
Artificial Intelligence for Financial Services: New Pathways to Value



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“Financial services businesses are data businesses whose future competitive advantage will depend on their ability to understand and apply data in new ways. With clearly defined business goals, strong governance and skilled data scientists, artificial intelligence (AI) will enable progressive financial services businesses to transform processes, operate more efficiently, cut fraud and generate increased customer revenues. To do this successfully, partnering for strategies, skills, technologies and platforms will be critical to success.

Atos strives to be the financial services sector’s trusted partner for digital transformation. Applying AI for our customers’ advantage is at the heart of this ambition. With our strategic AI partners Microsoft and Dell EMC, we offer unparalleled global strength and depth in AI services, assets and capabilities and so look forward to engaging you on this important endeavour.”



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Data in the digital era

Few would argue that data has gained a new prominence in modern society. The constant flow of news, incidents, investigations, public debate, regulation and law making has raised awareness of how business, government and individual's data can be used and abused.

The meteoric rise in social media's global adoption and influence has acted both as a stimulus to new ways of handling personal data and an uncomfortable example of how dramatically these can compromise personal privacy and impact commercial interests, for good or ill.

In business, major advances in data analytics capabilities, tools and economics are reflected in a growing willingness to embrace hybrid

cloud, grow increasingly skilled data science practices and act to shift culture decisively towards technologically-enabled intelligence. At its most successful, where data used to be produced as a by-product of running a business, now business is produced by the intelligent application of analytical techniques to its data. This is nowhere better demonstrated than in today's financial services industries whose core activity is handling data and whose reputation rests

upon on complete trust, absolute data integrity and privacy, whether they operate in banking, insurance or financial markets.

In this newly data-driven world, what role does the emerging use of artificial Intelligence play? How can it be put to work for socially and commercially productive purposes to improve lives and businesses? And what is artificial intelligence anyway?

Artificial Intelligence defined

AI can be defined as intelligence exhibited by machines. In computer science, the field of AI research defines itself as the study of intelligent agents, that is, any device that perceives its environment and takes actions that maximise its chance of success at some goal. Colloquially, the term 'artificial intelligence' is applied when a machine mimics cognitive functions that humans associate with other human minds, such as learning and problem solving¹.

AI is not new. The drive to create the capability of machines to simulate aspects of human

intelligence has been envisioned for millennia and AI-focused scientific and technological research pursued in the modern era for at least 60 years². The rapid emergence of AI-infused tools in customer service contexts, such as intelligent telephone agents, avatars and so called 'chatbots' is mirrored in intelligent supply chain management applications, assisted domestic energy management, fitness management applications, medical diagnostic applications and a thousand other use cases, down to the self-correcting spelling, prompted words and selection of language on our personal smartphones.

Neither is artificial intelligence 'fake' intelligence, rather, it is a machine-executed processing which simulates certain attributes of human thinking. For example handling and making sense of multiple sources of structured and unstructured data. Whilst the machine will be programmed to achieve some goal, the way in which it will act will vary dependent on what kind of analysis is called for. At its most advanced this will include 'unsupervised' learning, where the machine will itself make sense of many data inputs, then act on that knowledge to augment its understanding, driven all the time by the goal it has been set to achieve.

Good governance for the right outcomes

It follows that the quality of the governance, management and oversight of analytical activities which rely on artificial intelligence are extremely important to get right, whether the application of the intelligence be in the social, governmental, military or commercial domains.

This recognises that in the right hands, with strong and well-exercised governance, with well-formed goals informed by expert data scientists, artificial intelligence holds great potential to improve lives, economic efficiency, improve healthcare and prevent financial crime, to name but a few of the key benefits now within reach.

To do so to best advantage, a key enabler and accelerator will be either the establishment of a capable in-house data analytics practice or, where the skills are not available, procuring the services of expert partners who have those skills. Here's why this is the case.

¹ AI: The Validity and Reliability Conundrum, Richard Nettleship, Atos, 2018

² https://en.wikipedia.org/wiki/History_of_artificial_intelligence

AI enhances data analytics

Data analytics has long been held out as a strategy to create competitive advantage in business and especially in financial services, whose very business is the creation and management of high volumes of sensitive numerical and customer data.

