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HOW AI WILL TRANSFORM INVESTMENT

A Funds Europe survey in partnership with Caceis



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GREAT MINDS

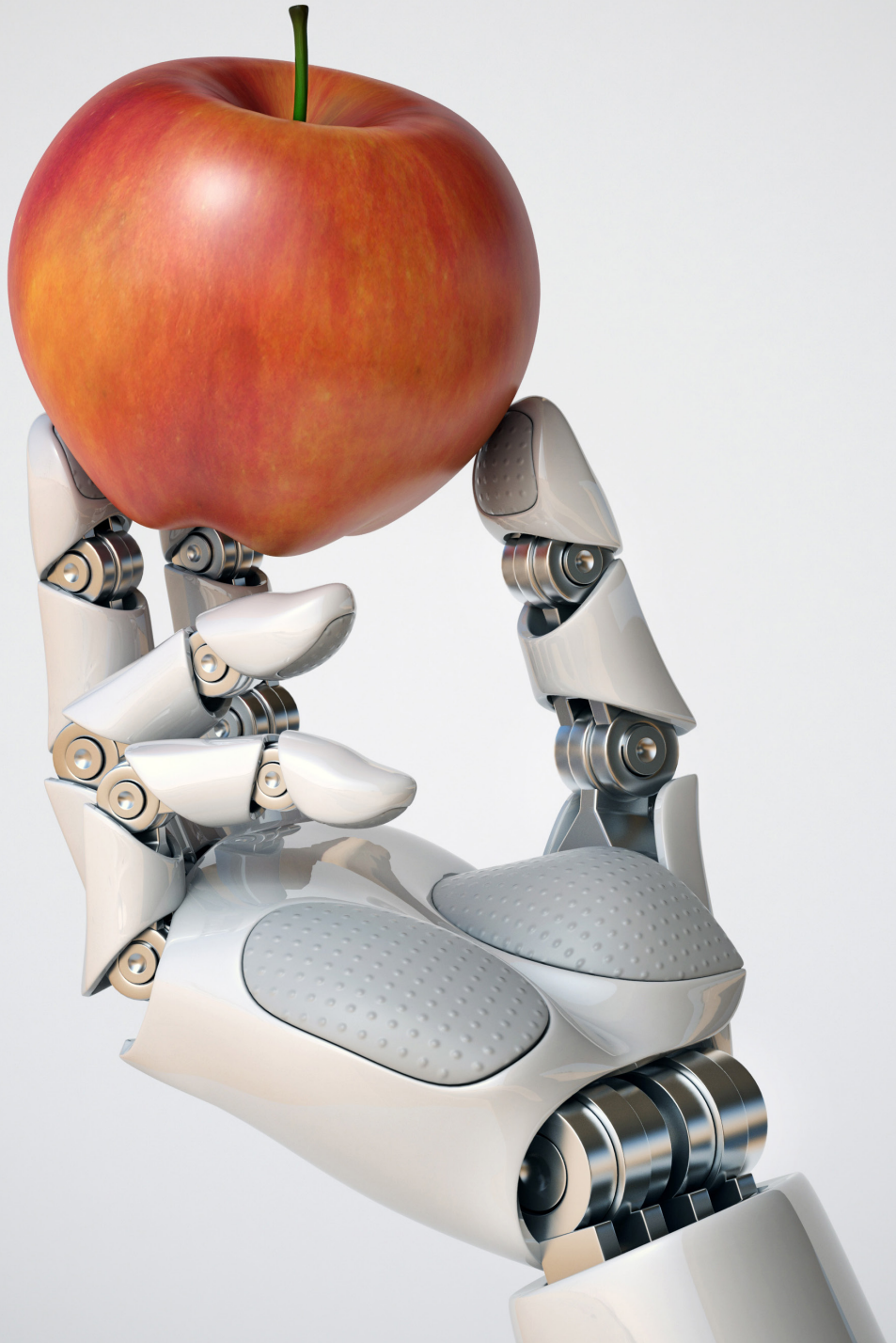
APPLYING ARTIFICIAL INTELLIGENCE TO ASSET MANAGEMENT

Highlights

Artificial intelligence is widely talked about in financial services. But, arguably, the industry still lags behind other sectors – particularly technology giants such as Amazon, Google, Netflix, Apple and Facebook – in putting artificial intelligence (AI) applications to work. *Funds Europe*, in association with Caceis, surveyed the industry to assess what the future holds for asset management firms intending to apply AI.

- 80% of respondents said that artificial intelligence and data engineering are tools that all investment managers will use in the future.
- 66% said that AI will deliver benefits across the front, middle and back office.
- The major impediments to applying AI are a lack of maturity in the technology and a lack of existing use cases that demonstrate how it can be applied.
- 24% said key decision-makers still fail to understand how AI will bring value to customers.
- 40% of respondent firms have already started their AI research and development projects, while 11% said that they will be launching their AI projects in the next 12 months.

A total of 270 funds professionals participated in the online survey. See 'survey methodology' (page 21) for more information.



FOOD FOR THOUGHT

HOW THE FINANCIAL SECTOR REALLY FEELS ABOUT AI

ARNAUD MISSET – CHIEF DIGITAL OFFICER, CACEIS GROUP

Digital is playing an increasingly important role in all our lives and especially in the finance industry. As a leading asset servicing company, we have a clear responsibility to leverage our industry knowledge and resources to ensure that the products we develop provide the sophistication, reliability and comfort needed for clients to entrust their business to us. Technology has always been central to this, and now, as artificial intelligence and advanced process automation techniques enter the mainstream, this has become a key focus for Caceis, and our shareholder, Crédit Agricole Group, with its “Le Village” technology incubation environment.

