



Department
for Education

Cloud computing services

Guidance for school leaders, school staff
and governing bodies

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1.0 Summary

This is a non-statutory guidance document issued by the Department for Education. It has been produced to help schools understand some of the key considerations to make when thinking about moving ICT to cloud based service provision. We've also included some links to material that could help schools in thinking about whether moving to a cloud based service is right for your school. We've tried to make all the content as non-technical as possible. It is supplier independent.

Expiry or review date

This guidance will be reviewed before January 2017.

Who is this publication for?

This guidance is for:

- School leaders, school staff and governing bodies in all maintained schools, academies and free schools.

Main points

- The guidance covers the potential of cloud computing solutions to improve the delivery of school teaching and learning, together with the associated benefits and risks of moving some or all services to the cloud.
- It also explores some opportunities for cost-effective improvements and offers recommended approaches and next steps that should help schools to move successfully to cloud.
- Whilst the Department considers that there are potentially significant benefits to be gained from the uptake of cloud based services, schools themselves are best placed to decide whether the adoption of cloud based solutions can contribute to meeting ICT needs in a cost effective way.
- The potential move to cloud services is not necessarily an “all or nothing” decision. Many schools already use some cloud applications (such as email), and a more comprehensive take-up of cloud services should make sense for educational, financial and technical reasons otherwise alternative solutions should be considered.

Data Protection: When entering into an agreement with a “cloud” service provider, a school still remains responsible for the security of data held. The Department has put in place [Data Protection in the cloud](#) guidance with a supplier self-certification process to enable a school to review supplier suitability. **Model Privacy impact** notices for schools use can also be found at [Model Privacy Notices](#).

The remainder of this guidance sets out in more detail the opportunities and challenges which schools will want to consider as they assess the appropriate way forward.

Are cloud services for everyone?

Migrating to cloud services and systems can result in significant savings and an enhanced learning and teaching experience. Having said that, whilst it is true that all of the major suppliers of software to schools already deliver their services over the internet, or have a strategic vision to do so in the near future, that still doesn't mean that every school should (or can) immediately change their ICT strategy.

Whilst there are some clear benefits enabled by cloud, there are also some essential conditions that must be met before these opportunities can be realised:

- **Broadband.** High download and upload speed, effective WiFi, reliability and sufficient capacity are all needed to enable an effective and beneficial cloud service.
- **Existing ICT infrastructure.** The state of the current school ICT, existing contracts and commitments and future technology strategy should all be carefully reviewed to ensure that a move to cloud will not result in unnecessary duplication of cost.
- **Readiness to transition.** Schools may have plans for change in many areas and it may just not be the right time to move in a new ICT direction.

This guidance is aimed at those schools that feel capable of making the required changes, highlights the important areas that are affected and offers recommended approaches for consideration.

Not every school is the same

In a sector of some 25,000 schools, a "one-size fits all" approach is unlikely to result in a successful result. As there are a number of different 'types' of school organisation, a different approach to change is likely to be required. Broadly speaking the strategy will depend on the individual circumstances of the school:

- **Smaller schools or schools with relatively straightforward requirements** will typically be buying in their technical support, and therefore have a freedom of choice in selecting the supplier and platform that best suits their needs. These schools will probably not have expertise in choosing between a number of different systems and will therefore be reliant on the judgement of their supplier or technical support provider. The majority of their ICT provision may well be sourced from a single point of supply and the challenge is to make sure that the solution is the right fit for the school (rather than that which a supplier would prefer to propose). An overview such as provided by this guidance is

very useful and the seeking of clear and independent advice and guidance should also be a priority.

- Larger, more complex schools or academy groups will more than likely have their own on-site ICT support team (either employed by the school or contracted in from a support provider). The priorities here will be about systems integration, migration and enthusing / upskilling staff for the change – in both technical terms and with work/collaboration tools.

Schools not moving to the Cloud

There will inevitably be some schools who for perfectly valid reasons, will decide that migration to cloud based services is not appropriate for them at this time. It is also clear that even when a decision is taken to adopt a cloud-based approach, schools will require appropriate time to plan the change.

However, the marketplace is increasingly seeing cloud services as the way forward and in some cases encouraging schools to move to cloud by reducing discounts for non-cloud products.

Whilst it is for individual suppliers to develop their future strategies as they see fit, the Department has, however, agreed with the major supplier of schools on premise software (Microsoft) that schools using a subscription-based approach for traditional on premise software should expect to see no increase in that pricing before at least July 2018. It is unlikely that the existing beneficial discount structure for on premise licensing will continue beyond July 2018 so it is important that schools make plans as soon as possible for their future strategy.

Full details of the Department's [agreement with Microsoft](#) are available to view.

It does therefore seem that there will need to be change in the way that technology is currently used in schools. The major software providers all seem to be targeting investment in the cloud and successful adoption of cloud services has the potential to deliver significant benefits - in the classroom, in the back office, when working remotely and when assessing the overall costs of ICT provision.

This document offers an overview of the opportunity presented by cloud services, the potential impact of change together with some guidance on best practice, recommended approaches and next steps.

Overview

The key audience for this guidance is the school leadership team and those concerned with the strategic development of the school and its associated business.

