


Figure 4: The increasingly smart-connected WeChat platform

With increasing pricing pressures right across the value chain, and the regulatory mountain of papers seemingly getting ever higher, a solution which promises instant processing of data, the ability to recognise and account for multiple variables, avoid human biases, and bring costs down is an enticing solution.

In the legal sector, businesses such as casetext are developing machine learning for advanced legal searches and to find case laws related to a particular brief. The same principles are already being applied to the UK's complex Financial Services regulatory system by businesses such as Waymark and Corlytics to speed the product development process and find anomalies in FCA regulation which can then be raised and resolved.



## Digital ('robo') advisers – disruptors or disrupted?

Based on client work, discussions with industry experts and our own research, Altus' view is that most organisations right across the wealth sector have developed, are now developing, or are at least considering, some type of digital advice proposition. Learning from the early digital-only pioneers, many of these propositions are now developing as a hybrid service, combining digital and human at different points in the process. This hybrid approach also enables these new services to lower both the amount needed to invest and the cost of advice (when compared to traditional human advice channels), making them accessible to all.

But while most propositions have focused on a standard rules-based re-work of the existing linear advice journey (frequently linked to just an investment wrapper), others are applying machine learning much more creatively.

For example, in the United States, Pefin claims to be the world's first AI financial adviser. The company charges 0.25% (the first \$5,000 (£3,700) is managed for free), has no minimum investment, and charges \$15 (£11) a month for financial advice. While that on its own is not dissimilar to some other 'robo' advisers around the globe, what sets Pefin apart is its ability to use:

- interactive chat to plan for life events
- machine learning<sup>28</sup> to create a financial plan, show customers if it is affordable, how they can save to achieve their goals, when they should repay debt, whether investing is appropriate, and if it is, how they should invest.

**“Pefin was built to make sure anyone could access true fiduciary advice – from planning and saving to investing, in a way that only acts in their best interest.”**

Ramya Joseph, Founder at Pefin



<sup>28</sup> The Pefin machine learning incorporates inflation, taxation, market conditions, and the customer's personal financial information, such as their credit card and current account details, their debt and any other investments

With between 2 and 5 five million data points for each user (including both market and personal spending behaviours and preferences), over time, Pefin ‘learns’ and updates the customer’s financial plan automatically, providing real-time advice while tailoring their investment portfolio to their needs.

Without human emotions and behavioural biases which typically impact investment decisions (and therefore returns), Pefin has created a compelling value proposition – a strategic plan to achieve long term personal goals.

Almost 80% of consumers said it was ‘important’ for them to recognise and trust the online brand

47% of consumers stated they are ‘comfortable’ investing online using an intelligent online money manager

Elsewhere in the US, large incumbent brands such as Vanguard and Fidelity continue to develop AI-based robo-advisers in the apparent ‘race to zero cost’. Such developments in the US, UK and elsewhere will put increasing pressures on the D2C ‘digital wealth’ linear investment journey ‘robos’ scrambling for new direct investors but without a formalised B2B(2C) strategy. We expect a number of them to either be acquired (like Wealthify), pivot their business model (as MoneyFarm, Moola, Nutmeg and Scalable Capital have done) or quietly disappear when the funding runs out.

Altus consumer research<sup>29</sup> confirms this thinking: whilst 47% of people advised that they would be ‘comfortable’ to use an ‘intelligent’ online money manager, over 80% of these said they’d want the service to take into account their wider financial position, meaning that Pefin-equivalent propositions in the UK will be well-placed, particularly when brought to market by recognised and trusted brands (important to almost 80% of the consumers researched).



<sup>29</sup> Altus consumer market research conducted by OnePoll, Q4 2017 (1000 adults, age bands from 24+, across socio-economic bands A, B, C1, C2)

## The rise and rise of the ‘robo’

In the UK a real focus for an increasing number of firms is to develop AI-powered digital (‘robo’) advisers. In addition to mitigating the human biases of investing, ‘robo’ software also reduces the time and costs associated with investing, as investment, management and advice fees decrease when automated planners assist or replace human advisers.

Many financial services organisations today claim to use AI to improve their processes and outcomes for customers. In Altus’ experience, whilst this may be the case in some instances, there is also a significant amount of hype. In our view, a pre-coded simple decision tree that underpins a very narrow digital (robo)-advice journey, for example, is not really AI at all, certainly doesn’t utilise machine learning, is not ground-breaking, and will look a pale imitation when compared to those organisations which are harnessing the power of what more advanced machine learning can really do.

