Bloor

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The new reality for government

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Executive Summary

For CIOs and digital leaders in the UK government a tipping point is approaching. Soon the capabilities available within its current IT resources will no longer match the needs demanded by its internal stakeholders and the wider UK public. It is also at a point where major change to the structure and delivery of its IT resources is inevitable, rather than a 'nice to have'.

The majority of the British public already use smartphones, online retail, location-based technology and on-demand services of ever-increasing variety, all tied together through the Internet. The same is becoming widely used in government departments, their internal operations and their communications with each other.

With that crossroads approaching, the government has little option but to rethink the way it operates by moving beyond digital transformation to digital reinvention. Even as change is being forced upon it, there is an opportunity for the government to use these changes to its advantage. There is huge potential to lead the way proactively, in terms of how the government engages with the public and drives operational efficiency. By taking this approach, the government can rework how its departments operate now whilst building new services of real value to the public.

To achieve this the government needs to reinforce its 'Cloud First' policy. This is about delivering 'government-as-a-service' and will include the integration of some established, legacy applications and processes. This will remain the best solution for the foreseeable future.

There is also a need to understand the economic choice between building its own cloud services from the ground up or buying in ready-to-run services. A build-your-own cloud-services route can appear to have real cost advantages, but headline prices are only the beginning. Creating all the new services required will take time – keeping them working and collaborating with other services will be a full-time job for many. This will ramp up costs significantly and will be heavily dependent on the availability of a good supply of skilled staff, at a time of growing skills shortages.

Buying in cloud services, if a service provider has the right mix of skills, technologies and resources, can often be a far more effective and reliable approach. It also has the advantage of freeing up staff to innovate new services that government departments will certainly need.

To cover data sovereignty and security issues it does mean that the service provider must have a number of data centres around the UK. It should have a wide range of modern, open development tools so staff can readily engage in the process of innovation. It must also have the most advanced technologies as integral components of its services, such as analytical tools, cognitive AI and machine learning services, data science skills, the ability to scale services to meet any need, the ability to integrate established applications into new collaborative services, and a resourceful ecosystem of partners capable of servicing the needs of the smallest niche market sector.

Having studied the services and capabilities of IBM Cloud, Bloor Research is of the opinion that IBM is one of the few service providers that has the depth and breadth of resources to meet the demands of the UK government as it moves through the digital reinvention process to engage with the public in the most effective and compelling way.

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Introduction

There is a fundamental change underway in the social contract between the UK government and the UK population. This change is being underpinned by developments in technology – though its impact goes far deeper than technology. Unless the government keeps up with this change, it risks losing touch completely with the British people. It is mainly through technology that the means to keep the government in step, and proactively leading the way, can be found.

There is a growing use of smartphones, online retail, location-based relationships with retailers and on-demand services of an ever-increasing variety, all joined together by the Internet and World Wide Web. This has created a population that is increasingly geared to accessing the services they need, where and when they need them. Today, smartphones and tablets give people recommendations about nearby restaurants or shops, for instance. People can use their devices to purchase every kind of product or service – from a can of beans to a car or an airline reservation. In addition, people can select, download and interact with a huge and diverse range of entertainment services. Therefore, it is increasingly logical to them that interaction with government services should work in exactly the same way.

The innovative digital technology that will provide these services is only just starting to determine the new types of services that are likely to shape the future. However, this technology does provide the tools and building blocks with which government – both national and local – can reinvent itself to match the needs and expectations of the population across a wide range of services. It is safe to assume that people would prefer collaboration to confrontation when it comes to their interactions with government departments and services, and the widespread application of digital technology. It is also safe to assume that many would prefer to work with self-service models, just as they already do in many other aspects of their daily lives.

There is now a huge requirement for service innovation within all branches and levels of government. Importantly, government needs cost-effective access to the growing range of new tools and services that will allow its staff to innovate those services, while providing greater agility to change and adapt them as user needs change.

This paper is intended to identify the broad set of tools, technologies and services available (from IBM) to the UK government to both start and complete this important reinvention journey.

One of the key factors of all these technologies is that they share common ground with the technologies and tools being used by everyone on the other side of the social contract, from an individual with a smartphone to a large organisation with thousands of staff. At the heart of that common ground is cloud computing, which has one capability more important than any other: its ability to run applications and tools, collaboratively, from any source, to deliver a result to an end user. And that is what the end users want: answers to their questions and the provision of services where, when and how they choose to have them.

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The drive behind reinvention and how the social contract can benefit

There are six main areas that government would benefit from when it comes to reinventing the way it interacts. These interactions can be internal – between departments and internal organisations. They can also be external, which covers everyone from an individual with a tax or benefits inquiry through to major businesses operating as primary contractors on key investment projects.

