techUK

Cloud 2020 and beyond

Unlocking the power of the cloud

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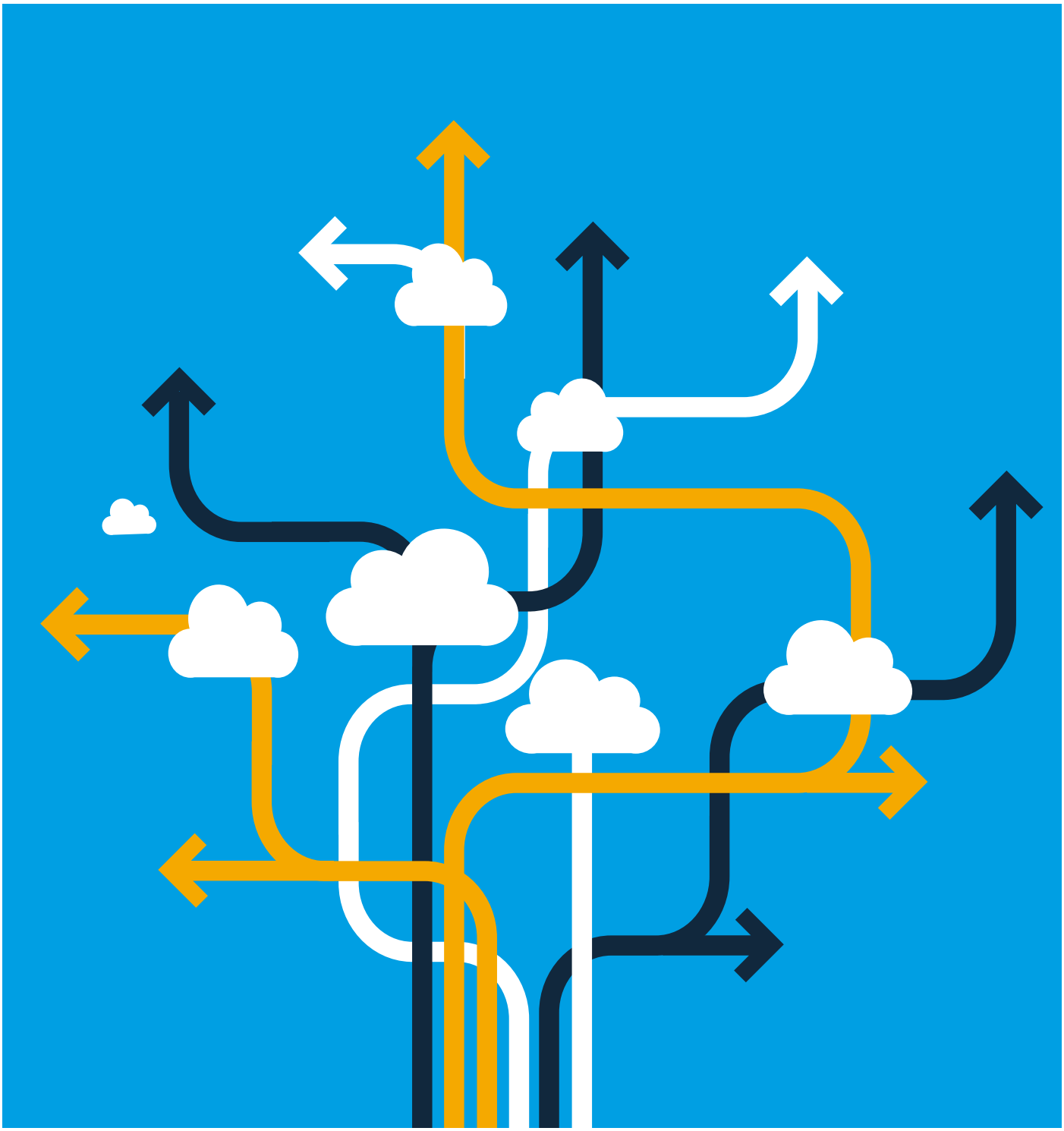

Executive summary

In 2016, techUK published its Cloud 2020 Vision to keep the UK at the forefront of cloud adoption.[1] The report made recommendations to drive greater take up of cloud computing services and ensure the continued growth of a world-leading cloud market in the UK. Since then, adoption in the UK has increased with cloud becoming the new norm for organisations to store and manage information, host and access business critical applications. At the same time, the global cloud computing industry has evolved at pace with new cloud models and services, such as containerisation and serverless solutions, being developed, adopted and deployed.

In 2019, cloud computing is increasingly providing the platforms, infrastructure and computing power for businesses looking to explore and adopt emerging and transformative technologies such as Artificial Intelligence (AI) and the Internet of Things (IoT). With the potential of advanced digital technologies to increase economic growth and productivity across the UK, the continued adoption and use of cloud computing holds the key to unlocking this value.