Even where the solutions do employ genuine AI, the underlying systems are generally provided as ‘black boxes’, where potential B2B partners (or investors) have no knowledge of their internal workings, making it difficult to evidence suitability. Recent advancements in machine learning in the digital advice sector aim to address this.

For example, Wealth Wizards is focusing its AI effort on some of the more complex areas of the financial planning process, including retirement planning and optimising income (and tax) in retirement<sup>30</sup>.

Previous implementations of machine learning to provide advice led to impressive results but were not useful in the regulated environment as they were not explainable (i.e. they operated as a black box where the team could ‘prove’ that the results were correct, but the system could not explain *why* it made those choices).

The team is confident that the investment in its new turo system (see the case study in the panel) will set the standard for others to follow in the increasingly competitive B2B / B2B2C digital advice sector.

Having researched and studied the UK digital advice sector for more than five years, Altus is convinced that it will be the confluence of machine learning with data, analytics, low cost computing power, biometrics – and importantly, intelligent humans with a healthy disregard for the status quo – which will create real disruption. In the process they will make many of the much-hyped digital (‘robo’) advisers of today look like yesterday’s Sinclair ZX Spectrum.

<sup>30</sup> Source: Altus interview with Peet Denny, Chief Technology Officer, Wealth Wizards, December, 2017

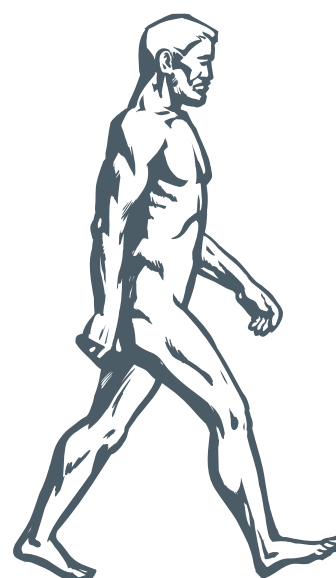
## Case Study: Wealth Wizards – investing in the future of AI-powered digital advice

- AI capability has grown from a small lab of three people working part time on chat bots and neural networks to a permanent cross-functional AI guild of twelve people
- The team reports it has discovered an innovative way of building new advice capabilities in a fraction of the time using machine learning
- This approach is being used to build advice product offerings across a broad range of financial areas during the course of 2018
- Their approach also makes it much simpler to ‘learn’ a new B2B partner’s advice philosophy and replicate it as part of the on-boarding process, allowing a much faster and cheaper take on

## Wealth Wizards

### SMART PLATFORM

- The team has ambitious plans, and in 2018 its machine learning adviser capability – turo – will:
  - conduct a fact find for most product sets using a natural language interface
  - build out its anomaly detection system to spot deviations in responses
  - not only be able to give advice, but will also clearly explain *why* it made the choices it did
  - support increasingly complex interactions through Alexa
  - even take a CII examination



# Financial advice future gazing

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There is no part of our lives that won't be directly impacted by AI – or more specifically, machine learning – developments; every app, application and service will incorporate AI at some level. While we won't notice the changes day-to-day, our dependence on machine learning will increase at exponential rates<sup>31</sup> – it will make everything run better, faster and at reduced cost. Over time a number of key themes will develop which are underpinned by the increasing sophistication of machine learning.

## The augmented financial planner

In the short-term we can expect to see firms use AI (in its broadest sense) more often to make very specific (narrow) decisions, taking the repetitive nature out of jobs, and adding intelligence and insight to complement human thinking. And while AI (and automation) will replace some jobs, it's important to remember that in the short-term at least, collaboration between human and digital will be key: this technology will augment human jobs, instead of replacing them.