The continual need for change

All branches of government are facing transformation. That is the inevitable consequence of the changes being forced on them by both the social contract and continuing budgetary pressures. Also, it is inevitable that change will occur more often and more quickly. One of the biggest problems faced by government today is that many of the operational processes by which it operates have long, sometimes very long, lifecycles, which leads to classic attitudes within the organisation. These include "It works, why change it?" "We have done it this way since I started here," and similar common responses. Now, however, instead of having a lifecycle of tens of years, the trend is for services to have much shorter lives, often measured in months. Even before that time is up there will be a need to modify and adapt a service to optimise it to match additional changes being demanded by users.

Often, that modification will involve government departments moving or dividing workloads between on-premises and the cloud. Systems will be linked together in a common, open way using open-source tooling that developers have a good knowledge of. This hybrid approach allows systems in the cloud to connect quickly and easily to on-premises systems which are equally easy to set up and use. In this way, users can build and re-build services as service requirements change.

The ability to react to these changes with new services, or with adaptations to existing services, is the new imperative. This will demand much greater operational flexibility, coupled with the agility to modify and adapt applications and tools quickly and easily.

Meeting that need: A clear example of this is the identification by the National Audit Office of around 300 new work streams that are now required. These are the result of the changes in regulation, lines of authority, and new operational structures due to Brexit. Many regulatory bodies are currently EU-based, covering all countries in the Union. Once the UK has left the EU, it will require the establishment of its own regulatory bodies that, even if they mirror the operations of the existing EU bodies, still need to produce and manage their own records, which must provide an audit trail of any operation or transaction. Much of the relevant data already exists, but the new bodies will need to pull it together and set up the tools and applications needed to process it. Cloud-delivered services are well-suited to this type of task.

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"It works, why change it?"

Traditional attitudes to operational processes need to change.

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The digital skills shortage

This is a growing problem, both inside and outside of government, which is not going to be solved quickly. In response, the government need to develop and grow digital skills across the population of the UK. Most pressing, however, is the need to reinvent much of its operational infrastructure. This generates an urgent requirement to implement new digital infrastructures and tools that make the best use of the skills currently available across all branches of government.

The best, most flexible option here is a much wider use of cloud-delivered services which can be tailored to meet existing and new requirements. Using the cloud means that tools and applications can be available 'as a service' rather than as products that need to be purchased, installed, commissioned and optimised to a task before being used. These cloud-delivered as-a-service applications and tools can be accessed as needed and can often be implemented and operational in days – sometimes even hours – rather than weeks or months.

Yes, there can be drawbacks using the cloud, and much will depend on the choices that are made by business and department managers. Making a choice based on price – the top-line quote from a service provider – may seem appealing. But that price is often dependent on the availability of sufficient skills within the business or department to fully implement and manage every aspect of optimising cloud service delivery.

It can often be a better option to select a service provider based on the service ecosystem it provides. Can they manage the availability of applications and tools as and when required? Can they provide and manage interconnections between different services both within and outside of government? Do they have a wide range of service partners that can enhance, extend and fulfil workloads as they grow and change? Can they provide this type of service support efficiently and reliably without bringing government service delivery to a halt? Do they have a wide spread of infrastructure options available, up to and including dedicated

'bare metal' systems and cloud-delivered mainframe services?

This will appear to cost more. But, over time, costs and risks will be reduced as government departments will not have to employ and train their own staff or bring in expensive, scarce skills to execute and manage cloud environments. Furthermore, the existing, rich skills within the service provider can be shared across them all.

In addition, government businesses and departments can get more value from their existing skills base. They can free up these valuable resources to address important aspects of service innovation and development, rather than 'keeping the lights on' with existing services.

Cloud is also the best way to deliver new software development tools and environments, a growing number of which exploit automation. These are becoming increasingly popular and are starting to be more widely used, particularly with tasks such as automated testing and deployment. This makes development capabilities more available and acceptable to the new generation of staff coming through colleges and early work experience.

Meeting that need: Government departments, like businesses, must undertake marketing and promotional tasks at times, and these are often combined with a detailed analysis of the results to check their effectiveness. IT systems can, and do, play a part in the development, design, execution and analysis stages. Yet, to date, they have had one major drawback: there is a group of specialists behind these stages, and they each have their favourite software tools they wish to work with. To be effective, however, those tools need to collaborate and work together as a team.

To date, this has always required another team of specialists with the relevant skills to engineer and test the connections between the tools. The process takes time, costs money and requires staff with the right skills. The combination of these three factors is often the reason for many tasks being

late, or not even attempted.

API (Applications Programming Interface) is a technology widely used in building cloud-delivered services. APIs are now available for just about every program in use, and they provide the common ground for communication between them. Using APIs enables established back-office applications and brand new web services to communicate directly, allowing those 'teams' of applications to be created, used and pulled apart again easily, and rapidly.

Digital reinvention
The important point here is the increasing pace of change, with the digitisation of everything possible. Individuals and business are exploiting smartphones and computers as the common access points to a vast, and rapidly growing, range of services they can interact with directly. Therefore, all branches of government now need to be 'people facing' in as many ways as possible.