Whether we’re talking about robotic process analysis or machine learning, one thing that you can be sure of is that the technology is still in its infancy. There remains an enormous amount of work for those of us in the finance industry to do to harness its potential. However, despite the increases in speed, reliability and cost reductions these technologies offer, it is essential to step back for a second and understand the ethical considerations of this paradigm shift. What impact does this have on people’s jobs and on society in general?

At Caceis, we see AI not only providing material benefits that we can pass on to our clients, but also enabling us to free up staff from repetitive, low value-added tasks to positions that truly require human interaction, and in many cases, AI will not take over jobs but act as a valuable assistant or partner, augmenting our individual capabilities. This partnership approach is a core part of Caceis’ philosophy, whether we are researching industry topics with *Funds Europe*, as we are in this survey, or creating strong business relationships with our clients. Picking the right partner is key.

Humans have long attached

great value to intelligence, as the Latin representation of the human species as homo sapiens, or ‘wise man’, illustrates. This is reflected in a desire to understand the world and to train our actions so that we can be as effective as possible in

achieving our objectives.

AI as a discipline goes a little further than that: we attempt not only to understand the world and train our own actions, but also to build intelligent entities (or ‘agents’).

The intelligent (or ‘rational’) agent is central to the concept

of AI and its practical application.

An agent is something that uses a sensor to perceive an environment and an actuator to act or respond. For a human agent, the sensors may be its eyes, ears, touch or taste, and the actuators may be its voice, hand or foot.

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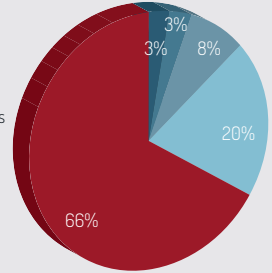
For a robotic agent, the sensor may be a camera or a range finder and the actuator may be a kinematic arm or a motor.

For a software agent, the sensor may be a keyboard, joystick or voice-recognition system and the actuator may be the hardware to write to a file or to send network packets to an internet address.


An intelligent agent is one that selects the 'best' action from the range available. In AI speak, the experts tell us that

1. WHEN PEOPLE TALK ABOUT AI, WHAT DO THEY MEAN?


- The use of automated processes
- The use of robotics
- The use of algorithms
- The use of self-learning computers
- A combination of these themes



TRAINING THE INTELLIGENT AGENT



In an intelligent agent's world, it has a **state** (imagine it is at square c4 on a chess board, for example) and a range of possible **actions** (such as moving one square in any direction). By applying a reward (+10) when it achieves a desirable outcome (e.g. finding the pot of gold at square g7) and applying a penalty (-10) when it achieves a negative outcome (stepping on the bomb at square f5), we gradually train the agent to do a particular task (i.e. find the gold). Typically, we will apply a small penalty (-0.1) for each move the agent makes, to force it to complete the task as quickly as possible.



We run the model many times and ask the agent to choose the action from each state that delivers the highest reward. Although heavily simplified, this principle provides the foundation for various widely used AI algorithms.

"for each possible sequence of input events, the intelligent agent selects an action that is expected to maximise its performance measure, given the evidence that has been provided by the input sequence and whatever built-in knowledge that the agent has".

In simpler language, the intelligent agent assesses the available options and picks the best one, given its experience and knowledge of its surrounding environment.

Taking one step further, an intelligent agent is intelligent because it also has the ability to learn – to improve its performance over time.

One practical application of AI in asset management is in

"It is impossible for humans to fully grasp the scale of global data and the cross-relationships of such data... The industry is attempting to hastily perform a long-overdue paradigm shift, thinking 'Alexa' might be able to intelligently invest soon."

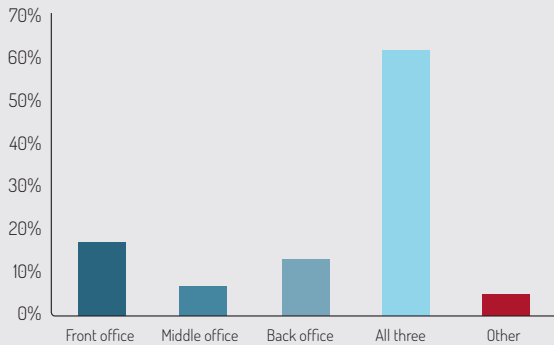
HELMUT PAULUS,
CEO, QUONIAM ASSET
MANAGEMENT

robotic process automation (RPA). This involves the use of robotics to process transactions, manipulate data and communicate with other digital systems. In practice, RPA uses software tools for repetitive processing and for completing standardised, low-complexity tasks without human involvement.

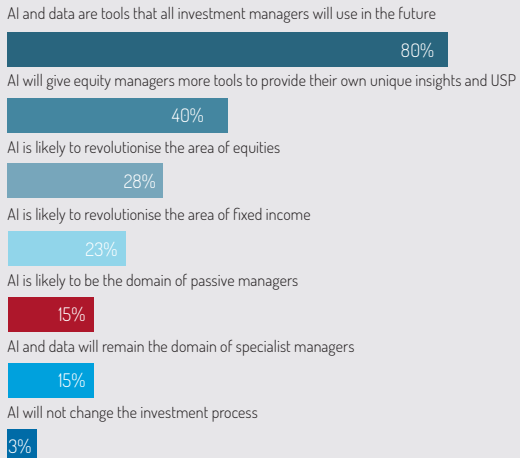
Natural language processing is the application of algorithmic models to analyse and understand human dialogue (written or spoken). Using this technique, the model will identify key terms from unstructured text. In the asset management industry, NLP is being applied in compliance software, for example, where it is used to identify keywords from unstructured text input and to populate this into structured data fields to enable audit, reconciliation and

“AN INTELLIGENT AGENT ASSESSES THE OPTIONS AND PICKS THE BEST.”