Just as the best chess in the world is now played by humans and AIs working together as a team, rather than human vs digital, the same will be true of advice, and some organisations have expressed their vision to develop their AI capability into a fully qualified financial planner. As Peet Denny, CTO of Wealth Wizards, points out, “some parts of the advice process can be mathematically proven, others require a large amount of memorisation or calculation. AI will handle these aspects, leaving the more interesting and subtler edge cases to be handled by the human adviser.”<sup>32</sup>

**“The best chess player in the world is not a human, or a computer, it's a human and computer playing together.”**

Don Scuerman, CTO, Pegasystems

<sup>31</sup> Source: Ray Kurzweil, Google's guru of AI and futurism

<sup>32</sup> Source: Altus interview with Peet Denny, Chief Technology Officer, Wealth Wizards, December, 2017

Fintech creates efficiencies for advisers. The AI-augmented human adviser will be able to handle a much larger number of cases in this way, and will spend more time focused on engagement and growth, and be exposed to and practicing the interesting and challenging parts of the advice journey, improving their skills at a faster rate.

From a customer perspective, their interactions with human advisers will be much softer, while also being more accurate and far faster. Denny's vision is for the advice process to take minutes, not days or weeks.

The customer will spend most of their time talking about their dreams and goals, their needs, their wants, their fears, while the 'hard facts' will be collected by an AI-powered robo-paraplanner authorised by the customer to collect all of the pertinent details from one of the data aggregators such as Moneyhub or Moneyinfo. Another benefit of the hybrid approach is the reassurance that human interaction can provide.

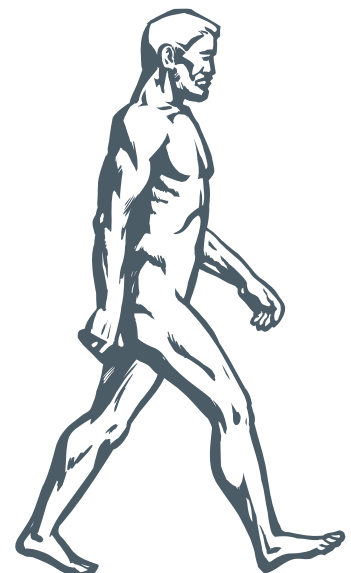
Altus research<sup>33</sup> clearly demonstrates customers' desire to be able to contact a human via phone or webchat either during or after they had made the decision to invest in a digital ('robo') adviser – important to 80% of customers.

80% want to deal with a person too, not just a robot

**“If you’re going to take bold bets, they’re going to be experiments. And if they’re experiments, you don’t know ahead of time if they’re going to work. Experiments are by their very nature prone to failure. But a few big successes compensate for dozens and dozens of things that didn’t work.”**

Jeff Bezos, CEO, Amazon

**amazon.com**<sup>®</sup>



<sup>33</sup> Altus consumer market research conducted by OnePoll, Q4 2017 (1000 adults, age bands from 24+, across socio-economic bands A, B, C1, C2)

## Re-imagining the customer experience – the smart-connected digital platform

More broadly, global smart-connected digital consumer platforms – think Facebook, Amazon, Alibaba, WeChat – will become ever more sophisticated. A range of businesses will co-exist on the platform and easily, seamlessly exchange information. The technical infrastructure of these ecosystems will be ahead of the curve, supported by both well-established technology providers and new market disruptors.

PSD2 and Open Banking has provided a real ‘break through’ for similar platform-type propositions in the UK – albeit on a much smaller scale. The major banks, as well as the smaller challenger banks, employee benefit providers and other major brands and affinity groups, will be in a strong position to optimise the opportunities that these regulatory developments will bring, creating modern, client- (rather than product-) centred solutions. Many procedures will become simple and automated as businesses work hard to redesign the service to eliminate friction, making it valuable for customers.

We can expect personal financial management tools where the financial planning AI – with unrestricted access to all financial data – considers a client’s entire personal financial situation: how they manage their money, their savings and spending habits, their behaviours and so on to consider alternate *what if* scenarios in real time, recommend changes for improving their financial wellness. This will take the user experience to the next level and increase the value of the service offered to users.

Put simply, the transition of the financial industry to an Open Banking model using smart-connected open APIs will require a complete rethink of the financial user experience. The winners will be those who utilise (and understand the customer benefit) of the wide range of technology developments, not just AI but Big Data, IoT, augmented reality, biometrics, 5G and so on.

For example, biometrics – providing accuracy, security, and ease of use – will consign PINs, passwords and security questions to the bin, while voice interfaces (Alexa, Siri, Cortana et al) will be incorporated more and more into the overall (increasingly personalised) customer experience, helping people manage their daily lives.