This report therefore considers what action may be needed beyond 2020 to ensure the UK can remain a leader in cloud adoption, optimisation and technical implementation and maintain its position of strength as a vibrant and competitive cloud ecosystem. However, given the speed of innovation and change in the cloud industry, looking too far into the future at what the UK cloud computing industry might look like may be difficult. This report identifies where action is needed in the next three years to drive greater cloud adoption and ensure UK organisations are cloud-ready for the next wave of the digital evolution.

In particular, the need to encourage a data portability and system interoperability by design approach in cloud procurement to ensure these issues do not hold back greater adoption, ensure cloud services are being adopted and used securely to build greater trust in the security of cloud and equip organisations with the understanding, skills and knowledge to make the right cloud decisions for them. The report also outlines the need to raise greater awareness of the sustainability and environmental benefits of cloud adoption as well as deepen and widen public sector usage of cloud service to support digital transformation and continue a technology neutral approach to the legal and regulatory framework for cloud remains key. Finally moving faster to achieve full fibre connectivity is identified as not only key to driving cloud adoption forward but also essential to help organisations to unlock the full power of the cloud and release the full potential of emerging and transformative technologies.

Introduction

In 2016, techUK published its Cloud 2020 Vision and recommendations to keep the UK at the forefront of cloud adoption.[2] As this new report shows significant progress has been made. There has been continued development of a vibrant cloud industry in the UK that is now projected to be worth around £9 billion by 2020.[3]

Adoption and take up of cloud services has increased between 2016 and 2019. At the end of 2016 36 per cent of UK businesses were purchasing and adopting cloud services.[4] This figure had risen to 41.9 per cent[5] by the end of 2018. The UK is currently ranked sixth in the EU for adoption of cloud services.[6]

Cloud computing is becoming the new norm for organisations to store and manage their information, as well as host and access business critical applications. As a result, business investment in cloud infrastructure during 2018 surpassed on-premise spending for the first time; with 19 per cent of IT budgets being spent on cloud compared to a 18 per cent spent on-prem. Organisations are adopting a range of public, private or hybrid cloud models and services as well as considering the role of innovations, such as containerisation and kubernetes. With predictions that by 2022 only 12 per cent of IT budgets will be devoted to legacy technologies, the direction of travel is clearly towards increased investment, take up and adoption of cloud services by UK organisations.[7]

As well being driven by organisational efficiency and cost reductions, organisations also see competitiveness through digital innovation as a benefit of cloud. Cloud computing is providing the platforms, infrastructure and computing power for businesses to explore and adopt emerging and transformative technologies such as advanced data analytics, Artificial Intelligence (AI), Internet of Things (IoT), Augmented Reality (AR) and blockchain. For companies concerned about the possible environment impact of advanced digital technologies, cloud computing is also starting to play a role in organisations sustainability efforts.

With emerging technologies such as AI expected to be worth £232 billion to the UK economy by 2030, and the IoT over £75bn in the next five years, the continued adoption of cloud computing holds the key to unlocking significant economic growth in the UK. However, if we are to ensure UK organisations have the computing services, power and resources needed to realise the full potential of emerging and transformative digital technologies, such as AI, action is needed to increase and deepen the adoption, deployment and utilisation of cloud computing models and services by organisations of all size and sector nationwide.

The good news is the UK is starting from a position of strength given the progress made since 2016. However, now is not the time to become complacent. There are areas where cloud adoption still remains shallow, particularly in the public sector, and organisations that are not yet fully utilising the benefits the cloud has to offer. There also remains a long tail of organisations, mostly SMEs, that have not yet started their move to the cloud. If we do not create the right conditions for increased cloud adoption, and provide the right support and help so organisations can make the right cloud decisions for them, there is a risk that UK could simply be left behind as the global Fourth Industrial Revolution continues to gathers momentum.

In order to determine what action is needed to ensure this happens this report will:

- Review the progress that has been made in the six key areas identified in techUK's Cloud 2020 Vision[8].

- Identify key cloud-related issues that have emerged since 2016 which now need addressing.

- Identify and explore areas where further action is needed to drive greater cloud adoption and ensure UK organisations are cloud ready for the next wave of the UK's digital evolution.

Review of the progress made on the Cloud 2020 Vision report recommendations

Before considering the action that is needed to increased adoption and use of cloud computing services across the UK, it is important first to assess the progress made with respect to the recommendations made in 2016 The following assessment evaluates where progress has already been made and highlights where more action may be needed. It also identifies key issues, which have arisen since 2016 that must now be addressed.