What is more, most of these people will expect to be able to access self-service portals that give them direct access to the specific services they need. If they know what they want to achieve and have the necessary information to hand, they will be able to complete tasks without any assistance from government staff.

This does require something of a root-and-branch re-imagining of the way complete government departments operate and achieve their objectives. Re-imagining is important here, because this process not only involves reworking what the departments do now, but also imagining what they could add to build new services of real value to the public. It is all about enabling government departments to achieve efficiency, productivity, reliability and cost reduction and, perhaps above all, gain a better reputation among the people.

Cloud delivery of services can provide a faster, more flexible and more agile route to developing the new service innovations that will emerge, and the transition of existing applications into the new world. Many popular applications are now available in cloud-ready versions, meaning that many of the existing, on-premises implementations of these applications can be moved to a cloud environment. And if the cloud service provider works closely with the vendors of those applications, the efficiency and reliability of the transition process should be far more assured.

At that point, those existing applications become available for new uses, working in collaboration with innovations that provide real value to end users and the social contract. In addition, it becomes possible to slash the time taken to develop and implement these new and adapted services, by using new application development methodologies such as DevOps.

Meeting that need: An example of a successful people-facing capability in action is the DVLA's online service for providing vehicle Road Fund Licences. Instead of the traditional method – visiting a post office to obtain the right form, filling in the form and writing a cheque, then returning to the post office to have the form checked and approved to get the all-important tax disc – the whole process is now an online service for the licence payer. Back at the DVLA, a hybrid mix of well-established on-premises applications and new web services allow currently held data to be checked and confirmed, any necessary changes to the data made and validated, and an online payment made as part of the same process. And, as all vehicle data is now held online for the shared access of other authorities, such as the police, there is no longer a need to display the tax disc as proof.

Augmented Intelligence and its advantages
There is a lot of noise and hype around the potential for what some vendors call 'artificial' intelligence. In fact, it is the opinion of Bloor Research that the UK government needs to focus more on the use of Augmented Intelligence (AI) services, together with increasing levels of automation and machine learning. These

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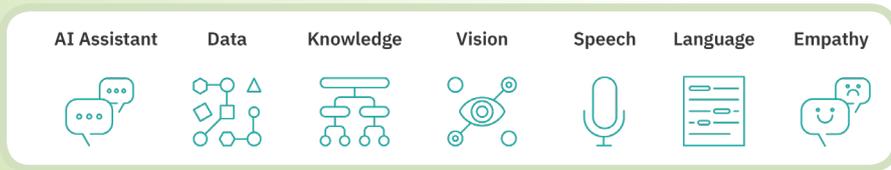
are all, of course, natural extensions of the use of data analytics tools, and can significantly aid all branches of government in defining more targeted, relevant services as core parts of an enhanced social contract.

Such technologies come into their own as a direct consequence of the digital reinvention process. This is because cloud delivery provides a convenient point at which to access most of the data being processed, and analyse it in any way

AI Assistant	Data	Knowledge	Vision	Speech	Language	Empathy

and for any purpose that is relevant. The information can then be used in many ways. For example, automated services can be built to meet a specific service requirement that always involves the same processes being run together in a specific way. That then becomes a process flow that is well-suited to automation. In more complex situations, machine learning systems can track the options that users select and the circumstances behind that selection. That way, a process can be developed that identifies sets of user circumstances and offers the most appropriate service choices. AI systems can work with analytics tools to help human decision makers to identify and focus on the best solutions to a problem, including consideration of all relevant data that might be associated with that problem, from time of day to the current state of best practice regulations.

IBM does provide a specific advantage here: its own cognitive AI service, Watson. These technologies can be provided as consumable APIs or as a fully cloud-delivered Software-as-a-Service (SaaS) offering. IBM's Cloud services have been designed to work with Watson from the ground up. In addition, it has some 40 separate analytical services available, both from IBM itself and from partners. Many of

these are open-source analytics tools.

Having access to – and experience of using – advanced analytics, AI and business automation tools will also present the government with new opportunities to foster and promote such services across UK business, industry, social services, healthcare and so on. In addition, it will allow government departments to build analytics and AI-based services that collaborate with such systems out in the field.

Meeting that need: Every government department is, by its very nature, swamped with unstructured data in the form of letters, reports, emails, social media interactions and anything else that is written in an unstructured format. There is a wealth of valuable information in that unstructured data, but extracting it is impossible for most current tools. This is where the cognitive capabilities of Watson are already coming into play. One of its strong suits is working with natural language information, seeking out and pulling together themes and details that become actionable insights.

This capability can be applied to a wide range of decision making that every department is involved in every day, from deciding whether a new technology or design is worthy of a patent through to helping to identify a complex tax fraud.

L O N D O N

Cloud first

In practice, a decision to move as many services to the cloud as possible is no longer just a good policy decision from a cost point of view. It is arguably the only option that can help government departments meet the growing and all-embracing expectations of the social contract by being able to deliver anywhere, any time, and do that via any device an individual uses to access a service.

