

A UKAuthority Briefing Note



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Rise of the Bots 2017: Artificial intelligence in public service delivery

“Artificial Intelligence: The theory and development of computer systems able to perform tasks normally requiring human intelligence, such as visual perception, speech recognition, decision-making, and translation between languages¹”

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¹ https://en.oxforddictionaries.com/definition/artificial_intelligence

1. Introduction

From AI to machine learning and robotic process automation to bots, the next revolution in public services is approaching. Artificial intelligence has developed from a future concept of which most people were aware, but few saw as an immediate issue, to a prospect that is beginning to influence thinking and plans for the next few years.

A handful of pioneers are planning the early use of AI in public services, mainly in the simple form of internet bots but with some more ambitious projects. In addition, government representatives have been talking up its potential, and questions are being asked about how it can be used, its limitations, and possible downsides. There is a growing consensus that within five years or so it will play a significant role in many public service organisations, but still a lot of uncertainty, and significant anxieties, about how this play out. Public officials know it is coming, and they want to know more.

It was against this backdrop that UKAuthority staged a conference in June 2017 – supported by Microsoft Services, Arcus Global and Vanad Enovation – that brought together some of the early adopters, informed observers of AI’s emergence, and representatives of central and local government, the NHS and emergency services who were eager to learn more and share their own thoughts.

There are more questions than answers about AI at the moment, but several strong ideas and some clear priorities emerged from the discussions. The following pages bring together the main lessons from the day.

2. Definitions

First comes the need for clarity when talking about AI and two related, but not identical, concepts.

2.1 Robotic process automation (RPA)

RPA involves the use of software that is configured to automatically process a transaction, manipulating the data, triggering responses and communicating with other systems. The general thinking is that it will be increasingly useful for high volume, low value transactions in which there is no need for human judgement, or in which the judgement is a based on firm criterion that can be programmed into the software – or robot.

2.2 Machine learning

Machine learning goes beyond this in using algorithms within the software that learn from the data it collects and can adjust its actions accordingly. It is effective when focused on a specific task, but can be used for more proactive tasks than RPA, such as identifying people at risk and handling legal processes.

2.3 Artificial Intelligence (AI)

AI goes further in having the ability to understand its environment and contextualise information. This gives it capabilities resembling those of humans, such as the ability to reason, plan and

understand the intricacies of language. It takes software into the realms of problem solving and sophisticated support in decision-making.

There are ambitions for all three in public services, all promising benefits but also raising concerns about negative consequences.

3. Early progress

It is very early days for AI and related technologies in public services, but over the past year there have been a number of developments that point to growing momentum.

The London Borough of Enfield created a stir in 2016 when it announced plans to use the Amelia virtual service agent for customer contact. The implementation has proved more complex than hoped and it remains a plan, but the council has also committed to working with Microsoft on developing a 'CitizenBot' for a range of processes.

Aylesbury Vale District Council is planning to use the Amazon Alexa AI service to support its customer interactions, and has developed a skills set to work within the system.

In central government, HM Revenue & Customs has indicated that it is planning trials of AI in a number of its processes.

In healthcare, the North Central London Clinical Commissioning Group is into a six-month trial of a mobile app that uses a chatbot and draws on artificial neural networks and semantic knowledge to support guidance for patients.

Although machine learning is less sophisticated it could be as equally ambitious, and the Royal Society recently published a report² on its public sector potential that included functions such as targeting interventions of 'at risk' groups and improving responses to civil emergencies.

The prospects also drew the attention of former chief scientific adviser to the Government, Sir Mark Walport, who early this year spoke about the applications of AI in public services, saying they could provide improvements in several areas. But he also warned of limitations and the dangers of over-estimating the technology's subjectivity.

This was soon followed by a report from the think tank Reform forecasting that AI could replace up to 250,000 public sector workers by 2030.³

All this is sparking an energetic debate about the benefits and dangers of the technology that influenced much of the talk during the conference.

² Machine Learning: the power and promise of computers that learn by example
<https://royalsociety.org/topics-policy/projects/machine-learning/>

³ Work in progress: Towards a leaner, smarter public sector workforce
<http://www.reform.uk/wp-content/uploads/2017/02/Reform-Work-in-progress.pdf>

4. Benefits

The clearest benefits in AI are in its capacity to process a huge volume of information at speed, and to learn from what it processes. It goes way beyond automation to providing an analysis or diagnosis and helping to solve problems.

On a more routine level, it can carry out tasks that require close attention to detail and an assessment of the information more quickly than humans. For example, it is being used to read x-ray images for customs inspections in the Port of Rotterdam, and the early ambitions of Enfield and Aylesbury Vale are focused on helping customers find information and services.