RECOMMENDATION	ACTION OR ACTIVITY SINCE 2016	PROGRESS ASSESSMENT
Enabling data portability and system interoperability within the cloud computing ecosystem	Introduction in May 2018 of a 'right to data portability' in the General Data Protection Regulation (GDPR) has played a significant role in ensuring that cloud providers embed data portability and system interoperability within their systems. Codes of practice for cloud services are currently being drafted by the EU.[9]	Good progress
Building trust in the security of cloud computing services	Building trust and confidence in the security of cloud computing services remains fundamental to the take up, adoption and use of cloud services by organisations. While the security of cloud services is no longer the main barrier to cloud adoption, as it once was, further work is needed to raise awareness of the continuing evolving online threat environment and support customers to securely transfer their data to the cloud and future-proof their systems.	Good progress
Supporting the cultural shift required to optimise the use of cloud	There remains a significant long-tail of businesses that are not moving to the cloud because they don't know how to make the right decision about what cloud services to use and they are worried about the impact of making a wrong decision on the organisation and ultimately jobs including their own. At a time when climate change issues and sustainable procurement is increasingly of importance to business leaders the potential sustainable benefits of a move to the cloud are not being fully considered.	Lack of progress

Building a coherent regulatory framework for cloud	In May 2018, the EU introduced the General Data Protection Regulation (GDPR).[10] Subsequently the UK's Data Protection Act[11] came into force. In addition, we have seen the adoption of the EU-US Privacy Shield and the passing of the Investigatory Powers Act. Since 2016, the future of cloud adoption has also been bolstered by the development of Free Flow of Data Regulation in the EU, which came into force in May 2019. The introduction of the EU's Network and Information Systems Directive (NIS)[12], which has specific cloud requirements, the publication of the European Banking Association (EBA) cloud outsourcing requirements[13], and the development of the National Cyber Security Centre[14] in the UK are some further examples of activity in this area. Overall the legal and regulatory framework for cloud has remained technology neutral which is key.	Good progress
Ensuring effective public sector adoption and usage of cloud	Over the past three years greater engagement between public sector and the cloud industry has happened and case studies, and real-life examples, of where cloud adoption is making a difference to the delivery of public services are now being seen. However, to date, a majority of public sector applications are only using lower-level services, such as IaaS and the transition of large legacy systems from on premise onto the cloud continues to lag.	Progress made
Having a communications infrastructure that keeps pace with mass cloud adoption	Significant progress has been seen in the roll out and take up of fibre. Looking ahead at the role of mobile investment in 5G testbeds and trials is also now being seen although the impact of 5G will only be felt in the future.	Progress made

Based on this assessment of progress since 2016, the current pace of change within the cloud computing industry and input from members during a series of Cloud 2020 Vision workshops held in 2018 and 2019, techUK believes action is needed to encourage and drive greater adoption and optimisation of cloud computing services so that UK organisations have the computing services, power and resources needed to realise the full potential of emerging and transformative digital technologies.

techUK has identified the following seven key areas where action is now needed:

1. Bake in a data portability and system interoperability by design approach into cloud procurement.
2. Ensure cloud services are being adopted and used securely.
3. Equip organisations with the understanding, skills and knowledge to make the right cloud decisions for them.
4. Raise awareness of the sustainability and environmental benefits of cloud adoption.
5. Deepen and widen public sector usage of cloud services.
6. Ensure a technology neutral approach to the legal and regulatory framework for cloud.
7. Work harder and faster to achieve full fibre connectivity is key to drive cloud adoption forward.

1. Data portability and system interoperability by design should be baked into cloud procurement

Since 2016, there has been an increased take up and adoption of cloud computing within organisations looking to use different cloud services to host, manage or develop new innovative technology tools, solutions and applications. For new organisation, that were born in the cloud, data portability and system interoperability is not holding back cloud adoption. However, for organisations with legacy systems and data infrastructure a lack of data portability and system interoperability could still hold back organisations move to the cloud. This is despite the introduction of a 'right to data portability' in the EU's General Data Protection Regulation[15] (Article 20 of the GDPR) in May 2018 which has played a significant role in ensuring that cloud providers embed data portability and system interoperability within their systems.

For a competitive cloud market to work, customers need to be able to choose and switch between cloud services, as and when their requirements change. Since 2016, the role of open data standards and APIs, that allow integration with different data sets, has therefore become a key part of the conversation between cloud users and service providers.

Progress has also been seen in the UK cloud supply-side, where a plurality and diversity of cloud computing businesses has been fostered. The UK's diverse cloud market not only expands customer choice but also increases competition. In the public sector, for example, five years ago 80 per cent of public sector IT was dominated by eight large public sector IT service providers. In recent years we've seen an increase in the number start-ups and scale-ups providing products and services to government with these new services often being supported and enabled by the wider cloud ecosystem.

