Cloud Services Market Research.

Summary of Findings
March 2023

Context Consulting

Ofcom

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Research method & objectives

Ofcom wished to deepen its understanding of the market for cloud services, especially IaaS and PaaS, and the providers of these services

Background & Context

Ofcom wanted to develop its understanding of the provision of cloud computing services.

Ofcom wished to conduct research amongst a range of UK businesses that use cloud services.

The Cloud is a critical input to many digital markets as it is part of the infrastructure of the internet and so enables online commerce, social media, digital advertising, voice assistants, digital mapping streaming services email, and OTT calls.

The Cloud is typically described by reference to three vertical layers referred to as IaaS, PaaS and SaaS.

For the purposes of this research exercise, Ofcom is looking to focus its sample and questions towards a wide range of organisations (not just telecoms and broadcasting) that use Cloud layers, but with particular focus on the use of IaaS and PaaS.

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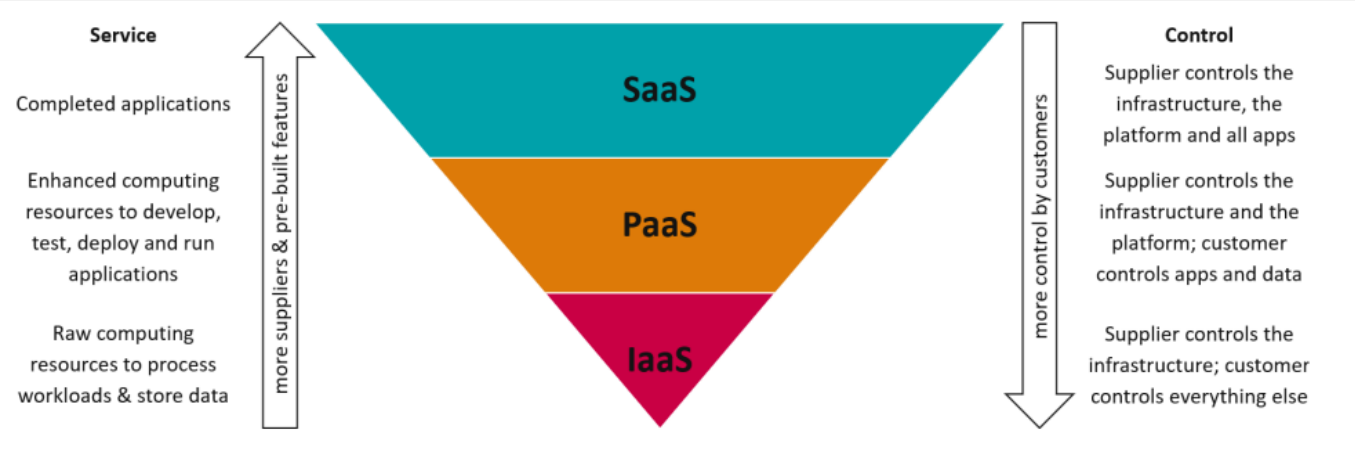
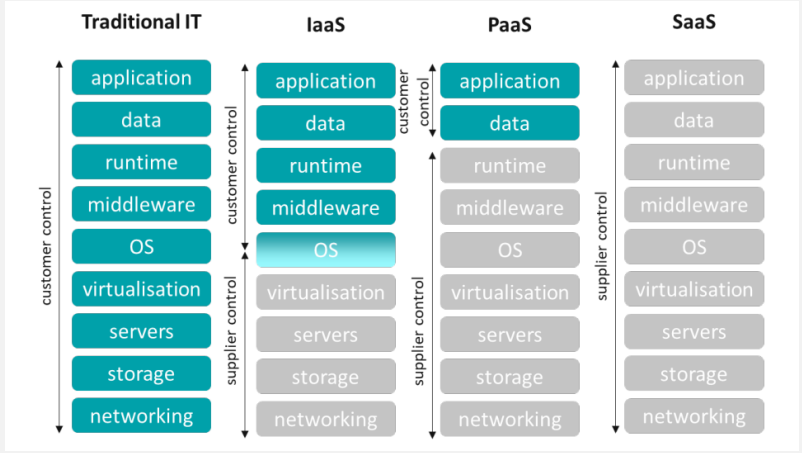
IaaS, PaaS and SaaS are distinct cloud computing service models, offering different levels of control and ownership over IT elements





Cloud services are typically classified according to their service models: IaaS, PaaS and SaaS. These are differentiated by the level of control the customer has over the management and maintenance of the computing resources.

Infrastructure as a service (IaaS) are cloud services that provide access to raw computing resources for processing workloads and storing data.

Platform as a service (PaaS) provide access to a virtual environment for customers to develop, test, deploy and run applications. These include application development computing platforms and pre-built application components and tools which customers can then use to build and manage full applications.

Software as a service (SaaS) are complete applications hosted in the cloud.

A more detailed definition can be found in the Appendix – click here

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This study provides insights into the usage of cloud services, the suppliers of these services and the customer journey undertaken

Project Objectives

The primary objectives of this study were to:

1) Measure use, experience of, and attitudes of customers towards Cloud services and service providers across the UK, to paint a reliable general picture of the UK position across the economy.

2) Gain more detailed insights into the customer journey for the purchase of cloud services (i.e. IaaS and PaaS)

More specifically, this study will inform Ofcom on:

Types of Cloud services used:

What Cloud services are used and where do they sit in the service model framework (e.g. IaaS, PaaS SaaS) and deployment model framework (e.g., private, public, hybrid)?

Drivers for Cloud Service use:

What is the rationale for adopting Cloud services and is its use expanding in any particular areas?

What proportion of their IT needs are provided through Cloud services and how is this changing?

Choice of suppliers:

How are suppliers identified?

What are the key criteria for selecting a Cloud supplier?

Nature of contracts:

How are the services priced?

What role do volume discounts or other incentives play?

How long do contracts last? What fees are charged on termination of contracts?

Experience and satisfaction:

What are customers' views about the choice, price and quality of services available?

Our approach included both qualitative and quantitative primary research phases to generate rich, detailed and robust insights

Understand

Briefing with core team

Finalise objectives and outcomes

Agree sample specifics and timings

Desk research: review of existing reports

Agree on hypotheses to lead into qual phase

Clear direction set; hypotheses to test including specific topics where detail is required

Validate

Qualitative

- N=50 x 60-min online depth interviews
- Sample to cover all key size bands, sectors, regions etc.

Quantitative

- N=1000 x 20-min online survey
- Sample to cover all key size bands, sectors, regions etc.

Comprehensive insight into overall, identification of a core target and delivery of target profiles

Inform

- Interim and final stage debriefs delivered in-person or online
- PowerPoint decks for final delivery
- Final report to be published on Ofcom's website
- Data delivered at respondent level and as data tables
- Technical appendix

Detailed outputs in report and presentation format, with in-person debriefs to ensure effective communication of learnings

We conducted 64 interviews with UK decision-makers with a broad range of organisations, 50 initial discussions plus 14 follow-up interviews

- In-depth interviews were conducted with decision makers across a range of UK companies, across size bands and industry sectors
- To qualify, organisations had to be existing users of cloud computing services (IaaS, PaaS or both), or considering adoption within 12 months
    - Majority were users of IaaS, with PaaS usage at a lower level; All these organisations were also existing users of SaaS
- In this report we use the word 'providers' to describe organisations that provide IaaS/PaaS services. In some instances, depending on the question context, respondents would have been referring to providers of cloud services more generally.
- Equally, participants had to be decision-makers responsible for IT services
- Interviews were conducted by Context Consulting's interviewers over *Teams* and lasted up to 60 minutes
- We subsequently conducted 14 follow-up interviews lasting 30-40 minutes to explore specific topics in more detail.

Industry Sector | Interviews

White Collar	Blue Collar	Pink Collar	Public Sector	NFP / Third Sector	IT & Tech	TOTAL
15	17	10	12	5	5	**64**

Size band | Interviews

Up to 49	50-249	500-999	1000-4999	5,000+	TOTAL
4	11	18	17	14	**64**

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Key: Qualitative findings are marked with this symbol 

We have conducted over 1,000 survey interviews with UK decision-makers across the range of organisation size bands and industry sectors

- **1,004 online quantitative survey interview** with ICT decision-makers across a range of UK organisations, across size bands and industry sectors
- To qualify, decision-makers had to work for organisations that were **existing users** of cloud computing services (IaaS, PaaS or both), or **considering adoption** within 12 months
- **89%** of our sample were **existing IaaS/PaaS users**, **11%** were **actively considering** adopting IaaS/PaaS in next 12 months
- **Interview length:** 20 minutes
- **Fieldwork dates:** 20th September – 4th October 2022
- **Sample source:** Specialist B2B panels
- **Quotas:** minimum quotas were set to ensure a robust base of company size and sector for analysis
- **Significance testing:** We have used a 95% confidence level (standard in market research) within this study. The following symbols have been used in this report

⇧ **Significant difference – higher than total**

⇩ **Significant difference – lower than total**

Industry Sector | Interviews

White Collar	Blue Collar	Pink Collar	Public Sector	Health	IT & Tech	TOTAL
229	233	140	121	96	137	**1,004**

Size band | Interviews

Up to 49	50-249	250-999	1,000-2,499	2,500+	TOTAL
174	279	259	101	191	**1,004**

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Key: Quantitative findings are marked with this symbol

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Please note that the views presented in this section are those of the respondents to our survey. They do not represent the views of Context Consulting or of Ofcom.

Summary of key findings

Key findings: There is a widespread desire among firms to move towards cloud computing, with continued investment likely

Usage of cloud computing services

- Migration to cloud computing is **widely viewed as desirable** and is the **clear direction of travel**, with companies at different stages of adoption.
- Many firms are using **more than one service model** and 1 in 3 use all of IaaS, PaaS and SaaS models concurrently. Indeed, while IaaS and PaaS are used today, many companies perceive **SaaS as the model they ultimately prefer**, not least for its simplicity.
- IaaS/PaaS adoption has **largely taken place in last 1-5 years**, but almost 1 in 4 of the larger firms interviewed adopted IaaS more than 5 years ago. The speed of adoption of cloud services is being delayed, rather than prevented, by various internal and external factors.
- There has been **growing investment** in cloud computing, with over **4 in 5 having increased spend** in this area in recent years, and this is particularly true among larger firms.
- Cloud computing is perceived to bring many benefits, with the key drivers being greater **flexibility**, **agility**, and improved **security**.
- Looking ahead, cloud computing **investment is predicted to increase** in the next 18 months by a large majority of companies.
- As more workloads shift to the cloud, the **battle for skills** will be a key challenge, especially among larger companies, the public sector and IT / tech firms, as the pool of qualified cloud professionals struggles to keep up with demand.

Key findings: The cloud supplier landscape is led by the big 3, with many companies not looking at the smaller players

Cloud computing supplier landscape

- The cloud supplier landscape can be grouped into **three broad categories**. The **'big 3'** of Microsoft Azure, Amazon Web Services and Google Cloud Platform lead the market, which also includes **mid-tier players** and a **long tail** of niche suppliers.
- Microsoft is a **leading player**, and is seen as a **logical choice** due to the **ease of integration** with existing IT. While there are many positive experiences of working with Azure, there is **some concern** around Microsoft's market power and its commercial stance.
- AWS is viewed as a cloud computing **technology leader**, with an extensive product range, as well as offering good value archiving.
- Google is also perceived as a major player, though less prevalent than Azure / AWS, and is more known for **PaaS than with IaaS.**
- Smaller players have significantly lesser **market share**, with a range of concerns meaning most firms do not consider these.
- **Take-up patterns vary.** Early adopters are more likely to look beyond the big 3, and Azure is more widely used in larger firms, while AWS is more likely to be used by early adopters including companies in the IT & technology sector.
- **Service quality** is the most important reason for choosing cloud suppliers, followed by **value for money**.
- Overall, around half of companies currently use a **single cloud computing provider**, while nearly a quarter have 3 or more providers.
- While multi-cloud users value benefits of **resilience and control**, they are more likely to be faced with **integration and management** challenges.

Key findings: We found many companies struggle to accurately predict costs of cloud computing, and price increases at renewal can be steep

Contracts and purchase process

- For both IaaS and PaaS, **most organisations buy indirectly** via managed service providers. 29% solely buy IaaS direct from hyperscalers and 24% solely buy PaaS direct, while a smaller proportion purchase IaaS and PaaS via both direct and indirect channels – 22% for IaaS and 14% for PaaS.
- Third parties are favoured for **advice, support** and better '**understanding**'; by contrast, **price is key** for those buying direct.
- **Bundling is a polarising topic**, welcomed by some and resisted by others, who see it as further evidence of vendors' market power.
- Experience of **actual versus planned costs** is an emotive topic, and decision makers feel it is more difficult to manage than need be.
- 1 in 3 users find it **difficult to accurately predict** the future costs of cloud computing, though a larger proportion does not consider this an issue.
- Most receive **discounts** of some sort; Azure users are less likely to be paying the quoted price than Google and AWS users.
- However, the businesses we interviewed told us that **price rises are relatively common** and can be significant. Microsoft users are most likely to have had price rises, with figures for AWS and Google only marginally lower. Among those that experienced a price increase when renewing their contract, the mean reported **increase was around 20%.**
- Many users call for **greater transparency** over costs, while accurately forecasting expenditure on cloud computing causes challenges, especially in the public sector.

Key findings: Switching between PaaS/IaaS providers is relatively uncommon, but this is not perceived to be due to restrictions imposed by suppliers

Service and supplier switching

- Around 1 in 5 firms in our sample said that they have switched IaaS/ PaaS provider, while over a third have added additional providers.
- There is a high level of inertia which means something very significant would need to happen to prompt a switch away from an incumbent PaaS/IaaS supplier.
- We found that barriers to switching between PaaS/IaaS providers included perceived effort, skills issues and dependency on ecosystems, with limited upside anticipated. Few, if any, firms, told us that they wished to switch providers but were impeded from doing so by the policies of their providers.
- Among those that have switched supplier, most found it easy, but a significant minority had difficulties.
- Looking ahead, nearly a third feel they are likely to switch in the future triggered by improved service quality, lower prices or better security.

Key findings: Diverse views co-exist as to the degree of commercial choice and competitiveness in the cloud computing market

Customer attitudes to competition in the cloud market

- Both qualitative and quantitative research identified **very mixed views** of the level of competition in the cloud market.
- A good proportion of qualitative respondents are **relatively comfortable** about the competitiveness of the market, while a similar proportion **expresses disquiet** about the lack of competition in the market. These respondents often stated they expect this to get worse.
- The survey also uncovers **contradictory views**. Most firms agreed that there is a good degree of competition in the market for IaaS services, more so than for PaaS.
- There are widely-held views that the presence of **multiple providers**, as well as **numerous deals and pricing offers** are all signs that this market does function effectively.
- However, many businesses are also concerned about various aspects of the way the cloud market works; the **difficulty and expense of switching**, including egress fees, are key.
- Most companies have taken some action to **mitigate the potential for cloud lock-in**, and those providers with multiple cloud providers are employing a greater range of mitigation strategies.
- Ultimately, most businesses believe the cloud computing market **could be improved**, especially around billing transparency, choice of supplier and ease of switching.