2. WHERE DO YOU THINK AI IS LIKELY TO HAVE THE GREATEST BENEFIT?



3. AS AI IS USED MORE WIDELY IN THE INVESTMENT PROCESS, WHICH OF THE FOLLOWING DO YOU AGREE WITH?



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reporting functions. In another situation, NLP may be used to populate fields in a smart contract to support trading or reconciliation conducted on a blockchain.

Robo-adviser models make use of a range of AI techniques to offer investment advice and portfolio monitoring. Typically, the investor completes an online survey, which is used to evaluate their risk profile and return expectations. An algorithmic model will then select an investment strategy that aligns with these criteria. Investors can monitor the performance of their investments via an online dashboard and apply portfolio

“ASSET MANAGERS ARE EXPERIMENTING WITH USING NLP TO PROCESS CLIENT QUERIES.”

balancing in line with changes in investment conditions or their wealth management targets.

To complement such a strategy, AI techniques may be used to provide automated customer credit evaluation and to set credit limits. These techniques have been applied

4. HOW DO YOU VIEW THE ROLE OF DATA IN THE FUNDS INDUSTRY?

Data is fast becoming a key investment tool

83%

The funds industry just does not understand data

25%

Data is really for compliance

20%

Data is all about back-office processing

20%

Data is something we outsource to the experts

9%

in a similar way by insurance companies for risk assessment and underwriting functions, providing guidance on the level of insurance cover that a customer should receive and the premium they should pay.

In customer service functions, asset managers are experimenting with using NLP and other AI techniques to process client queries. An intelligent agent may be used to interpret a standard client request such as updating their contact details or viewing their recent transaction history. If a request is more complex, the intelligent agent may refer this to the appropriate member of the customer service team for further action.

AI is also playing an important role in IT security and fraud detection. Usually this will involve running statistical analytics on input data to find patterns that lead to fraudulent activity (‘clustering’) and to identify users that present

“Deploying AI to optimise investment strategies is challenging. AlphaGo Zero had to play millions of games, sometimes winning, sometimes losing, before it became proficient. Replicating this training strategy with investment markets is almost inconceivable.”

JONATHAN HAMMOND,
PARTNER, CATALYST

the highest risk. Drawing on an intelligent agent's ability to learn, AI plays an important role in identifying new patterns of fraudulent activity as criminals become more creative, while also minimising disruption created by false alarms.

What is AI?

So far, we have provided a short overview of AI's foundations and how this is understood by the scientific community.

In our survey, we began by asking respondents what they understand by the term 'artificial intelligence' (fig 1, page 6). The most popular response (66%) was that AI is a portmanteau term that implies a combination of the use of automated

processes, use of algorithms and robotics, and use of self-learning computers. The most popular single answer was that AI implies the use of self-learning computers. This response aligns with the definition of AI that we advanced earlier, where we proposed that AI typically implies the use of an intelligent agent that will select actions designed to give the 'best' outcome, but will also have the ability to 'learn' and to improve its performance over time.

Most readers of this survey will be interested in AI for its practical applications – for the benefits this can deliver for their operational efficiency, business profitability and for the quality and range of services this can

"As traditional sources of differentiation become increasingly commoditised, AI has the ability to provide opportunities that extend far beyond cost-reduction and more efficient operations."

**KEITH PHILLIPS,
EXECUTIVE DIRECTOR, THE
INVESTMENT ASSOCIATION**

help deliver to customers.

To explore this further, we asked respondents where they expect AI to deliver greatest benefit for their business.

Two-thirds stated that the benefits of AI will not be limited to the front, middle or back office, but will be realised across each of these three areas of the investment value chain (fig 2, page 7). Many firms are seeking to apply AI to promote end-to-end automation across the investment life-cycle and this response aligns with that view.

From the remaining respondents, 18% indicated that the benefits of AI would be experienced predominantly in the front office, while 14% believed these would be primarily in the back office.

We already see examples of prototypes and implementation in each of these areas. In the front office, big data is being

5. WHERE IN YOUR ORGANISATION DOES DATA SIT? WHAT IS ITS PRIMARY FUNCTION?

Data is seen as a key investment research tool



We have a chief data officer responsible for all company data



Data is purely a back-office function



Data is seen as a marketing resource



Data management is an outsourced function

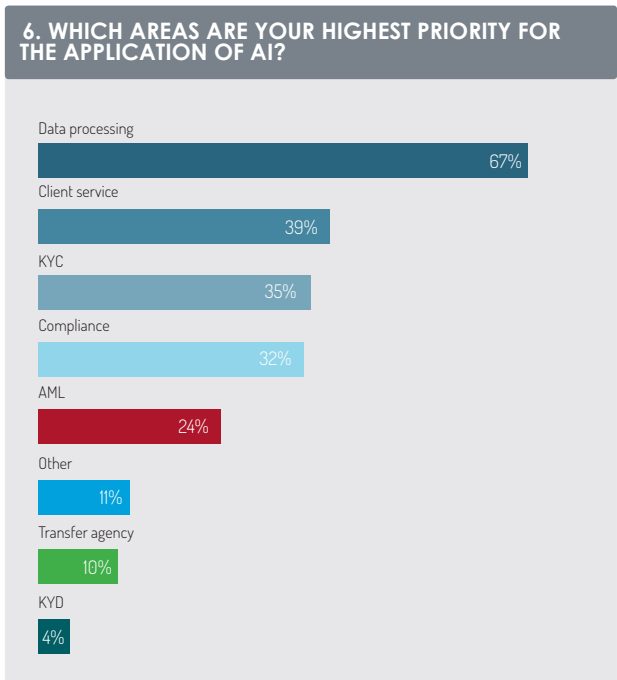


analysed to learn about the customer and their buying preferences. Predictive analytics may then be used to build a model portfolio, rather like Amazon or Netflix provide suggestions based on a customer's previous purchases. Investor preference data may also be used to classify investors into categories based on their risk appetite and required rate of return (automated segmentation analysis).