However, if we are not able to address data portability and system interoperability issues the perception that customers are locked-into cloud services could reduce further take up of cloud. Ensuring there is data portability and system interoperability is vital for the UK to continue to grow a thriving, open, competitive cloud computing ecosystem. Given the importance of data portability and system interoperability, more must be done to educate customers to expect, require and even mandate portability where it is critically important. Organisations looking to provide cloud services should ensure that data portability and system interoperability functionalities are built into their services.

This is likely to remain a pertinent issue for companies to consider when moving their data into the cloud. Therefore, ensuring interoperability requirements are built into the design of cloud services being offered today, and in the future, could ensure that portability and interoperability issues do not hold back the adoption and take up of future cloud services.

RECOMMENDATION

- techUK will work with members to develop and promote a checklist of questions on data portability and system interoperability that cloud customers should ask cloud providers when procuring services.

2. Ensure cloud services are being adopted and used securely

Building trust and confidence in the security of cloud computing services remains fundamental to the take up, adoption and use of cloud services by organisations. Ensuring the security and privacy of data, particularly in mission critical systems, is crucial. When techUK's Cloud 2020 Vision was published three years ago, the perceived security risks associated with cloud were considered a significant barrier holding back adoption, particularly by SMEs.

Cloud users seem to be increasingly recognising the security benefits of cloud services and that the cloud is more secure than typical on-premise infrastructure. However, given the importance of cloud computing to the UK's digital future, it is vital to continue to build trust in the security of cloud computing. This will ensure that the messages, and advice, on cloud security being delivered today remain relevant to the current online threat environment, to how cloud services have evolved, and to the security concerns being raised by cloud users.

Where business leaders' appetite and decision to move to the cloud has changed and moved on, there is concern as to whether the security approach and processes being taken by organisations, when moving data and applications to the cloud, have also moved on.

For example, the process of organisations 'lifting and shifting' business systems to the cloud without conducting a risk management process, reviewing the appropriateness of existing control frameworks and existing security policies and processes, could introduce security vulnerabilities into the cloud. Vulnerabilities that may exist in an on-premise environment could be made worse when lifted and shifted to the cloud.

For example, mature systems that have many open ports and legacy authentication procedures may leave an organisation's system open to new risks when the system becomes more widely connected to other systems. This can ultimately result in organisations being open to an increased risk of security breaches as well as causing severe reputational damage to the cloud computing industry. Further education is therefore needed so that customers can adequately review their control frameworks and existing security policies and procedures, as well as conduct a rigorous risk management process. This will ensure that robust security frameworks are in place that are fit for the cloud services being used. Also, greater awareness is needed of new and emerging developments in cloud technology, such as containerisation, which can also help to address security issues and vulnerabilities throughout an application's data lifecycle.

A loss of trust and confidence in cloud services could put at risk the increased adoption and use of innovative, emerging technologies that are beginning to be born in, and only offered via, the cloud. If the adoption and use of advanced digital technologies is key to UK organisations reducing costs, driving growth, productivity and remaining competitive, then moving fast and fixing misconceptions and misunderstandings around cloud security is vital.

Despite increased customer awareness of the benefits of cloud, further work is therefore needed to raise awareness of the continuing evolving online threat environment and support customers to securely transfer their data to the cloud and future-proof their systems against possible emerging cyber security risks. We must also ensure that organisations are not just adopting secure cloud services but are using them securely.

Moving data from on-premise to the cloud requires a shift in mindset in addition to the technological changes. A significant challenge is reframing customer expectations in relation to security services. In particular, the demand for delivery of security logs of cloud-based security incidents. Requirements for security logs are being seen based on the experience of using historical on-premise tools. These requests are outdated with how cloud services are being provided and need to change.

RECOMMENDATIONS

- A joint cloud and cyber security roundtable will be held to discuss how techUK is best placed to support organisations to adopt and use cloud services securely.
- techUK will work with members to develop a checklist for SMEs outlining the necessary steps that need to be taken to re-architect existing control frameworks and security policies and procedures before systems are moved to a cloud environment so that security vulnerabilities are not simply lifted and shifted to the cloud.
- techUK will identify and promote examples of best practice in secure cloud adoption and use across the ecosystem.

3. Equip organisations with the understanding and knowledge to make the right cloud decisions

Since 2016, the growth of the cloud has helped to flatten the technology landscape; providing organisations with significantly more opportunities to access on-demand compute power and data storage to businesses of all sizes at affordable prices. This has resulted in more business and ethical questions, choices and decisions that business leaders have to make about which cloud services should be adopted and deployed. In many cases these are decisions that will impact people's jobs and everyday lives.

Moving to the cloud can be emotive as it can lead to changes in the way a business operates, its relationship with employees and overall culture. While the benefits of increased efficiency and reduced costs offered by the cloud are well understood, it is still unclear as to whether organisations have the level of understanding, skills or time, bandwidth and experience to make the right decisions for them about the cloud services being offered.