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Usage of cloud computing services

3.1

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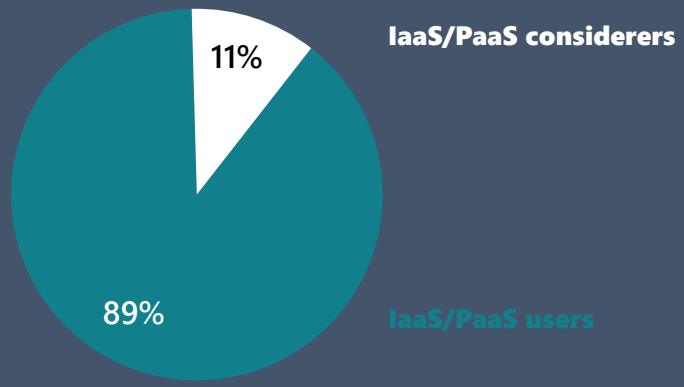
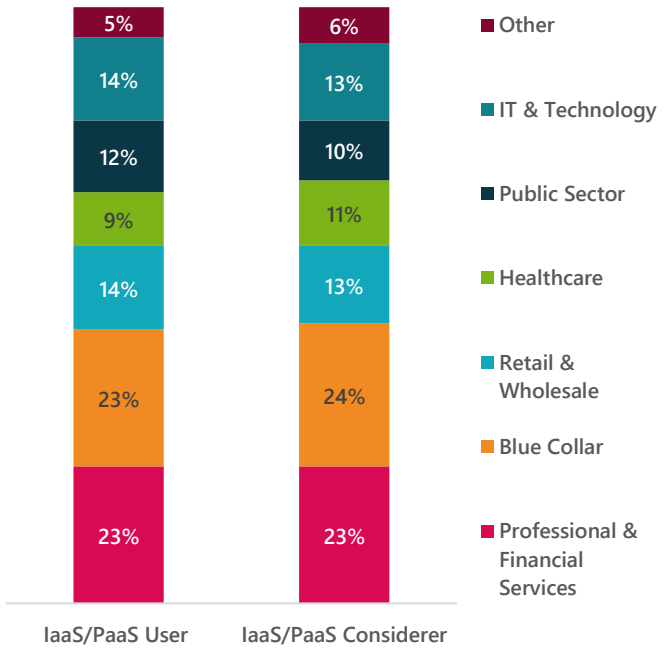
IaaS / PaaS usage



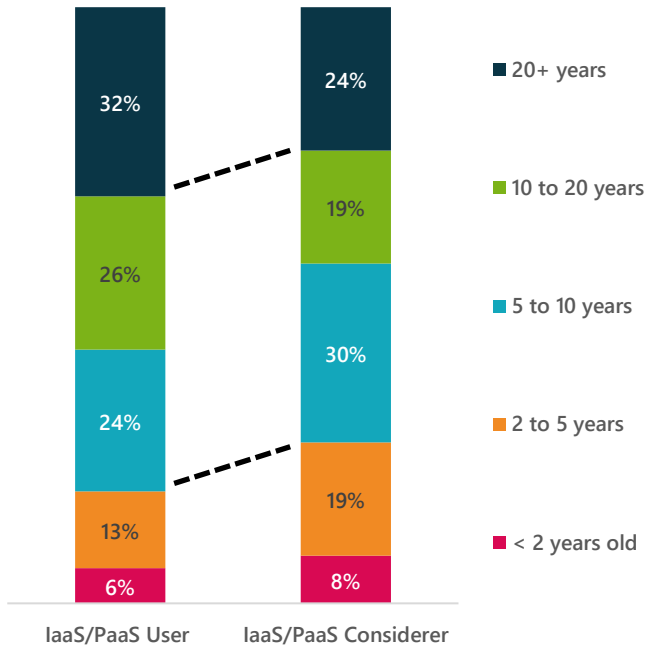
Our universe

IaaS/PaaS users and considerers within our sample have a similar sector profile, but users skew older and bigger

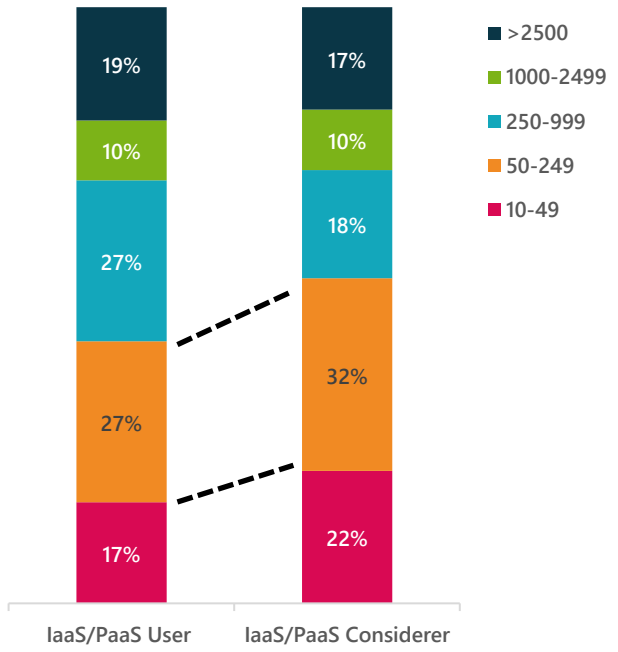
Sector



Company age

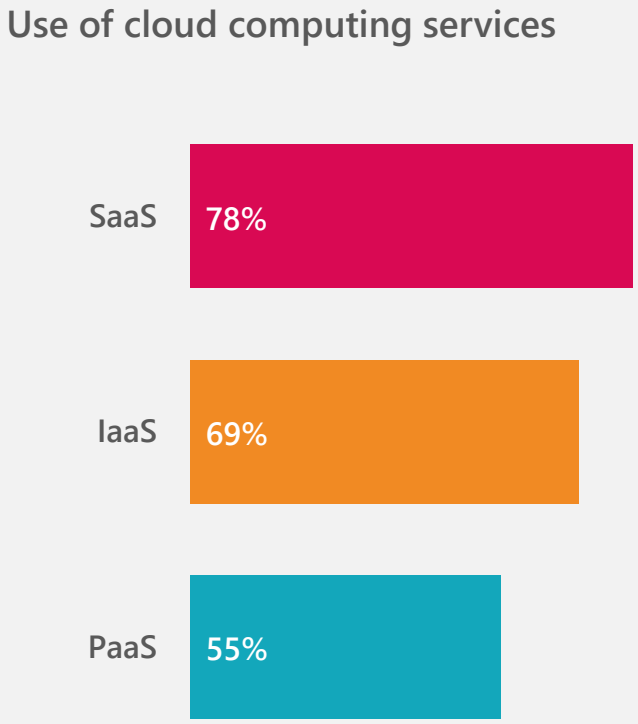


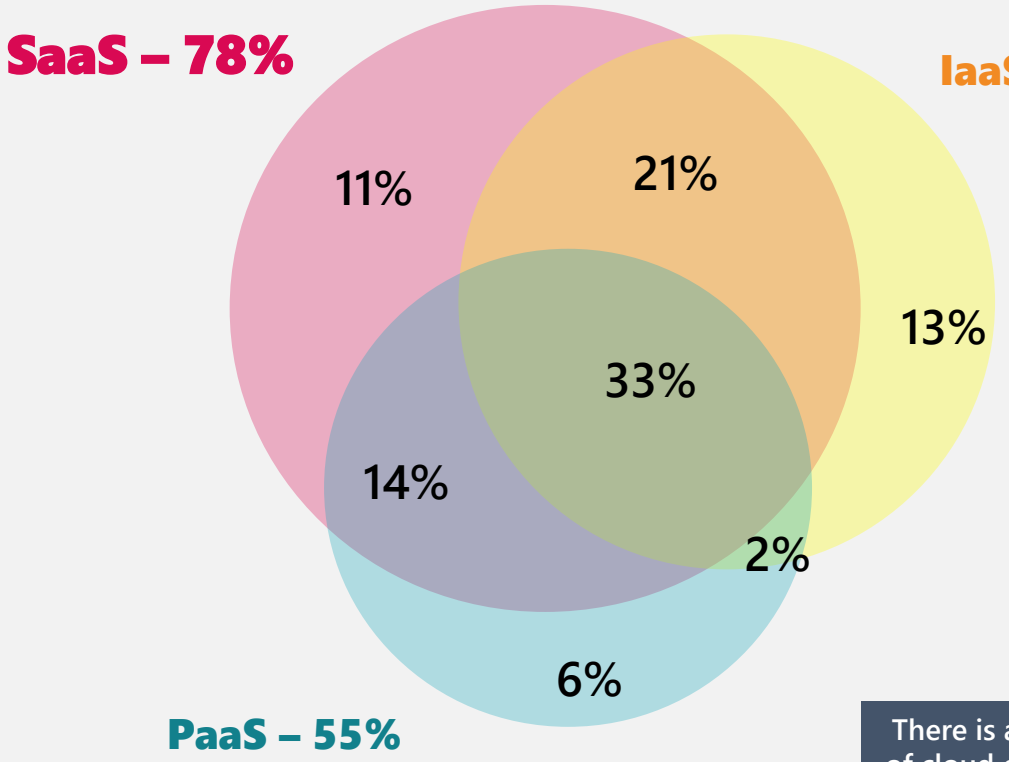
Size (number of employees)



Q4: Including yourself, how many staff work in your organisation in total? Q5: Which industry sector does your company operate in? Q68: How long has your business been established?
Base: IaaS/PaaS user (n=889) IaaS/PaaS considerer (n=115)

In our sample, SaaS and IaaS are widely used, with PaaS being slightly more niche; most firms are using more than one cloud model



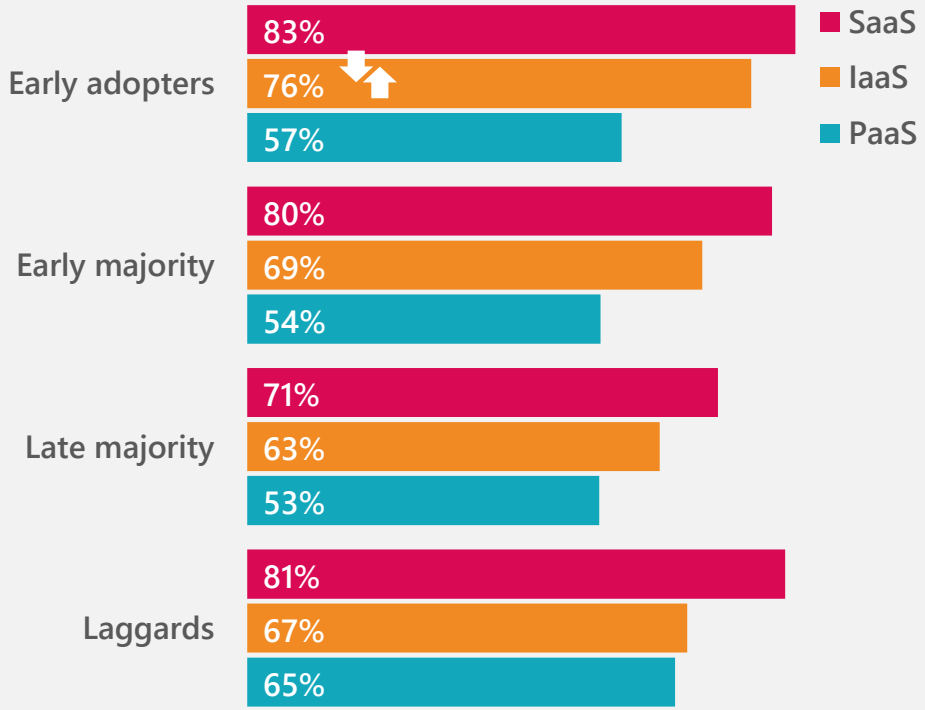


There is a lot of overlap in use of cloud computing types, with a third using all three

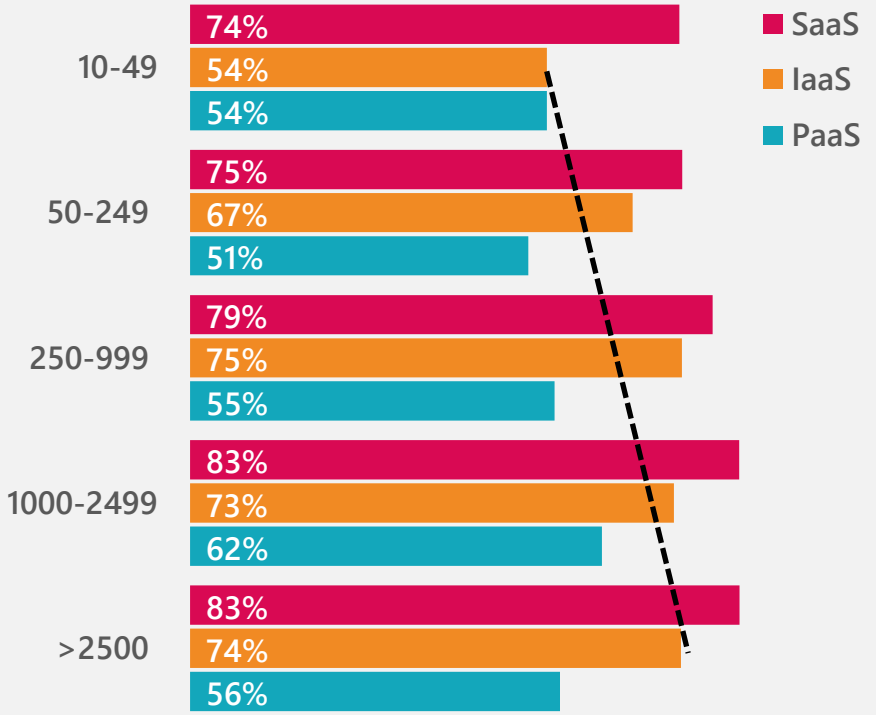
Q9. Which, if any, of these cloud computing services does your company currently use? Base: all (n=1004)

IaaS cloud services have higher usage among early adopter companies AND has higher usage in 50+ employee businesses

Use of cloud computing services by tech adoption profile*



Use of cloud computing services by org size



Q9. Which, if any, of these cloud computing services does your company currently use?
Base: All (n=1004); Early adopters (n=224), Early majority (n=454), Late majority (n=272), Laggards (n=54); 10-49 employees (n=174), 50-249 emp (n=279), 250-999 emp (n=259), 1000-2499 emp (n=101), >2500 emp (n=191).

* NB. Tech adoption stage descriptors in the left-hand side chart are based on responses to Q67. Which of the following best describes your company's attitude to investing in new technology for your business? Respondents were asked which of these four categories best describes the company's attitude to investing in technology.