As consumers become more comfortable with voice-enabled technology (or even life-like avatars which understand facial expressions and gestures, and how a person is feeling based on their tone of voice, choice of words and facial expressions), their interactions with their smart device will become ever more natural, and they will begin using it for financial interactions.

Bots will be both a purely informational ‘voice assistant’ (“Hi Alexa, what’s the value of my ISA, please?”) and an increasingly sophisticated transactional concierge that proactively manages a customer’s money, assets and debts in the best way possible. These chatbot advisers – always on rather than session based – will emerge in the social media space where consumers feel most comfortable.<sup>34</sup>

Importantly, while the trend for using chatbot advisers is increasing (currently 18%<sup>35</sup>), uptake in this type of concierge technology will take some years before mass adoption in the UK.

<sup>34</sup> Chris Gledhill - CEO and Co-Founder at Secco

<sup>35</sup> Altus consumer market research conducted by OnePoll, Q4 2017 (1000 adults, age bands from 24+, across socio-economic bands A, B, C1, C2)



## How much of your total assets would you invest in a digital-adviser?

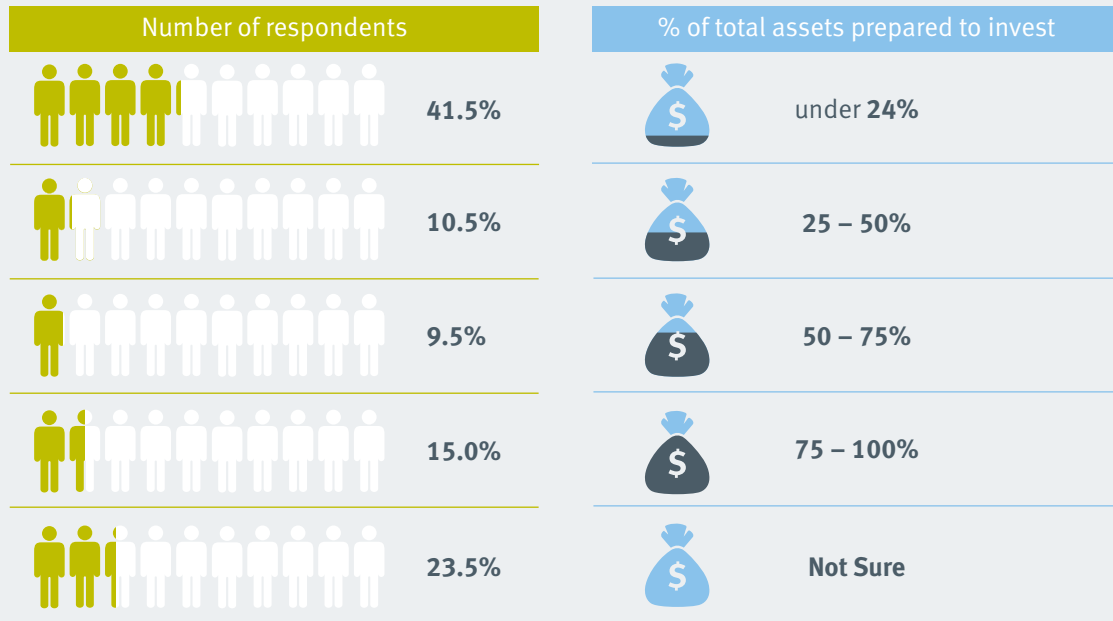


Figure 5: Attitude to investment via a digital advice service

While some consumers may choose to do this on their own, others will prefer the augmented human adviser plus digital approach, whether that be in reality or virtually. The most progressive advisory firms will look at how AI technology can extend their brand and reach among their ideal clients. This includes technologies that help advisers to communicate more efficiently and in a more targeted way, use social media to build engagement, and capture leads more effectively.

Whilst Altus consumer research indicates that individuals are still reluctant to commit a large percentage of their portfolio to a digital advice proposition (see Figure 5), we expect the trend to go upwards as people begin to trust their ‘digital adviser’ more and more.



## Looking further out...

“Artificial General Intelligence (AGI) is the concept of human-level intelligence and cognitive abilities that can perform a broad range of tasks and apply that knowledge to solve unfamiliar problems without being trained to do so.”<sup>36</sup>

While some industry commentators warn of the doomsday scenario of humans becoming irrelevant, an alternative viewpoint is that if the right government policies are put in place, “automation should enable us to work better, but less... [for example], redistribute the productivity gains in the form of a shorter working week.”<sup>37</sup>

A number of businesses now have AGI (to build machines with human-like intelligence) as their mission. But having witnessed such exponential change across all technology fields in the past ten years – including machine learning – making forecasts (and the timing of them) is almost impossible.