Also, while organisations may be aware of the questions they need to ask cloud service providers, it is not clear whether business leaders are asking the right questions for their organisation, if they fully understand the implications of the answers and whether business leaders know who they can trust when choosing a cloud service provider. As a result, decisions about not moving to the cloud are being made for the wrong reasons (even resulting in organisations rejecting cloud and returning to on-premise solutions), or not being made at all resulting in a lack of adoption.

There remains a significant long-tail of businesses that are not moving to the cloud because they don't know how to make the right decision and are worried about the negative impact of making a wrong decision. Similarly concerns around data and system security, and a lack of understanding about the role risk management can play to address these issues, remains a key obstacle to businesses making a decision about moving to the cloud. However, if these organisations do not get help to conduct risks assessments and make the right cloud decisions they will simply be left behind. Alternatively, IT professionals within these organisations could also find their role usurped by individual business leaders that simply make their own decisions to adopt cloud-based services to achieve their individual business objectives. This could result in a significant shadow IT risk that could put the security of an organisation and its data at risk.

In 2019 and beyond we must find ways to equip all organisations, and IT professionals, with the understanding, necessary cloud skills and knowledge to make confident decisions about cloud services. If business and IT leaders can understand what moving to the cloud will mean for the organisation, and for them, and understand and trust answers given by cloud services providers, then the long-tail of organisations not making the move to the cloud can be reduced.

Key to achieving this is ensuring businesses have access to a talent pool of skilled cloud professionals with the necessary expertise and experience needed to advise and support cloud adoption. However, the shortage of skilled cloud experts, and the ability of SME organisations to be able to pay for these expert services, is already a key barrier to greater cloud adoption. We must address this issue if we are to move the UK cloud market forward.

RECOMMENDATIONS

- techUK will create a joint cloud and talent, diversity and skills working group to develop action-orientated work to address the shortage of skilled IT professionals with the specific cloud skill set needed to advise users.

- Using engagement tools, such as techUK's Cloud Week and podcast, techUK will showcase the benefits of moving to the cloud and highlight real-life use cases of companies' cloud adoption journey.

4. Raise awareness of the sustainability and environmental benefits of cloud adoption

The cost savings and operational efficiencies offered by the cloud are increasingly understood by businesses. However, the potential sustainability benefits attributed to the cloud are perhaps less well known, or overlooked, by business leaders when making the decision to move to the cloud. These benefits are offered through a combination of factors that include virtualisation (sharing workloads to minimise server numbers), and the consolidation of IT equipment into purpose-built data centre facilities offering efficient IT equipment and infrastructure.

In the UK, cloud providers may run their own data centres or, more commonly, take space in third party colocation facilities. It is critical that this core supporting infrastructure is operated efficiently and sustainably. Fortunately, the UK data centre sector has a good story to tell: commercial providers participate in a Climate Change Agreement, which sets demanding efficiency targets for operators and, equally importantly, requires complete transparency on energy consumption. As a result, the UK has probably the most robust data in the world on the energy used by its commercial data centre sector and a powerful incentive for good operational energy stewardship.

While energy efficiency has been a priority for the data centre industry for some time, in recent years, sustainable cloud procurement has grown hugely as a concept, with one techUK member reporting a 20 per cent rise in sustainability requirements in tenders. For example, UKCloud already provides details of the carbon associated with the cloud services that they provide to UK Government as a matter of course and we expect to see this become an increasingly standard customer expectation. Supporting the fight against climate change and tackling other environmental issues is becoming a priority for businesses. Employees and stakeholders are also more mindful of these issues. As a result, we are seeing more and more companies disclosing their greenhouse gas emissions and publishing information on their environmental impact. Businesses are seeking more transparency on the carbon associated with the cloud services they are procuring. This may be because they wish to report scope 3 emissions[16] or because they need to provide robust evidence that outsourcing activities are sustainable. Customers are now asking cloud providers for a breakdown of their carbon emissions, not just for reporting purposes, but to use it to drive company decision-making.

Reports are also beginning to focus on the possible carbon saving on offer from moving to cloud. UKCloud, for instance, explain how this can be achieved in their Greening Government ICT White Paper.[17] Another study from cloud provider Microsoft shows that one customer emitted 93 per cent less carbon by moving to their Azure platform.[18] Figures from Google[19] on electricity savings resulting from a move to cloud paint a similar picture. Given the interest in sustainable procurement, there is clearly more that needs to be done to position sustainability as a key consideration for companies looking to adopt cloud models and services.

The adoption of cloud models and services presents organisations with an opportunity to demonstrate a relatively 'quick win' for cutting down emissions related to their operations. Cloud service providers should be doing more to demonstrate and showcase how carbon emission can be reduced through cloud adoption. Focused work is needed to help cloud providers attribute carbon emissions to individual customers so that companies can demonstrate, with a reasonable degree of confidence, that their outsourcing decisions are delivering environmental benefits. Helping companies to evaluate the sustainability benefits offered by the cloud could become a powerful tool to increasing greater cloud adoption across the whole of the UK.