⇧ Significant difference – higher than total

⇩ Significant difference – lower than total

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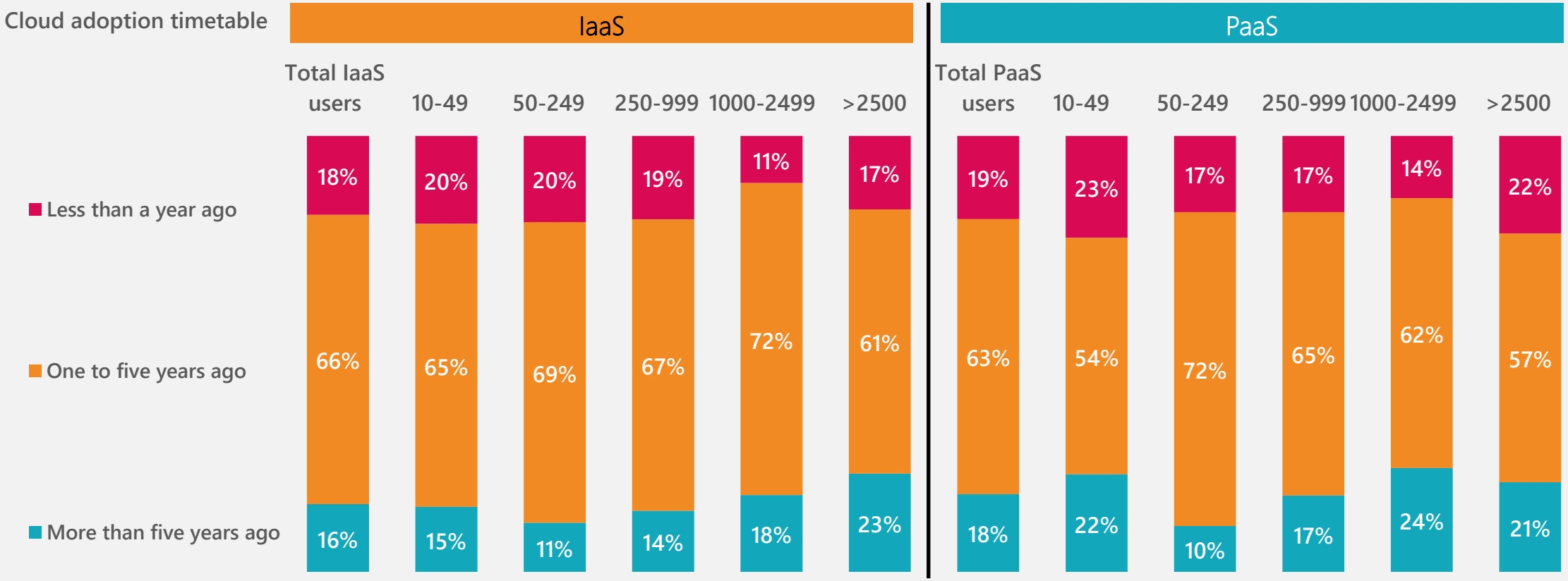
For most, IaaS/PaaS adoption has taken place within the last 1-5 years, but almost 1 in 4 larger corporates surveyed adopted IaaS 5+ years ago



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Q14: When did your business start using SaaS/IaaS/PaaS? Base: those using each technology IaaS Total (n=690), IaaS 10-49 (n=94), IaaS 50-249 (n=187), IaaS 250-999 (n=193), IaaS 1000-2499 (n=74), IaaS >2500 n=142); PaaS Total (n=550), PaaS 10-49 (n=94), PaaS 50-249 (n=143), PaaS 250-999 (n=143), PaaS 1000-2499 (n=63), PaaS >2500 n=107)

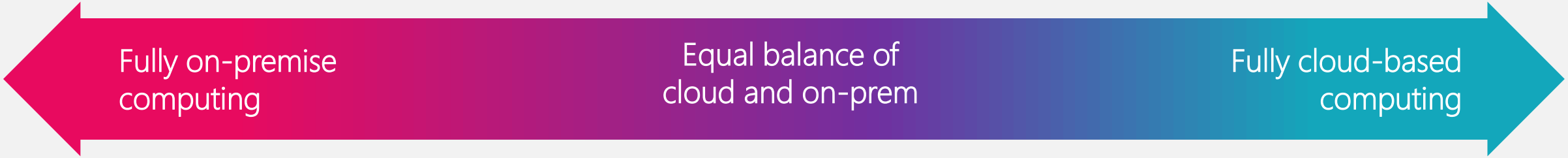
Migration to cloud computing is widely seen as desirable, though organisations interviewed are at different stages of adoption

- All firms interviewed were **users or considerers** of cloud computing – and all agree that cloud is the **direction of travel**
- However, we saw **big differences** in the extent of adoption, with some key patterns emerging *(see below)*
- **IaaS is used more often than PaaS**, which is considered a more specialist use case (e.g., for software development, BI etc.)
- However, both set-ups are **considered 'stepping-stones'** towards a predominantly SaaS-based future

Public sector organisations more likely to be later adopters, not helped by very complex systems and challenges over financing

Large enterprises with 1000s of staff and long-established legacy systems were more likely to be in a transitional stage

Smaller private companies were most likely to have migrated more fully to cloud computing



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The roadmap for cloud computing is clear, with most organisations we spoke to stating an intent to migrate more usage to the cloud

- The direction of travel is clearly towards cloud, although the specific cloud model to adopt is a **nuanced issue**
- For most firms we spoke to, it is a question of **when, and how quickly**, to move towards a cloud-based model, rather than if to do so
- **Covid-19** helped to reinforce the importance of moving to cloud, as organisations moved rapidly, to flexible and remote working models
- While the pandemic **helped to underscore** the value of the cloud approach, it simultaneously **hindered adoption** among some organisations, due to the impact of CV19 on funding and staffing levels alike

We want to completely remove our on-prem server infrastructure within 3 years. **For both financial and green net zero reasons**, we want that all gone within 3 years. We've got a data centre that is bigger than it needs to be as you shift across to cloud.

In the last 3-4 years there has been a **real effort to go on a journey to the cloud**. Inevitably we are finding problems, but the aim is for everything to be cloud-based. A significant proportion has moved but **there are still legacy systems for now**. Ultimately there will be no on-prem solutions – our target was 2020 but it has been harder to get there than envisaged.

We were in the process of quite a big shift to the cloud and then COVID hit. So, we had to throttle that back, but now we are **busy planning and moving more and more things to the cloud** once we've done our ERP upgrade next month, we are moving the CRM and comms platform as well.

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The dividing line between IaaS and PaaS was not always clear to users; while many decision-makers ultimately aspire to a SaaS-based approach

- Our study required companies to be users or intenders of IaaS and / or PaaS, and so is **not market representative**
- Infrastructure-as-service was used **significantly more frequently** than Platform-as-a-service, which is considered more **specialized** than IaaS; IaaS is considered relatively **more straightforward** and undifferentiated 'plain tin'
- PaaS is more likely to be used for **specific use cases** such as software development, AI and business intelligence, while IaaS tended to be used for migration of existing 'legacy' apps
- Having said this, the **dividing line** between IaaS and PaaS is not always clear, and some less technically savvy customers speak of the two interchangeably
- A key finding is that many IT decision-makers – especially in smaller and less technology-dependent firms - express a **preference for SaaS**, and consider IaaS / PaaS as a transitional stage, rather than a strategic, long-term aim.
- However, this is unlikely to be a reality in the **foreseeable future**
- The key benefit of SaaS is its **simplicity**, removing the need for IT teams to worry about infrastructure at all, making this the simplest to manage

In the long run we will **move a completely SaaS model**, and the SaaS provider will be able to run on any cloud they like. So, the **lack of competition in IaaS and PaaS will be temporary**. My prediction is we will see less and less consumption of IaaS and PaaS in Azure, but we will stay with Azure for that particular purpose because it's just simple.

I think it is mostly IaaS. I **don't know if I can tell you the exact dividing line between those two phrases, to be honest**, because I think suppliers tend to talk across them. But we don't have any internal developers - that that's all done by externals so probably not much PaaS.

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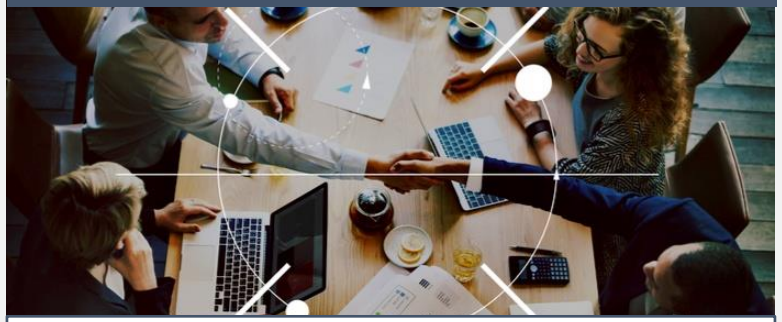
Level of dependency on the cloud varies by the extent of adoption and criticality of use case, but outages would be hugely damaging for most

Most companies interviewed expressed a high level of dependency and criticality on cloud services.

As a result, outages at their cloud provider would be a huge issue for most firms



With **80% in the cloud**, it is vital. Without it we couldn't operate and our sales reps in 80 countries would be completely unconnected with HQ.

We couldn't function for long the without the cloud. Any **downtime is a major issue**.

These companies host critical business systems, e-commerce, collaboration etc. in the cloud infrastructure

CV19 also underscored the need for remote working, and continuous access to system...

Our most important business systems are cloud based, but we have our **accounting system on-premise** mainly because the finance team are happier working over the LAN

It's **absolutely critical**. We couldn't operate and would lose valuable customers if it went down.

However, for some slower adopters, the cloud is yet to assume this level of criticality ... for now at least

These are more likely to later adopters in the Public Sector, where a much more limited set of use cases has been adopted

The cloud is **not yet terribly important** to us as there are still no mission-critical systems there.

We use it for **basic stuff**, mainly around storage, especially for offsite backups. We also have some **very small workloads** that we're looking at as well around some automation pieces, but that's very, very small.

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3.2

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Perceptions of cloud computing

The many advantages of cloud computing can be summed up into three broad categories: peace of mind, cost benefits and greater agility (1)

Peace of mind

- Frees up IT time by **reducing the need to focus on mundane tasks** and the minutiae of systems management
- Enables IT teams to **focus on business objectives** and adding value to the business
- Provides access to **more sophisticated security, resilience, back-ups and support** than would typically be available in-house
- Considered a more **environmentally friendly** approach, helping firms to deliver on green objectives

Cost benefits

- More **flexible cost model**, without need for long-term commitments
- Smoother and more predictable investment cycle
- Reduction of **IT headcount** is often possible as a result of the shift
- Helps to **free up valuable space** occupied by on-premise IT
- Can help to **reduce the required specs of IT hardware** (e.g., if processing takes place in cloud) allowing cost savings
- May **reduce need for expensive systems** to support in-house IT (e.g., bandwidth and resilience)

Agility & flexibility

- Makes it **easier to access systems flexibly** and remotely
- **Limitless scalability** on-tap as and when needed, esp. for short bursts
- Easy access to a **wide range of prepacked components** integrated with cloud provider and not inhibited by internal infrastructure
- Can **speed up development times** significantly
- This particularly helps smaller firms to **punch above their weight**, as they lack economies of scale to develop this infrastructure

The many advantages of cloud computing can be summed up into three broad categories: peace of mind, cost benefits and greater agility (2)

Peace of mind

In a traditional data centre, you spin up a server, buy an application, install it on a server, you're securing it and have all the overheads of patching it, whereas Azure gives us access to all those services that we can play with, without the hassle.

We see a lot of efficiencies in terms of our IT teams' time. The ease of use, scalability and not having to worry about it.

The main benefit from my perspective is security. Microsoft has thousands of employees around the world and if a problem arises, they usually solve it quickly because they have the resources.

Cost benefits

Cost is easier to manage because it is managed externally in a way that nobody internally needs to take care of the physical hardware. So, from that perspective, obviously it is a monthly cost as opposed to a CapEx, it's easier to plan and much easier to flex.

We have the flexibility of the pay-as-you-go model. Now not only can I get it quickly with cloud computing, but what I can do is use it only when I actually need it. The benefits we see on that front is I can get access to £1,000,000 worth of IT infrastructure but only pay for the one month I need it for.

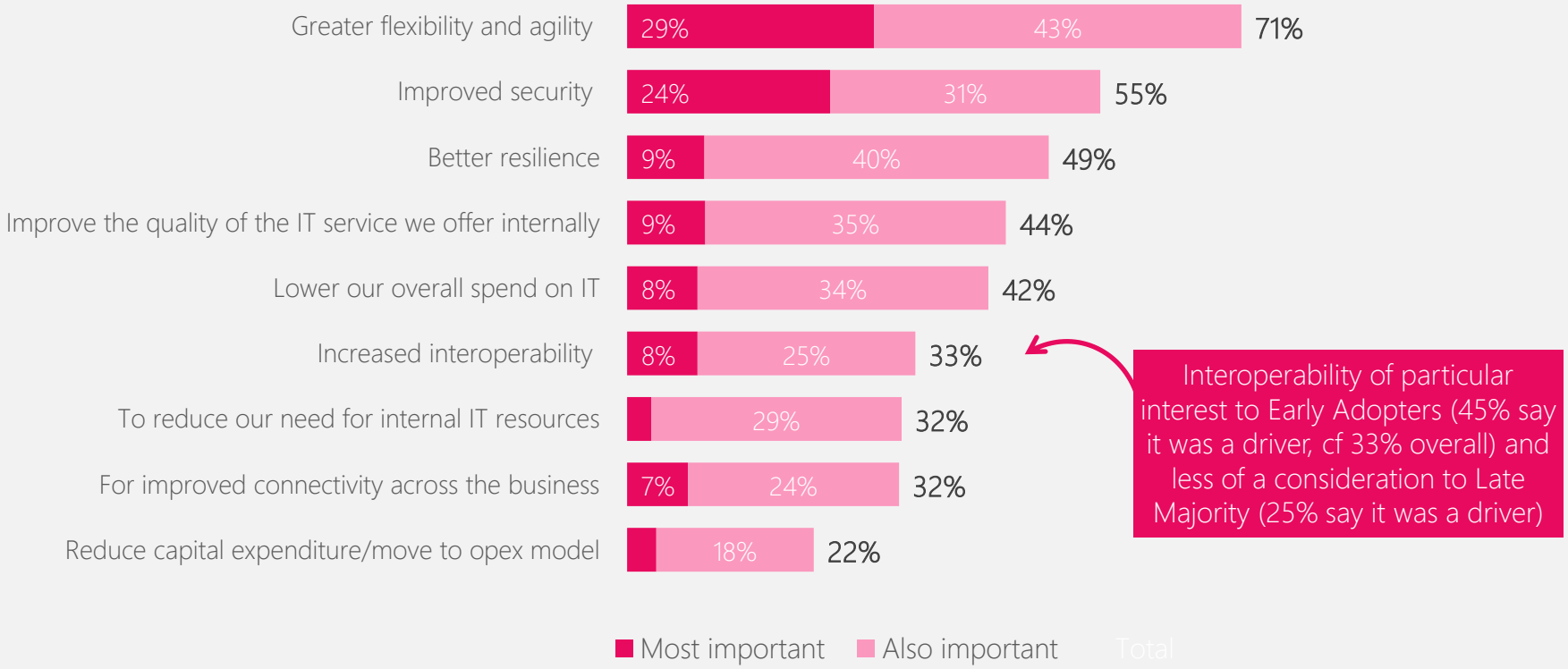
Agility & flexibility

Capacity - for us to procure whole new servers and put them in will take us weeks on end and cost significant amount of money, but for us to spin up additional capability will take minutes - so we can have somebody up and running very quickly.

