

The journey to the cloud

A guide to navigation on your cloud migration

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Pinning down the cloud

The cloud continues to grow apace. In 2021, global cloud infrastructure as a service revenues grew by 41% to £72bn¹. By the end of 2023, the market is forecast to grow to £120bn². Amazon Web Services is the market leader by quite some margin, but is starting to lose market share to other providers. The top five providers account for over 80% of cloud use.

So, what is the cloud? In simple terms, it is the delivery of a shared pool of computing services over the internet in a way that can be provisioned easily and rapidly on demand. All the big providers fit this definition. The US National Institute of Standards and Technology defines five key characteristics expected of cloud providers:

Self-service

You must be able to request and set up the cloud services you require by yourself, turning on whatever systems you need without engaging anyone from the provider.

Broad network access

You must be able to access the cloud resources over the internet in a wide variety of ways via a broad range of technologies – e.g. accessing your data centre over dedicated wires, or via your laptop in a coffee shop, or monitoring it on your mobile.

Resource pooling

Cloud providers must offer a huge pool of shared resources, giving customers access to resources that an individual organisation could never afford to purchase. This scale allows both for a reduction in cost and also access to a rate of infrastructural innovation that just wasn't possible before.

Rapid elasticity

You must be able to scale up and scale down instantly. If demand for your services suddenly goes through the roof, it should be straightforward to obtain additional resources, cope with the increased demand while it lasts, and then drop back down to a nominal level.

A measured service

Cloud providers will monitor usage of each part of their services in various ways. These metrics are then used to bill you for your usage, and to give you insight into your applications' utilisation of the cloud services.

¹ Gartner Says Worldwide IaaS Public Cloud Services Market Grew 41.4% in 2021, Gartner, 2 Jun 2022. Visit <https://go.scottlogic.com/cloud-journey> for clickable links of all footnotes.
² Gartner Forecasts Worldwide Public Cloud End-User Spending to Reach Nearly \$600 Billion in 2023, Gartner, 31 Oct 2022.

Puncturing some cloud myths

Today's most successful organisations have harnessed the cloud to build and grow their businesses at unprecedented rates.

This has led some other organisations to rush towards the cloud based on nebulous promises of instant business agility and huge cost savings, only to then hit apparent impediments which have put a halt to their plans for cloud adoption.

With so much hot air spoken about the cloud, it's important to be clear-eyed in perceiving what cloud adoption truly means for your organisation. Here we puncture some of the more persistent cloud myths in order to get to the real, practical questions your organisation needs to consider.

Myth 1

The cloud is always cheaper than on-premises hardware

This myth is based on an inaccurate understanding of how the cloud works. If you were to move from running 24/7 on-premises servers to running 24/7 cloud servers, savings would probably be minimal and without the benefit of any discount, it would almost certainly be more expensive. But the elasticity of the cloud means that you don't need to run servers 24/7; you can run them when you need them and scale up and down as demand requires. The cloud moves you to a consumption model, analogous to a water meter. You gain a clearer understanding of your usage and this is what allows you to make savings, configuring your cloud servers to match variations in demand.

There's another view that adopting the cloud moves you from up-front CapEx expenditure (purchasing on-premises hardware) to variable, on-going OpEx expenditure. While this is generally true, cloud providers typically offer large-scale savings if you can pay for things up-front; however, to benefit you need to be in possession of a clear plan.

This needn't compel a waterfall approach to planning, however; with the cloud, you can pay up-front at any stage of your project, not just at the beginning. This means that you can run proof-of-concept projects using OpEx before committing to any CapEx. In the long term, the biggest savings come from re-architecting your applications, which, in essence, means redesigning and rebuilding them to be cloud-native. This approach will undoubtedly mean a substantial amount of work and careful consideration of the costs and benefits will be required before embarking on such an undertaking. Later in this paper, we look at the seven options open to you in preparing your applications for migration.

Myth 2

The cloud delivers business agility to organisations

The cloud offers unparalleled technical agility which can underpin business agility. With the cloud, your organisation can accelerate its speed to market and gain new insights on customer engagement with your products and services. With these rapid insights, your organisation can innovate faster; and then with the cloud's capacity to automate much of the delivery pipeline, you can quickly deliver incremental improvements and new features that better meet customer needs. In doing so, you can demonstrate your organisation's greater customer responsiveness.

But in itself, the cloud does not confer this business agility on an organisation. Your organisation's people, processes and ways of working need to become more agile before the cloud can facilitate your progress towards greater business agility.