There are many potential benefits presented by cloud computing solutions in schools. This guidance is aimed at providing a balanced view of these benefits and also suggests some recommended approaches that will help make a success of a transition.

Potential benefits

The underlying premise of cloud is that by moving some traditionally hosted services to an internet-based provision (“cloud”), a range of associated benefits are presented. These benefits may include:

- Reduction of the number of servers required for hosting (less capital expenditure, lower licensing spend, reduced electricity and cooling costs).
- Taking more advantage of “free” or lower-cost cloud software offered by major providers (for example Google Apps or Microsoft Office 365).
- Reducing the traditional cost of supporting on premise ICT across the school.
- Better provision of “anytime, anywhere, any device” access to teaching and learning resources.

Achieving success

Realisation of benefits is best achieved by fully understanding and addressing the changes required. These are likely to include:

- The need for a clear demonstration of the expected benefits and the reason for change.
- A strategic vision of school leadership willing to look beyond existing ICT practices and resources.
- A flexible approach to the way that services and learning resources are delivered.
- A knowledgeable and experienced service provider that shares the school vision and can provide both initial and ongoing assistance.
- Understanding of how to maximise value during the movement to cloud by making the best use of existing infrastructure.
- Careful planning of the need for training and support in new ways of working.

Cost-effective, best value solutions should be the overriding ambition when considering the effective delivery of teaching and learning. This may or may not be “cloud” for every school but this guidance is offered to assist in the decision-making process.

Important note: This guidance is designed to provide an overview of the potential for cloud computing to deliver cost effective solutions for a school. Whilst the main considerations are addressed, it cannot claim to provide a comprehensive checklist covering every aspect. It is important that a school seeks specialist support from an experienced provider in order to achieve a successful move to cloud.

The following sections explore the various components to be considered when assessing the potential of cloud computing for a school. These are divided into four parts:

- The impact of cloud computing on teaching and learning.
- Changes to the ICT business model.
- The impact of cloud computing on the cost of ICT provision.
- The structure of ICT in schools and recommended approaches.

Considerations for each aspect of change are suggested, together with a recommended approach where applicable.

(NB. More fundamental information covering an introduction to cloud computing, the various types of cloud computing provision and the differing solutions is available in Appendix 1. A glossary of terms used can be found in Appendix 2.)

2.0 The impact of cloud computing on teaching and learning

It is clear that ICT is best able to support a school achieve its educational objectives when it is deployed in a manner which renders it:

- flexible – such that it can easily respond to changing pedagogical requirements.
- reliable and responsive – such that it engenders confidence in users.
- easily enhanced – such that it can encompass new services when required.
- widely available – such that it can facilitate extended learning by students and flexible access by teachers when not on school premises.

It is, of course, possible to provide these attributes from on-premises solutions, and very many schools have been successfully doing so for many years. However, it is often simpler, more reliable, faster, less expensive and less support-intensive to deliver these important attributes of effective ICT provision by appropriately utilising a cloud based approach.

Flexible ICT provision

In order for ICT to effectively support teaching and learning and thus deliver the benefits that underpinned the investment, it must be able to facilitate a wide range of pedagogical practice, enable access to stimulating and challenging resources, be reliable to use and easy to manage. Cloud computing has the potential to offer advantages in all of these areas.

Reliable ICT provision

Teachers and students, through their frequent personal use of public cloud services such as Google, Skype etc., have become used to solutions which have very high levels of reliability. As the complexity of locally hosted, school based ICT solutions increases, it can become more and more challenging to ensure the same level of reliability in respect of the ICT provision in schools.

Cloud hosted ICT provision has the potential to offer higher levels of reliability than can be easily achieved through on-premises solutions. This higher level of reliability will assist schools as they seek to increase the confidence of teachers in using ICT to help the school meet its educational objectives.

Responsive ICT provision

As increasing numbers of teachers and students make more and more use of a school's ICT provision, this loading can have implications for the quality of the ICT experience seen by users – potentially impacting usage and uptake.

This loading can be addressed by, for example, increasing the number and/or specification of servers underpinning the solution. Whilst such upgrades can be accommodated by the purchase of physical upgrades to the local provision, it can be achieved much more easily where the infrastructure is cloud based. Thus the school can more quickly and easily respond to any potential (or actual) issues of performance degradation.

Easily enhanced ICT provision

The flexible nature of cloud based services can deliver enhanced educational benefits when there is a need to quickly and reliably deploy new applications and services or upgrade existing applications. The ability to quickly create a test environment for the new or upgraded application and make it available via cloud hosted infrastructure means that teachers and students can typically have quicker access to new opportunities than might otherwise be the case.

More connected ICT provision

Schools have for many years been familiar with the connectivity and collaborative capabilities of ICT tools such as email, blogs, websites etc. As their ICT provision moves to encompass cloud based services, this collaborative potential expands making it easier for teachers and learners to connect with a wider community.

This enhanced connectivity can help build the capacity of teachers to use technology to support more effective teaching and learning by allowing them to enhance their evidence base regarding what works effectively (and what does not) by interacting with other colleagues.

It can also help reduce workload by facilitating collaborative planning and enabling access to an ever widening range of resources which can be used, adapted and enhanced by teachers to support their own practice.