The journey to a more intelligent enterprise is reflected in several stages of data analytics maturity, to each of which, increasingly advanced artificial intelligence disciplines³ may be applied to enable the desired business results:

- **Descriptive analytics** provides historical data organised in management information reports and does not normally call for or rely upon artificial intelligence. It is used principally for business monitoring purposes.

- **Predictive analytics** includes statistical analytics as well as the broad categories of predictive analytics (e.g. clustering, classification, regression) and data mining. The goal of this level is to quantify cause and effect, establish confidence levels and measure goodness of fit. AI can be applied in clustering data sets to make better sense of them and enable statistical analyses to be performed on them. It creates business insights which improve the scope for better decision-making.
- **Prescriptive analytics** includes machine learning, deep learning and neural networks. The goal of these advanced analytic algorithms is to enable computers to learn on their own; to identify patterns in data, build models that explain the data, and predict outcomes without having pre-programmed rules and analytic models.

It enables businesses to optimise their operations as they come increasingly to accept and rely upon machine-generated prescribed actions and recommendations.

- **Cognitive analytics** includes artificial intelligence, reinforcement learning and cognitive computing. These advanced analytic algorithms self-monitor, self-diagnose, self-adjust and self-learn. These analytics perceive the world around them, create goals, make decisions towards those goals, measure decision effectiveness and learn, to refine the decisions that advance towards the goals, maximising rewards while minimising costs. It enables businesses to develop a markedly different way of operating, where self-diagnosis and self-learning augments the collective intelligence of the enterprise.

Analytics stage	Offers	Purpose	Benefit	Analytics discipline	AI discipline
Descriptive analytics	Management information	Business monitoring	Quantify cause and effect	Statistics	—
Predictive analytics	Insight and foresight	Business insights	Improved scope for better business decision-making	Classification	Clustering
Prescriptive analytics	Optimised human decision-making	Business optimisation	Prescribes actions and recommendations	—	Neural networks Deep learning Machine learning
Cognitive analytics	Intelligent Enterprise	Business metamorphosis	Self diagnosis and self-learning, augmenting Enterprise intelligence	—	Reinforcement learning (Reward maximisation) Artificial intelligence Cognitive computing

Figure 1: AI's contribution to different level of data analytics

³ https://infocus.dellemc.com/william_schmarzo/artificial-intelligence-not-fake-intelligence/

Getting to grips with machines which learn

A feature common to each kind of applied artificial intelligence is that machines 'learn'. As they do this in different ways, an appreciation of how and where they best can be applied to business problems is useful to grasp.

Machine learning⁴ gives computers the ability to learn without being explicitly programmed. Machine learning focuses on the development of computer programs that can change when exposed to new data. It quantifies existing relationships from historical data and applies those relationships to new data sets. It discovers latent relationships to draw inferences buried in the data.

Machine learning accomplishes these two tasks using either supervised or unsupervised learning algorithms. Supervised learning includes the classification or categorisation of the outcomes (e.g. fraudulent transaction, customer attrition, purchase transaction, web click) in the observations. Unsupervised

learning does not have the outcomes in the observations.

Supervised learning techniques enable classification and regression problems to be solved. They are called 'supervised' as the values of the output variable have either been provided by a human expert (e.g. the patient had been diagnosed with diabetes or not) or by a deterministic automated process (e.g. customers who did not pay their fees in the last three months are labelled as 'delinquent').

Unsupervised learning - the machine is presented with unlabelled data and is asked to discover the intrinsic patterns that underlie the data, such as a clustering structure or association. It can also employ artificial neural networks⁵, which consist of a large number of processors operating in parallel and arranged in tiers. The first tier receives the raw input information and each successive tier receives the output from the preceding tier and

performs further analysis.

The last tier produces the output of the system. Neural networks are adaptive, which means they modify themselves as they learn from initial training.

Deep Learning is a subset of machine learning. It refers to algorithms where multiple layers of neurons learn successively complex representations. Deep learning leverages neural networks and a great deal of computational power for activities like natural language processing and image object recognition. Deep learning methods are a modern update to artificial neural networks that exploit abundant inexpensive computation. They are concerned with building much larger and more complex neural networks, and many methods are concerned with semi-supervised learning problems where large datasets contain very little labelled data.