Using cloud service delivery and agile development methodologies encapsulated by DevOps is the only way to provide the agility for fast change and adaptation of services. All branches of government now need to innovate new people-facing services of value. They must also accommodate, repurpose, re-engineer or supersede existing legacy systems, applications and services as valued elements of the people-facing environment.

As part of these changes, there is also the chance for government departments to provision a much wider, more flexible and adaptive ecosystem of services and service providers. Potentially, this allows individual government branches and departments to create one logical 'master service' that is theirs, utilising a wide range of service-provision partners from within the service provider's range of partners. This can give a fast, efficient chain of command and responsibility with maximum flexibility in agile service innovation and implementation.

Meeting that need: IBM Cloud has been designed from the ground up to meet the service needs of large and complex organisations such as the UK government. A network of cloud data centres around the UK ensures data sovereignty and system availability. Furthermore, one data centre is located right next door to the Crown Hosting site on the ARK data centre complex in Farnborough. This means that government organisations using Crown Hosting facilities can potentially access the IBM Public Cloud with almost zero latency, high levels of security and no public Internet access costs.

Pervasive Cyber Security

A full-on digitally-based and cloud-delivered reinvention of how government connects across its many branches and departments – as well as with the people – will need to be built on much stronger, more reliable connections than ever before. That is because it will be a major target for malicious attacks of all types. However, it will also provide a far greater coherency to the actual provision of services, and therefore to the overall protection of those services.

It can, for example, be used to implement – and impose – best practice in operations and ensure user compliance. It can also provide full audit trails of every activity by every user, in real time if necessary. That way, it becomes possible to identify not just what happened, but when it happened, where it happened, who did it, who they were working with and how they did it. Furthermore, analytics, machine learning and AI tools make it possible to stop many malicious attacks as they are being initiated and before they can do any significant damage. Using machine learning technologies also allows IBM to provide services that can predict attacks before they happen. However, it must be assumed that those with malicious intent will also be using such tools themselves.

Meeting that need: The use of AI and machine-learning tools can trap actions that are, say, undertaken by a member of staff and exceed policy or predefined operational boundaries. For example, a member of staff may be using a work laptop outside office hours, in an unusual location (identifiable from network data). This individual may be sharing unauthenticated third-party files that are not to be shared beyond an authorised recipient list (identifiable as such from machine logs). The chances are high that this is malicious practice, but the good news is it can be remotely terminated.

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The new reality is mutable service development and delivery – how to get there

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Use cloud services that have proven operational capabilities available as core parts of their total service offering. When evaluating cloud offerings, be careful not to define cloud too narrowly. Infrastructure-as-a-Service (IaaS) and Platform-as-a-Service (PaaS) are key components of the cloud but are merely two of the building blocks essential in delivering agile, cost-effective applications and business processes as-a-service. Look for innovative applications, modern, open development, testing and management toolsets all delivered in the cloud.

The objective is not to select the seemingly most cost-competitive IaaS offering in the market. Responsibility for the management of such an environment usually falls on the user. Managing costs, performance and security requires significant skills and effort that may be difficult, and expensive, for government departments to find. It also takes scarce resource away from the task of reinventing public services and building that new social contract.

The objective should be to identify service providers who have strong cloud-delivery capabilities. These can provide access to a wide range of innovative applications and tools that are open and transportable, from themselves or an ecosystem of partners. And, crucially, these are service providers who can effectively work with government organisations on their respective journeys to the cloud.

IBM and the cloud

IBM was one of the first traditional large-scale IT companies to commit to the cloud. If your definition of cloud is essentially public cloud and IaaS, IBM has significant capability, but in pure revenue terms lags a long way behind market leader AWS and Microsoft Azure. However, we believe that, to be truly mutable, an organisation needs to embrace a wide array of new skills, tools and applications, all delivered 'as-a-service'. IBM sees its cognitive AI service, Watson, as an essential tool and a significant USP. This comprehensive as-a-service approach encompasses public, hybrid and private clouds and relies upon the significant skills and experience of cloud service providers to help deliver genuine digital reinvention. Taking this wider view of cloud, we believe IBM has highly credible solutions, with some genuinely innovative and unique capabilities. It should also be noted that using this wider definition of cloud, industry estimates put IBM ahead of AWS in revenue terms.

So, what are the key points of the IBM Cloud story?

The buy-or-build question

Given the inevitability of the UK government needing to reinvent the way it manages its operations, one of the most important questions it faces is whether it should buy in the resources with which to provide these new services or build its own.

Building them on top of one of the major public cloud service providers can look attractive, as the headline costs can provide an initially compelling argument. It is an argument that even holds water in some circumstances, but they are circumstances that need to be considered in some depth.

The main consideration is whether each government department or organisation has sufficient staff, with sufficient experience and expertise, to not only build the complex cloud services they will require, but also keep them working effectively, and

modify or adapt them to meet changing circumstances. In practice, this can make the top-line service costs seem like a small-change expenditure. There is also the issue of managing and resolving issues when failures occur (and the chances are they will).