In the middle office, firms are experimenting with AI in NAV

“PREDICTIVE ANALYTICS MAY BE USED TO BUILD A MODEL PORTFOLIO, LIKE AMAZON PROVIDING SUGGESTIONS BASED ON OLD PURCHASES.”

calculation, bringing greater automation to NAV generation and reducing the time involved (i.e. targeting 60-min NAV and below). AI is being applied extensively in optimisation algorithms for liquidity and collateral management. Natural



language processing is being used for populating structured message fields from free text or for use in compliance checking (KYC, AML) and parallel regulatory technology applications.

In the back office, firms are exploring opportunities to apply AI to support smart contracting in transaction settlement (typically in combination with blockchain technology), along with prototypes to deliver automated income collection, corporate actions management,

client reporting and to automate simple client service queries.

AI and investment strategy

We moved on to focus on investment strategy, asking how the use of AI will affect the investment process and whether specific types of investment strategy will benefit from its application. Respondents were asked to select as many as three statements that they most agreed with from a list.

There was almost universal agreement that AI will change

“The sheer amount of data is both a curse and a blessing. Only those who have verifiable experience in digital or quantitative asset management will be able to reliably use the benefits of machine-learning technology.”

HELMUT PAULUS,
CEO, QUONIAM ASSET
MANAGEMENT

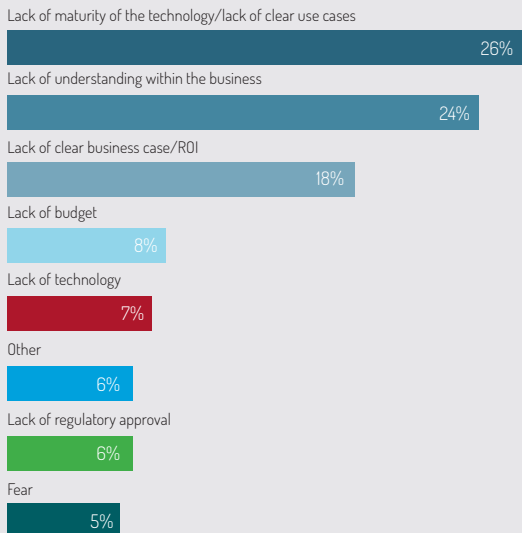
the investment process. Only 3% of respondents said that this would not be the case (fig 3, page 7). Meanwhile, 80% of respondents said AI and

data engineering will be tools that all investment managers will use in the future. They identified particular benefits for equity managers, indicating that the use of AI will provide actively managed equity teams with additional tools to bring their own unique insights to the investment process and differentiate themselves from competitors. Application of AI will also benefit fixed income managers (23%), although to a lesser extent than teams managing equity strategies.

“A BIG MAJORITY WISHED TO PERFORM THEIR DATA MANAGEMENT IN-HOUSE.”

Only 15% of respondents said that AI will be primarily the domain of passive managers. It will be interesting to watch this space, given that AI in robo-advisory applications may be well suited to some passive investment strategies.

7. WHAT DO YOU BELIEVE IS THE GREATEST CURRENT IMPEDIMENT TO THE USE OF AI INTERNALLY?



Examining the data

AI is a data-intensive discipline and relies on a high-quality data set to deliver effective results. To drive AI strategies, the algorithms will typically run initially on a 'training' data set which, as the name suggests, is used to train the model. That is how the model learns to recognise words and patterns in natural language processing algorithms, or facial recognition algorithms learn to distinguish a human face from other objects. The training data set tends to be the largest part of the overall data set, representing 75%-80% of the data for the project.

Having trained the model (and typically undergone additional

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validation checks), it is then applied to a 'test' data set and asked to make predictions. Here the model is being applied to real-world scenarios, to do the job it is created to do in an applied context.

In this AI world, data is air and water, essential nutrients that enable the intelligent agent to learn and to do its work. A large dataset is needed to train the AI model, to run the validation and testing. In this process, data quality is paramount. If the model is trained with poor-quality data, the predictive analytics it delivers will typically also be of poor quality.

In this section, we looked at the importance of data in driving investment strategy, operational processing and compliance. Again, respondents were asked

"Once trained and operational, not even the programmers of AIs are able to comprehend the strategies they are using. Explaining an AI's unusual investment decision, that may only pay off in many years, to a client or regulator would be challenging."

JONATHAN HAMMOND,
PARTNER, CATALYST

8. AI COULD BE APPLIED TO COMPLIANCE PROCEDURES LIKE KYC. WHAT IS THE GREATEST IMPEDIMENT TO DOING SO?

The industry is not good at sharing data

42%

Cyber-security concerns with cloud computing

25%

There are no suitable independent platforms

15%

The regulator will not approve

9%

Regulators do not like relying on other jurisdictions

8%

Paper is the only reliable resource

1%

to select statements they most agreed with from a list (choosing up to three).

Four-fifths of respondents confirmed the rising importance of data as an essential input to the investment process (fig 4, page 8). Given this importance to investment decision-making, it is significant that a large majority of respondents wished to perform their data management in-house. Only 9% indicated that data management was a function best outsourced to a third party.

In keeping with this answer, respondents were sceptical of the view that data is important just for compliance or for back-

office processing functions.

As many as a quarter of respondents indicated that the funds industry "just does not understand data". This is therefore a domain where research and education can offer major benefits.

What's the use?