A few years ago, if I wanted to deploy a service, I'd get a bunch of infrastructure people working for me. I'd have to work out how many servers and hard drive space and other stuff I need. Whereas now my time to market is in seconds, not in months. There's an immediate benefit I see for cloud computing - the flexibility.

Cloud computing is perceived to bring many benefits, with the two key drivers being greater flexibility and agility, and improved security

Key drivers of cloud computing



Interoperability of particular interest to Early Adopters (45% say it was a driver, cf 33% overall) and less of a consideration to Late Majority (25% say it was a driver)

Q12. What drove you to use cloud computing? Base: all cloud computing users (n=1002)

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There are some restrictions in the use of cloud, as well as several factors which are delaying, though not preventing, migration (1)

Internal factors tend to delay rather than deter cloud adoption

- For many interviewees, **especially in smaller private firms**, there are no perceived limitations on use of cloud
- This is not so for all companies, with several internal blockers being mentioned
- Most of these will not prevent, but **may delay adoption**, and these include:
  - **Migration costs** becoming apparent through pilots etc.
  - Need to **convince sceptical senior management**, for example in terms of security and resilience
  - **Lack of staff / time** to complete migration
  - **Technical limitations**, with certain apps not working as well in the cloud as desired
  - Desire to **retain at least some on-prem** infrastructure for resilience reasons

External factors are more sector-specific and may require specific changes

- For larger firms, especially in public sector and regulated sectors, there are some more specific restrictions
- These may not impede adoption, but may increase the complexity and / or costs of migration, including:
  - Not being able to use **public cloud**
  - Concerns over the storage of **sensitive personal data**
  - **Data sovereignty** requirements
  - Specific levels of **assured resilience**
- These concerns are most prevalent within **critical national infrastructure** including healthcare, utilities and financial services sectors
- Though not insurmountable, these needs tend to create **additional demands** and require more custom solutions, increasing cost and narrowing options

There are some restrictions in the use of cloud, as well as several factors which are delaying, though not preventing, migration (2)

Data sovereignty is an issue. We migrated a couple of apps which were previously in the US and EU. These are now hosted in the UK which gives us a little less redundancy. We are sticking with this approach for privacy reasons – these are not subject to EU laws etc. – so these are all slight restrictions, if not drastic.

In terms of information governance, we are very strict on data location, in that we are UK only. We also have specific requirements in terms of resilience – we insist on two geographically diverse sites with at least dual internet going into it, dual power supply going into each etc.

Another restriction is that because of the nature and the control of certain data we haven't got to a place where we can put that in a public cloud environment. In our industry there is an extra need for security, and so it's the kind of regulation on a certain type of data we have that we must be able to prove that that person cannot get access to it.

The constraints on using the cloud are getting the funds, the skill set needed by users, the perception of lack of security, and the resistance to change of IT managers. These do not stop the change, but they delay it.

The only thing that is prohibitive is you must be careful of the costs, which you can rack up hugely and not know straight away. We have been very cautious about this. Just from rolling out test environments on Azure, our latest bill was £2000 higher a month. It is hard to gauge how much to put aside for the costs and that restricts us somewhat.

We would never put the core systems that manage our manufacturing sites on the cloud. If they went down, we would need those up really quickly. We're talking losing a million pounds a month.

However, there are downsides, including initial challenges of migration, as well as loss of control, costs and security / resilience concerns

Migration is challenging

The process of moving to cloud comes with many risks

- Migration is often more **time consuming** than anticipated
- Respondents often report **feeling overwhelmed** at the amount of work involved in migrating
- It can be easier to **stick with the status quo** in many cases
- **Lack of suitable skills** adds greatly to these challenges

Loss of control

IT teams can suddenly feel exposed and insecure

- Moving to cloud can significantly **limit ability of the in-house team** to resolve issues themselves
- Vendors can make customers feel **unempowered** – 'in the dark'
- **Unforeseen risks** can greatly increase
- **Risk of outages** becomes a concern the risk of losing data is a fear; Updates can take place at the wrong time, limiting access at the wrong time etc.
- This creates **reliance on external support** which is not always of highest quality

Cost management

Actual experience of costs is often at odds with initial view

- Costs can **quickly escalate** beyond initial expectations in many cases
- Users readily accept that the fault for this can lie with a **lack of discipline** internally, and they are maturing in this respect
- The **OpEx model** does not work for all
- **Monitoring usage levels** is not easy, and bills can be unclear
- As a result, it can be easy inadvertently to **run up a large bill**
- Also, **skilled staff** are in short supply, meaning costs to employ these individuals can be very high

However, there are downsides including initial challenges of migration, as well as loss of control, costs and security / resilience concerns

Migration is challenging

The process of moving to cloud comes with many risks

Cloud migration is a lot harder to do than the salesman would have you believe; there are lift-and-shift tools, but it would run expensively and not optimally. To do it right and re-develop for the cloud, assuming you are coming from legacy pre-cloud environment, that is time consuming and expensive.

The inertia and pain of transferring to the cloud: you'll have to pay to move there, which is a bunch of pain. And then when you get there, you're gonna have to train all your people up in using the new service. And they've already said they're far too busy to get trained up in that.

Loss of control

IT teams can suddenly feel exposed and insecure

Sometimes the control isn't there - if you move to IaaS, you lose a percentage of your control which you can't always get back. if there is a massive failure, some suppliers don't understand that for us lives are at risk, they just see it as a problem that needs to be fixed.

In the past, something goes on with your server you can get on and fix it. But if it's a managed service in the cloud then you're waiting on a help desk and sometimes to speak to somebody who knows what we're talking about.

Cost management

Actual experience of costs is often at odds with initial view

Bills can be confusing. There's not much info on them. When you try to find out about something, it can be really difficult. For instance, we, use quite a lot of Google Analytics and the bills we get from them are really confusing. Very strange.

The main drawback of the cloud is cost, which is 5x higher than having everything on premise.

It's difficult to predict costs. The vendors would say it is, but once running it's difficult to tie down new usage to say a server on a task. How much is that costing? It's very hard to see.

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3.3

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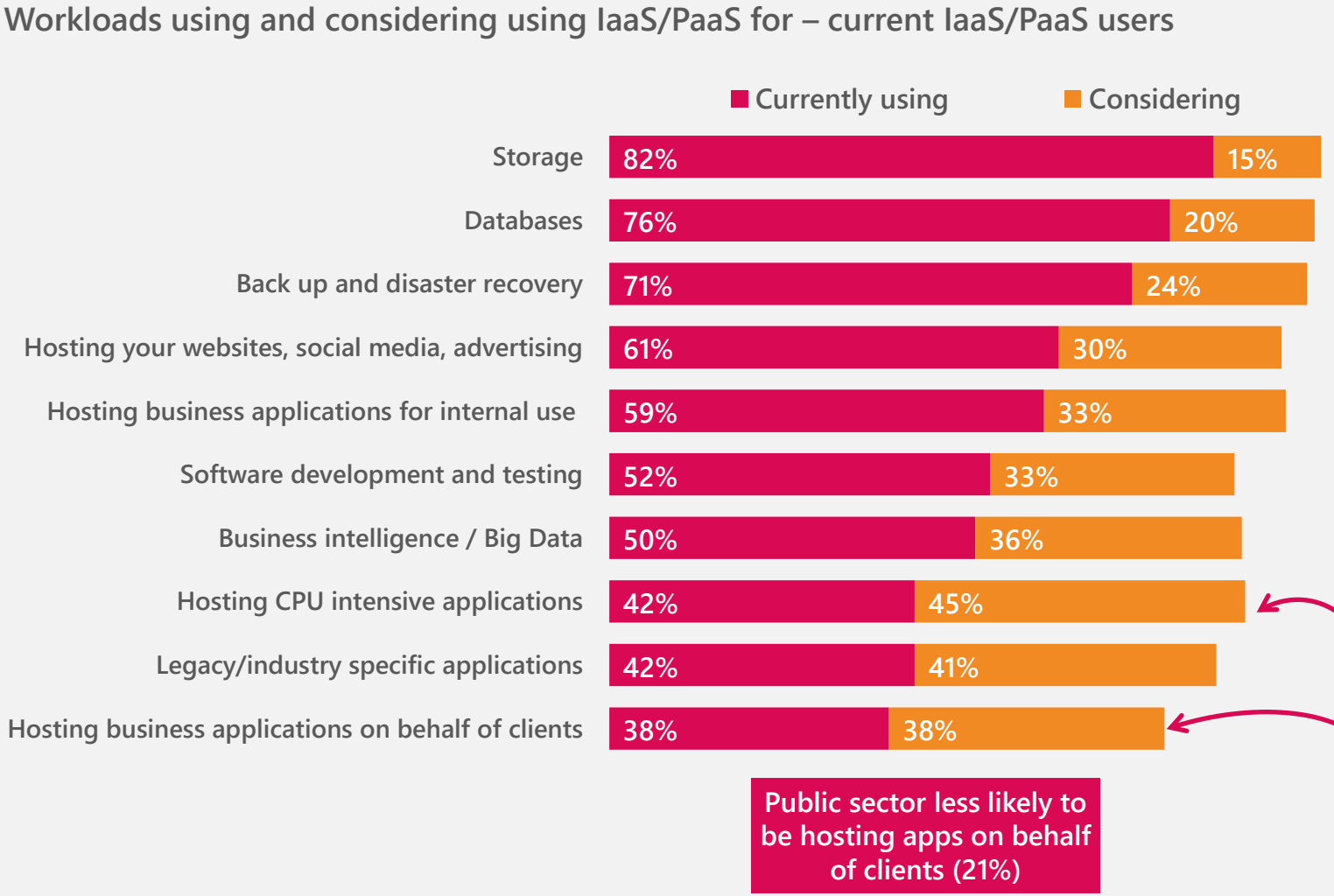
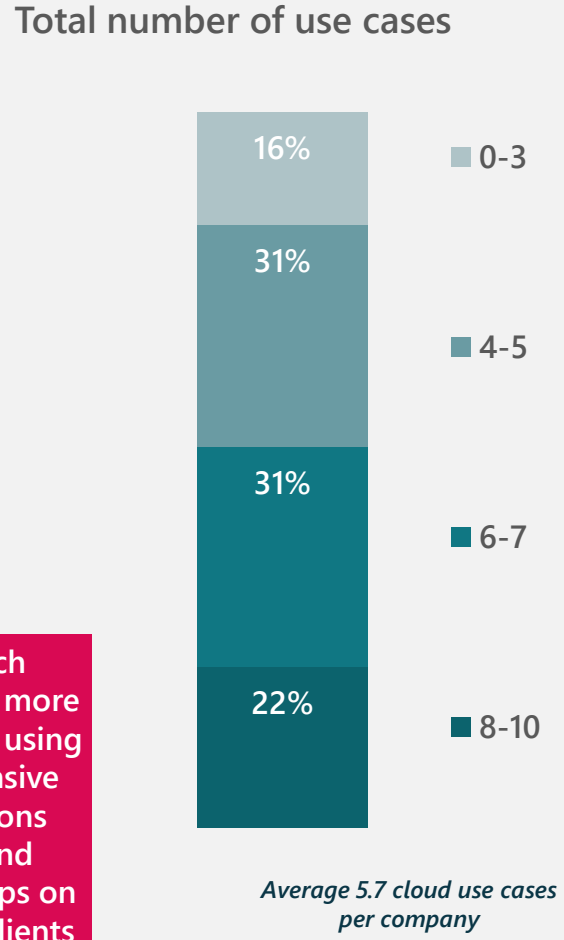
Cloud computing use cases

On average, adopters we surveyed use cloud computing for 5.7 use cases; storage, databases and disaster recovery backup are the most prevalent

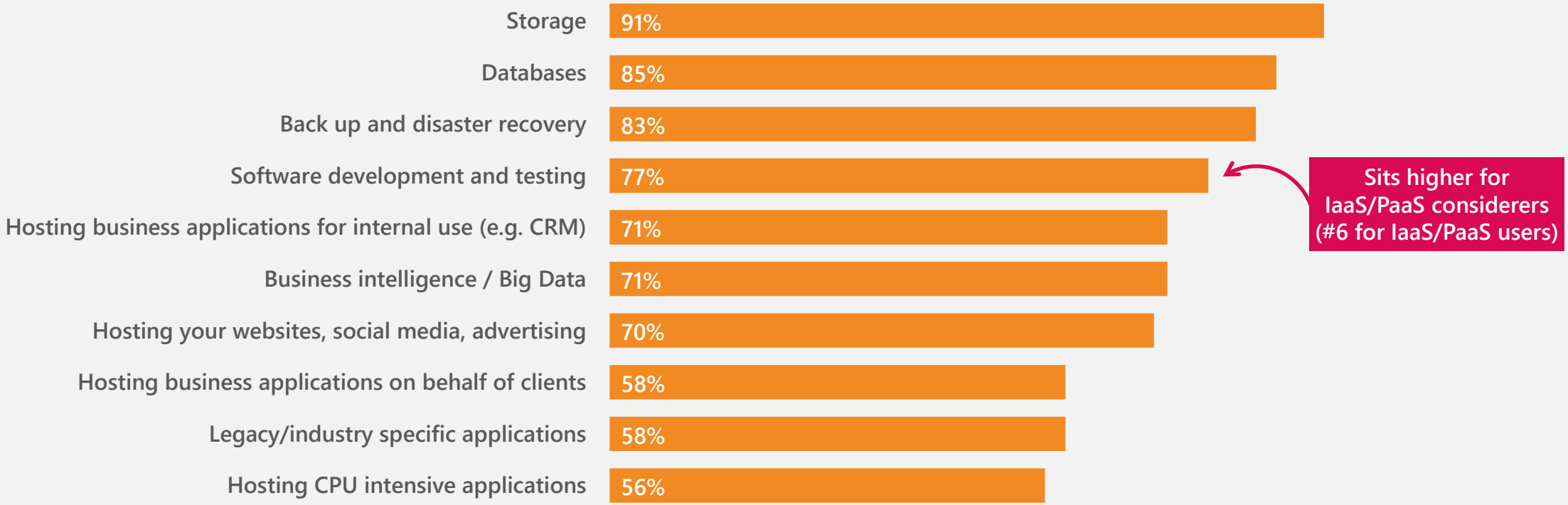




Q15. Which of the following workloads are you currently using or intending to use IaaS or PaaS for?
Base: current IaaS/PaaS users (n=889)