The buy-in option can look more expensive at face value. But as a rich and diverse set of options becomes available – with much of the service infrastructure built in – the easier it becomes for any department or organisation to select and pull together an environment capable of delivering the specific services required. This option can also deliver them much faster, and much more reliably, than is normally ever possible with the build option. Much of it will come with the internal testing the cloud service provider has already conducted around servers, storage, networking, software tools and applications.

Providing this level of services is the ongoing goal of IBM Cloud. Not only can it provide them now, but it understands that it too has to grow and develop its service capabilities into the future if it is to continue to support an organisation like the UK government. It also offers the flexibility to work in the way the government requires, rather than be prescriptive in the solutions it can offer.

IBM-owned backbone network

IBM Cloud's UK data centres are part of a high availability zone of six data centres covering both the EU and UK markets. This is well suited to public sector applications, offering highly reliable, secure and fast delivery of services at low cost and high cost-effectiveness.

Within these data centres, users can select a wide range of system options, allowing them to choose the most appropriate environment on which to run their workloads. Key here is offering users the opportunity to balance their choice of services between cost, performance and security.

Virtual servers, either running in a public cloud environment or dedicated specifically to a workload, are readily available and allow users to scale

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system resources dynamically to whatever size the workload demands at that time. This is a highly cost-effective option that is ideal for regular and lower-priority workloads, while offering the opportunity to raise the stakes when required, such as when a larger than normal workload needs to be processed.

Dedicated virtual servers balance some elements of the cost-effectiveness equation against the need to run more specialised workloads. Here, factors such as higher security requirements, the need to comply with regulated processes, or workloads that demand a minimum guaranteed performance level are parts of the mix.

For those applications and services where performance, security or compliance with stringent regulations outweigh the issue of service cost, IBM Cloud offers the option of using dedicated bare metal servers. An entire physical computer system is given over to a specific workload so it can be processed in an isolated, tightly managed environment configured to meet the precise needs of that workload.

As highlighted earlier, one of the UK data centres is located next door to the Crown Hosting site on the ARK data centre complex in Farnborough. This means that government organisations using Crown Hosting facilities can potentially access the IBM Public Cloud with almost zero latency, high levels of security and no public Internet access costs. This provides government organisations with greatly increased flexibility in choosing where to run workloads, depending upon their requirements and relative importance. This is then coupled with the agility to make and act on such decisions rapidly enough to make a real difference

in areas such as resource and cost management.

Low-cost hybrid cloud connectivity

The term hybrid cloud sounds like something special and different, a branch of cloud technology all on its own. In practice, most users of cloud technology are running a hybrid cloud. It simply means an environment that uses different types of IT working together.

The key issue with running hybrid cloud services is the connection and collaboration between the different environments. Some applications are on-premises, some are running on bare metal or dedicated virtual servers in a private cloud, and some are sharing resources in a public cloud. Without forethought, it can become quite expensive to get applications running in one environment to collaborate seamlessly with those running in other environments. Yet it is the ability to build seamless collaboration that is crucial to innovating and building the internal- and external-facing applications and services government will require.

Building and managing the underlying connectivity that enables such collaborations is second nature to IBM. For example, its Global Services division has been providing these capabilities to many of the world's largest enterprises and organisations for many decades. That experience and expertise is now part of the core fabric of the IBM Cloud services offering.

Open development, orchestration, management and security

Committing to just one proprietary technology as the basis of any cloud service is now the equivalent of travelling down a dead-end road. No one technology can provide the solution to every issue an organisation with the size and scope of the UK government will face. Its need for adaptability, flexibility and, above all, agility can only come with cloud services based on open-source applications, tools and services, such as found with IBM Cloud's Open Architecture.

IBM is a full and contributing member of the large, and growing, open-source community. The advantage of this can be seen in the development of OpenWhisk, IBM Cloud's execution environment for serverless applications. This is an open-source development which could allow government developers to innovate (and even contribute back) new capabilities. Both of the alternatives – AWS Lambda and Google Cloud Functions – are proprietary and restrict that possibility. Another example is the availability of Spark, an open-source cluster computing framework that can significantly speed up analytics applications. This has been developed with the Apache Software Foundation, which fosters a large open-source developer community and is now available on the IBM Cloud as a service option.

The IBM Cloud also comes with a comprehensive range of application development tools. These range from its own well-established WebSphere web applications development environment through to the latest Docker container technology for the rapid deployment and management of ready-packaged applications. There are also the Kubernetes service orchestration tools, allowing the rapid creation of complete services that can be deployed as a single entity.

One of the goals here is to keep the new generation of developers happy and passionate about the potential of their work. For example, most new cloud-delivered applications are created using a wide range of open-source tools and languages, the majority of which are available for use with IBM Cloud. Indeed, IBM is a major contributor of code to the open-source community. Developers are also keen to make increasing use of modern development and deployment approaches, such as DevOps and Continuous Delivery. These can provide developers with dramatic improvements in productivity. They can also provide the organisation with significantly increased agility in tracking and implementing changes in services as

they are required, and they can increase the reliability of applications and services when they are deployed.