Better connectivity can more easily facilitate access to key learning systems from beyond the school, for example on field trips, when pupils are unable to attend school due to illness, or when they wish to follow up a particular educational activity after school.

The move towards cloud hosted provision of tools such as management information systems and learning platforms can assist in reducing unnecessary data duplication between systems, thus increasing the quality of data available to teachers and policy

makers - and at the same time reducing the burden associated with frequent data collection requirements.

Preparing students for future life and workplace

Schooling is all about preparing children for life as well as being an end in itself. Cloud services also have a part to play in meeting the needs of students by ensuring they have broad exposure and experience in systems and processes that are an essential component of life in the modern world.

3.0 Changes to the ICT business model

Schools are used to procuring ICT solutions where the supply model is primarily “product based” and schools have focused on the acquisition, integration and technical support of those products.

This traditional approach to provision would ideally be underpinned by a typical Total Cost of Ownership (TCO) analysis whereby schools would have reviewed the current and future financial implications of their ICT investment by analysing the relevant whole life costs. The hardware and software elements of the above analysis would also, of course, be subject to frequent refresh and replacement costs.

This traditional procurement approach would have generated significant capital outlay and resulted in a cost profile that would have varied significantly year on year. Additionally, schools may have had little visibility of the actual whole life costs of their ICT provision.

Cloud based provision on the other hand is not about the cost of **ownership** but about the cost of **usage**. Cloud based costs are therefore likely to be broadly constant from month to month and year to year and primarily recurrent as opposed to one-off capital based.

Significant elements of the traditional TCO analysis have the potential to be significantly reduced. Schools should expect to see monthly or quarterly “per user” and “per service costs “ and thus have greater transparency over their costs and greater control over the ongoing level of their ICT expenditure, potentially freeing up resources for the front line.

It should be noted, however, that not all the cost implications of cloud computing may be necessarily downwards. For example:

- Schools may need to invest in additional support to facilitate the transition to cloud services.
- During the transition both on-premises solution and cloud solutions may run in parallel for a time and, to manage this, additional software tools may be needed.
- Additional networking costs as schools upgrade their local networking, wide area networking and internet bandwidth to support the cloud solutions being deployed.
- Usage-based costs should be carefully assessed and routinely monitored.

In conclusion, cost reduction opportunities are clearly an important potential advantage of cloud computing - but they are not the only advantage. Ease of provisioning ICT services, more flexible and agile ICT systems and reduced management overheads are equally important potential benefits.

4.0 Cloud computing and the cost of ICT provision

One of the key factors driving the uptake of cloud computing solutions (both in the public and private sectors) is the potential that such solutions present to deliver business benefits via enhanced ICT provision. These benefits encompass increased flexibility, enhanced reliability and scalability and facilitate easier collaboration.

Much experience to date suggests that cloud solutions also have the potential to significantly reduce the whole life costs of ICT provision and to fundamentally change the related business model. New models of service delivery, coupled with more efficient laptops & tablets, may also help to reduce electrical usage and the school's direct carbon footprint.

Achieving the benefits from ICT investments

The key to achieving value for money from all investments in ICT is to see it as a strategic asset which has the ability to improve educational outcomes, reduce the burden on teachers and help manage costs. It is also recognised that an approach focused on the provision of resources (cloud based or otherwise) will only succeed if supported by a properly resourced change programme.

When schools are reviewing the potential benefits enabled by cloud based services they will want to consider:

- Cost reduction opportunities.
- Willingness and readiness to adopt new ways of working.
- Changes in the ICT business model.
- The potential for some short term cost increases.

Cost reduction opportunities

The key cost reduction opportunities flowing from the deployment of cloud based approaches in schools will encompass:

- lower capital expenditure as schools no longer need to pay significant up-front costs to provide and replace their own expensive data centres, choosing instead to reduce such costs via a subscription based service.
- reducing the costs of the provision, maintenance and support of client devices. Cloud services can under some circumstances move much of the management and the computing resource (such as processing power and storage requirements) from the client device to the cloud computing infrastructure. This has the effect of lowering the required specification and cost of the client devices.

Schools should also expect to incur lower device replacement costs as technologies such as virtualisation have the potential to extend device lifespan.

- reducing the costs of managing and supporting their ICT infrastructure by making more effective use of available in-house technical support. Staff may be refocused away from purely technical support of a multitude of in-house systems towards supporting the uptake of the ICT and thus delivering improved benefits for the teaching and learning outcomes.
- as more providers bring forward no-cost (or low cost) cloud application services with enhanced communication, collaboration and online storage tools, schools can significantly reduce their ICT costs by phasing out use of their traditional “local” implementations of such services.

Cost reduction considerations

Whilst migration to the cloud holds out the possibility of multiple benefits, including potentially significant cost reductions, such opportunities require careful planning if they are to be realised. Effective realisation of benefits will include the need to recognise that:

- before initially migrating services to the cloud, extra investment may be necessary to enhance local and/or wide area connectivity services along with internet connectivity services.
- migration to cloud based services is likely to be phased over a period of some months and during that transition period existing solutions will need to be integrated.
- successfully implementing solutions may require some technical migration from existing arrangements as well as initial user training and support.
- suppliers’ charges will need careful monitoring as schools move into new arrangements.
- perfectly workable local solutions should not be retired before their natural end of life.
- new opportunities should be highlighted and communicated through an inclusive and informed change programme involving all staff.