'AI could add an additional USD \$814 billion (£630bn) to the UK economy by 2035, increasing the annual growth rate of GVA from 2.5 to 3.9%'

Growing the artificial intelligence industry in the UK
Professor Dame Wendy Hall and Jérôme Pesenti April 2018

⁴ https://infocus.dellemc.com/william_schmarzo/machine-learning-primer-business-leaders/

⁵ <http://www.learnartificialneuralnetworks.com/introduction-to-neural-networks.html>

Why AI matters now to Financial Services

Better business outcomes

Revenue growth, cost reduction, operational efficiency improvement, risk and fraud reduction, customer satisfaction and loyalty improvement. Each of these business outcomes is available to the financial services organisation which can define the issue or opportunity to be tackled accurately; to recognise what additive value AI will bring to its analytics and operations and to organise itself to put the right systems, controls, expertise and sponsorship in place. For those who do this, the investment will create business outcomes which stand them apart from their competitors.

Integrated change

Artificial intelligence disciplines sit at the heart of a set of linked technology changes which are in the process of reshaping what work is done and how it is enabled. They are also redefining how data is gathered, how used and with what safeguards. For a successful introduction of AI into financial services organisations, it is therefore important that the interdependent parts of the system be recognised and addressed by the financial services organisation as it reshapes itself, through artificial intelligence, for greater success.

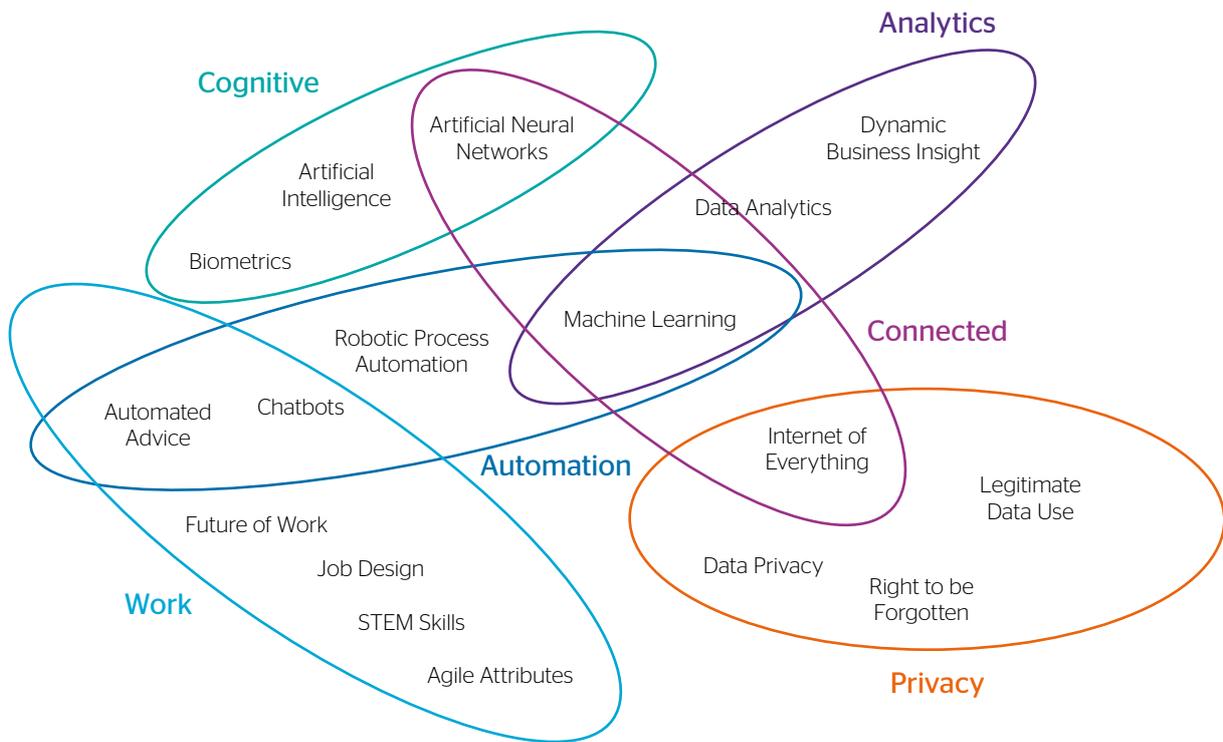


Figure 2: AI disciplines at the heart of transformational change in financial services

Starting well: business-driven thinking

AI serves the business so the business must first work out why it would want AI. As we have seen, AI augments data analytics, on which financial services businesses are now fully engaged. So applying AI can be a natural enhancement of what is already going on. It follows that the pathway can be quite similar, although the technologies deployed may be quite different.