To increase awareness and get this message out to business decision makers techUK will work with members to determine where the current information gaps exist, the level of data required by customers to demonstrate sustainability benefits of move to the cloud and what tools, or rules of thumb, can be applied to help organisations estimate the environmental impact of their cloud activity, without resorting to detailed analysis.

RECOMMENDATIONS

- techUK to work with its members and relevant external stakeholders to develop and promote briefing paper to support companies looking to measure carbon emissions associated with their outsourced digital activity. This paper will include useful case studies, signposting to existing tools and some examples of the typical questions that companies are asking cloud providers when they go to tender.

- Work should be undertaken to explore how the benefits of cloud adoption could be included as part of every UK company's low-carbon business strategy.

5. Ensuring a technology neutral approach to the legal and regulatory framework for cloud

Since the publication of techUK's Cloud 2020 Vision, we have seen an increase in the data laws, regulations and requirements that apply to cloud services. For example, the introduction of the General Data Protection Regulation (GDPR) in May 2018, adoption of the EU-US Privacy Shield and the passing of the Investigatory Powers Act. Since 2016 we have also seen the passing of a Free Flow of Data Regulation in the EU which was welcomed by industry as a key move forward to create a European Digital Single Market and significant for the future of cloud adoption. We have also seen the introduction of the EU's Network and Information Systems Directive (NIS), which has specific cloud requirements, and the publication of the European Banking Association's (EBA) cloud outsourcing requirements. We have also experienced the introduction of considerable uncertainty in part due to the UK's Exit from the European Union. This is continuing to cause a lack of clarity and certainty around the ability of data to flow between the UK and the EU and whether the UK will achieve an adequacy agreement post Brexit.

The UK has continued to push forward with the adoption and deployment of new technologies that are underpinned by cloud services since 2016. This is largely due to the technology neutrality of the UK and EU's legal and regulatory framework which is welcomed by industry and should continue. Taking a technology neutral approach means that laws remain flexible, up-to-date and relevant as cloud services and the cloud market continue to evolve. This approach is a key driver and enabler of increased digital innovation and an open and competitive technology market and industry. As we look to a digital future underpinned by emerging technologies and digital innovations which may not even have been created as yet, it is important that a technology neutral approach continues.

To ensure this happens policy makers in the UK, EU and around the world that are currently unfamiliar with cloud computing, must continue to be educated about the cloud to ensure that they can recognise the benefits of this technology and support the increased adoption and use of cloud services. The lack of recognition of the importance of cloud computing to the full realisation of the UK Government's Industrial Strategy and associated Grand Challenges was seen by techUK as disappointing.

With the legal and regulatory framework relating to cloud likely to continue to be a patchwork of requirements it is even more important that there is consistency in the requirements being made and that businesses, particularly SMEs that may not have access to legal experts, have access to practical support and guidance. It is important to help them understand how to apply the current legal and regulatory framework that relates to cloud-based operations. Producing practical help, in the form of checklists and guidance, particularly for SMEs, is key to help businesses to ensure they are meeting their legal requirements.

RECOMMENDATIONS

- We must continue to engage and build greater understanding and awareness ss amongst policy makers in the UK and across Europe of the essential role cloud computing plays in the UK and EU's digital future and the importance of continuing a technology neutral and consistent approach to the development of regulatory and legal frameworks relating to cloud.

- techUK will look to promote practical compliance tools and guidance for SMEs produced by the cloud industry to help ensure that their cloud-based operations are aligned with existing legal regulations.

6. Deepening and widening public sector usage of cloud services is key to digital transformation

In 2016, techUK called for government departments and civil servants to utilise the full benefits of cloud computing and for departments and industry to work together to make this happen. In particular we called for greater engagement with industry in the commissioning process and the promotion of positive case studies where the use of cloud computing has delivered business transformation.

Over the past three years engagement between public sector and the cloud industry has increased. Also, there are now many case studies, and real-life examples, of where cloud adoption is making a difference. For example, the Met Office is using cloud services to support greater collaboration and data sharing[20], the Universities and Colleges Admissions Service (UCAS) uses the cloud to support their annual clearing process for UK Universities[21] and the Department of Transport is using cloud to digitise its Latest Earnings Networked Nationally Overnight application to help them better understand how the rail network operate.[22]

The publication in April 2019 of the National Audit Office's "Guidance for audit committees on cloud services"[23] was seen by industry as a useful step forward in assisting public sector leaders looking to make decisions about a move to the cloud. The reference in the guidance to a possible review, by the Cabinet Office, of the Governments flagship Cloud First Policy (first introduced in 2013) was of particular interest and an area where techUK would like to see engagement with industry.