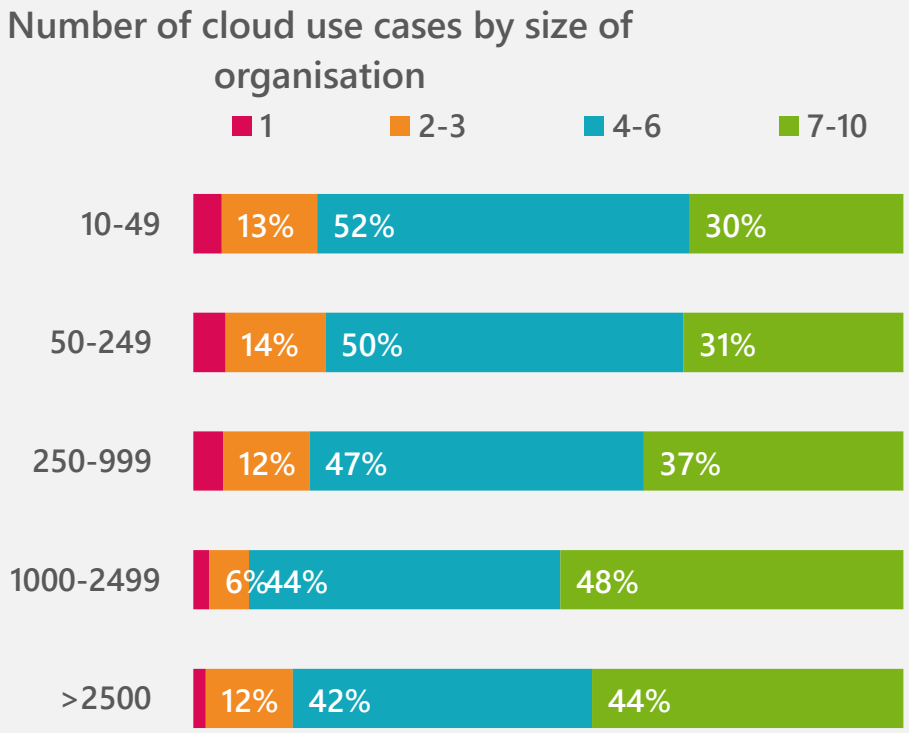
Cloud use cases for IaaS/PaaS considerers are similar to users – storage, databases and back up; however, software development is higher up the list

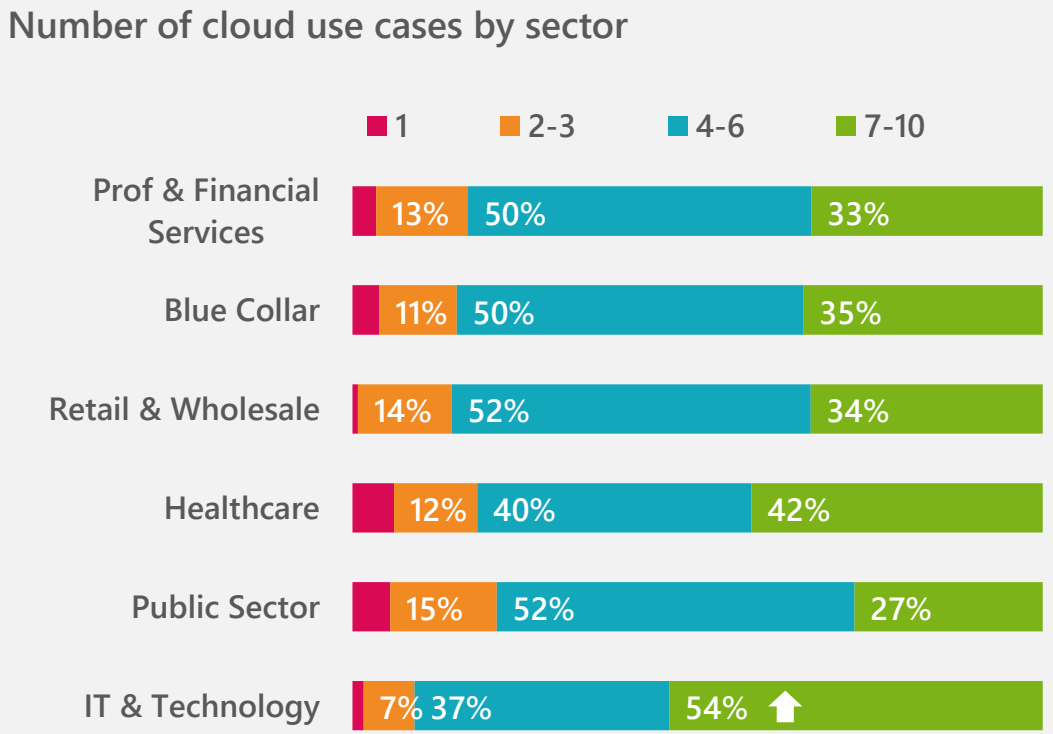
Workloads considering using IaaS/PaaS for – IaaS/PaaS considerers



Q15. Which of the following workloads are you currently using or intending to use IaaS or PaaS for? Base: IaaS/PaaS considerers (n=115)

In general, larger organisations we surveyed have more cloud use cases. As expected, companies in the IT/tech field also have more cloud uses





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Q15. Which of the following workloads are you currently using or intending to use IaaS or PaaS for? Base: IaaS/PaaS users 10-49 employees (n=149), 50-249 emp (n=242), 250-999 emp (n=238), 1000-2499 emp (n=89), >2500 emp (n=171); Prof & Fin Serv (n=203), Blue Collar (n=205), Retail & Wholesale (n=125), Healthcare (n=83), Public Sector (n=110), IT & Technology (n=122)

3.4

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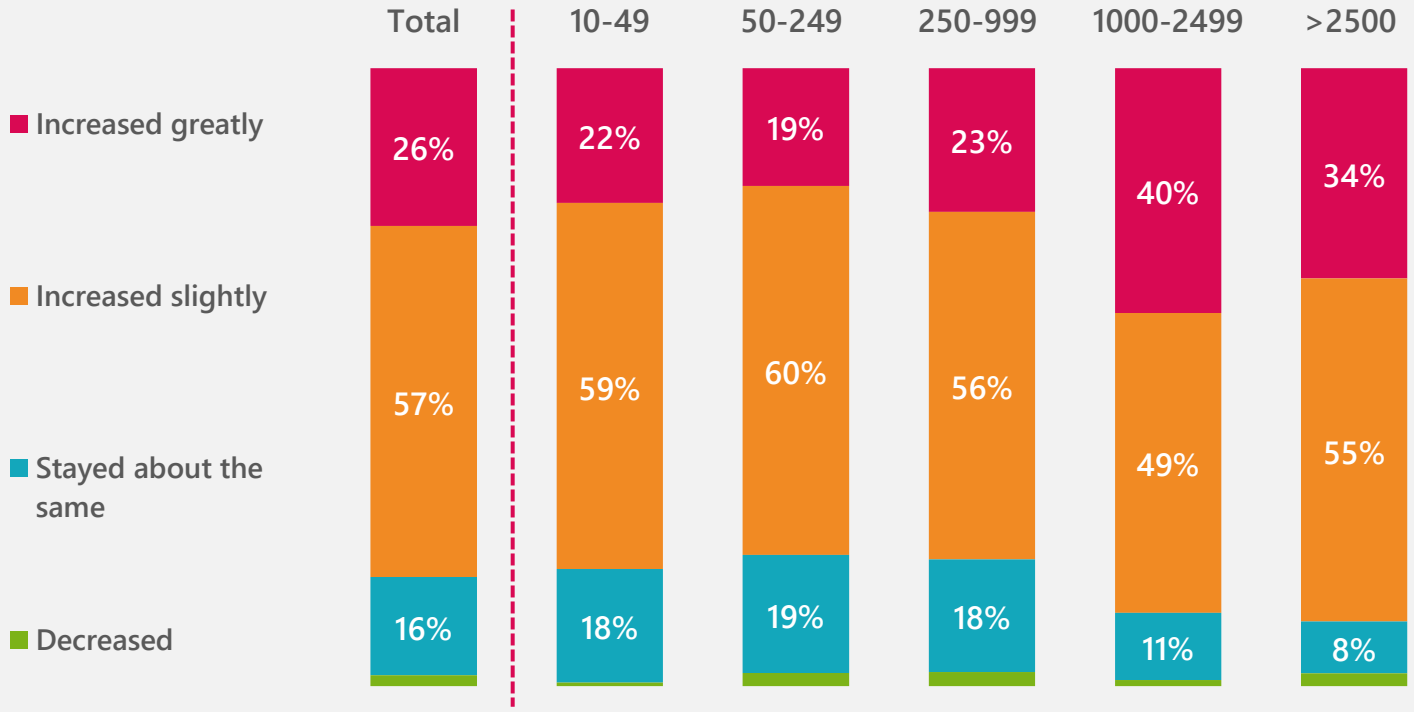
Spend on cloud computing

There is growing investment in cloud computing, with over 4 in 5 firms surveyed having increased spend in this area in recent years, particularly in larger firms

82%

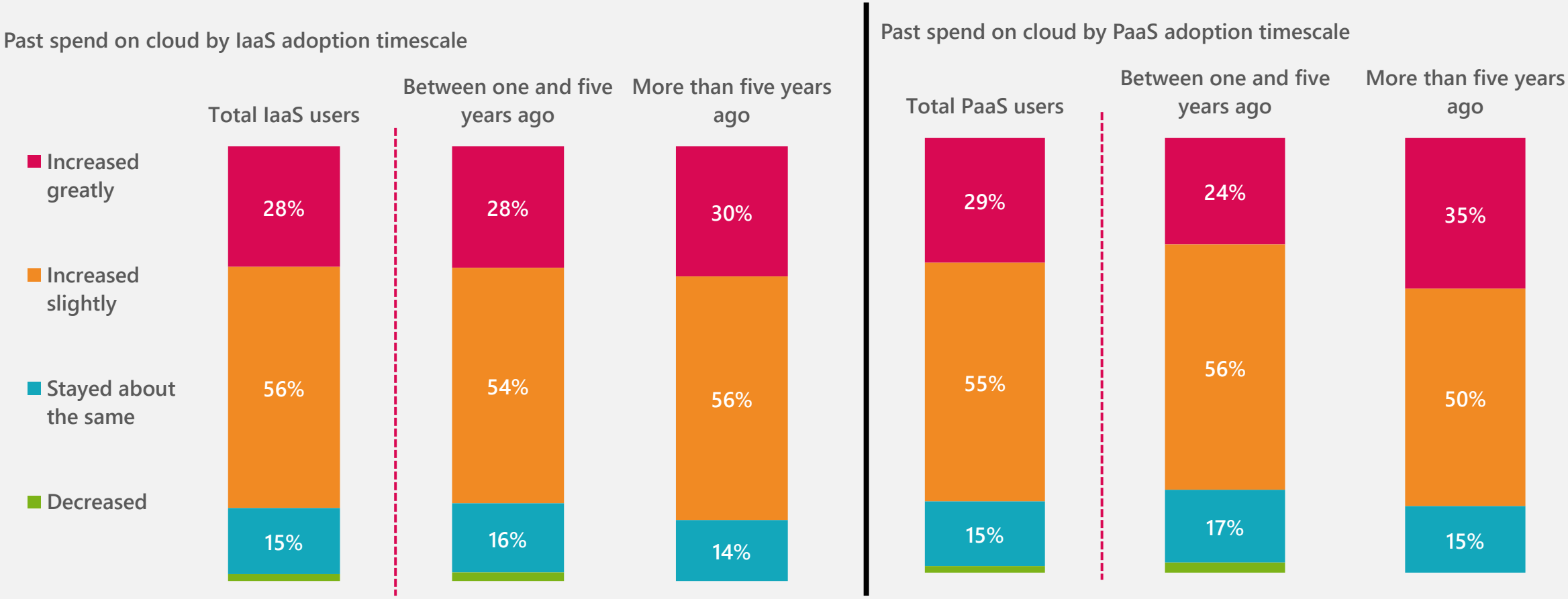
Of cloud users have increased their spend on cloud in recent years

Past spend on cloud by size of organisation



Q16: In recent years, has your spend on cloud services increased, remained roughly the same, or decreased? Base: All cloud users (n=1002)
10-49 employees (n=174), 50-249 emp (n=278), 250-999 emp (n=258), 1000-2499 emp (n=101), >2500 emp (n=191)

Spend on IaaS is relatively stable regardless of when adopted, however, for PaaS, those who have adopted 5+ years ago are increasing faster



Q16: In recent years, has your spend on cloud services increased, remained roughly the same, or decreased?
Base: All IaaS users (n=690) , 1-5 years ago (n=458), 5+ years ago (n=107). Base: All PaaS users (n=550), 1-5 years ago (n=347), 5+ years ago (n=98).