For example, consider your supply chains. If you are delivering physical products, the cloud might accelerate some parts of the process, but this will only serve to emphasise bottlenecks elsewhere in the organisation that will slow down or impede delivery. A multi-stage process is only as fast as its slowest step, so bottlenecks will need to be addressed or removed. Business agility will only become possible as the organisation grows more capable of keeping pace with the rate of change that the cloud can offer³.

Another part of this myth is that you can only achieve business agility by automating everything in the cloud. While automation is an important factor in the way that the cloud supports business agility, it doesn't have to be a binary switch. Cloud adoption should be a journey. You can start by establishing the simple ability to release small increments; you don't have to accelerate from zero to fully functional Continuous Deployment in sixty seconds. It's much better to take an iterative and incremental approach to your cloud adoption journey.

A very valuable benefit of this approach is that it's easier to take staff along on the adoption journey. IT Department staff will have time to appreciate that the cloud is unlikely to pose a threat to their jobs. Instead, their roles will evolve so that the automation of manual tasks frees up time for them to prioritise previously neglected work of significant value.



³ *The Phoenix Project* (2013; authors Gene Kim, Kevin Behr, George Spafford) explores these ideas in an accessible and engaging way.

Myth 3

The cloud is either (a) less or (b) more safe than on-premises

When planning to migrate to the cloud, security will likely be an important consideration on every designer's or architect's mind. When you build services, you must integrate security correctly from the very beginning. So when it comes to the cloud, which is it: more secure or less secure? And how easy is it to comply with regulatory requirements? Just like most IT answers: it depends! The cloud can be more secure, but it still requires attention and care to make it so.

The basic overarching security principles remain the same. However, the implementation is often very different between what you do in a data centre and in the cloud. For example, the cloud's perimeter defences are generally completely different from what you would be accustomed to.

All the major providers have a shared responsibility model for security. You will be responsible for aspects such as data security, regulatory compliance and data sovereignty. The cloud provider may provide best-practice advice, example architectures and blueprints, showing how best to ensure that your data and deployed workloads are shielded and defended appropriately. Automatic reviews and consultancy may also be offered, but these areas remain your responsibility.

Physical security becomes the sole responsibility of the cloud provider. They have huge security teams, and security around the data centre is tightly controlled. Access to the actual data centre is limited to approved personnel, and those who are granted access are limited to specific areas for very limited periods

of time for very specific reasons. Cloud providers also use 'Red Teams' – groups of security experts whose job it is to attack their own architecture to find vulnerabilities and see whether they can breach them, helping to inform defensive improvements. Providers comply with a formidable range of security standards, all of which are audited by third parties and the reports of these audits are typically available on their websites.

Turning to regulatory compliance, even in industries with the tightest regulatory regimes – such as financial services – it is increasingly the case that the regulators provide guidance supporting the use of cloud providers⁴. The providers have worked closely with the regulators to ensure that organisations can adopt the cloud and remain compliant. In the UK, the government has established the National Cyber Security Centre which provides guidance and recommendations on how to use the cloud safely, enshrined in 14 security principles⁵.

Myth 4

We will be locked in to using a single vendor

Organisations are often concerned about this level of dependence on a third-party. What if there's an outage and your systems are down for hours? Will the SLA cover the loss to your organisation? These anxieties are well-placed but nothing new; many organisations already use third-party data centres. Let's look at the realities of the cloud and your options for mitigating what risks there are, starting with availability.

All the cloud providers offer SLAs for every service they provide which, typically, will be at the 99.99% level, albeit with certain caveats. A cloud-native application built using a variety of individual services will have its own SLA that can be calculated from the underlying SLAs of its components. 99.99% availability equates to five minutes' downtime a month, which could be a reason to use multiple providers. However, outages are very rare in reality. At the time of writing in mid-2023, AWS's last issue that led to broad and significant customer impact was in December 2021⁶. The cloud providers provide guidance on how to build resilient systems which recover quickly when a failure does occur⁷.

Cloud adoption should be a journey. You can start by moving some of the easy workloads into the cloud and providing some proofs of concept to the organisation, before then moving on to the harder workloads and the bigger wins, over time. You don't need to select a single provider. Working with multiple cloud providers can create complications, but in some scenarios it can be better. And while it can be difficult to move between providers, this is becoming easier. Not only are vendors' offers becoming more aligned, but there are also third-party technologies like Terraform and Pulumi that support multiple providers. There is one thing to avoid: adapting your applications for the lowest common denominator. All cloud providers have specialities. If you build to a common level, you will lose out on some of the value.