Progress in the use of cloud services has certainly been seen since the Cloud First policy was introduced. However, while adoption does seem to be increasing, there is a real concern that only a small percentage of workloads are being sent to the cloud and whether the usage of cloud services across departments continues to remain shallow and limited. Particularly as, at this current time, the majority of public sector applications seem to only be using lower-level cloud services such as IaaS. Also, very few of the big back office applications that drive the public sector can be found on the cloud. For example, while the service to pay the vehicle road tax is on the cloud, the HMRC's tax system is not. This is seen as a missed opportunity given that the transition of large back-end legacy systems from on premises and onto the cloud could deliver the biggest impact in terms of efficiency and costs savings for Government.

Given the benefits offered to public sector organisations (increased agility, reduction in IT complexity, lower capital expenditure costs) more action is needed to help public sector organisations deepen and widen the use of cloud services and find ways to encourage departments to move more of their applications and operations to the cloud. There is a real need for government bodies and agencies to modernise outdated legacy systems and applications to deploy advanced and innovative digital public services across a variety of different platforms as and when services are needed by the public. The good news is advancements in cloud computing have been made and the development of advanced technologies since 2016, such as containerisation, offer additional solutions to assist government bodies.

To move the UK Government into the next phase of cloud utilisation action is needed to help support public sector leaders in three key areas:

1. Think cloud first for workload selection and governance - Public sector organisations should review existing business applications to determine their suitability for a move to the cloud. Planning must consider the issues including data security, privacy and governance processes, staff training needs and procedures to ensure requirements are appropriate in the cloud. Also planning should include the possible implications of moving applications that may be linked in the cloud. For example, increased costs can occur where applications are moved to the cloud that are constantly connected, and can be "chatty", with other cloud applications.

2. Think management of cloud – As the range of cloud models (including public, private and hybrid) and dedicated and specific cloud services continues, and organisations continue to adopt new emerging technologies, it is important that organisations have the ability to visualise and manage the different cloud systems and applications being used. For example, having a real time dashboard to be able to monitor and manage the different cloud and on-premise services being used. Also, where hybrid cloud is being used key issues to be addressed will include identity management, access control and having appropriate information polices and cyber security processes in place. Getting the right balance between optimising safety and business functionality will be key.

3. Think controlling cloud spend and exit strategy – While moving to the cloud will bring cost savings, getting the right architecture and design for cloud applications and organisations making the right decisions for them about what applications to lift and shift to the cloud is key. The good news is cloud customers in the UK have access to a range of diverse and specific cloud services based on what their individual needs and wants may be. Looking beyond 2020 and in the future, it is understandable that cloud users may want the ability to move cloud applications and data from one cloud

provider to another in the future. Using open source-based cloud solutions should also be considered. Also using common PaaS components in the build and design of cloud services will also enable organisations to move their data more easily in the future, if necessary.

These three issues are key to helping public sector organisations to adopt and consumer more cloud services. In order to move forward, techUK stands ready to help government departments to maximise the full opportunities from cloud computing services and help public sector leaders to overcome these issues so that they can increase not only their adoption but usage of cloud computing in the future.

RECOMMENDATIONS

- The Cabinet Office team working on the review of the Government's Cloud First Policy must engage with industry to ensure that the refreshed guidance reflects the direction of travel for cloud services and provides useful advice on how public sector bodies can pivot to the cloud.

- techUK will help public sector bodies to address the need to re-architect existing control frameworks and security policies and procedures, based on the cloud model being adopted, before systems are moved to a cloud environment so that existing security vulnerabilities are not simply lifted and shifted to the cloud.

7. Work harder and faster to achieve full fibre connectivity is key to drive cloud adoption forward

Connectivity remains fundamental to keeping the UK at the forefront of cloud adoption and technical implementation. As more organisations are moving business critical data and applications from on-premise to the cloud, the ability of businesses to be able to connect and access cloud services is key to operational efficiency, effectiveness as well as their productivity and subsequent economic growth.

As UK businesses move more of their operations to cloud services the ability to guarantee the ongoing performance of applications is vital. Therefore quality, resilience, low latency, and performance of the connectivity offered has become a key part of the decision-making. Many businesses see a mix of fibre and mobile connectivity provided by 4G, and potentially 5G, as key to increasing cloud adoption and maturity.

The good news is that since techUK's Cloud Vision report in 2016 significant progress has been seen in investment and funding for the roll-out and take up of full-fibre connectivity in the UK. Recent Government funding announcements - such as £740 million in digital infrastructure by 2020-21, £200 million for local authorities to stimulate private investment in fibre networks, and £16 million for a 5G hub – are all welcomed by techUK.[24]

The UK government has set some ambitious targets for improving the UK connectivity infrastructure with nationwide full-fibre coverage to premises by 2033 and 15 million premises connected to fibre by 2025. This ambition is welcomed by the cloud industry. However, there is a considerable amount of work that is needed to deliver this target. The UK currently lags behind most other European countries with only 8 per cent full fibre penetration although the UK does have high levels of superfast broadband coverage.[25] Government and industry must work harder and faster to increase this figure and push out superfast coverage to as near 100 per cent of homes and businesses as possible.