5.0 The structure of ICT solutions in schools and recommended approaches

Schools have been investing in ICT solutions for over thirty years and have deployed a wide variety of technologies, strategies, and support arrangements as part of that investment.

Over the last 5 years there has been a significant increase in the diversity of those arrangements as schools have embraced approaches such as Bring Your Own Device (BYOD), thin client computing, increasing use of internet based resources, and an increasing focus on portable devices from tablet computers to smartphones. In such a complex and diverse ICT estate, it is not possible to set out specific recommendations regarding how cloud computing might impact on any particular school.

It is, however, possible to examine the common components which are likely to underpin much of the school ICT provision and to suggest some recommended approaches.

Those key components are considered to be:

- Networking Provision.
- Server Provision and Backup.
- Software and Services.
- User Data Storage and Backup.
- Client Devices.
- Solution Management and Support.

Networking provision

Effective networking has always been the fundamental building block on which reliable school ICT services have been based. School networks typically comprise of a number of separate but interdependent elements including wireless access within the classroom, the local area network within the school, the links from the school to its internet service provider, the links from the internet service provider to the wider internet and the links from the wider internet to the specific service being used.

Network effectiveness is not just a matter of bandwidth but must also address attributes such as reliability, scalability, security, latency (responsiveness), and the ability to assign a quality of service to various types of network traffic. Wherever possible, schools should seek to acquire their networking provision under arrangements that provide “end to end” network management.

All the above attributes of the network will be placed under greater strain when a school moves aspects of its provision from locally hosted to cloud computing. The extent of that impact will depend on the nature of the service being moved to the cloud. For example, moving your backup and archive arrangements from locally hosted servers to the cloud

will be unlikely to impact the classroom wireless requirements but will impact many other links in the network chain.

Recommended approach - Prior to any cloud migration being progressed an IT network audit should be completed which should identify any enhancements (including bandwidth, latency and security enhancements) that should be made prior to moving to a cloud based service.

It can often be the case that a move to adopt cloud services is linked to other initiatives designed to increase the effective use of ICT across the school and it is clearly the case that an effective cloud deployment is absolutely dependent on an effective networking infrastructure.

Server provision and backup

Servers are the core engines which deliver much of the computing power to underpin school ICT provision. As their ICT estate has developed year on year, schools have acquired an increasing number of on-premises servers to deliver core workloads. These may include email, document management, curriculum application hosting, user file and data storage, user authentication, remote access management, management information systems, print management, media streaming, web hosting, learning platforms etc.

In very many cases these core workloads are delivered via individual servers which once commissioned, will require operating system licences, server management licences, client access licences, hardware and software maintenance arrangements, technical support, not to mention regular updating and replacement.

In addition to the complexity of providing and supporting the servers, schools are faced with the ongoing challenge of ensuring that appropriate backup and storage arrangements are in place for their server stack images and data.

Recommended approach - Cloud computing presents a range of opportunities to move some or all of the above provision from school hosted infrastructure to a hosted datacentre which provides managed, flexible, agile, scalable, reliable and affordable alternatives. Such migration can allow a school to significantly reduce its expenditure on the acquisition and management of multiple physical servers and will also significantly reduce the environmental impact of the school's ICT provision along with reduced requirements for data room storage and onsite support.

It should be noted that the usage model underpinning some supplier costing in respect of hosted servers and associated data backup can be complex. Schools are advised only to enter into arrangements for such services when they have a clear understanding of the proposed costs and the competitive nature of the offering being provided.

Before selecting a back-up service provider, schools should ensure that their proposed supplier has completed the DfE self-certification checklist and that they are happy with the supplier's responses. The guidance and checklist can be found at [Data Protection in the Cloud](#).

Software and services

One of the most powerful features of cloud computing is its ability to deliver ICT solutions as a Software as a Service (SaaS) model. Over recent years, many schools have already taken advantage of some basic software as a service solutions such as the free cloud email offerings from providers such as Google and Microsoft.

Additionally, many schools are utilising free or low cost cloud-hosted office productivity tools and the use of cloud-hosted document management solutions is on the increase. Schools will find that more and more suppliers of learning management systems and management information systems are making those offerings available via cloud-hosted solutions. So the impact of SaaS cloud computing on how schools deliver their key ICT workloads has the potential to be transformational.

Recommended approach – SaaS solutions provide a real opportunity for schools to simplify aspects of their ICT provision. Some of the most obvious examples include email and office productivity solutions. Whilst these products are being offered as “free” it should be noted that whilst they may be provided free by the providers they may not be free to adopt by a school. It should be noted that some suppliers who previously provided their software on traditional media may seek to increase costs as the product moves off a Software as a Service solution. If schools consider that the costs being applied are excessive they should use the opportunity to consider alternative suppliers whenever possible.

User data storage and backup

Schools continue to integrate ICT across the curriculum, support ever-improving computer to pupil ratios, and facilitate the use of an increasing range of device types.