Whether you opt for one provider or several, you should apply the same due diligence as if you were selecting a data centre. You should ensure you know which workloads will be hardest to move and shape the design to allow for sufficient availability.

⁴ For example, see the Financial Conduct Authority's SYSC Handbook, Section 8.1.8.

⁵ Cloud security guidance, National Cyber Security Centre.

⁶ AWS Post-Event Summaries.

⁷ For example: Reliability Pillar - AWS Well-Architected Framework.

Dark clouds on the horizon: approaches likely to fail

Now that we have punctured some persistent myths about the cloud, we hope you will agree that with the right mindset and approach, you can begin to access the cloud's great potential to offer value to your organisation.

As we have indicated, cloud adoption is by no means a small undertaking. It is very likely that it will require some fundamental changes to your organisation, touching all parts from front-line services, through to Finance, Operations, HR and beyond. People and processes will need to adapt in order to get the most from the cloud, and this will need appropriate planning, management and resourcing.

It's a significant undertaking, but the rewards can be great in terms of reduced operational complexity.

At Scott Logic, we have seen a range of different approaches to cloud adoption, and at either end of the spectrum are approaches that are likely to fail. Let's look at those first before moving on to a tried-and-tested approach to cloud adoption.

Top-down

In this approach, the Executive team in the organisation has already accepted the benefits offered by the cloud. An executive sponsor is tasked with leading a transformation programme, the aim of which is to migrate the organisation over to the cloud in one fell swoop. The programme is full of large batches of work, such as moving the entire data centre into the cloud in one go.

As with all large-batch approaches to work, this removes the ability to test, learn and adapt as you go. Early in the programme, the organisation will have neither the information nor the skills it needs to accomplish the migration successfully – and this learning journey plays a key part in securing buy-in from individuals and teams as the cloud adoption progresses.

Bottom-up

At the other extreme is the grassroots method. A subject matter expert enthused by the benefits of the cloud makes the case to manage a proof of concept as the starting point for an incremental cloud migration programme. However, without top-level sponsorship, unsanctioned cloud adoption can be the result.

This is particularly the case in organisations where bottlenecks and frustrations with internal processes have led to multiple failed attempts to kick-start cloud adoption in this bottom-up way. In this scenario, organisations can find themselves beset with multiple silos of adoption, with different teams using different approaches and different providers, and an IT estate in which it is extremely difficult to ensure organisation-wide compliance with policies such as data protection and security. What's more, the promise of reduced operational complexity offered by the cloud will have been missed entirely.

The silver lining: Centres of Excellence

One approach that we at Scott Logic have seen work successfully time and again lies somewhere between those two extremes: establishing a cloud Centre of Excellence.

This approach is designed to break down silos from the start and bring together people from different levels of the organisation to plan and implement the business-wide changes required for cloud adoption – starting with a small 'quick win' project to offer an exemplar of what can be achieved. There are five steps to getting a Centre of Excellence up and running.

Step One

Select the right proof-of-concept project

It is important for the Centre of Excellence to identify a small project that can be delivered quickly – a project which will deliver benefits that are well understood by a wide organisational audience, and which also provides a shining example of the advantages of migrating to the cloud.

Step Two

Put together the right team, suited to the project

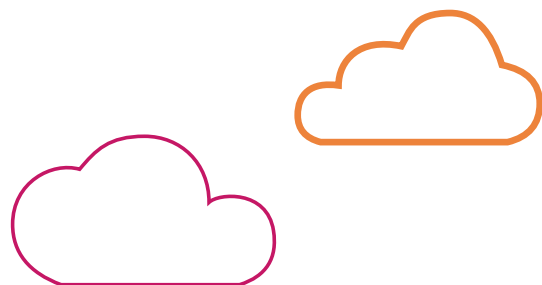
In the spirit of breaking down silos, and to move towards ways of working best suited to the cloud, the project team should be cross-functional. It should bring together representatives of security, operations, infrastructure and application delivery. That said, the team should still be small – ideally a “two-pizza team” (i.e. the number of people that could be fed with two pizzas). Wherever possible, the team should come from internal reallocation, rather than through external hiring, to demonstrate the capacity of existing colleagues to adapt to the new approach.

The team should comprise people who want to learn, who want to help the organisation change, and who want to evangelise that change. They should be allowed to be agile and make mistakes – aiming for early, incremental value delivery, rather than seeking perfection through exhaustive up-front design.