Considering how AI could help

AI can offer many benefits to help tackle the main challenges financial institutions face today. All four main areas of attention that the industry now faces, in customer experience, trust and compliance, business reinvention and operational excellence, highlight specific issues or opportunities where at least one of the AI technologies can offer value.

Some examples of use cases from these categories include:

- Automating client interaction to reduce the impact of service requests and raise client happiness
- Analysing personal data with financial

transactions and claims to identify fraud rings

- Combining internal client data with publicly available data, in order to generate the next best sale
- Automating repetitive administrative processes to reduce processing time, cost and chance of errors.

As there is no shortage of use cases that can apply AI in financial services, it can appear daunting to know where to start. One way is to consider the ways in which AI could better fulfil an opportunity or better solve a problem than existing approaches have been able to achieve. Another way is to consider new

opportunities which are as yet unaddressed and for which AI might provide a unique benefit. As a stimulus, they could consider these AI fundamental tools and techniques⁶:

- Algorithm design
- Semantic text analysis
- Natural language processing
- Speech recognition
- Image recognition
- Video recognition
- Process automation
- Deep learning frameworks.

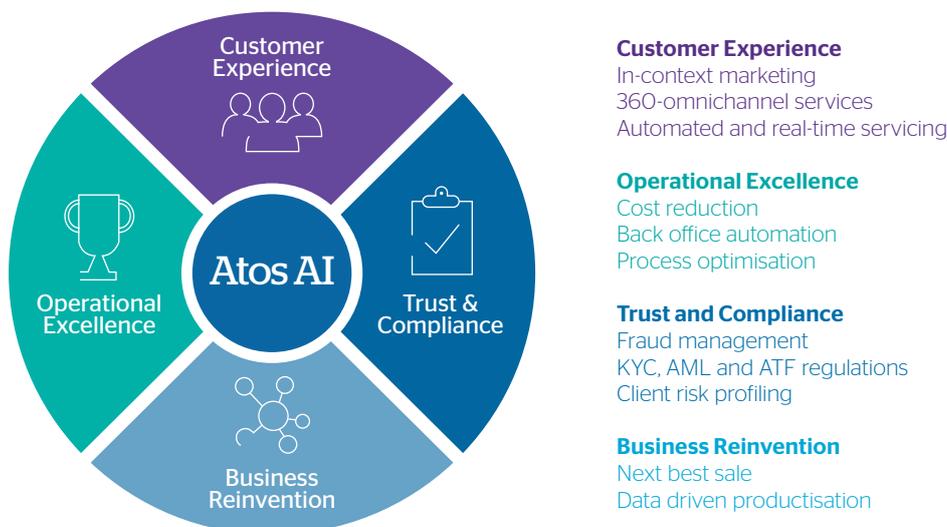


Figure 3: Selecting the business problem or opportunity for AI in financial services

⁶ <https://eiopa.europa.eu/Publications/Reports/2.%20The%20European%20insurance%20sector.pdf>

Starting well: business-driven thinking

Developing the use case

Because AI will most often be applied in a live business context, developing a well-formed use case is a critically important task which requires inputs from many sources other than data scientists. The knowledge contributed by subject matter experts, process practitioners, customer facing staff, legal, regulatory, risk and compliance professionals, customers, analysts and consultants will need to be sifted and considered carefully to conceive both the unique value-add to be created by AI, and the solution framework which it would deliver it.