Schools also continue to deploy ever more comprehensive management information systems, improve the uptake of their learning platforms, move much of their document management online and facilitate the storage of more and more pupil and teacher data. That data can range from simple document files to comprehensive multimedia presentations and comprehensive data sets.

Schools therefore have a need to develop a comprehensive approach to data storage implementing solutions which can address not just the range of the data but the fact that much of it is highly sensitive.

Additionally, teachers and students are increasingly expecting to be able to access their stored files from a wide range of devices, and from anywhere with suitable network access at any time.

In addition to free offerings in respect of communication tools and office productivity software, a number of providers are making online storage available to teachers and students to facilitate “anytime anywhere” and “any device” access to their documents and files. These online storage solutions have the potential to provide vast amounts of data storage at no, or virtually no, cost to the school.

Recommended approach – the use of cloud based storage for student and teacher data can provide a relatively straightforward introduction to the benefits of cloud computing whilst at the same time relieving schools from the cost and management burdens of allowing “anytime, anywhere, any device” secure access to user data.

Schools should, however, not use non-managed storage solutions for storing data that is personal (about students/staff etc) or critical to the running of the school.

They should also ensure their supplier has completed the Self Certification check list covering [Data Protection in the cloud](#) and that they are satisfied with the responses to the issues raised in that checklist.

Schools are advised only to enter into arrangements for such data storage services when they have a clear understanding of the proposed costs and the competitive nature of the offering being provided.

Client devices

Historically schools have made extensive use of powerful (or “thick”) local clients such as desktop PC’s, laptops or powerful tablets. Under this model of provision, as cloud services are deployed, there is the opportunity to extend the life of client devices by the use of technologies such as virtualisation which are typically an inherent component of cloud solutions.

This allows much of the processing usually carried out by the client device to be carried out on the cloud infrastructure. This should mean that devices are less likely to become obsolete due to issues such as processor power or memory.

Some schools are moving away from the more traditional model and deploying browser based computing devices which rely almost extensively on network access to the internet. These devices have typically lower costs of provision, lower costs of support, and are easier to reimage and update. However, they may offer reduced functionality and have limited ability to be effectively used in the absence of network access.

Recommended approach - Schools considering a move to cloud based services should not just assume that the current model of provision should be “ported” to the cloud but

should also ensure that it remains appropriate from a cost, pedagogical and usability perspective in the cloud computing environment.

Whilst it is technically possible to operate both systems on the same infrastructure, browser based solutions work best when they are fully integrated into the supporting cloud infrastructure.

Solution management and support

Just as there is a wide range of ICT products and service in use by schools, so the nature and extent of the arrangements in place to manage and support those ICT products and services is equally diverse. Those support arrangements might encompass one or more of the following ICT staffing models:

- Staff employed full time or part time by an individual school.
- Staff shared between a number of schools, perhaps a post-primary school providing support to a consortium of primary schools.
- Staff employed by the Local Authority, or a Multi Academy Trust.
- Staff provided via a services contract with a local supplier or a national or international ICT provider.
- Staff provided as part of a wider ICT managed service contract.
- Staff contracted in on an “as required” basis.

Based on sector experience generally, and specifically in those schools (or clusters of schools) that have adopted a cloud based approach, the following support implications are likely:

- There is likely to be an overall reduction in the amount of routine technical support required at the individual school level.
- There should be an opportunity to redirect some existing technical support resources to more front line support for teachers thus helping build their confidence in the use of ICT.
- Where schools are contracting for external provision of ICT support, there should be an opportunity to redefine the nature, scale and scope of such contracts.
- Where clusters or large groups of schools are being managed under a common management framework there is the opportunity for a strategic review of the ICT support arrangements ensuring all schools have equitable support and that the support arrangements are cost effective.
- As mentioned previously, there is a possibility that some additional technical support and expertise may be required to cope with the initial migration and the issues associated with operating hybrid systems.

Recommended approach - When considering the potential ICT support implications of any move to cloud computing, it is important to recognise that there should be appropriate and early engagement with relevant ICT support staff and their professional organisations. This is particularly important where structural changes in ICT support arrangements are being considered.

Successful strategies

Regardless as to the factor or factors which initiated the decision to consider a move to cloud based provision, experience from schools who are successfully implementing such changes highlights:

- The need for any strategy to be firmly rooted within a policy framework that clearly understands how the school expects its ICT provision to facilitate the achievement of its educational objectives and an improvement in educational outcomes or organisational effectiveness. ICT initiatives which are driven simply by a technology perspective rather than an educational perspective are highly unlikely to deliver value to the school as a whole.
- A requirement to develop (in conjunction with users) an effective change strategy which supports those users impacted by the change in a timely and effective manner. Where multiple school deployments are being considered it is usually more effective to allow individual schools a degree of flexibility regarding how and what to provide as an element of that support package.
- The importance of engaging effectively with key stakeholders including the governance structures, the senior leadership team, the ICT support team, teachers and, where appropriate, students and parents. It is important that everyone understands the benefits anticipated, the implications for them, the nature of the support being offered and the underpinning project plan and key milestones.
- The importance of recognising that there should be appropriate and early engagement with relevant ICT support staff and their professional organisations where structural changes in ICT support arrangements are envisaged.
- A requirement for effective project planning which identifies key activities and deliverables and an agreed project timeline. An assessment of the costs and savings which should be underpinned by a realistic and achievable benefit realisation strategy.