These new applications rarely stand alone. It is essential that they connect with and augment the many tried-and-tested IBM development tools and management features, and the continued development of existing legacy applications. For example, it is essential that new applications can seamlessly integrate with existing and new security tools and methodologies – to ensure that new points of attack are not opened up. It is just as essential for new front-end web applications to collaborate smoothly with legacy back-office applications.

There is, of course, IBM Garage as well. This service can bring development teams together to work with IBM specialists to double-down on particular aspects of a cloud deployment.
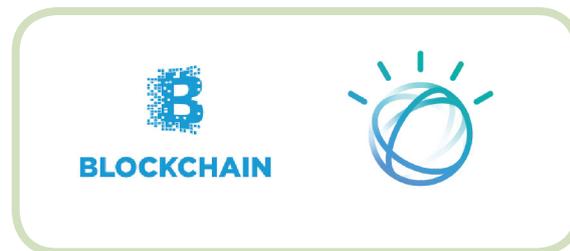
Blockchain, AI and data science

As part of its wider interest in helping organisations develop new services, IBM has made significant investments in its own development of three important new areas: Blockchain, cognitive Augmented Intelligence, and data science.

Blockchain

IBM is certainly among the world leaders in the development of Blockchain-based services for use in enterprises and organisations. It claims to be the first player in the emerging market sector to offer an enterprise-ready Blockchain-on-Cloud capability. Blockchain is a technology capable of producing immutable transaction ledgers that cannot be changed or 'hacked' except by authorised users. It came to fame as

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the ledger underpinning transactions in the somewhat notorious crypto-currency bitcoin. But its growing reputation for building 'bomb-proof' transaction ledgers is now opening up new application potential, especially in areas where the complexities of multiple, interacting cloud service transactions make tracking processes increasingly difficult. And without the ability to track and manage transactions accurately, possibilities for fraud and theft open up rapidly.

To meet this need, IBM Cloud already has a Blockchain Platform available for UK government departments to work with. This allows them to accelerate their ability to innovate and develop new and complex transaction management applications, and ensure they operate within multi-institution networks, with high levels of governance.

As a founding member of the Open Linux Foundation, IBM Cloud has also contributed large amounts of code to that community as part of its work in creating a Blockchain Hyperledger fabric that is capable of scaling in a secure manner in step with the growth that might be expected of a busy government department. It has also created, and donated to the Linux Foundation, a graphical user-interface tool for creating Blockchain components, such as smart contracts.

Cognitive Augmented Intelligence
Many technology vendors that have recently entered the AI marketplace are hoping to ride a wave of interest and use in artificial intelligence systems and automation. For them and their potential customers, however, it is a sector that is still in its very early stages of development, where large amounts of both trial and error can be found.

IBM has been one of the leaders in the practical application of such technologies, following many years of extensive research into the subject. This has resulted in a couple of important distinctions from most of its competitors. For example, it has a different perception of AI that leads to a different interpretation: Augmented

Intelligence, where the goal is to get the balance right between the analytical and data management capabilities of the machine and the creative interpretation skills of the human. That way, far better, richer decisions and ideas can emerge than are likely from either acting on their own.

The second difference is that IBM is now much further down the road of AI implementation than many of its competitors. The company's technology and brand, Watson, is already well established. It is also available as cloud-delivered SaaS, not just as a development kit to experiment on, but as a range of business-facing practical services. This is the Watson Data Platform (WDP), which brings together data management, data policies, data preparation, and analysis capabilities into a common framework. Each of these elements are available as consumable APIs that can be accessed and exploited simply and directly. Many of these have the potential to enhance existing government applications and services, and indeed become a core component of new people-facing applications and services.

As well as Watson, the company also has a wide range of analytical tools available both from within IBM and from the open-source community.

Data science
As the complexity of analytics increases – through the exponential growth in available data and the number of potential questions that can then be asked – the need for data science skills rises dramatically. All the tools and resources in the field of data science are readily available to IBM Cloud users through Data Science Experience (DSX) architecture. This provides, on a single screen, access to all the tools, such as collaborators, data and analytic assets, bookmarks to important resources, and other services, that are needed to create and deliver an analytical project quickly and effectively.

Collaborators can be anyone that can help users identify what questions, out

of the millions that could be asked, are actually relevant and what data sources are most pertinent to deriving answers and, sometimes, help interpret what the answers actually mean.

It is the opinion of Bloor Research that, taken together, these capabilities have the potential to provide government departments with more comprehensive and focussed information with which to create well-informed, smarter decisions, with the ability to arrive at them faster than ever before. It can also help to reduce, and sometimes remove, more mundane work, freeing staff to be more innovative.