Step Three

Secure the involvement of appropriate senior stakeholders

In addition to the senior stakeholders who are members of the Centre of Excellence, appropriate senior stakeholders should be identified for involvement in providing right-size governance of the proof-of-concept project. These stakeholders need to support the team's agile ways of working and allow it room for manoeuvre, and will ultimately be responsible for approving the implementation of the proof of concept. As early witnesses of the difference made by the cloud, they will then be in a better position to lead the larger organisational change.



Step Four

Get security and compliance right from the start

As ever, security is key. So, it is critical for the proof-of-concept project to prioritise security, regulatory compliance and legal compliance from the very start. In so doing, the team will demonstrate a key advantage of the cloud – the ability to create reusable patterns, architectures and policies that can be propagated as the cloud is adopted in the wider organisation. The more consistent your workloads are, the lower the operational burden will be. Cloud providers offer best-practice blueprints, but you should tailor these to the specific requirements of your organisation. Automation can drive this consistency and deliver big agility gains as you work towards Continuous Integration and Continuous Deployment.

Step Five

Evangelise the new tech and ways of working

No matter the size of the proof-of-concept project, it still represents a big step in the right direction and it should be showcased as such to the rest of the organisation via whatever channels are best suited to this. You can demonstrate broad buy-in to the new ways of working by emphasising the cross-functional membership of the Centre of Excellence and the project team. The new practices and processes should be documented, and other teams trained. To help to propagate the new knowledge and experience, members of the Centre of Excellence can be seconded into other teams.

Alternatively, the Centre of Experience could be expanded, but this should be done carefully so as not to impede its ability to make decisions and act.



Preparing the organisation for cloud adoption

In parallel with the proof-of-concept project, the Centre of Excellence plans and executes the programme of work to prepare the wider organisation for cloud adoption.

The major cloud providers offer a lot of guidance to organisations to support this transformation. [AWS's Cloud Adoption Framework](#) is an excellent example, and [Azure](#) and [Google Cloud](#)⁸ offer similar resources. Regardless of the supplier, the frameworks are universally applicable. Let's look at the AWS framework in a bit more detail.

The framework is designed to help you to approach your action plan from six perspectives, aligned to six categories of stakeholder across the organisation. It encourages you to identify and engage with them during discovery to understand their questions and any concerns that could delay the cloud migration. Through this discovery phase, you explore capability gaps in relation to skills and processes, so that you can factor into your plan how you will address them.

The six perspectives are below. The first three broadly focus on business capabilities and the second three on technical capabilities:

Business

Through the Business perspective, the framework guides you to fully align your IT strategy with the business strategy, so that the transformation's outputs and outcomes support the outcomes of the business.

People

The People perspective helps your HR department to prepare teams for cloud adoption by planning and delivering appropriate training programmes to develop cloud-based competencies.

Governance

The Governance perspective is designed to support you in aligning IT governance with organisational governance, resulting in agile, best-practice IT governance that helps to foster business agility.

Platform

The Platform perspective guides you in designing and setting up your cloud architecture in support of your business strategy, and provides support for migrating your first applications and workloads.

Security

The Security perspective guides you in reviewing the current security processes and guidance, and in selecting which of them need to be implemented in the cloud. It helps you to develop from the start the controls that are to be used across the organisation.

Operations

The Operations perspective focuses on how to enable, run, use, operate and recover workloads in support of the business strategy, including considerations around SLAs, realistic uptime and disaster recovery.



⁸ Visit <https://go.scottlogic.com/cloud-journey> for clickable links.

Preparing workloads for cloud migration

Having looked at preparing the organisation for cloud adoption, let's drill down to how you prepare workloads for migration to the cloud. Cloud providers offer guidance to support you in this planning process. [AWS has the 7 Rs](#), seven strategies to choose from once you have reviewed the workload in question. As with AWS's Cloud Adoption Framework, the 7 Rs are universally applicable. There are variations on the Rs, such as Gartner's original 5 Rs and Azure's 5 Rs, but we'll focus on AWS's 7 Rs here.

Once a workload is selected as a candidate for migration, the first thing you need to do is to review it so as to understand fully what it is, how it contributes to business outcomes, and what shape it should take in the cloud. Having completed the review, you can then select the most appropriate migration strategy. The goal, as always, is to maximise the value from the cloud while minimising the time, effort, cost and risk to the organisation.