Risks and challenges

It must also be recognised that as schools become more and more dependent on their educational ICT provision (for everything from recording attendance to delivering lessons), any changes to that ICT provision need to consider:

- the school's ability to deliver an effective education.
- the school's capability to perform the required management and administrative tasks.

An assessment of the potential risks and challenges should be carried out as part of any migration planning and should cover such matters as:

- possible user resistance to the introduction of new systems and procedures.
- potential for disruption should new systems not operate as intended.
- cost overruns either during the implementation of the new systems or when usage patterns and costs are higher than expected.
- technical incompatibilities where the new systems do not interoperate as expected with other existing systems.
- potential for future supplier lock-in.

A proper management strategy for each of the above risks should be carefully developed in conjunction with the appropriate users and staff.

Next steps

In general terms, making use of some of the basic "free" cloud based software applications can be a reasonably simple exercise and most schools have some experience of the email and document storage services on offer. Taking advantage of more comprehensive hosting, storage, collaboration and communications services can prove to be a successful cost-effective option when supported by a well thought out strategy and communications plan.

Some suggested next steps:

- Talk to other schools who have made or are making the journey. Ask them for lessons learned, do's and don't's and what they would do different next time. Arrange a site visit if possible and explore the thinking behind their ICT approach.
- Involve your existing senior staff and secure buy-in for the agreed approach. Communication of the expected benefits is a key driver for successful change and should involve staff, teachers and parents.
- Partner with expert solution providers. Select an experienced and knowledgeable supplier prepared to provide both initial and ongoing assistance. Ask for references or case studies.
- Develop a future plan that encompasses learning outcomes as well as infrastructure and business needs.
- Ensure that technology solutions make the most of existing infrastructure.
- Insist on clear and unambiguous quotations so that costs going forward – and the expected benefits - are known and affordable. This should be supported by

a contract and service level agreement setting out expectations, commitments and remedies.

Advice and guidance is available from a variety of sources, from both public sector and private providers. Schools are often keen to share their ideas and experiences and we will be providing more links and case studies as the market develops. Some of the currently available support is listed below.

6.0 Accessing Support

Support Available from the Information Commissioner

Data Security - The ICO has issued a number of useful documents which are relevant to the use of cloud computing services by schools. They include:

- ICO Guidance on the use of [Cloud Computing](#)
- ICO 2012 report on the [Data Protection Act and schools](#)
- ICO Guidance on assessing the adequacy of [International Data Transfers](#)
- ICO Guidance on Bring Your Own Device ([BYOD](#))

Privacy Impact Assessments - Additionally, the ICO has recently updated its guidance on Privacy Impact Assessments (PIAs). A PIA is a tool to help organisations identify the most effective way to comply with their data protection obligations and meet individuals' rights of privacy. The PIA Code of Practice is available at [ICO guide to privacy impact assessments](#)

Model privacy statements available for use by schools are available at [Privacy notice model documents](#)

Support Available from the Department for Education

Data Protection and Cloud Services - The Department has published [guidance](#) on the data protection and the use of cloud services by schools. It contains a self-certification procedure whereby suppliers can indicate the extent to which their services comply with the requirements of the Data Protection Act.

Effective Procurement - The Department has also developed [procurement guidance](#) which will be relevant when schools choose a cloud services provider.

Further support and guidance can be obtained from the Department at schools.ictsupport@education.gsi.gov.uk

Support Available from Cloud Suppliers

The following providers of cloud services have completed the self-certification checklist in respect of Data Protection and have confirmed to the Department that they have advice available which might be helpful to schools as they consider the most appropriate approach to the provision of cloud based services.

The Department will update this list from time to time as further suppliers confirm that they have helpful guidance available. In some cases, the guidance includes case study material.

Important note regarding choice of supplier

It is important to understand that the Department is not endorsing the products or services made available by any particular cloud service provider and has not itself quality assured any supplier products, services or the advice offered as part of this exercise.

Selection of suppliers should be based on a number of key criteria (including data protection practices, school requirements including service levels) and is entirely a matter for the particular school which must ensure it complies with any applicable local, UK and EU procurement regulations.

Links with resources to support a move to cloud services can be found below:

Supplier resources	
<u>Google</u>	<u>Microsoft</u>

Appendix 1: Introduction to Cloud Computing

What is Cloud Computing

Cloud computing represents a radical change in the way that schools can access, use and pay for their ICT provision. In a traditional model of provision, schools will physically host servers, storage, applications and data within their institutions. Cloud computing, however, normally involves schools accessing a shared pool of ICT services remotely via a private network or the internet and consequently will have considerably less on-premises equipment but a more flexible, affordable and manageable model of ICT provision.

But it is not only models of ICT provision that can be challenged by cloud computing – so too is the funding model. Traditional models of provision are underpinned by a payment approach which requires up front capital payments for the purchase and replacement of a wide range of ICT assets which in turn have on ongoing maintenance and support costs. Cloud based provision normally requires straightforward subscription payments based on the number of users accessing the chosen service and the range of services being used.