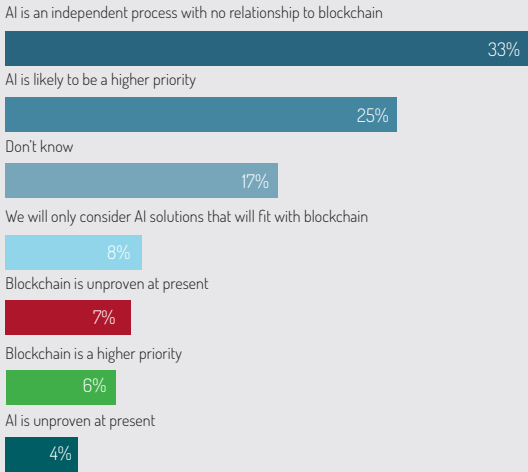
We moved on to ask respondents how data was used within their organisation (fig 5, page 9). Just over a third view data management primarily as a task to feed their investment research (34%). Some firms have established specialist data engineering and data science teams to manage their data

“ROBOTIC COGNITIVE AUTOMATION IS BEING USED TO ASSIST WITH DOCUMENTS.”

resources, overseen by a chief data officer (27%). A smaller number of firms view data management primarily as a back-office function (19%).

It is testament to the importance of data as a strategic asset that only 6% of respondents said that they had outsourced their data management to a third party. Many investment firms view data as a crucial input that can drive better investment decision-making, a deeper understanding of performance

9. HOW DO YOU SEE THE RELATIONSHIP BETWEEN AI AND BLOCKCHAIN?

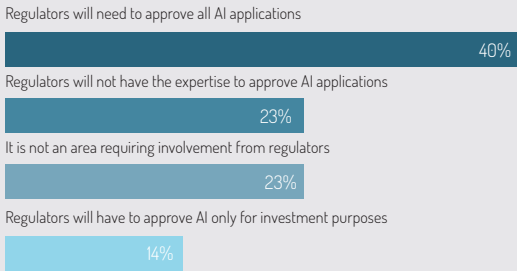


and risk, higher operational efficiency and potential automation across more stages of the investment life-cycle.

AI in practice

The next question asked respondents to specify which areas within their business are highest priority for the application of AI (fig 6, page 10). Given the importance of data as a strategic asset, it may come as little surprise that data processing was by far the most common answer (67%). This aligns with the strong movement towards use of data science, reinforcement learning and predictive analytics to support respondents’ investment strategies, performance and risk analysis,

10. REGULATORS MAY NEED TO APPROVE THE USE OF ANY NEW INNOVATION. HOW WILL THIS BE HANDLED?



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and reporting requirements.

Other priority areas for the application of AI were client service (39% of respondents), KYC (35%), compliance (32%) and AML (24%).

Each of these areas is seeing significant development activity from fintech firms and from their investment management or investment services partners. For example, robotic cognitive automation is being used to assist with document preparation and reconciliation – applying AI to populate structured message fields and to check consistency of documentation (to ensure, for example, that information in a Key Investor Information Document aligns with that in a fund prospectus). AI-based platforms are also being used to develop an automated service for AML, identity verification and enhanced due diligence.

For those that responded 'other', we asked them to specify areas within their organisations that are a priority for application of AI. The answers that we received include:

- Augmented investments.
- Any function where large complex documents or data sets can be interrogated (incorporating machine learning)

11. HOW WILL THE USE OF AI TIE IN WITH OTHER REGULATIONS SUCH AS GDPR, MIFID II AND UCITS V?

Don't know

36%

AI will need new legislation

29%

New approvals and amendments to existing legislation will be required

23%

AI is already covered by legislation in its current form

12%

12. WHERE DO YOU BELIEVE THE FUTURE AI SOLUTIONS FOR THE INDUSTRY WILL COME FROM?

They will come from small specialist fintech providers

40%

They will come from specialist asset management industry software providers

22%

They will come from the technology giants

16%

They will be developed in-house

13%

Other

5%

They will come from asset servicers

4%

for rules-based interpretation (e.g. fund prospectuses).

- Asset liability management and strategic asset allocation (SAA) derivation, along with prediction models for capital

markets to support investment strategy definition.

- Fund administration.
- Investment process and stock selection.
- Independent financial adviser

"In deploying AI, firms need to assess their current technology strategies, infrastructure, governance and talent. However, early movers will benefit from the long-term strategic advantage."

KEITH PHILLIPS,
EXECUTIVE DIRECTOR, THE
INVESTMENT ASSOCIATION

(IFA) and common reporting standard (CRS) management.

- Risk and portfolio management.
- Business intelligence.
- Investment decision support.

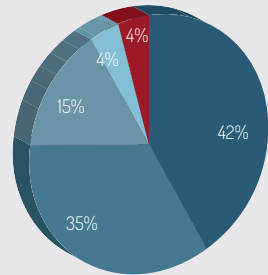
Constraints

Having asked respondents to identify areas of highest priority for the application of AI, in the next question we asked them to identify the major impediments that they face in applying AI. The most important constraint (fig 7, page 11) was a lack of maturity in the technology and a lack of existing use cases that demonstrate how this technology can be applied (26%).

In all, 24% of respondent firms indicated that there was still a lack of understanding among key decision-makers or budget-holders within the firm regarding how AI will benefit

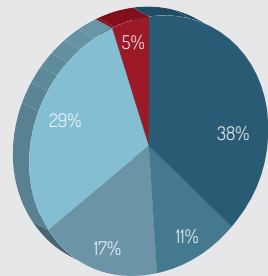
13. WHERE IN YOUR BUSINESS WILL THE INTRODUCTION OF AI BE PRIORITISED?

- Investment
- Operations
- Compliance
- Marketing
- Other



14. IN TERMS OF TIMING, WHERE ARE YOU IN THE PROCESS?

- We have already started
- We will do so this year
- We will do so in the next 1-2 years
- This is a longer-term project
- This is not something we are interested in



their business and bring added value to customers.