In-depth security expertise and tools
Last year, IBM Cloud was identified by Gartner Research as one of the leaders for Access Management services, and its security, identity and access management solutions could give the UK government the ability to protect and monitor user access across a large and diverse cloud environment. These can also help safeguard valuable data and applications with context-based access control, security policy enforcement and business-driven identity governance. This will strengthen compliance regimes and reduce risk.

The company has a broad range of Identity and Access Management offerings available, including IBM Cloud App ID, an authentication and profiles service; IBM Security Access Manager, a simplified access management solution for enterprises; IBM Security Identity Governance, IBM Security Directory Suite, and Intelligence, and IBM Security Privileged Identity Manager, all three of which are security-focused advanced statistical analysis tools; and IBM Cloud Identity Connect, which provides non-disruptive ID as a service that can bridge from existing on-premises Identity and Access Management to the cloud.

Legacy system transformation
For a long-standing, well-established organisation such as the UK government, one of the deep-seated technical problems it will face is what to do about its many existing applications. Many of these have not only served the organisation well, but continue to do so. Some, particularly mainframe applications, are the only options available to deliver a range of vital tasks. Migrating these existing applications into the cloud can be an expensive process at the best of times, and more so if there is insufficient planning and care in place. But the capacity to bring these applications into the modern world as integral components in an organisation's reinvention is crucial. IBM Cloud has a solution: packaging.

Packaging brings together the software tools and services needed to migrate an application onto the IBM Cloud, pre-configured and optimised to work with IBM Cloud and migrate the application smoothly and as quickly as possible. All the planning and pre-migration software engineering tasks become part of the migration package. Many of these legacy applications run under the popular VMware environment. IBM has brought together its cloud infrastructure and VMware configuration and management technologies to streamline VMware workloads of three main types from on-premises environments to the IBM Cloud.

- VMware vSphere: this is a customisable virtualisation service that combines VMware-compatible bare metal servers, hardware components and licences that allows a user to build their own IBM-hosted VMware environment.

- VMware vCenter Server: this automates deployment of the underlying vSphere and vCenter layers needed to build a flexible and customisable VMware solution.

- VMware Cloud Foundation: this is a Software-Defined Data Centre (SDDC) solution that brings together IBM Cloud infrastructure and VMware, vSAN, NSX and SDDC for a simple hybrid extension to an existing on-premises data centre.

A package is also available to integrate VMware's Hybrid Cloud Extension (HCX) with IBM Cloud.

> "
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> "

> **The process of government is more complex and multifaceted than ever before.**

When it comes to migrating mainframe applications, the *'package'* is a complete data centre. The Z-Series Cloud data centre is a mainframe-specific cloud service that gives users access to isolated partitions on Z-Series mainframe systems housed in an IBM Cloud data centre. This protects the mainframes behind the full range of cloud security tools, while providing users with the opportunity to 'cloud burst' applications or migrate them to a cloud or operate a 'mainframe-as-a-service' environment without having to pay the normal hardware and system software and support costs.

This capability might also be of interest to those UK government departments that have a need to run large numbers of simultaneous instances of applications running on Linux. The partitioning tools on the Z-Series mainframes allows the machine to be partitioned into several thousand individual virtual servers, each capable of running an instance of Linux. This creates an ideal environment to run multiple instances of the same application, an option often used to process large volumes of data and a capability that some government departments might well find attractive.

IBM also has a wide range of modern development tools available that can also bring mainframe applications into the new DevOps world.

Large partner ecosystem

The range and number of partner businesses in the IBM Cloud ecosystem is enormous, stretching from major global systems integrators through to small, local specialists offering skills and expertise in niche sectors. IBM also has one of the oldest and most experienced global systems integrators, IBM Global Services. In its time, it has tackled just about every business management issue any organisation has ever faced, and that time has been almost as long as IBM has been in the business of providing IT solutions.

From the point of view of the UK government, this ecosystem has the potential to be a vital plus-point. The process of government is more complex and multifaceted than ever before, and each department will have its own unique requirements and will need its own solutions. IBM's Cloud services are well suited to provide the platforms on which those solutions can operate.

That is where the extensive ecosystem comes into its own. Among its membership any government department will be able to find any specialist solution it requires. And because it is available through IBM Cloud, it can be integrated easily into that department's overall package of services. That way, each department can create its own unique mix of services, coupled with its own approach to delivering people-facing solutions.

To make this process even easier to work with, the IBM Cloud is also available from the government's own G-Cloud portal service, as are the services provided by some members of the IBM Cloud ecosystem. This way, departments can either select IBM Cloud from G-Cloud and find the right partners, or select the right partner and come onto the IBM Cloud that way.

Extensive UK public sector understanding and expertise

With a relationship going back some 50 years, it goes without saying that IBM has a long and successful track record of working with most of the departments within the UK government, and continues to do so. Each side of that equation knows well how the other side works, what it thinks and why it thinks it. This depth of relationship can be a vital factor for the UK government as it faces up to the significant changes that will come with the all-important digital reinvention it really has to undergo.