Types of Cloud Computing Provision

The term cloud computing is used to describe a wide variety of solutions and services that can be relevant to schools but to understand its meaning in a particular context it is important to appreciate which of the four main types of cloud provision is underpinning the proposed services:

Public Clouds – are clouds where the infrastructure is owned, managed and supported by the organisation providing the cloud service which is then made available to the public. Search engines, online marketplaces, social networking sites and media streaming services are examples of public cloud services.

[The major global providers of public cloud services include Amazon, Facebook, Microsoft, Google, Twitter, BBC iPlayer etc.] A key aspect of a public cloud service is that the provider and the user are on different networks – the provider is on the public internet and the user is typically on the school's local area network.

Private Clouds – are clouds where the ICT solution is operated for a single organisation and utilised by its clients. Access may be restricted such that only users on the local network or trusted wide area network have access to the services but a key attribute will be that the service user and the service provider are on the **same**, private, trusted network. ICT services available only within a local authority or multi-academy trust would be examples of a private cloud as would the services provided by a Regional Broadband Consortium.

Community Clouds – are clouds where the services are shared between a group of organisations or users typically within a specific area of service provision. They

are most often found across organisations with similar business needs and with similar security and compliance requirements. For example, one community partner may host and operate a children's care ICT solution on behalf of a number of local authorities who use the solution and share the costs. A different application, for example, a payroll system could be hosted by another member of the cloud community and again costs shared across the community of users.

Hybrid Clouds – are clouds which comprise more than one type of provision (public, private or community). In this model some ICT resources are likely to be hosted in-house with others hosted on private, public or community clouds. The network arrangements for a hybrid cloud will likely consist of a combination of trusted private networks and some public networks. So, for example, some of the services could be hosted within a school and thus dependent on the school's local area network, some services hosted in a central multi-academy trust facility may rely on a trust-wide managed wide area network, and some services hosted on the internet will rely on public network services. **Hybrid clouds are particularly important where there are broadband constraints which limit connectivity or where for policy or security reasons there is a need for local hosting.**

Each of the above cloud delivery options brings with it its own set of costs, benefits and challenges and it is likely that in the immediate future schools will use a mixture of public cloud services (such as online educational resource library), private cloud services (such as a hosted Learning Management System), and on-site services, such as a locally hosted Management Information System. Identifying how the cloud can best support the effective delivery of its ICT provision will be a key element of a school's ICT strategy.

Types of Cloud Computing Solutions

However the cloud service is deployed, it is likely to offer at least one of three different cloud services:

Infrastructure as a Service (IaaS) is the foundation layer for all cloud services and contains the basic building blocks of a typical ICT infrastructure. It usually provides access to networking features, physical or virtual computing engines (servers) and data storage and recovery facilities. IaaS provides the highest level of flexibility and management over raw ICT resources and provides an architecture quite similar to the ICT provision that many schools will have on premises today.

Platform as a Service (PaaS) builds on the IaaS structure and extends it to include operating systems, programming languages and tools. In a PaaS arrangement a school does not manage or control the underlying cloud infrastructure but importantly has control over the deployed applications.

Software as a Service (SaaS) – this service builds on the PaaS model and offers schools access to a range of software which is hosted, supported, updated and maintained by the SaaS provider. Typical SaaS solutions will include office productivity software, communication and collaboration software such as student

and teacher email, calendar solutions, learning platforms and/or management information systems and online content repositories.

Every cloud service used by a school will therefore consist of at least one deployment model and at least one service model. All of the above will require effective networking infrastructure in the school to facilitate access to the cloud service and this network dependency is covered in more detail elsewhere in this guidance document.

Appendix 2: Glossary of terms

Term	Meaning
Access device	In this context, the device used by teachers, staff and students to access the school network (for instance laptop, tablet, smart phone)
Anytime, anywhere	Anytime, anywhere access means that staff and students have access to networks at school, at home, and everywhere in between.
Back up	A copy of computer data, or the act of making a copy of data
Bring Your Own Device (BYOD)	BYOD refers to the policy of allowing employees to bring personally owned mobile devices (laptops, tablets, and smart phones) to their workplace, and to use those devices to access school networks, information and applications
Broadband	A system that makes it possible for many messages or large amounts of information to be sent at the same time and very quickly between computers or other electronic devices
Browser	A computer program (such as Internet Explorer, Google Chrome or Mozilla Firefox) that enables internet users to access, navigate, and search World Wide Web sites.
Client access licences	A commercial software licence that allow clients to connect to server software and use their services.
Client devices	In this context refers to the computing devices used by staff and students (i.e. tablet, laptop, smartphone)
Cloud	Cloud computing is a general term for the delivery of hosted services over the Internet
Cloud-based service provision	Services provided over the internet
Data centre	Normally a large group of networked computer servers used by organizations for the remote storage, processing, or distribution of large amounts of data.
Device lifespan	The expected useful life of the device considering expected technological developments
“End to end” network management.	A term commonly used to describe management of the entire network from user device applications to hosted