A further 18% indicated the lack of a clear business case to justify investment in AI applications at this time or a fear that AI projects will fail to

deliver their targeted return on investment (ROI) within a required timeframe.

Given that there is a limited track record of successful AI implementations in the funds industry, firms remain cautious

of backing the wrong horse or of ‘early adopter risk’ – the danger of implementation costs and inefficiencies borne by the ‘pioneers’ that may not be shared by the ‘followers’, who may time their entry to learn from the mistakes and successes of their predecessors.

Only 8% of respondents indicated that the major obstacle to AI implementation was lack of budget. There appears to be a level of agreement that if a firm identifies a business case for utilising AI and key decision-makers have an understanding of the technology, then the firm will typically make budget available to finance the project.

AI and regtech: Confronting the cost of compliance

We now turn specifically to compliance responsibilities. There is a huge resource cost associated with managing KYC and AML reporting requirements and this may be one area where use of AI may deliver major efficiency benefits.

But what are the principal impediments to the use of AI to support compliance and regulatory reporting?

The largest impediment (fig 8, page 12), according to respondents, is that the industry

15. WHERE ARE YOU LIKELY TO GET YOUR AI SKILLS FROM?

We are likely to use a range of specialist skills, best of breed, from individual partners

38%

We do not know at present

24%

We will recruit these skills in-house

21%

We are likely to use a single specialist partner

15%

We do not think we need these skills

2%

“MANY SAY THE INDUSTRY IS NOT GOOD AT SHARING DATA. THIS IS COMPOUNDED BY FEARS AROUND DATA SECRECY AND DATA SECURITY.”

is not good at sharing data (42%). This is compounded by fears around data secrecy and data security. This is particularly the case for compliance solutions that employ cloud computing for delivery (for example, Software-as-a-Service, or SAAS) or for data management.

For some respondents, lack of suitable technology is also a primary constraint: 15% indicated that development in this area is held back by an absence of suitable independent platforms. Given the sizeable investment being made in platform development by technology companies (often in partnership with large asset management or asset servicing companies), it is important to monitor how this sentiment changes over the coming 12 and 24 months.

It is noteworthy that less than 10% of respondents were discouraged from applying AI-based compliance solutions on the grounds that these are not favoured by the regulatory

authorities. Financial regulators have been working with industry associations and their members in a number of jurisdictions to refine use of compliance technology solutions that may improve the efficiency of regulatory reporting.

AI and blockchain

There has been extensive research during the past five years exploring how financial transaction processing and record-keeping can be remodelled using distributed ledger, or blockchain, technology. This does not rely on the use of AI and has emerged as an independent research area with a parallel set of applications – although in

some specific contexts, financial services companies may wish to use AI and distributed ledger technology together. This survey asked respondents whether, in their minds, they identified potential linkages between AI and blockchain in their business applications.

Roughly one-third of respondents said that AI is an independent process with no obvious relationship to blockchain technology (fig 9, page 13). When asked to identify whether AI or blockchain projects are higher in their list of current development priorities, a quarter of respondents indicated that AI is of higher priority, with 6% indicating that this was the case for distributed

ledger. Only 8% of respondents indicated that they will only consider AI solutions that will fit with blockchain.

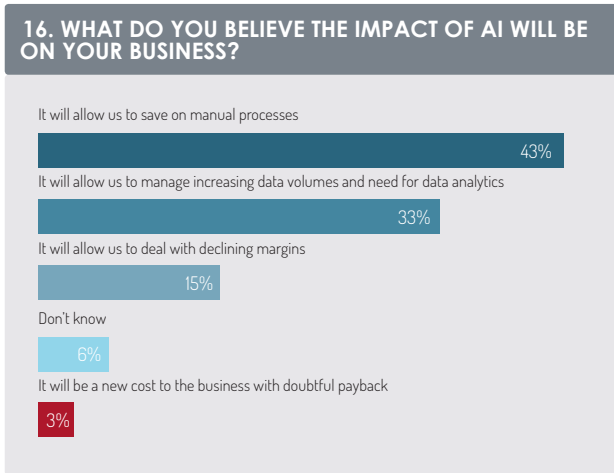
AI and regulation

With any new innovation, the application and requirements may need to be approved by regulatory authorities. In the next question, we asked respondents to comment on the level of approvals that would be required for AI projects and how these will be managed by the financial regulators.

The majority view was that financial authorities will take a close interest in how financial services companies apply AI across the investment value chain (fig 10, page 13). Some 40% of respondents predicted that regulators will need to approve all applications making use of AI technology; 14% of respondents firms said that regulators will need to approve only AI applications that are applied directly to the investment process.

In contrast, almost a quarter of respondents said that this area does not demand further involvement from the regulators.

Interestingly, 23% said regulators will not have the



expertise to approve AI. This highlights the need for close dialogue between industry associations, AI subject experts (private sector, academic sector) and financial authorities to ensure that any potential knowledge shortfall is promptly addressed.

The next question drilled into regulatory and compliance challenges in further detail. Is existing regulation under GDPR, MiFID and Ucits V fit for purpose in providing a regulatory and legal framework that will support use of AI applications?

“Don’t know” was the most common answer (36%). Respondents indicated that there is still considerable uncertainty regarding how existing legislation will need to be adapted to accommodate AI applications (fig 11, page 14). For some respondents, this question was likely to be outside of their area of expertise.

A total of 29% said that new legislation will need to be passed to support AI applications. A further 23% indicated that amendments will be necessary to existing legislation.

Only 12% believed that AI applications are already covered by existing legislation.