But imagine if Google’s DeepMind, the team behind AlphaGo and currently looking at healthcare, or IBM Watson perhaps, were to join forces with Experian or another major data provider in the UK and turn their focus (and incredibly deep pockets) to financial services?

The detailed financial picture of the user, compared with the behaviour patterns of millions of other customers, would allow the Data Giants to personalize the user experience.

They would be able to spend time modelling how customers might react to various scenarios, testing assumptions on a user’s “digital twin” to optimise the whole experience. This would provide users with the most suitable solution (including financial solutions) from the thousands available in the market – exactly when they really need it.

For financial advisers, working with machine learning to complement their own skills and knowledge will become the norm if they are to survive and thrive.

Leading experts across all industries are agreed that machine learning is the future. And whether that be simply increasing automation, or a human-robot hybrid (a chip in your brain rather than the terminator scenario, referred to as ‘the singularity’<sup>38</sup>) only time will tell.

<sup>36</sup> CB Insights

<sup>37</sup> CB Insights

<sup>38</sup> The Singularity – exponential change in human intellect occurs where the human brain is merged with machines.

# Conclusions

Media and research papers frequently make bold claims about AI or machine learning techniques solving human problems and beating human experts, or the dangers we face if progress is unchecked. There is always a lot of hype around anything connected with technological developments, and separating fact from fiction is not easy. With that in mind, we conclude with Altus' view on how the future might play out.

Whilst challenges will remain because of bias, privacy, trust, lack of trained staff, and regulatory concerns, we expect over the next decade the Data Giants (Apple, Amazon, Google, Alibaba, FaceBook, Tencent, etc.) to deliver the most disruptive force in the wealth and financial industry, with their breadth of proposition, agility, innovative capabilities, massive resources and deep wallets.

It is therefore critical that the traditional wealth industry – and even the fintech disruptors – really start to come up with answers to remain competitive, not least in the provision of wealth management services and digital advice. Companies have to create an AI advantage to survive. The Data Giants already know this; any business serious about its long term future needs to recognise this, too.

## The illusionists

Whilst some organisations will give the illusion of 'being busy' and consume their budgets by tinkering around the edges, guarding against cannibalisation, focusing on finding efficiencies, and 'playing' at AI, they won't deliver (or even experiment) with anything radical or "transformational". Some currently successful organisations will fail because they're afraid to hurt their core business.

**"The pace of progress in artificial intelligence (I'm *not* referring to narrow AI) is incredibly fast. Unless you have direct exposure to groups like DeepMind, you have no idea how fast – it is growing at a pace close to exponential."**

Elon Musk – entrepreneur, CEO of Tesla and SpaceX, and co-chair of OpenAI



The real deal

Others will use AI to augment business strategy and planning, using the power of data analytics and simulations to help provide answers to critical business questions (see Table 1).

“If we’re not making mistakes,  
we’re not trying hard enough,”

James Quincey, CEO of Coca-Cola



Table 1. Asking the right questions

1	Who are our customers, who should be our customers, and how do we deliver increased personalisation to them?
2	How are our customers and their needs, their attitudes and their behaviours changing?
3	What new markets do we want to enter?
4	In what existing markets can we maximise the opportunity, and which markets should we exit?
5	Where do we wish to increase productivity, cut costs, or derive new value? And how will we measure value?
6	What parts of our business processes are high volume and low margin?
7	What work or existing processes wastes time or frustrates our teams, our distributors or our customers?
8	Where could we score some ‘quick wins’, and where should we make our longer term, strategic bets aimed at growth, scalability, simplicity and future-looking business models?
9	Do we have the right knowledge and skillsets in-house, and if not, how will we manage this?
10	How will we measure value?

In a world of smart-connectivity, AI is the key to harnessing the power of data. Winning businesses recognise that AI is the key to a sustainable, long term future and will demonstrate a foresight and a willingness to respond – boldly – before it is obvious they have to do so. Even if it means that sometimes they get it wrong.