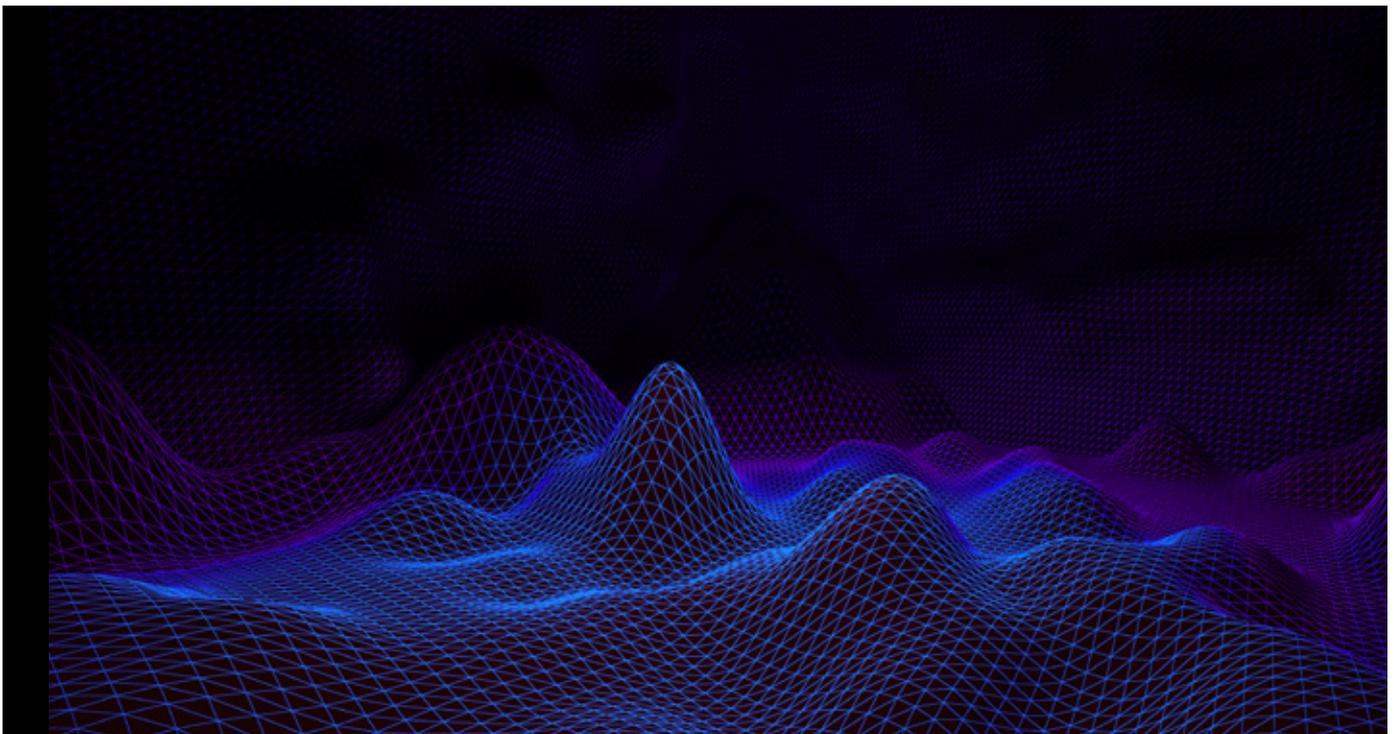
Defining the full solution framework

As there are many dimensions to AI, so there are many pathways to value from using it. For example, a single application of a process automation using robotics is likely to suggest a known set of robotics automation technologies and solutions. The development and implementation of an AI-enhanced customer service channel strategy with specific customer experience, cost reduction, job enhancement and supply chain objectives⁹ suggests that a far more extensive solution is called for. That is why it is important to have the right mix of technology, business and advisory skills at the table throughout the definition and elaboration of scope.

Atos has partnered with Microsoft and Dell EMC to enable its financial services customers to benefit from exactly this mix of skills, knowledge and the right technological assets to deliver class-leading results. The solution framework that follows explains how we help navigate to new paths to value.

Proving value

As with any data analytics development, the AI-dependent use case needs to be proved once it has been designed. This requires only that it be developed to the point where comprehensive testing of data can be undertaken, valid and reliable results generated and conclusions drawn. In practice this will be an iterative process with the duration and number of proving cycles dependent on the degree of complexity in the use case and the extent of the AI working in it.



⁹ <https://www.bing.com/videos/search?q=microsoft+AI+Macs&view=detail&mid=8FAAD3C24E9C1A10DA778FAAD3C24E9C1A10DA77&FORM=VIRE>

Atos Intelligent Automation Platform

The Atos Intelligent Automation Platform (AIAP) takes the best of breed technologies in the market and links them together into a comprehensive and complete solution to address the most pressing challenges and opportunities which financial services businesses face.