In simple terms, when making significant changes to an established organisation, it is best to change only those elements that need changing. Undertaking a digital reinvention that includes working with partners that are new to the organisation (and the organisation is new to them) can add a serious level of complication to the process – through misunderstandings and miscommunications if nothing else. This is especially the case when, in the view of Bloor Research, IBM Cloud provides a far deeper and richer range of services, coupled with a long-term understanding of the operations and needs of the organisation, that correspond with what the UK government will require over the coming years.

UK case study example

A case study showing how NHS Blood and Transplant services have worked with IBM can be found **_here_**.

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> **IBM Cloud provides a far deeper and richer range of services.**
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Conclusion

T he developing social contract between the people of the UK and the UK government, and the rate at which the people are taking up the tools of direct interaction between themselves and a boundless range of services, is making the need for all UK government departments and organisations to re-engineer themselves a necessity rather than something that is simply 'nice to have'.

From that point onwards, the decisions facing the government seem, to Bloor Research, to be clear cut. To go forward with either an upgrade of existing systems or a major rip-and-replace of the existing on-premises with another on-premises solution will move all government departments even further out of step with the population than they already are. The only viable option is to go with cloud-based solutions, in the widest sense, that enable government-as-a-service.

This provides access to the resources required – both hardware and software – in the most cost-effective way possible, and delivers the levels of operational flexibility and agility needed to change, adapt and grow services needed. It is also the best option available for building and delivering the people-facing services that can allow the UK population to increasingly self-serve their interactions with government. It can also maintain the integrity of a user's data, which is a key maxim for IBM Cloud.

The question is whether to build a suitable cloud solution – or to subscribe to cloud services from a provider or a host of providers – that has the range and depth of services and resources needed to not only fulfil current needs but also grow into the future.

It is the opinion of Bloor Research that IBM, with its range of as-a-service offerings and service integration capabilities, is one of the few cloud service providers that can meet the spread of requirements – both now and in the future – that the UK government will require, and is therefore one of the best placed to meet government goals and objectives.

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FURTHER INFORMATION
Further information about this subject is available from
www.bloorresearch.com/update/2359

About the authors
Paul Bevan
Research Director: IT Infrastructure

Paul has had a 40-year career in industry that started in logistics with a variety of operational management roles. For the last 33 years he has worked in the IT industry, mostly in sales and marketing, covering everything from mainframes to personal computers, development tools to specific industry applications, IT services and outsourcing. In the last few years he has been a keen commentator and analyst of the data centre and cloud world. He is also a non-executive director in an NHS Clinical Commissioning Group.

Paul has a deep knowledge and understanding about the IT services market and is particularly interested in the impact of Cloud, Software Defined infrastructure, OpenStack, the Open Compute Project and new data centre models on both business users and IT vendors. His mix of business and IT experience, allied to a passionate belief in customer focus and "grown-up" marketing, has given him a particular capability in understanding and articulating the business benefits of technology. This enables him to advise businesses on the impact and benefits of particular technologies and services, and to help IT vendors position and promote their offerings more effectively

Martin Banks
Senior Analyst: Datacentre & Mainframe

Martin Banks has been an observer and commentator on the technologies and businesses of the electronics and IT industries since 1968. As one of the UK's leading specialist journalists he has observed the development of IT systems and their impact on both individuals and business since the emergence of the first semiconductor memory chips and, subsequently, the first microprocessors.

In that time he has either worked on or written for all the leading publications covering the industry, from trade papers such as Electronics Weekly and Computer Weekly, through to national press such as The Times and Financial Times. He was the first winner of the Times/ Hewlett-Packard Technology Columnist of the Year Award, an award he won twice.

Martin recently took on the Infrastructure Implementation brief for Bloor. This refers to the infrastructure and systems required to deliver applications and services to enterprise users, from servers, mainframe systems and data centres through to architectures and operational concepts such as Service Oriented Architectures (SOA) and Software as a Service (SaaS).

Complementing his Bloor work, he now runs his own specialist analysis and writing business. He is still a regular contributor to a number of publications, including Register Developer and IT Week, where he specialises in covering SOA, SaaS and enterprise infrastructure management and implementation. In particular, his focus is the business impact of such technologies.

Bloor overview

Technology is enabling rapid business evolution. The opportunities are immense but if you do not adapt then you will not survive. So in the age of Mutable business Evolution is Essential to your success.

We'll show you the future and help you deliver it.

Bloor brings fresh technological thinking to help you navigate complex business situations, converting challenges into new opportunities for real growth, profitability and impact.

We provide actionable strategic insight through our innovative independent technology research, advisory and consulting services. We assist companies throughout their transformation journeys to stay relevant, bringing fresh thinking to complex business situations and turning challenges into new opportunities for real growth and profitability.

For over 25 years, Bloor has assisted companies to intelligently evolve: by embracing technology to adjust their strategies and achieve the best possible outcomes. At Bloor, we will help you challenge assumptions to consistently improve and succeed.

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