The successful firms in 10 years’ time will have made more right decisions than wrong, in part driven by a willingness to collaborate with the machine and recognise that artificial intelligence can help people make faster, better, and cheaper decisions – augmented intelligence – even whilst recognising that over time, deep learning AI will gradually replace humans across all industries and at all levels. The important step is to make decisions, continually learn, check back (see table 2), and go again.

**Table 2. The AI 10-point checklist**

1	Are you making sufficient investment in AI and data skills (e.g. STEM skills), as well as recognising the importance of problem-solving, interpersonal skills, creativity and the arts <sup>39</sup> ?
2	Which tasks or parts of processes will become automated?
3	What specific higher-value work will human workers assume?
4	Which skills are needed and how will you upskill workers or procure new talent?
5	Is the algorithm or solution unbiased?
6	Can you explain what it is doing in a way that businesspeople and other stakeholders can understand?
7	Can you assure and verify it is working how it should, every time, and prove the outcome is correct?
8	Do you have the right controls built in that address various stakeholder groups?
9	What moral or ethical considerations need to be addressed?
10	What's your responsibility if others use the output or solution unethically?

Transitions for people into new roles – requiring an often dramatically different skillset – will be a huge challenge. Some will get left behind – become unemployable – and the provision of a Universal Basic Income may become serious parliamentary debate in the future.

Others will rise to the challenge and re-train themselves, developing new skills and ways of thinking that can't as yet be automated – creativity, unpredictability, uniqueness.

The question that everyone should be asking themselves is: “How do I become ‘uncloneable’?”

AI has the potential to create a ‘winner takes all’ outcome; while some organisations will thrive and deliver vastly improved profits, others will be left behind and die.

Now is the time for C-suite leaders to create and shape the future, augmenting increasingly smart technologies with smart humans to truly compete.

### **Simon Bussy**

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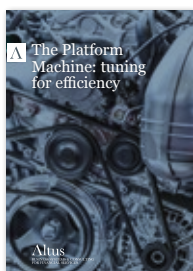
<sup>39</sup> Nesta research

# Altus white papers

With our focus firmly on the regulatory, strategic, propositional, operational and technological challenges our clients face, Altus understands the most pressing issues for financial services. We publish market insight, industry commentary and are at the forefront of industry debate.

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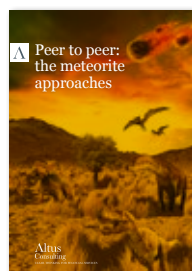
## TURNING SCALE INTO PROFIT



### The Platform Machine

‘The Platform Machine’ takes a good, hard look at the economics of the platform industry and asks “how do you turn scale into profit?”

## THE PORTABILITY CHALLENGE



### Peer to Peer

‘The meteorite approaches’ analyses what is happening with P2P and how traditional firms might evolve to benefit from the change rather than risk extinction.

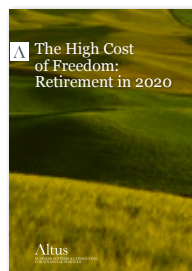
## REDEFINING THE CONSUMER



### Bringing in the Harvest

‘Bringing in the Harvest’ explores innovation in financial services and discusses how direct platform propositions will evolve in the future.

## MANAGING INDUSTRY CHANGE



### The High Cost of Freedom

‘The High Cost of Freedom’ examines the impact of the introduction of pension freedoms on the UK population.

## AUTOMATING ADVICE



### Rise of the Machines

‘Rise of the Machines’ explores the theme of robo-advice and looks past current implementations to the future of a smart-connected, personal financial management, well-being and lifestyle digital adviser.

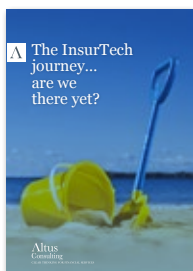
## DISSECTING INDUSTRY ISSUES



### The Lose-Lose Game

‘The Lose-Lose Game’ pulls apart the true cost of pension saving for vulnerable workers and questions the foresight of government policy.

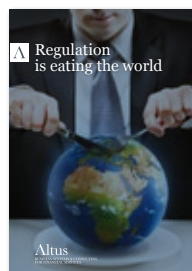
## INSURTECH



### The InsurTech Journey... are we there yet?

‘The InsurTech journey’ reviews the range of emergent trends in the insurance industry and predicts what the direction of travel means for the future.

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### Regulation is eating the world

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