3.5

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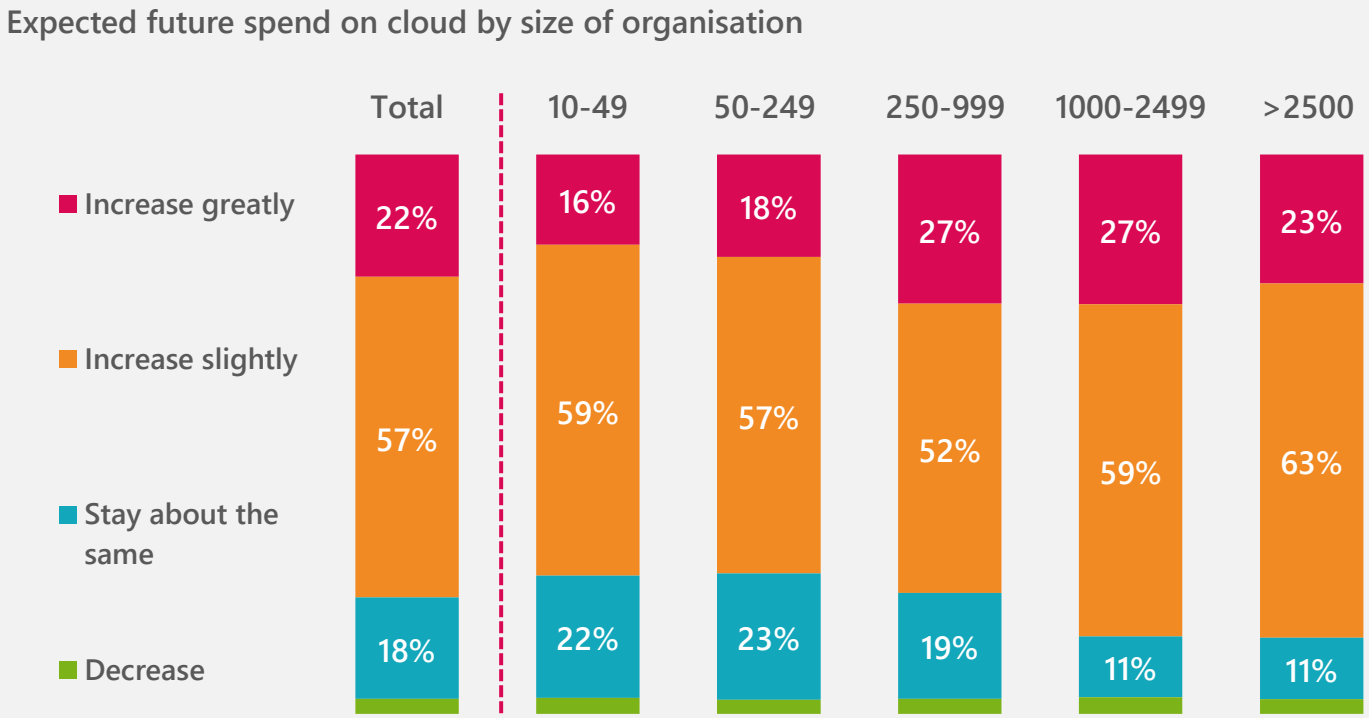
Future use of cloud computing

Investment in cloud computing is predicted to increase in the near future by a large majority of companies surveyed

79%

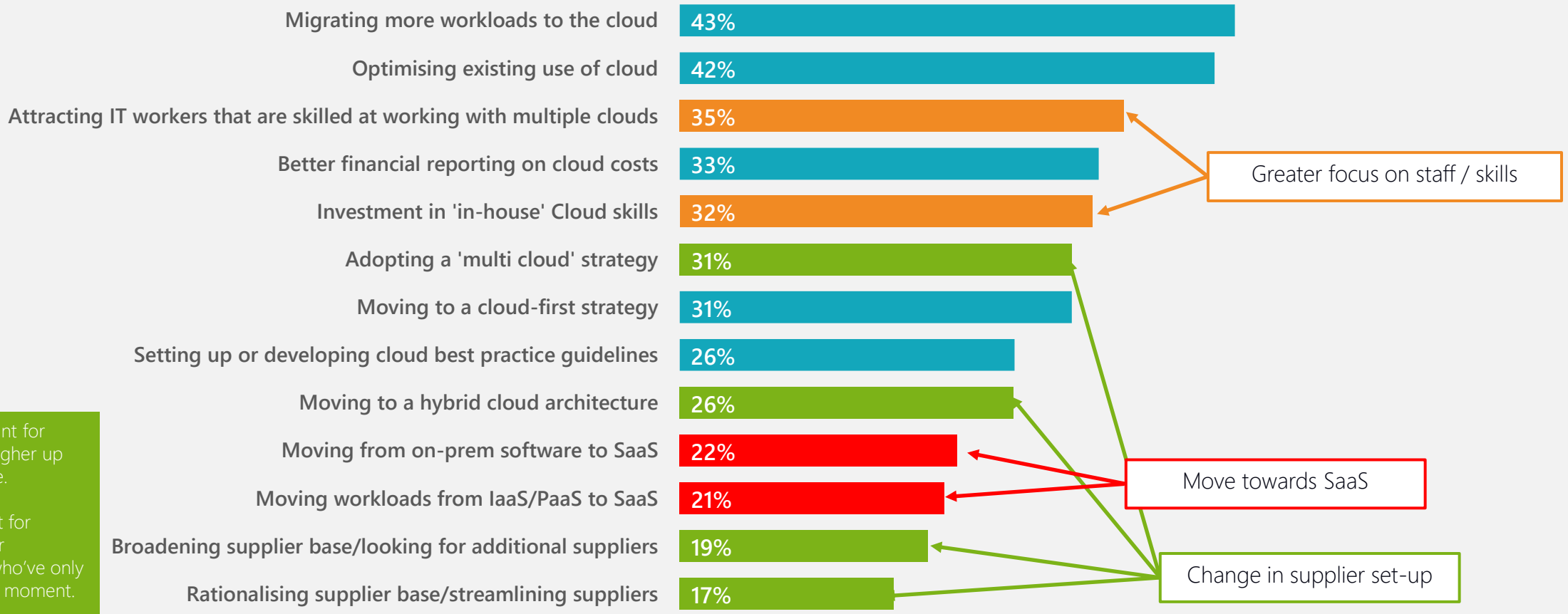
Expect to spend more on cloud in the next 18 months



Q17: How do you expect your spend on cloud services to change in the next 18 months? Base: All (n=1004); 10-49 employees (n=174), 50-249 emp (n=279), 250-999 emp (n=259), 1000-2499 emp (n=101), >2500 emp (n=191)

As workloads shift to the cloud, skills growth is high on cloud users' minds; a smaller proportion of users are focussed on supplier changes

Expected changes in cloud computing use next 18 months



Relatively more important for large firms and those higher up the tech adoption curve.

Relatively less important for healthcare/public sector companies and those who've only got one provider at the moment.

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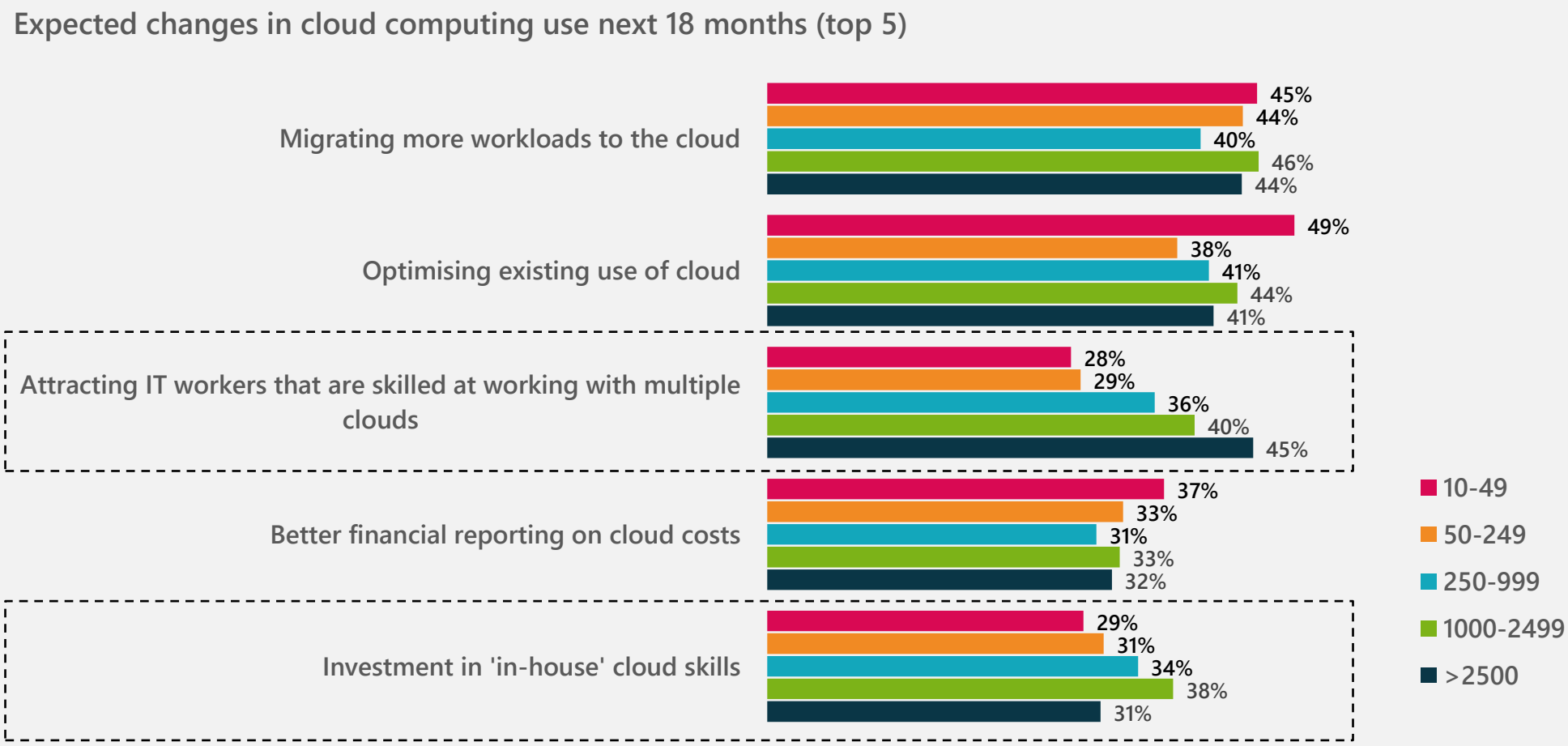
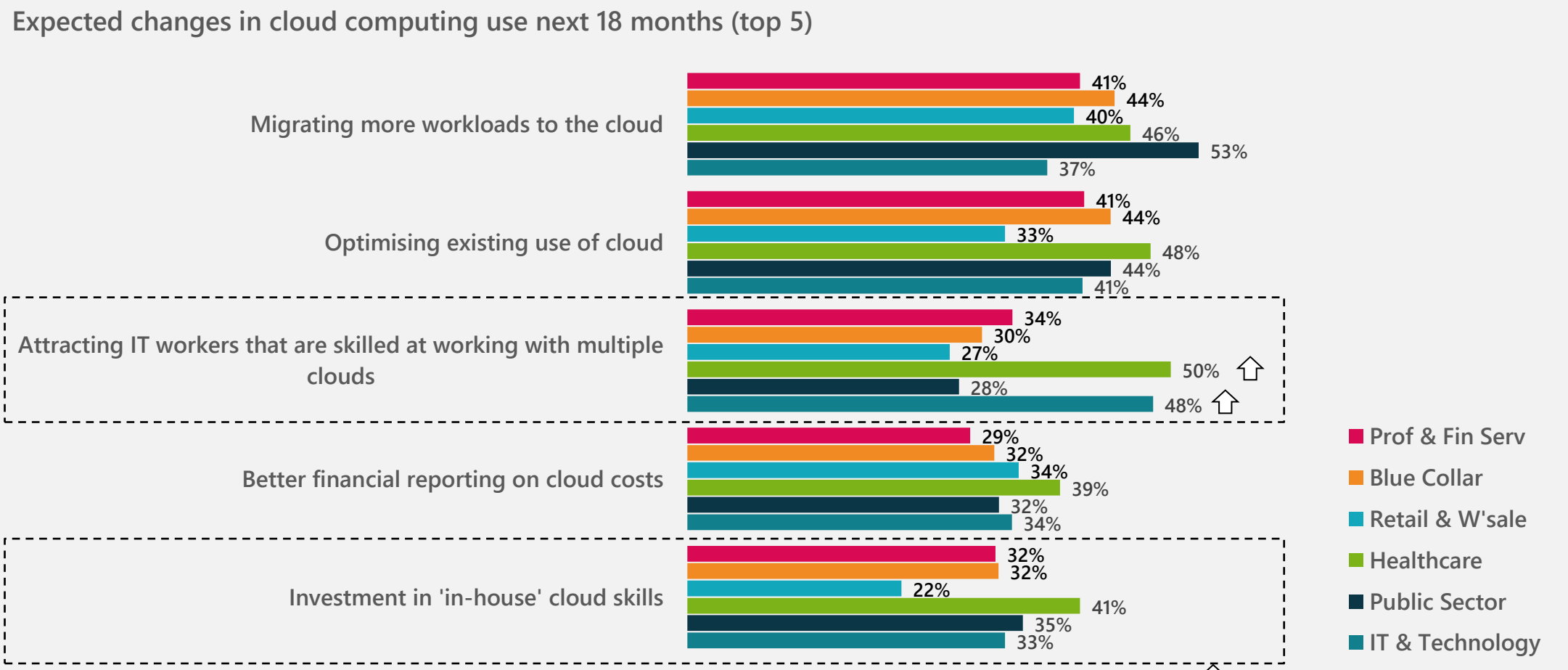
Q19. What changes do you expect to see in your use of cloud computing in the next 18 months? Base: All (n=1004)

Larger firms are particularly focused on attracting IT workers with multiple cloud skills and investing in additional in-house skills



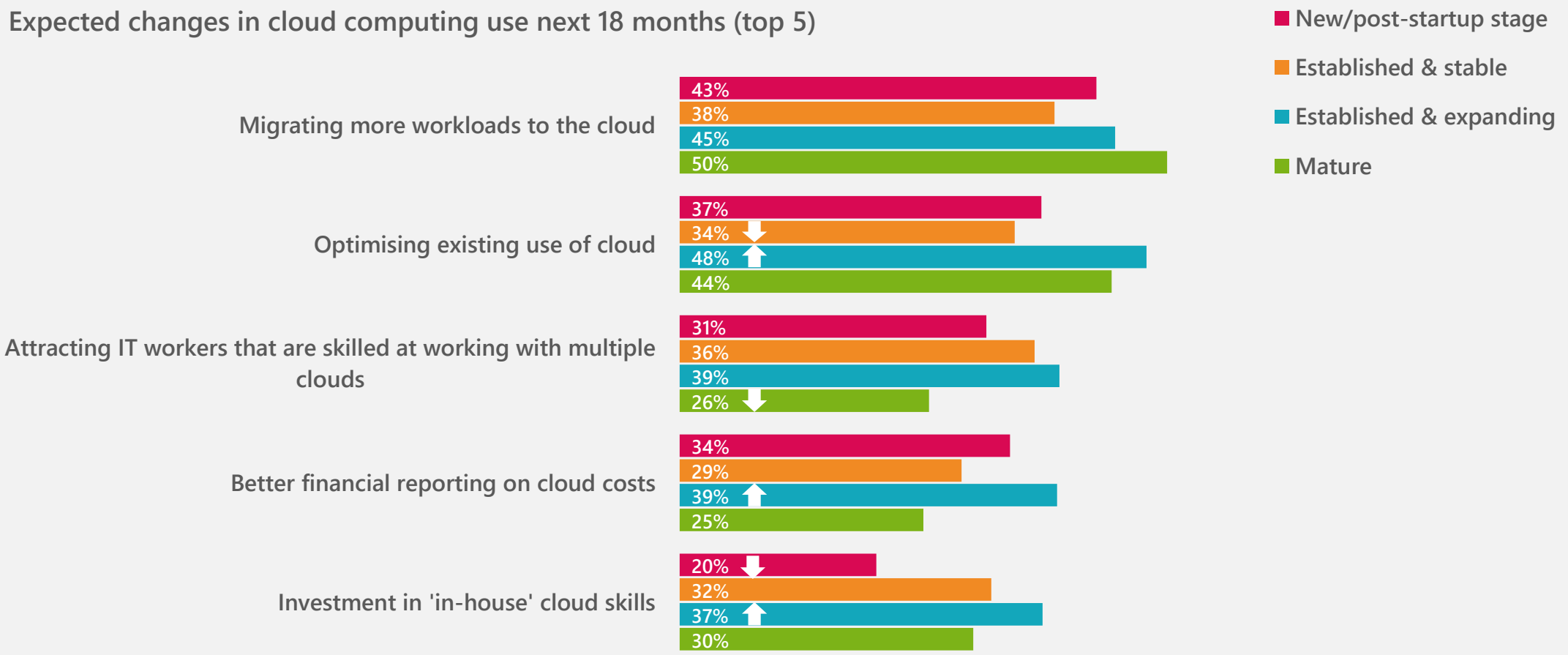
Q19. What changes do you expect to see in your use of cloud computing in the next 18 months? Base: 10-49 employees (n=174), 50-249 emp (n=279), 250-999 emp (n=259), 1000-2499 emp (n=101), >2500 emp (n=191)