One of the advantages here is in providing around the clock availability of a service, without the issues involved in ensuring human help is at hand 24/7; and there is the scope for large increases in productivity, as AI systems can handle a much heavier volume of enquiries and processes than any employee.

But it can also deal with tasks that require an element of reasoning and understanding of the nuance within questions. In Japan the Ministry of Economy, Trade and Industry is part way through an ambitious experiment in using AI to support officials who draft answers to questions from the National Diet to ministers.

The Stanford School of Engineering has published a report⁴ highlighting potential uses that include smarter management of traffic through using real time sensors and cameras to predict flows and optimise traffic light timing, and providing a new dimension to public transport through directing people to ridesharing.

In education, AI could be used in intelligent tutoring systems and online learning through a human-machine dialogue that mimics the role of a good human tutor. For public security it could draw data from surveillance cameras and drones to spot anomalies that point to a possible crime and for more predictive policing. It could also be used in helping police manage crime scenes with tools to prioritise tasks and allocate resources.

There are also possibilities to support social care in combining AI with robot technology, providing robotic carers to support elderly people in their homes.

But it can go further into dealing with highly complex challenges. There has been plenty of coverage of IBM's work in developing its Watson AI system for healthcare, drawing on vast quantities of medical research to diagnose conditions and recommend prescriptions and treatments for patients, even for very rare ailments.

The capability that makes this possible – surpassing humans in the volume of information that can be taken on board – can be used more widely to support decision-making on complex, sensitive issues, and to provide predictive capabilities. The latter could be used for day-to-day demands such as traffic management and the demand for healthcare services; for identifying risks and taking

⁴ Artificial Intelligence and Life in 2030
https://ai100.stanford.edu/sites/default/files/ai_100_report_0831fnl.pdf

preventative action; and in strategic planning, looking at all the elements that could affect the long term demand for and interactions between public services.

The crucial element is that ability to collect data on an unprecedented scale, identify the patterns and begin to make reliable predictions.

5. Anxieties

While the potential benefits of AI are becoming increasingly clear, some worries about its implications are also emerging - often related to ethical issues and the relationship between people and computers.

The one most often voiced is that this technology evolution threatens jobs. Even though it will most likely create new jobs, the overall effect will be to take more people out of the workplace, not just in the public sector.

When Reform published its report, it highlighted the potential to replace 250,000 public sector workers. This was followed by an international study⁵ from the Future of Humanity Institute at the University of Oxford predicting that in 45 years half of the jobs currently filled by humans will be taken by AI systems. The latter may seem stretched over a long period, but the change would begin to affect significant numbers of people much sooner.

The threat is largest for occupations that do not require the human assets not matched by technology, those that deal with information in its hardest sense and rely on analytical capabilities without drawing on empathy and emotional intelligence. Some observers forecast that the job losses over the next decade will be in routine tasks in areas such as finance and accounting, manufacturing, transport and distribution. Those that rely heavily on the 'human touch' will be better protected.

In addition, jobs are also more likely to go in large organisations that have the resources to invest in an expensive technology. For the foreseeable future AI will remain beyond the means of many smaller organisations.

There are also technical challenges. One of the big demands for the IT professionals in an organisation will be to ensure that AI systems work efficiently with the legacy IT. This is going to highlight a lot of unknowns. Which back office and line of business systems can be aligned with the algorithms? How will it interact with mobile technology? What are the implications for network security and connectivity infrastructure?

Obviously, much of the onus will be on suppliers to ensure their offerings are compatible with legacy systems. But authorities' IT leaders will have to devote careful attention to making sure the pieces fit, and in some cases it could require difficult decisions about spending extra money on replacing existing assets.

Other anxieties reflect the concerns raised earlier this year by Sir Mark Walport. There are worries about the ethical framework for AI, especially when it involves using the public's personal data for

⁵ When will AI exceed human performance? <https://arxiv.org/pdf/1705.08807.pdf>

purposes that are not necessarily clear and which may cause objections. The experience of the problems over the NHS care.data project - which hit the rocks amid claims that people had not been clearly told about how their data was to be used - highlights the potential for a backlash.

There are questions around how much we should trust what is essentially a digital system in decision-making, especially in areas such as the justice process that have big ramifications on people's lives. There is a consensus that experienced people should not be removed from decisions in many areas, but there is a debate to be had on just how much they should rely on AI systems for support.

Related to this is the fact that, despite its supposed objectivity, the algorithms in AI could be set up to reflect the biases of their programmers. It could be subject to its own prejudices and stereotypes that undermine the cause of making objective, evidence based decisions.