Whilst an increasing number understand the need to take advantage of AI to remain relevant and in front of their competition,

many nevertheless struggle to navigate the multitude of technologies available. This is especially relevant in integrating narrowly-focused AI technologies into their business operations and so to deliver tangible values to their business processes.

Atos takes on this complexity to support financial services businesses through the various maturity stages of AI adoption and identify the technologies which are most

suitable, for each level and for each business application. To enable its financial services customers to benefit most fully, Atos has designed and built a scalable solution that includes cognitive, self-learning and AI capabilities, based on a component model which allows it continually to develop and align with market developments yet considering practical implementation requirements and the requirement for a rapid return on investment.

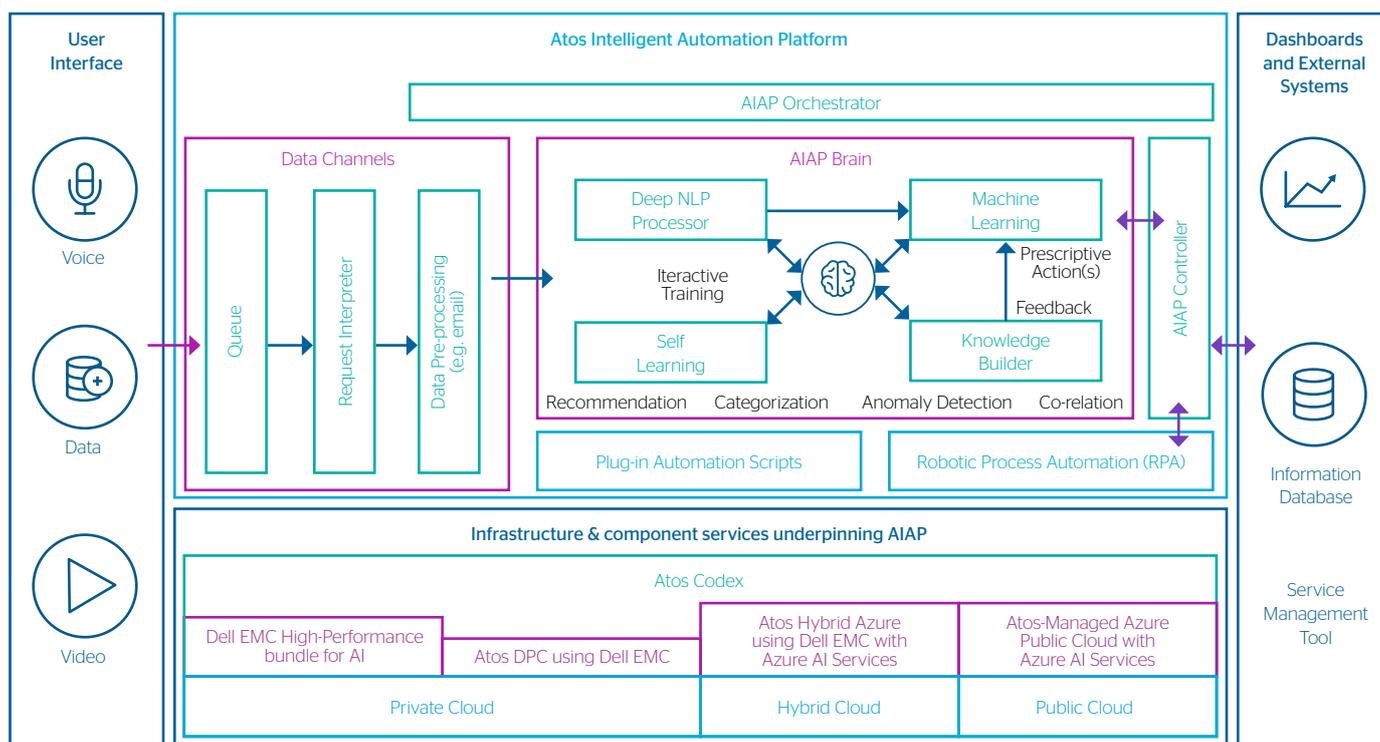


Figure 4: Atos Intelligent Automation Platform

- **User Interface** includes a variety of input mechanisms including voice, chat bots, video and data from supporting systems within an organisation. These provide the submission of structured, semi-structured and unstructured data that is the source material for the AIAP platform.
- **Data channels** are then the platform's components that queue the source data appropriately and prioritise based on rules defined. They go on to drive the digitisation

of the data into an appropriate format that can be interpreted and used to establish context in order to progress with the correct requests.