These survey responses

suggest that as the industry makes further use of AI in practical applications, it will need to prepare itself for the introduction of new regulation and amendments. Firms will need to take this regulatory overhead into account as they plan and budget for their AI strategies.

AI for the future

A number of asset management and asset servicing firms are conducting research into potential AI applications. Some are doing this in-house, some through collaborations with fintech companies, and others through public-private initiatives that have government involvement.

We asked survey participants, “Where do you believe the future AI solutions for the industry will come from?”

Respondents indicated that specialist technology vendors will be the major providers of AI solutions for the asset management industry (fig 12, page 14). Forty percent said this will come from fintech companies, with a further 22% believing AI solutions will come from asset management software vendors. Technology giants such as Google, Amazon

or Facebook may leverage their data science and machine learning research divisions to financial applications (16%).

Given the specialised skill set required for AI development and the major investment cost involved, only 13% of respondents predicted that AI solutions for the industry would be driven by in-house research and development. We should recognise, however, that a number of large asset management and asset servicing firms are major sponsors of technology labs and fintech innovation hubs. So although new developments may not come directly from their own proprietary research, these may be involved in developing AI-based applications through partnership arrangements.

If respondents indicated that new developments would come from other sources, we asked them to specify. We received the following comments:

- Large technology and banking firms are partnering with selected fintech companies, applying both the innovation of the fintech and the necessary capital investment.
- A combination of all of the above.

- A diverse ecosystem.
- Fintech companies as well as tech giants as well as in-house development.

In the next question (fig 13, page 15), we asked: “Where in your business do you expect the introduction of AI to be prioritised?”

More than three-quarters of respondents believe that the introduction of AI will be focused on either investment strategy or operations, with investment receiving a slightly larger share of the vote (42%).

Fifteen percent of respondents indicate that AI will have important implications in the compliance area.

R&D

How far have survey participants advanced with AI research projects and implementation? The survey found that just under 40% of respondent firms have already started their research and development efforts (fig 14, page 15).

Eleven percent said they would be launching their AI development projects during the next 12 months, with a further 17% expecting to do so in the next two years.

A sizeable group (29%)

viewed AI investment as a project for the longer term and indicated that they would begin this more than two years from the time of the survey.

This cross-section of opinion provides insight into current priorities at respondent firms, but also the degree to which resources are tied up with regulatory adaptation, compliance costs and other technology projects.

Just 5% of respondents said that AI was not an area their firm was interested in.

Talent

Next, we asked respondents how they will source the AI skills that they require (fig 15, page 16).

The largest group of respondents indicated they would access specialist AI skills on a best-of-breed basis from individual partners (38%). Just over a fifth of firms said that they would recruit these skills in-house.

Some firms, as we have noted, have established their own innovation labs and are sponsoring research and development via a small group of fintech partners. Others have sponsored and partnered with research teams in the university sector. Often, firms will source

talent and ideas through a combination of these channels.

The overarching theme, however, is that AI skills are important to the development and success of their business. Only 2% believed that they did not need these skills.

Given the rising demand for data scientists and data engineers, this skill set is becoming more expensive and hard to access. University computer science departments are responding to this requirement by accepting larger student numbers on data science courses – but currently this supply is not keeping pace with demand from financial services and other industries. In the face of these challenges, almost a quarter of respondents indicated that they are not clear at this stage where they will access these skills.

Impact

In the final question, we asked “What do you believe the impact of AI will be on your business?”

The largest respondent group (43%) said that it will enable their firm to eliminate manual intervention and to generate added-value services using high levels of automation (fig 16, page 17).

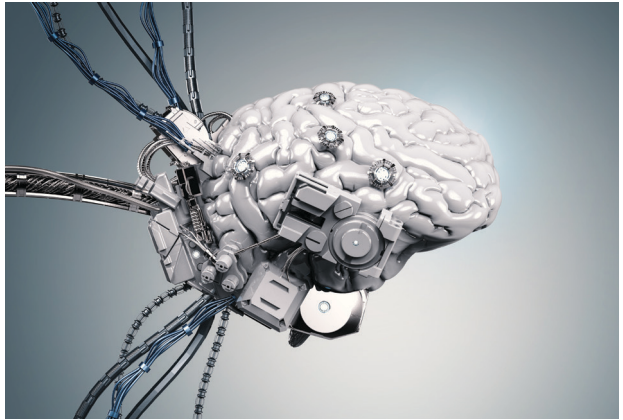
Some 33% of respondents highlighted the importance of AI in driving efficient data analytics and data science applications, disciplines for many firms that are essential to their future business performance.

A smaller group (15%) identified the value of AI principally in economic terms, as a way to address falling margins within their business. Given the rising cost of compliance and regulation, and the pressure this is placing on margins, we may expect a larger number of companies to prioritise AI applications as a means to address these economic pressures in the future. This is an issue to monitor in any update of the survey.

Only 3% believed AI will be a new cost to the business that has doubtful payback.

Conclusions

There is a high level of agreement across survey participants that artificial intelligence and data engineering are tools that investment managers will employ in the future. Two-fifths indicated that they have already initiated work on their AI research and development projects. A further 28% said



they would begin within the next two years.

The majority view was that the benefits of AI will be realised across the front, middle and back office. Respondents believed that equity managers in particular will benefit from use of AI techniques, enabling them to bring new insights to their investment process beyond the ideas traditionally generated by their investment and research teams.

AI will also transform the area of fixed income investment, but to a lesser extent than for equity teams. Both active and passive strategy managers will benefit from use of AI, with active managers experiencing most advantage in the near term.

High-quality data is essential to the effective application of

AI. Slightly more than a quarter of respondent firms have now established specialist data engineering teams overseen by a chief data officer.

It is testament to the importance of data as a strategic asset that less than 10% of respondents have outsourced their data management to a third party.