There is also a need for transparency. Some are worried that it will not always be clear when an individual is dealing with a person or computer programme, and this could build resentment against authorities.

These factors are combining to fuel calls for a wide ranging public debate over the uses of AI.

6. Four questions

Delegates to the event were invited to discuss some of the questions arising from the issues. These sessions produced some perceptive and sometimes unexpected views on how the public sector should be looking at what it could, should and maybe should not do with AI.

6.1 What are the more immediate uses for AI in public services?

There was a strong focus on customer services, especially in dealing with high volume enquiries on issues such as Blue Badge applications, school admissions, street maintenance, housing repairs and seasonal activities such as school holidays. It can also apply to the health service, with the arrangement of outpatient appointments and simple clinical support.

Chatbots provide a huge opportunity here, with the capacity to go beyond rigidly structured FAQs, processing the detail of what they are told to provide more specific information and find solutions to customers' problems. This can work with text enquiries and the potential for speech is not far from being realised.

The big potential here is for AI to identify the customer and provide personalised information, making people aware of services and activities that they have not asked about but which are relevant to them. It can also identify related issues to a problem and alert different service teams, or make connections across agencies, to carry out checks. For example, a report of emergency services being called to treat an elderly person in a fall in the street could trigger an alert to the council to check for potholes and pavement cracks at the site, and to check if the person is going to need subsequent social care assistance.

The development of AI that uses speech recognition – as with Aylesbury Vale's plans for Amazon Alexa – points to the potential for improving customer services for people who are uncomfortable or

unable to use to a screen. This could become a significant feature for local services over the next five years.

The data crunching functions could also have an early potential in fraud prevention – spotting the mismatches and relationships between data from different sources to identify possible abuses – and in predictive analytics. AI systems could monitor data to provide early alerts on emerging problems – maybe rising air pollution levels in specific neighbourhoods, or a prevalence of obesity in some areas – helping to identify groups at risk and point to the need for preventative action.

But good quality data is prerequisite for all this. Organisations will have to use the tools, and invest the human effort, into making sure the data going into the systems is going to provide an accurate, unbiased, picture of the real world.

6.2 How can you identify potential benefits in efficiency and service delivery for investment in AI?

It was back to basics in response to this question. The issue of cost savings loomed large, with the potential to reduce the headcount for some functions; although this will take any organisation into a sensitive area. It relates to the debate, on which there are diverging views, as to whether AI will remove more jobs than it creates. Given the financial pressures on public service organisations, the ability to take headcount out of the organisation is likely to be big factor in any business case for AI.

But the investment has to be targeted at the right services. Several delegates suggested involving staff in key areas to identify which processes could benefit from AI; although the anxieties around possible job losses could make this a sensitive task.

Other stakeholders – public sector partners and community groups – could also be brought into the effort, identifying where existing processes fall short, those that stretch human capabilities too far and exploring where valuable human time can be saved from the ‘routine and mundane’ to be spent instead on the complex.

There are also benefits in the capabilities of AI that could be emphasised in building a business case. These include the 24/7 availability, the potential to deal with enquiries in different languages – a significant factor in cities with big immigrant populations – the avoidance of human error in transferring and processing information, and the ability to harness big datasets.

The ability to meet specific local needs and personalise services can also be conveyed as a business benefit, as it can improve the targeting of resources as a way of providing better outcomes.

More generic research, at a national or international level, can also play a part. Any evidence of quantifiable benefits, especially in public sector organisations, would be an important element in building a case.

6.3 How can organisations assess the public reaction to ‘non-human’ interactions?

There were suggestions about testing the reaction to proposed systems among employees, taking into account that they are also citizens and are likely to share most of the reactions to AI. But most of the talk focused on dealing directly with the public, asking for feedback and developing a methodical approach that recognises the reactions of different groups.

A handful of techniques were identified:

- Carry out surveys and data collection. It could be possible to collect unstructured information on the internet through a well programmed scraping exercise.
- Segmenting users into cohorts, with an awareness that different generations are likely to have different expectations of technology.
- Developing user journeys and tracking these to assess the quality of the experience. A bot could be programmed to ask questions and request ratings along the way, making it possible to quantify the ease of the process and user satisfaction.
- AB testing, a controlled experiment where users are presented with two variants of a process. It could take members of the public through AI and non-AI versions to test their reactions.
- Getting the public involved in the design of systems through user research, hackathons or long term programmes.