- **Orchestrator** provides the end-to-end linking and sequencing from data pre-processing through to delivery of results in a form required by the service in question. It links the ingestion with the part of the AIAP platform that allows decisions to be made around the next actions to be taken

with the data and the part that initiates the appropriate action. It covers the capability to establish knowledge, develop self-learning and to provide recommendations based on robust and defined machine learning algorithms. The AIAP platform is also able to consume natural language and establish sentiment and extract the appropriate data for processing associated actions.

Atos Intelligent Automation Platform

- **AIAP Brain (Processing)** is the part of the platform that allows data that has been consumed to be routed correctly. This is done through establishing recommendations based on pre-defined thresholds for decision making support, categorisation of data and its correlation. This includes the identification of any anomalies which can be reported to platform users and administrators to interpret and feed back into the platform for better capabilities when processing subsequent data. The AIAP Brain draws on other components both internal and external to the platform to provide specific types of AI processing.
- **AIAP Controller (Execution)** includes the capability to execute pre-defined processes based on the data and decision made through the platform. This can be done through standard RPA or IPA technologies either within the platform or linked.
- **Dashboards and External Systems (Visibility)** includes the standard dashboards and reporting capability to establish the visibility of the platform. This includes auditing of transactions and activities as well as the performance of the platform, data quality and exceptions to processes.
- **Infrastructure and Component Services.** AIAP leverages the Atos Codex Analytics Framework and the offerings from our partners, Microsoft and Dell EMC, to extend the platform for specific AI-related tasks and for execution. For private cloud scenarios we position either the Atos Digital Private Cloud or, for some high performance scenarios, one of the Dell EMC bundles for AI. For hybrid and public cloud we utilise the Azure AI services running on the appropriate combination of Atos-provided cloud infrastructure and the Azure cloud. Atos uses Dell EMC technology as part of its private cloud offerings. We vary the extent to which Codex is used according to the richness of the functionality provided natively by the underlying platform.

AIAP and Microsoft



The Atos Intelligent Automation Platform is designed in a way that allows it to leverage the cloud; not only cloud infrastructure which is flexible and based on a consumption-based commercial models, but also which allows Atos to take advantage of new AI infrastructure, services and tools being made available through Microsoft Azure. These capabilities include the ability to leverage

Azure-provided processing frameworks like Hadoop and Spark; Azure AI services to help with the machine-learning development cycle and cognitive services including the analysis of video and images, audio-to-text conversion and natural language processing; thereby allowing the solution to scale and meet specific requirements from business users in a seamless and frictionless way.

AIAP and Dell EMC



A key challenge in AI has always been the ability to process the volume of data effectivity enough to add value. The software now present in the market allows data to be analysed and extrapolated to allow computers to make decisions and support business users in a much more complex and data rich environment. However, without the processing power and aligned infrastructure services to support such data volumes and

the complexity of AI methods, businesses would not be able to take advantage of AI in practice. Dell EMC has therefore designed and built tailored assets which leverage high performance computing specifically optimised for AI workloads and investing in the future capabilities required to support platforms and software including Atos Intelligent Automation Platform capabilities now and in the future.

Use case realisation

Use Cases enabled by Atos Intelligent Automation Platform

Atos AIAP is designed to be able to solve for a very wide range of use cases in financial services. The following example outlines how the solution worked in practice to automate the resolution of service requests.

Service Management: Automatic Resolution of Service Requests

- **Intended outcome:** automation of knowledge work required to classify and action service management requests in a timely manner, meeting stringent service levels and quality standards.
- **Operating situation:** a high volume of service requests was received through email and chat bot channels. Manual sorting and classification required significant effort and time with a dependency on expertise for the activity.

- **Solution opportunity:** Implementing AI to remove the dependency on knowledge workers for the classification activity. This was achieved through the implementation of open source and development of robust AI APIs models enabling the technology to classify the service requests and automatically resolve them as well as resolve for tickets generated manually.