Attracting skilled IT workers is particularly pertinent for healthcare and IT/tech companies surveyed; Public Sector most likely to be moving workloads



Q19. What changes do you expect to see in your use of cloud computing in the next 18 months? Base Prof & Fin Serv (n=229), Blue Collar (n=233), Retail & Wholesale (n=140), Healthcare (n=96), Public Sector (n=121), IT & Technology (n=137)

For the more mature businesses we surveyed, the priorities for the next 18 months focus on migrating and optimisation



Significant difference – higher than total

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Q19. What changes do you expect to see in your use of cloud computing in the next 18 months?
Q69. Which of the following best describes the current life stage of your business?
Base: New/post start up (n=124), Established and stable (n=294), Established and growing (n=403), Mature (n=176)

4

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Cloud computing supplier landscape

4.1

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Usage of suppliers

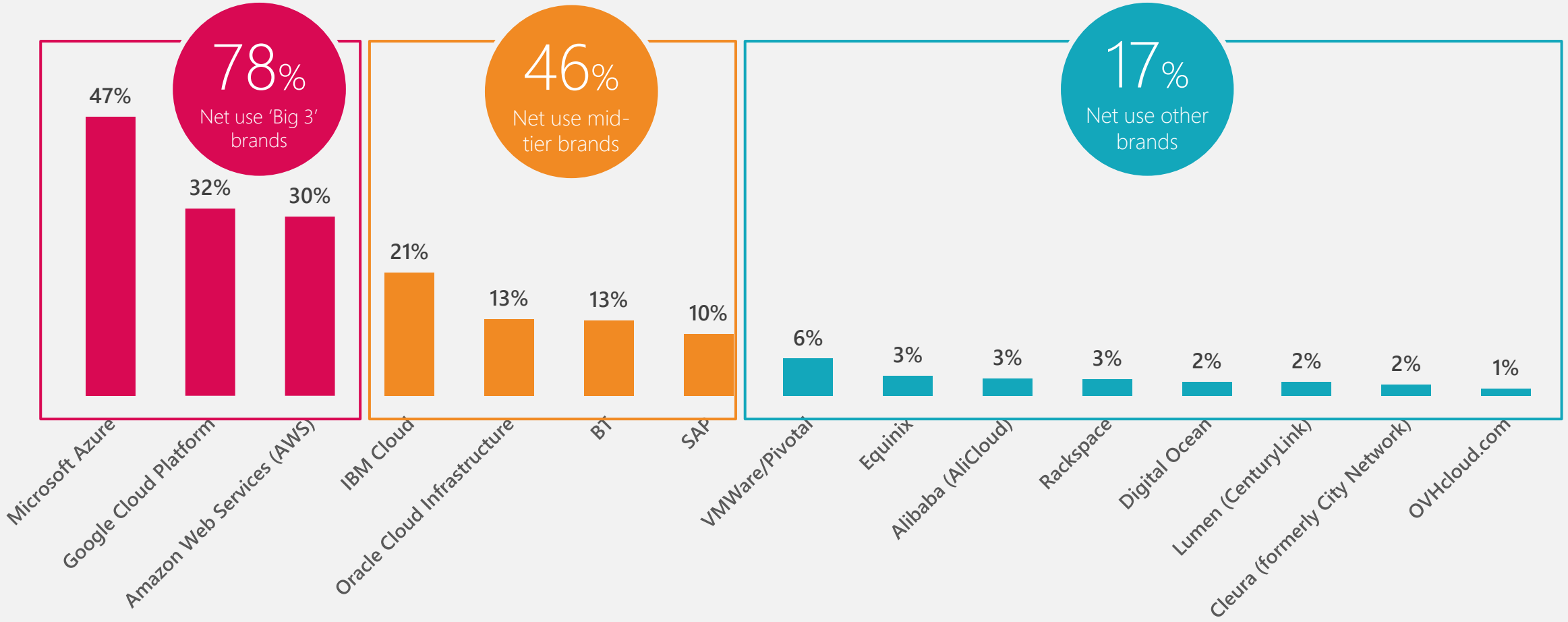
The vendor landscape is clearly concentrated among a small number of players, with Microsoft, AWS and Google a long way ahead of the rest

- Given the **importance of integration** with existing environments, it is no surprise that **Microsoft** emerges as the most common cloud provider among respondents
- **Smaller and less sophisticated** companies are especially likely to have a **sole vendor approach** only using Microsoft Azure.
- These companies are likely to buy via a **Managed Service Provider**, though these are also common across size bands and within the **public sector**
- Only the larger and more tech advanced companies tend to enjoy a **direct relationship** with hyperscalers

- In many cases, companies have a **twin-track approach**
- Microsoft, AWS or Google provides some **direct account management** (e.g., hosting regular meetings, providing inspiration and advice)
- While **day-to-day management** of purchasing, implementation and support comes via the partner
- Among the many firms we interviewed that use two vendors (usually Azure and AWS), these mostly have a **'major / minor' approach**, with one vendor being used for 80% of needs, and the other for more niche use cases

The cloud supplier landscape can be grouped into three ‘bands’; Azure is most widely used for IaaS/PaaS, by nearly half of our sample

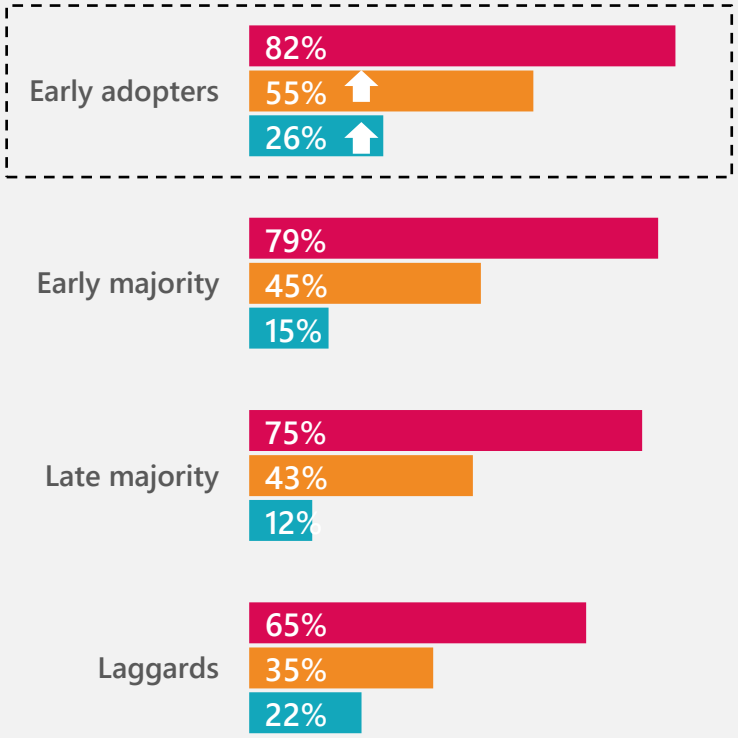
Usage of providers



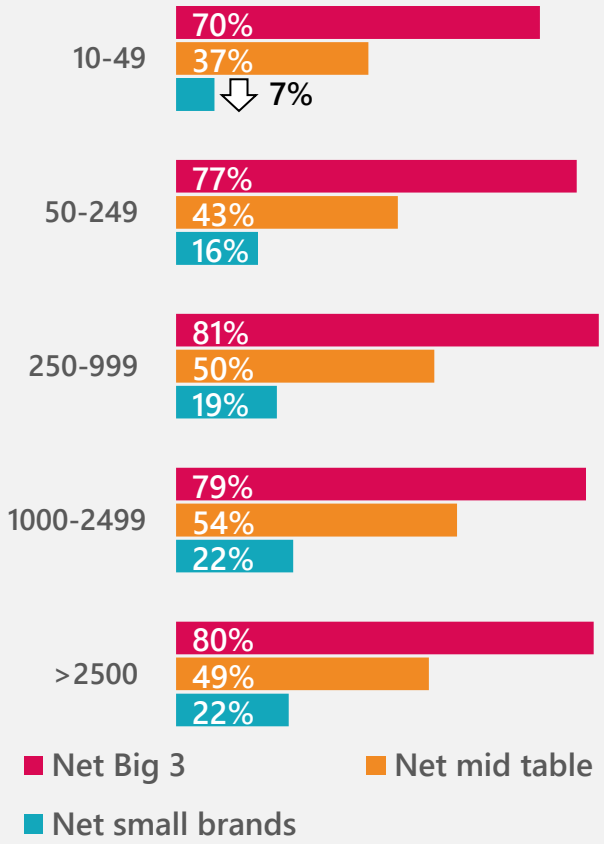
Q23. Which of the following cloud providers do you use currently for IaaS and PaaS? Base: All users (n=889)

Early adopters within our sample were more likely to look outside the big 3 providers

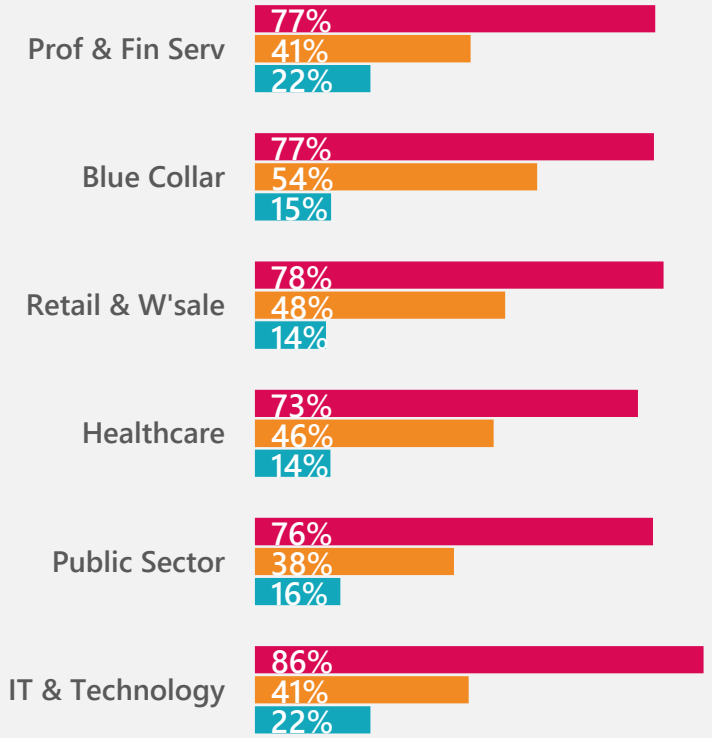
Usage of provider types by tech attitude



Usage of provider types by size



Usage of provider types by sector



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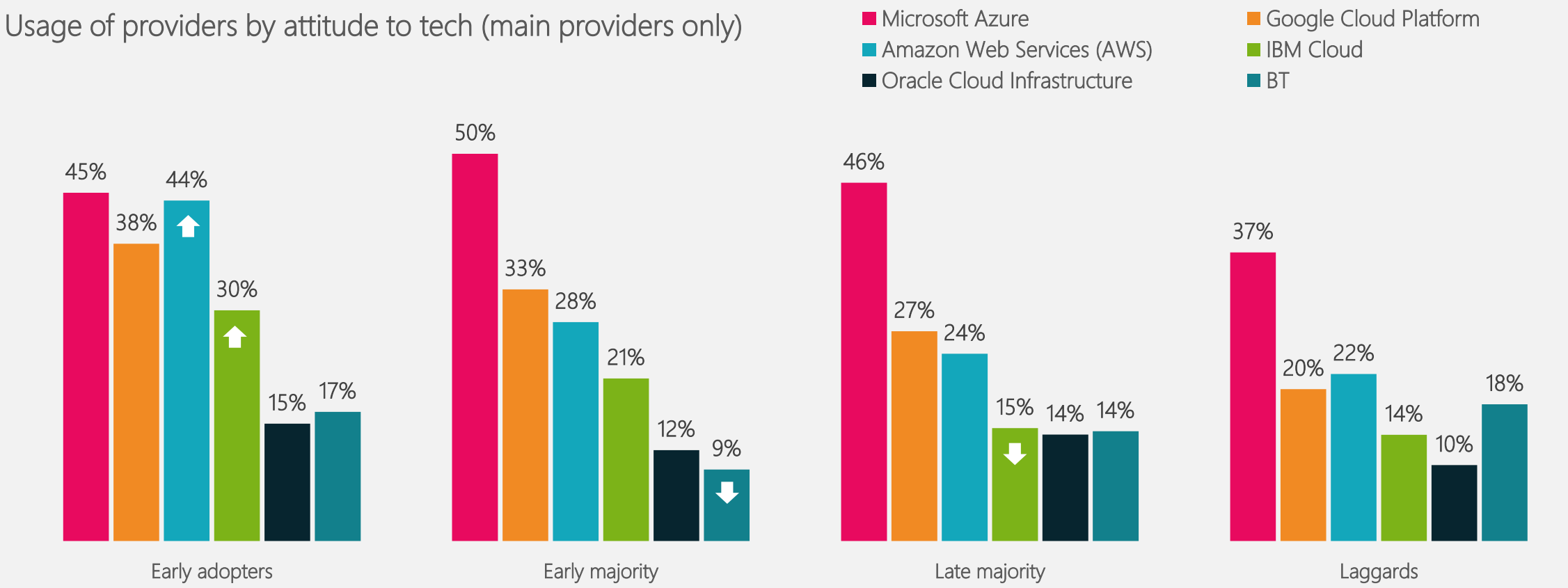
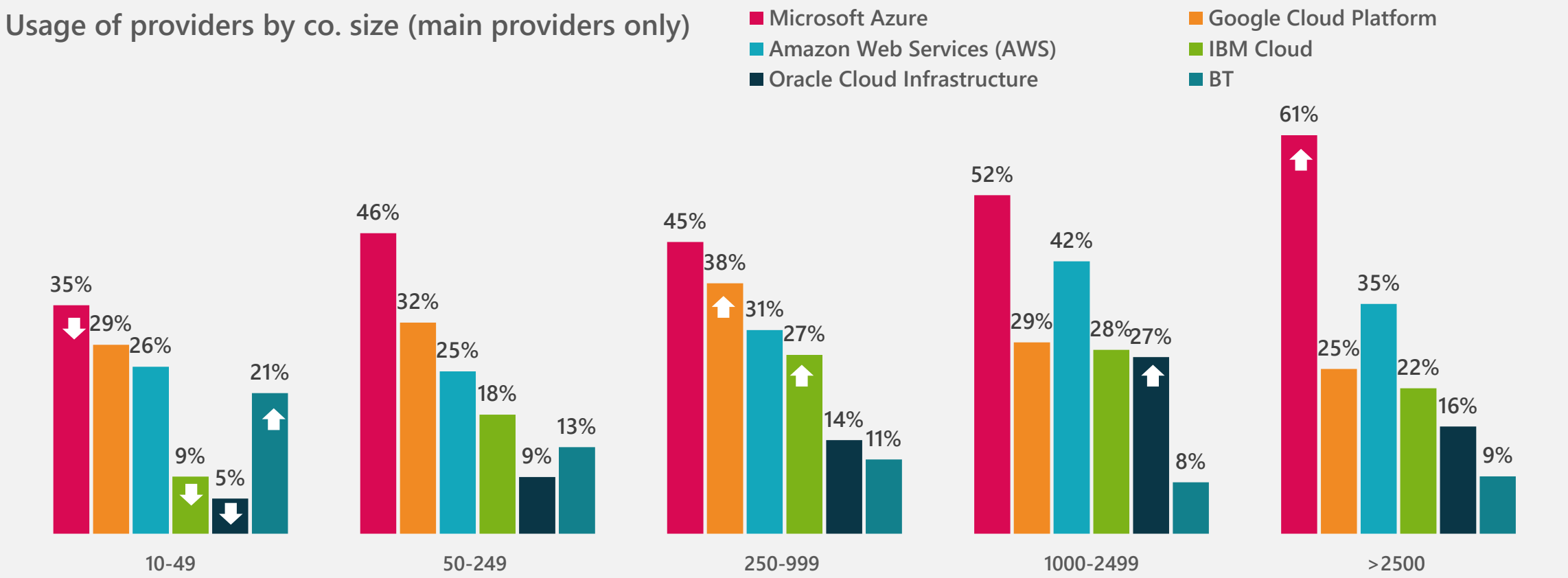
Q23. Which of the following cloud providers do you use currently for IaaS and PaaS? Base: All users (n=889) Early adopters (n=198), Early majority (n=400), Late majority (n=240), Laggards (n=51); 10-49 employees (n=149), 50-249 emp (n=242), 250-999 emp (n=238), 1000-2499 emp (n=89), >2500 emp (n=171); Prof & Fin Serv (n=203), Blue Collar (n=205), Retail & Wholesale (n=125), Healthcare (n=83), Public Sector (n=110), IT & Technology (n=122)