But underlying all this was a sense that the majority of the public would be quite responsive to the technology. The point was made that most people often use some form of bot through online platforms such as Amazon and eBay, and that it would not be a big leap for them to use similar functions in interacting with a public authority.

The argument goes that most people will not make the distinction between a human and non-human interaction if they are receiving the service they require; and AI is developing in a way that the distinctions between the two are becoming less apparent.

6.4 Should there be 'no go' areas for AI in public services? What are its ethical limits in decision-making?

There was a divergence of views on this: many delegates saw the need for limits with different ideas about where they should lie, a few came out firmly for the idea of no 'no go' areas, and some felt that there were no limits.

One group made the point that AI will often provide a more firmly structured, controlled and logically safer response when dealing with a complex issue; but that a human will often provide a less binary response, one that involves a subtle appreciation of the different factors involved. This can deal with the relative importance of factors – especially when they apply to an individual or specific community – and take in the emotional intelligence needed to persuade others it is a valid decision.

As AI becomes more sophisticated it will develop these capabilities to some extent; but its performance will depend on the strength of its design. One suggestion from delegates was that AI systems for specific purposes should be designed by committees of stakeholders to ensure they take the widest possible range of factors into account. The flip side of this is that it could undermine the coherence of the product – often the result when a product or service is 'designed by committee'.

Another issue to arise was around the need to understand the risk and who is liable for a decision made by AI. Would an organisation, or its senior officials, be ready to take on full responsibility for a

decision made by a set of algorithms? How would it affect the legal and political lines of responsibility? And how would it relate to any appeals process, if applicable?

Then comes down the fact that those sensitive areas can vary depending on the individual. Some customers may be happy to know that AI is handling enquiries and even making decisions on routine services, but more resistant towards those such as healthcare and social care for elderly relatives.

Most delegates indicated that the low volume, high complexity issues should remain under the control of humans; although AI can play a significant supporting role in providing guidance from supporting evidence, rather than taking the final decision.

They pointed to decisions on safeguarding children and vulnerable people, life or death situations, courtroom decisions; and said that if AI is used in support then safeguards should be built into the processes. There should also be a right of appeal against any decisions in which the emphasis is firmly on human judgement.

Another point to arise was that ethical viewpoints change, and that society moves the boundaries over time. In 10, 20 or 30 years any agreement on the ethical limits could be up for review.

7. The future

AI, in all its forms, is a new frontier for public services. Almost entirely unexplored, it is certain to create some difficult issues around processes, public and employee attitudes, and ethical tensions – and maybe a few knotty legal problems. Any deployments are going to have consequences, not all of which can be foreseen, and its introduction will have to be managed as carefully as possible.

The usual inclination would be to proceed with caution. But with the financial pressures on the public sector remaining, and demographic factors continually increasing demand for services, there is a strong sense of urgency for radical transformation. Increasing numbers of organisations are beginning to see AI as an important element for the future, even though they do not yet have a full grasp of how they will use it.

It is likely to have the same impact as many technologies – over-estimated and over-hyped for the next two years, but under-estimated for the following 10. With so many unknowns and grey areas deployment could prove to be more hazardous than for any technology so far. But it also promises a more radical transformation in public services than has been seen before, and the odds are that it will do more good than harm in the cause of delivering better outcomes.

Now is the time for public servants to grasp the potential and implications of AI and embrace it for the public good.

8. Commentary

Tim Gregson, CTO and Digital Advisor for Local and Regional Government, Microsoft Consultancy Services:

AI, machine learning, process automation and bots are all on the rise. These technologies are no longer ‘future concepts’, as they have been seen in recent times, but are already being used by many private sector organisations. For public sector, the time is now – we are seeing a number of organisations across all verticals – local and central government in particular – turning to AI and bots to process information, drive efficiencies in carrying out tasks, make cost savings and ultimately provide a better, more unified citizen experience. Those not yet testing these technologies are at least planning to use them in the not-too-distant future. We expect AI, bots and the rest to play a significant role across the public sector in the years to come.

Despite numerous benefits, it is clear that there is some anxiety around the implications and ethics of these new technologies. Firstly, there is the concern around replacing public sector workers in carrying out routine tasks and answering simple FAQ style questions from the public. In the short term at least, there will be some need for a human hand-off to bring the experience and empathy needed to complete more complex tasks. Work needs to be done on determining where the human/machine hand-off is, and how to exclude bias or whether the machine decisions can be relied upon.

Secondly, the ethics of how data flowing through these new technologies is processed and used, including whether an individual knows they are dealing with a machine. Regulation such as GDPR and other guidelines for data, along with high transparency for individuals on how their data will be used, should address this.