The increase in 4G coverage across the UK since 2016 has also played a role in the increase in adoption and use of cloud-based services, especially IOT and SaaS oriented services. However, a key issue that is concerning to the cloud industry is that 4G coverage is not yet universal. Many communities remain unable to get a signal leaving many rural based businesses, particularly SMEs, questioning whether 4G is the answer to their connectivity performance needs. These gaps in connectivity must be addressed urgently to mitigate the risk of a digital divide scenario, where cities become hubs for cloud adoption while rural areas are left without the connectivity needed to access cloud services.

While investment in the 5G Testbeds and Trail Programmes is key to the future of cloud services in the UK, right now further investment is needed on 4G connectivity geographically to deliver what was promised and help UK businesses to realise their cloud ambitions. While the Government wants 95 per cent mobile coverage by 2022, ideally with 4G or faster network technology, more encouraging is the statement that the UK should be a world leader in 5G, with the majority of the population covered by a 5G signal by 2027.

RECOMMENDATIONS

- Government must continue to move at pace to ensure continued funding of projects to deliver full-fibre connectivity across the whole of the UK by 2033.
- Government and the cloud industry should continue to work together on a wide breadth of connectivity options to ensure every SME business can take full advantage of future emerging technologies.
- Increased investment is still needed in 4G connectivity as we wait for 5G adoption. It is important that government and UK mobile operators work together to remove existing obstacles affecting mobile network roll-out.

Conclusions

- techUK will work with members to develop and promote a checklist of questions on data portability and system interoperability that cloud customers should ask cloud providers when procuring services.
- A joint cloud and cyber security roundtable will be held to discuss how techUK is best placed to support organisation to adopt and use cloud services securely.
- techUK will work with members to develop a checklist for SMEs outlining the necessary steps that need to be taken to re-architect existing control frameworks and security policies and procedures before systems are moved to a cloud environment so that security vulnerabilities are not simply lifted and shifted to the cloud.
- techUK will identify and promote examples of best practice in secure cloud adoption and use across the ecosystem.
- techUK will create a joint cloud and talent, diversity and skills working group to develop action-orientated work to address the shortage of skilled IT professionals with the specific cloud skill set needed to advise users.
- Using engagement tools, such as techUK's Cloud Week and podcast, techUK will showcase the benefits of moving to the cloud and highlight real-life use cases of companies' cloud adoption journey.
- techUK will develop and promote briefing paper to support companies looking to measure carbon emissions associated with their outsourced digital activity. It will include useful case studies, signposting to existing tools and examples of the typical questions that companies are asking cloud providers when they go to tender.

- Work should be undertaken to explore how the benefits of cloud adoption could be included as part of every UK company's low-carbon business strategy.

- We must continue to engage and build greater understanding and awareness ss amongst policy makers in the UK and across Europe of the essential role cloud computing plays in the UK and EU's digital future and the importance of continuing a technology neutral and consistent approach to the development of regulatory and legal frameworks relating to cloud.

- techUK will look to promote practical compliance tools and guidance for SMEs produced by the cloud industry to help ensure that their cloud-based operations are aligned with existing legal regulations.

- The Cabinet Office team working on the review of the Government's Cloud First Policy must engage with industry to ensure that the refreshed guidance reflects the direction of travel for cloud services and provides useful advice on how public sector bodies can pivot to the cloud.

- techUK will help public sector bodies to address the need to re-architect existing control frameworks and security policies and procedures, based on the cloud model being adopted, before systems are moved to a cloud environment so that existing security vulnerabilities are not simply lifted and shifted to the cloud.

- Government and the cloud industry should continue to work together on a wide breadth of connectivity options to ensure every SME business can take full advantage of future emerging technologies.

- Increased investment is still needed in 4G connectivity as we wait for 5G adoption. It is important that government and UK mobile operators work together to remove existing obstacles affecting mobile network roll-out.

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    Scope 1: These are emissions that arise directly from sources that are owned or controlled by the company, for example fuels
    Scope 2: These are the emissions generated by purchased electricity consumed by the company
    Scope 3: These emissions are a consequence of the activities of an organisation but occur from sources not owned or controlled by the organisation. For example, waste, water, business travel, commuting and procurement.
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Over 850 companies are members of techUK. Collectively they employ more than 700,000 people, about half of all tech sector jobs in the UK. These companies range from leading FTSE 100 companies to innovative start-ups.

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