The 7 Rs

Retire or Retain

Both of these are passive strategies and represent a decision not to migrate the workload to the cloud. If the workload is no longer contributing to business outcomes, you can opt to retire it. If you have made a recent, major investment in a data centre which is meeting the organisation's needs as is, you can opt for the retention strategy.

Rehost or Relocate

With the Rehost strategy, you 'lift and shift' the workload to the cloud. Rehosting offers a good first step away from on-premises hardware, so is worthy of consideration. However, it is unlikely to result in significant cost savings or other cloud benefits. The Relocate strategy is a variation of Rehost, but at the hypervisor level.

Repurchase

If there's a cloud version of the application in question, you can opt for the strategy of repurchasing the same application in the cloud. If the organisation's needs have changed, there is the opportunity to switch over to another cloud-based application with a more suitable feature set. The Repurchase strategy offers a quick win, with little cost and minimal retraining.

Replatform

The Replatform strategy enables you to make small enhancements to the application in order to take advantage of more of the benefits of the cloud than the Rehost strategy allows. For example, you might switch from an on-premises database server to a cloud-hosted database service. You also have the option to adjust the application to scale more elastically; while this involves more effort and cost, you reap more of the benefits of the cloud.

Refactor

This is the riskiest strategy, refactoring the application to be cloud native. In effect, you will be rebuilding the application from scratch, which could very well introduce a lengthy delay in

delivering business value and return on investment. There are scenarios in which refactoring is the best strategy to opt for, but the organisation needs to be aware of the risks and plan their mitigation.

Optimise with the Well-Architected Framework

If you choose anything other than Retire or Retain for your app, completing the migration is the first step. The next step is to optimise the app for the cloud.

At this stage, you review the decisions you made in preparing the app for migration to check that they have produced the desired results. AWS has produced a universally applicable framework for this, the [Well-Architected Framework](#). Azure's [Well-Architected Framework](#) and Google Cloud's [Architecture Framework](#)⁹ provide similar guidance, focused on their respective technologies. Aimed at technical staff, AWS's framework provides a yardstick against which you can measure the design and performance of your cloud-hosted app in relation to six key aspects:

- **Operational Excellence** – how easy is it to run, maintain and monitor your app, and to improve your processes and procedures?
- **Security** – how secure are your assets, information and systems, and how robust are your risk assessments and mitigation strategies?
- **Reliability** – how resilient is your app, how well can it recover from temporary disruptions, does it have the high availability that you require?
- **Performance Efficiency** – how well are you using your resources, and how well can they evolve with the changing needs of your organisation?
- **Cost Optimisation** – does the app deliver business value at the lowest price point?
- **Sustainability** – how well are you maximising the benefits of your provisioned resources and minimising total resources to reduce energy consumption and increase efficiency?



Fostering a DevOps culture

Optimisation is not just a matter of technology configuration. For cloud adoption to achieve its highest potential in delivering business value, a DevOps culture is required.

Many elements that we have already described are at the heart of DevOps ways of working, such as the formation of cross-functional teams. The same principles of shared responsibility, agility, transparency, and mitigating risk through automation apply equally to DevOps and to migrating complex apps into the cloud successfully. Adding security into the mix, there's the new phrase DevSecOps, expressive of the principle of shifting security compliance as far to the left as possible, and of new capabilities to automate compliance into your build and release processes.

The more you can move towards agile and DevOps ways of working in pursuing your cloud adoption programme, the more your IT organisation will be capable of underpinning your business agility.

DevOps is too big a topic for this white paper, but here's one we prepared earlier...

⁹ Visit <https://go.scottlogic.com/cloud-journey> for clickable links.

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The journey to DevOps

This paper by Bartosz Jedrzejewski introduces the core concepts behind DevOps and suggests how organisations can embrace the DevOps mindset and culture that is driving technical innovation in some of the world's biggest enterprises.



Thinking differently: The cloud as a value driver

This paper by Colin Eberhardt provides a corrective to the prevailing view that the cloud is chiefly a means to reduce costs, and makes the case for the cloud's potential as a driver of business value by enabling both technical agility and business agility.



If you'd like a copy of these sent to your inbox, please email colin@scottlogic.com



Let us help you ask the right questions

Enticed by the initial promise of what the cloud has to offer, many companies find themselves confronted with significant blockers to adopting the cloud. We hope this paper has given you the lie of the land so that you can map an onward route towards cloud success.

We can help. At Scott Logic, we have a great deal of experience helping organisations with cloud adoption. We can support you in shaping and executing an incremental plan so that you can deliver early and on-going value as you progress towards cloud maturity.

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