One of the key uses we at Microsoft see for the use of AI in public services is in triaging high-volume enquiries, particularly for local government organisations in the short term, but opening to healthcare, central government and even police over a longer period. We have developed an early implementation of this functionality with our CitizenBot. We are working with a number of authorities to develop this bot further to support their citizen experience and drive organisational efficiencies.

In addition, capabilities around data and analytics can support by spotting trends and identifying issues before they become problems and enable preventative action. For example, alerting a family of an ageing citizen that they haven’t woken up at their normal time.

In summary, those using AI, machine learning and robotics should no longer be seen as pioneers – instead this is becoming the new norm, with those not considering these technologies in their plans likely to get left behind.

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9. Rise of the Bots 2017 Partners

Microsoft Services



Microsoft Services sits at the heart of Microsoft, combining direct links with product groups and expertise in our portfolio, with deep technical knowledge and industry insight from our 25,000 employees.

Microsoft Services empowers customers to accelerate the value from their technology – whether you want to move to the cloud, create novel citizen experiences, innovate with new business models, services and products, engage employees, or improve business performance and operations.

We are already working with a variety of UK public sector organisations on projects in all of these areas, taking care of the technology as they continue taking care of their citizens.

To find out more visit www.microsoft.com/services

Vanad Enovation



The VANAD Group is one of the few family owned businesses in the ICT sector and with our headquarters in Rotterdam we operate in The Netherlands, Belgium, Luxembourg, Germany, USA, China and the UK. We are a fast growing organisation with over 1,000 employees and our focus is on Systems Integration and Robotic Process Automation, Customer Interaction Management, Transport & Logistics and Business Consultancy/Management Information.

We are accredited partners of Blue Prism, the pioneers of Robotic Process Automation software which enables our clients to deploy a Digital Workforce of Software Robots, run by the business but built with IT governance and security, which enables employees to focus on higher-value work while autonomous multi-skilled software robots tirelessly perform error-free rules based admin transactions. Blue Prism is deployed in Financial Services, Energy, Telco, Insurance, Logistics, BPO and the Public Sector but the technology is truly industry agnostic as the digital workforce tackles rules based administrative work on any system.

Our Health and Public Sector division, VANAD ENOVATION, has a strong user base in the UK which is underpinned by a very well established and highly competent team of individuals who have developed a reputation for delivering first class support and customer care. We work in genuine partnership with our clients to deliver successful projects which enable transformational change and operational efficiencies and offer a wide range of professional services to support projects including structured implementation methodologies, best practice operational models and access to online knowledge bases.

The VANAD Enovation team is passionate about Blue Prism and is always championing its virtues to clients, so it comes as no surprise that we use Blue Prism robots in our own company to vastly improve cumbersome, labour intensive and time consuming processes!

To find out more visit www.vanadenovation.co.uk

Arcus Global



Arcus Global was set up in 2009 by two Cambridge graduates, Denis Kaminskiy and Lars Malmqvist, who saw the potential that Cloud computing could offer to the public sector. They had a vision to simplify the cumbersome technology that was dominating the Public Sector, believing that it was taking up valuable time and resources.

To achieve this vision Arcus Global uses the most modern technology in a disruptive way that makes it accessible to the public sector. Arcus is able to assist the Public Sector to save costs and deliver transformational change via Cloud based solutions. Clients include local authorities, national government departments as well as Universities, the NHS and the private sector.

We are always at the cutting edge of solutions that will help the deliver the best possible outcome for our customers.

We work in close collaboration with Aylesbury Vale District Council (AVDC), a council whose ambition is to be a fully digital and self financing organisation. It was one of the first to adopt a cloud IT strategy, saving around £6m in the process. We developed the use of Amazon Echo technology making AVDC the first council in the UK to use AI (artificial intelligence) and AI powered voice control, to serve residents' needs.

Arcus is an AWS Advanced Consulting Partner with Public Sector Specialist Accreditation. At Arcus we are experts in designing secure, scalable and self-healing AWS infrastructure, and in defining and documenting secure processes.

To find out more visit www.arcusglobal.com

10. Return of the Bots

Back by popular demand...

Following on from the sell-out success of June's UKAuthority 'Rise of the Bots', and in response to both audience demand and the rapid pace of technology change, UKAuthority will be hosting 'Return of the Bots' on 14th November 2017 in central London.

NHS, local and central government and other public services will take to the stage to share their ambitions and progress with innovating and redesigning service delivery using these technologies.

We will also invite leading technology companies to partner with us and outline how their technology has helped to transform, inform decision making, interact with citizens, drive efficiencies and help create better public services.



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