Term	Meaning
	data centres
Google Apps	A package of cloud-based services that provide a school with range of online applications such as email and chat, video conferences, social media, real-time document collaborations etc.
Hosted	Hosted services are technology services offered by a provider that owns and maintains the physical servers at a different location. Access to the service is usually provided through a network connection usually via the Internet
Hosted datacentre	A hosted data centre is a facility used to house computer systems and associated components, such as telecommunications and data storage systems
ICT Infrastructure	ICT infrastructure is an overall name used to describe all the computer and communications hardware and software required to manage clerical, administrative, management tasks in organisations.
Internet connectivity services	The ability to link to and communicate with the Internet
Latency	Latency is the term used to indicate any kind of delay that happens with data communication over a network
Learning platforms	A learning platform is an integrated set of interactive online services that provide teachers, learners, parents and others involved in education with information, tools and resources to support and enhance educational delivery and management.
Loading	A measure of the amount of computational work that a computer system performs.
Local and/or wide area connectivity	A local area network (LAN) is a network that connects computers and other devices in a relatively small area, typically a single building or a group of buildings. A wide area network (WAN) is a telecommunications network or computer network that extends over a large geographical distance.
Local client	A computer program that, as part of its operation, relies on sending a request to another computer program in the same location.
Local solutions	Solutions relying on services provided by traditional

Term	Meaning
	software solutions (as opposed to cloud services)
Management information systems	Broadly refers to a computer-based system that provides managers with the tools to organise, evaluate and efficiently manage departments within an organisation.
Managed services contract	A managed services contract is a service level agreement (SLA) between a managed services provider (MSP) and its client that outlines the services to be delivered, both parties' responsibilities, minimum response times and liability protection etc.
Microsoft Office 365	Microsoft Office 365 is a cloud-based service that is designed to provide a school with range of online applications such as email and chat, video conferences, social media, real-time document collaborations etc.
Networking Provision	Typically refers to the provision of a number of separate but interdependent elements including wireless access within the classroom, the local area network within the school, the links from the school to its internet service provider, the links from the internet service provider to the wider internet and the links from the wider internet to the specific service being used.
Networking Infrastructure	Network infrastructure refers to the hardware and software resources of an entire network that enable network connectivity, communication, operations and management of an enterprise network.
Office productivity tools	A general term referring to word processors, spreadsheets, and databases. Technology tools for schools may also include graphing software, desktop publishing systems, Internet browsers, and video production equipment.
Online storage tools	Internet-based storage facility for documents
Re-image	Re-imaging a computer is the process to reformat the hard drive and repair damaged partitions. All the data stored on your computer gets erased from the hard drive and the computer is restored to its original state
Remote access management	The ability to manage functions of a computer from an off-site location

Term	Meaning
Scalability	The capability of a system, network, or process to handle a growing amount of work, or its potential to be enlarged in order to accommodate that growth.
Servers	A computer or computer program which manages access to a centralized resource or service in a network.
Server Provision and Backup	Server provisioning is the process of assigning server capacity and storage, usually in the form of server disk drive space.
Smartphones	A mobile phone that performs many of the functions of a computer, typically having a touchscreen interface, Internet access, and an operating system capable of running downloaded apps.
Software as a Service (SaaS)	A software licensing and delivery model in which software is licensed on a subscription basis and is centrally hosted. It is sometimes referred to as "on-demand software". SaaS is typically accessed by users using a thin client via a web browser.
Solution Management and Support	Refers to the management and support of an IT solution
Subscription based service	A business model where a customer pays a subscription price to have access to the product/service
Supplier lock-in	A situation where a customer becomes dependent on a vendor for products and services, unable to use another vendor without substantial switching costs.
Tablet computers	A small portable computer that accepts input directly on to its screen rather than via a keyboard or mouse.
Technical migration	The process used to move technical service provision from one service provider to another
Thick client	A thick client, also known as a rich client or fat client, is a computer (client) that typically provides rich functionality independent of the central server. The personal computer is a common example of a thick client, because of its relatively large set of features and capabilities and its light reliance upon a server.
Thin client computing	A thin client is a lightweight computer that is purpose-built for connecting remotely into a server (typically

Term	Meaning
	cloud or desktop virtualization environments). It depends heavily on another computer (its server) to fulfil its computational roles.
Total Cost of Ownership (TCO) analysis	With reference to IT equipment, the TCO costs would include server rooms/data centres, student and teacher devices, classroom display technologies, local area networking, wide area networking, mechanical and electrical services, software and content licensing, solution configuration, technical support and staff development.
Traditional media	Media such as print, telephone and television
User access devices	In this context, the device used by teachers, staff and students to access the school network (for instance laptop, tablet, smart phone)
User authentication	The process by which a system verifies the identity of a User who wishes to access it.
Virtualisation	Virtualisation refers to the act of creating a virtual (rather than actual) version of such products as computer hardware platforms, storage devices and operating systems etc.
Whole life costs	The total cost of owning an asset over its entire life. Whole life cost includes all costs such as design and building costs, operating costs, associated financing, support and maintenance and disposal costs
WIFI	The facility allowing computers, smartphones, or other devices to connect to the Internet or communicate with one another wirelessly within a particular area.



Department
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