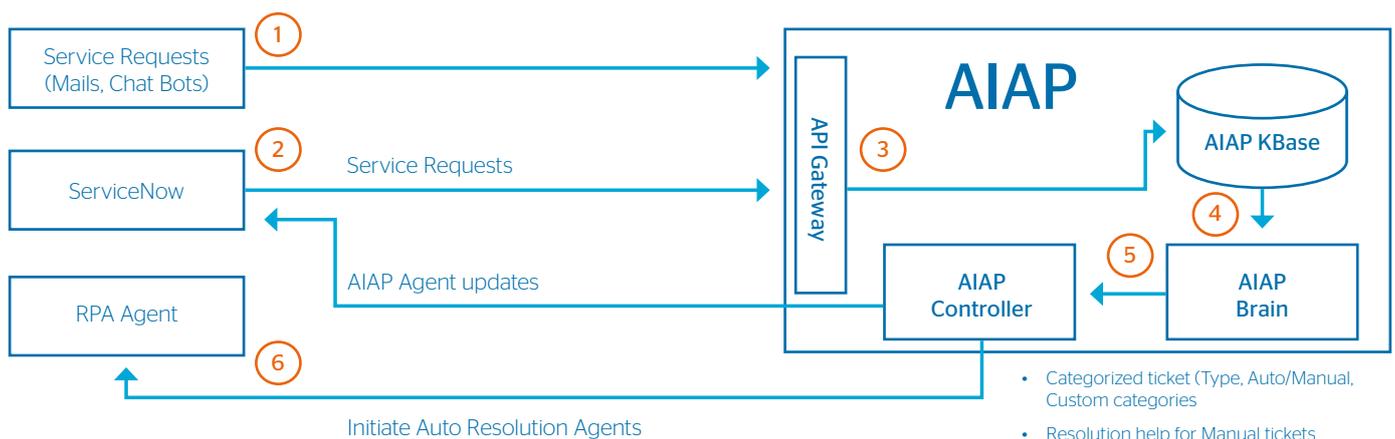


Figure 5: AIAP Use Case: automating the resolution of service requests

- **High level process:** implemented a step by step recreation of the process with AI learning capabilities to categorise service requests in a more consistent and reliable manner, using the AIAP.
- 1 Service requests were digested through multiple channels including email and chat bots.
- 2 Service requests were automatically raised in the management platform, in this case ServiceNow.
- 3 Data was digitised and normalised within the AI database allowing for interpretation.
- 4 The data was then processed and categorised based on defined algorithms and machine learning techniques.
- 5 The management platform (ServiceNow) was then directly updated with the categorisation determined by the AIAP brain component and allowed for further processing of the request.
- 6 Robotics Process Automation (RPA) technology was then used to execute the service requests without human intervention, based on the data, categorisation and pre-defined business process.
- **Results and outcomes:** delivered a reduction in the dependency, cost and time to resolve service requests raised, with a minimal number requiring manually intervention by the human workforce.
- **AI contribution:** the solution deployed several techniques and capabilities comprising self-learning within the Cognitive Brain; resilience through its fall-back processes; customisable and pluggable architecture; auto resolution of tickets and relevant support for manual tickets.

Your move, our invitation

We invite you to engage with Atos on AI for financial services and the Atos Intelligent Automation Platform to discuss your business goals and how AI could help you to realise them. For more information contact Michael Davison, Industry Principal, Financial Services, Atos UK and Ireland at michael.davison@atos.net.

About Atos

Atos is a global leader in digital transformation with approximately 100,000 employees in 73 countries and annual revenue of around € 13 billion. The European number one in Big Data, Cybersecurity, High Performance Computing and Digital Workplace. The Group provides Cloud services, Infrastructure & Data Management, Business & Platform solutions, as well as transactional services through Worldline, the European leader in the payment industry. With its cutting-edge technologies, digital expertise and industry knowledge, Atos supports the digital transformation of its clients across various business sectors: Defense, Financial Services, Health, Manufacturing, Media, Energy & Utilities, Public sector, Retail, Telecommunications and Transportation. The Group is the Worldwide Information Technology Partner for the Olympic & Paralympic Games and operates under the brands Atos, Atos Consulting, Atos Worldgrid, Bull, Canopy, Unify and Worldline. Atos SE (Societas Europaea) is listed on the CAC40 Paris stock index.

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