Currently, the major constraint to applying AI is a lack of maturity in the technology. There is also a dearth of visible-use cases to demonstrate how AI can benefit asset managers and their investors.

A quarter of respondents indicated that key decision-makers with asset management companies do not have a clear understanding of how AI will benefit their business. **fe**

Survey methodology

A total of 270 professionals drawn from *Funds Europe's* readership participated in the survey that was conducted online in late 2018 and early 2019. For some questions, the number of responses was less than this total because of dropouts.

The occupations of the respondents were primarily asset managers (over 50%), with asset servicers, consultants and "others" making up the balance. Respondents in the "other" category included software vendors, independent fund directors, distribution platforms, legal advisers, trade associations and private banks.

More than 50% of respondents came from Continental Europe (over 50%), with the UK accounting for almost 30% and North America and Asia making up the balance.

A panel of experts from across the funds industry was asked to comment on the survey:

HELMUT PAULUS
CEO AND MANAGING
PARTNER, QUONIAM ASSET
MANAGEMENT

Many players are beginning to sense the tremendous impact digital transformation may have on the industry. Accessing information is easier than ever. If machines already ‘understand’ (e.g. ‘Alexa’) what humans are saying and have access to an abundant amount of information, it seems obvious at first glance that machines will be able to take reliable investment decisions in the near future.

Big data and machine learning are definitely not new. The amount, speed and diversity of information available has been increasing over recent decades. In consequence, a small number of asset managers have established themselves which are already systematically processing and analysing available information using state-of-the-art technology and a sophisticated infrastructure. Essential in this context is the identification of relevant, value-adding data, whilst the

actual use of all data is less important. Commonly known as ‘quantitative asset managers’, it is not humans who ‘manually’ search for economically plausible and robust correlations but, rather, a suitable machine designed by humans. If such a machine is used in the right way, it is not only capable of continuously evaluating tens of thousands of securities with the newest data, it can even analyse its own forecasting errors, subsequently correcting itself. Thus, machine learning is not new either; what is new is the number of implementable concepts and their performance power – both have grown immensely due to available computing capability.

The industry’s hysteria surrounding these topics is more than understandable, bearing in mind that traditional managers, focusing on fundamentals, have ignored this development for decades, placing the competence of their ‘star’ portfolio managers above everything. Meanwhile, it is evident that it is impossible for humans to fully grasp the scale of global data and the cross-relationships of such data. Thus, on average, they are falling behind digitalised processes,

which are becoming increasingly powerful. The industry is attempting to hastily perform a long-overdue paradigm shift, thinking ‘Alexa’ might be able to intelligently invest soon.

Yet this is far from true: most machine-learning technology and big data benefits appear far easier to new arrivals in digital asset management than they actually are. The complexity arising from the combination of volume, variety, and velocity of data should not be underestimated. In fact, the sheer amount of data (hence the term: ‘big data’) is both a curse and a blessing. Only those who have verifiable experience in digital or quantitative asset management will be able to reliably use the benefits of machine-learning technology.

JONATHAN HAMMOND
PARTNER, CATALYST

It is clear that asset managers are optimistic about the use of AI and the more adventurous are exploring possible uses across their firms. Whilst many envisage AI being useful for identifying investments, there is also recognition that AI could be used in areas that are traditionally labour-intensive

and difficult to automate.

In general, appreciation of AI is improving as it moves into the mainstream. The survey reveals that the definition is expanding to encompass technologies that have not previously been associated with AI, namely robotic process automation (RPA) and, to a lesser degree, blockchain. Maybe this is part of the key to unlocking AI within investment firms. AI technologies to process text, speech, images and patterns in data are becoming more widely available but their use expects a level of expertise that is in short supply across the industry. As the survey notes, training these AIs is extremely data-hungry and not without its own problems, as IBM recently discovered when they incurred the wrath of the press for using Flickr pictures to train their facial recognition AI, seemingly without the consent of the individuals featured.

The Holy Grail of AI in asset management would be replicating the success of AIs such as DeepMind's AlphaGo for investment research and decisions. However, deploying AI to optimise investment strategies is challenging. AlphaGo Zero had to play millions of

games, sometimes winning, sometimes losing, before it became proficient. Replicating this training strategy with investment markets is almost inconceivable – the feedback loop is too long, potentially years, and the cost of losses could be high. Training an AI using historic data is potentially the only way. Unfortunately, this is not the end of the problem. Once trained and operational, not even the programmers of such AIs are able to comprehend the strategies they are using. Explaining an AI's unusual investment decision, that may only pay off in many years, to a client or regulator would be challenging.

KEITH PHILLIPS
EXECUTIVE DIRECTOR, THE
INVESTMENT ASSOCIATION

Artificial intelligence represents a broad technology category and, whilst there is no single accepted definition, it generally refers to a suite of technologies and modelling techniques that are enabled by adaptive predictive power with a degree of autonomous learning.

To date, AI applications within the industry have mainly centred on realising greater operational

efficiencies across front, middle, and back-office operations. However, as traditional sources of differentiation become increasingly commoditised, AI has the ability to provide opportunities that extend far beyond cost-reduction and more efficient operations. Focus is already turning to using big and alternative data sets to generate additional alpha through better structuring of investment strategies, the application of real-time customer segmentation and content tailoring for better funds marketing and distribution. There is also opportunity for continued enhancement of risk management and compliance processes through machine learning-driven automated data analysis. The effect is that traditional cost centres can be transformed into AI-enabled service offerings and, in doing so, release valuable internal resources.

In deploying AI, firms need assess their current technology strategies, infrastructure, governance frameworks, operating models and talent. However, early movers will benefit from the long-term strategic advantage and ultimately capitalise upon the returns that can be achieved.



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