AWS and IBM Cloud are significantly more used by early adopters



Q23. Which of the following cloud providers do you use currently for IaaS and PaaS? Base: All users (n=889); Early adopters (n=198), Early majority (n=400), Late majority (n=240), Laggards (n=51)

Microsoft Azure is the most used platform overall among firms surveyed, and this lead is especially the case in the largest tier of firms



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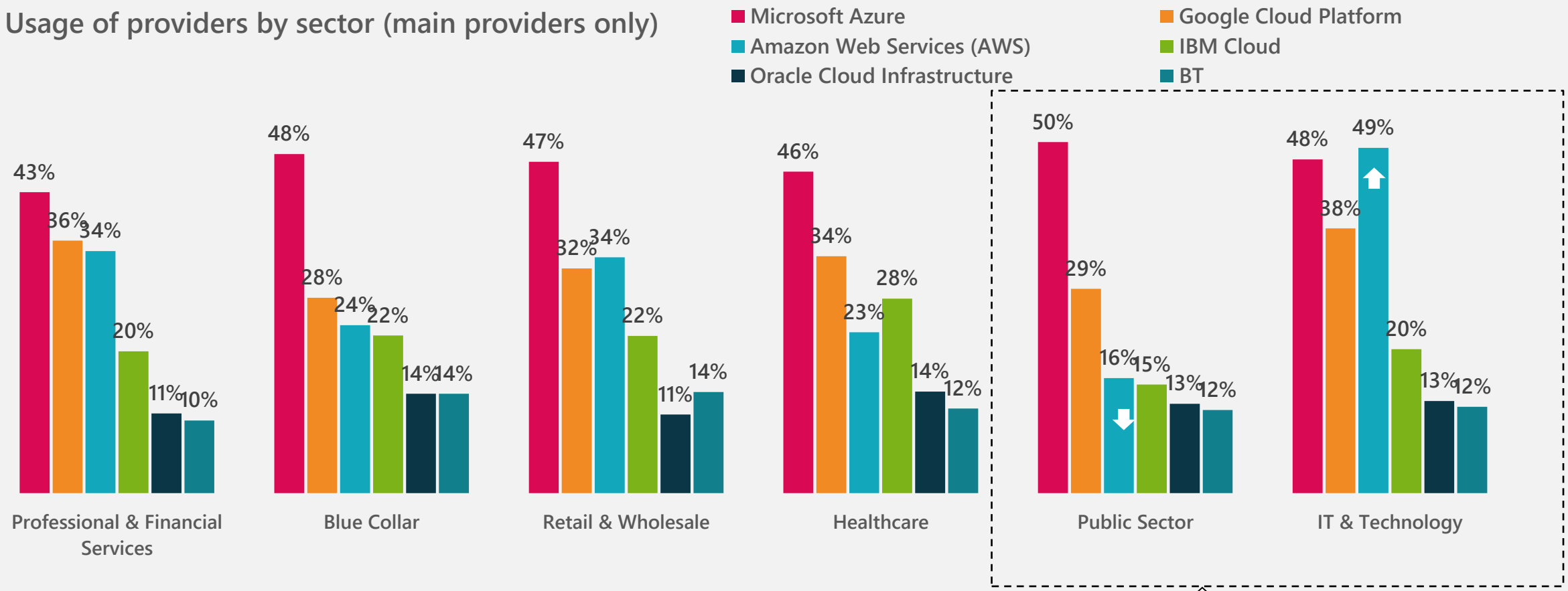
AWS is more likely to be used in IT & Tech sector, while Public Sector firms appear to be less likely to choose them according to those surveyed



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4.2

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Perceptions of suppliers

Microsoft is widely seen as a logical choice due to integration with existing software, but there are concerns, including ‘de facto’ lock-in

Advantages +

- Existing relationship makes Microsoft a **sensible choice**
- **Ability to integrate** with existing infrastructure helps to simplify IT management
- **Long-established relationships** across multiple products provide confidence
- Azure products generally perceived as **solid offerings**
- **Account management** praised by larger organisations
- **Financial incentives** offered to switch to Azure
- **Considered ‘fairer’** around Azure compared with monopolistic behaviour elsewhere
- Large **network of partners**, and wide skills base

Weaknesses —

- Considered **overly dominant** by many, and seen as too large even by some of committed Microsoft ‘fans’
- Smaller firms complain of **lack of engagement**
- **Support levels** criticized by many respondents, especially among those in smaller firms
- **Deceptively expensive**: make it hard to manage costs, with opaque pricing and billing
- Fear of **de facto lock-in** and inability to switch
- Seen as **inflexible**, with no flexibility on terms; have a ‘tie-in’ mentality
- Firms can feel constrained to **pay for products they do not need**

For many interviewed firms, existing investment in, and knowledge of, Microsoft environments makes using Azure a no-brainer

It's the **path of least resistance** and when the product is completely fit for purpose at a similar price and doesn't have any drawbacks its pointless to argue for AWS.

When the company wanted to use public cloud, it researched only the offerings of Microsoft and AWS. The **holding company has an agreement with Microsoft in 174 countries** and that gives us a good entry point that translates into direct savings using Azure.

Azure is our main provider. **Our ERP system is Microsoft and that was the main driver to choose them**. We have a good relationship. We have a monthly catch up and there is a lot of support, and the applications work well.

It was a conscious decision that was also a bit of a no brainer because we are **such a heavily Microsoft environment**. Having a reasonable spend with Microsoft it made sense to keep that all together. Our very old database servers will soon fall out of support. We haven't got the resource now so we are considering whether just that one goes into the cloud because **Microsoft will continue to support it** and protect it in the cloud and that's not something AWS does.

Microsoft make it **easy to use**, seeing as we were **already in bed with the licensing** for all the exchange, teams, SharePoint, OneDrive, it's all about how does it **seamlessly integrate** and Microsoft have thought about that.

The reason for choosing Microsoft is that although it is not cheap, the **integration with the other Microsoft systems is natural**.

We **didn't really consider any of the other options**; as a university we have so many different flavours of everything, we have Mac, Windows and are fairly technology agnostic but because we are a Microsoft house for authentication and domain and already moved to O365 and SharePoint online and Teams, the **path of least resistance** was always going to be azure. it made a whole lot of sense to us - it **really was a no brainer for us**.

There is criticism and concern from others around Microsoft's market power and its commercial stance, especially for smaller companies

We can't do a **straight comparison of costs**. We have to do calculations with both separately. There is an element of them trying to **muddy the waters in terms of costing** – Microsoft tend to bundle things. They tell you that it's cheaper to do things in Azure because they include an element of the license in the subscription - always a case of bundling and it being more expensive but explaining to you why it's cheaper because it includes things.

The licensing model is giving you **products that are not quite good enough, but you get it in your license for free**; they're not making it best of breed, so you either lessen your need or go with a sub-standard product or not get the benefit for that product. It's not constraining us into using their products, but it means we get the best value for money if we do.

The downside of dealing with Microsoft is that it's **difficult to walk away** from them because our **ERP system is with them**. You don't have much leverage for negotiation. Also, it's not as intuitive to use as the Amazon system that I've seen.

We're paying Microsoft for dozens of **features that we don't use**.

I think many software companies have abandoned the customer service aspect of their business. Now they're all out just to scalp everybody from what I can see. **Microsoft are probably the worst culprit**. I mean they wouldn't admit to it, but I think the customer service is shocking and compared to what it used to be.

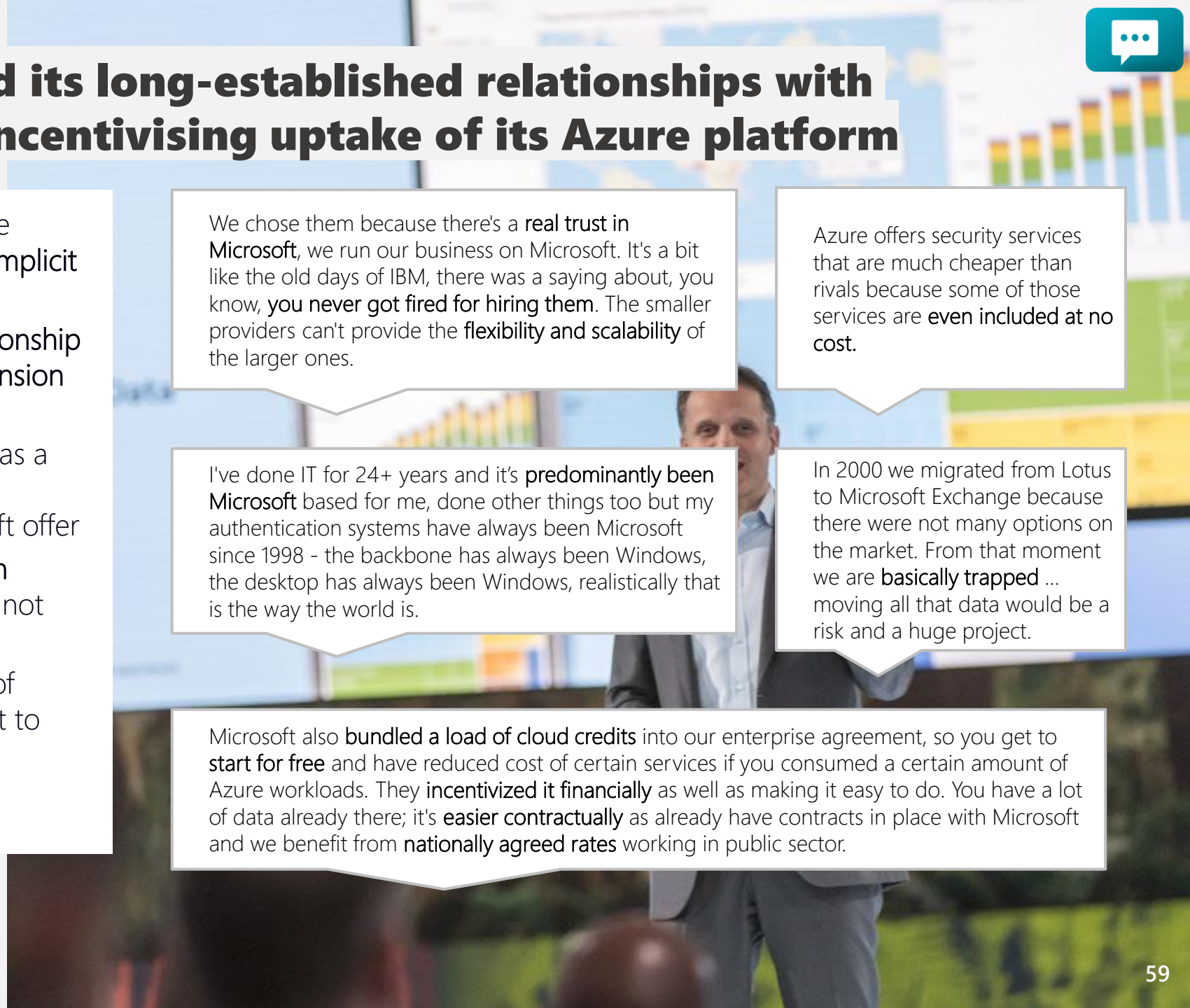
Microsoft, on the other hand, they do **want to tie you into contracts**. They do want to remove flexibility. They do want to confuse you a bit, so you may end up buying stuff that you don't need.

There is no relationship. You're just you. You discuss with them a number. And they come back "here's the number". There's no relationship at all. Hence, I'm happier to work with those smaller businesses who need your business.

There's lots of features we don't need. I mean, we might think something is completely superfluous and it's ideal for someone else. It's why you pay what you pay sometimes, because **they will tell us there's thousands of features and like, yeah, I need about four of them.**

Microsoft has leveraged its long-established relationships with companies and is also incentivising uptake of its Azure platform

- The length of time IT professionals have worked with Microsoft means **there is implicit trust** in its cloud platform
- Critically, this is **not a new vendor relationship** for companies to deal with but an **extension** of an existing one.
- Others describe the cloud relationship as a **continuation of the de facto lock-in** experienced around the wider Microsoft offer
- Respondents speak of the **simplification benefits** of an integrated environment, not least in terms of support.
- Additionally, several comments spoke of **financial incentives** offered by Microsoft to move to their cloud environment.



We chose them because there's a **real trust in Microsoft**, we run our business on Microsoft. It's a bit like the old days of IBM, there was a saying about, you know, **you never got fired for hiring them**. The smaller providers can't provide the **flexibility and scalability** of the larger ones.

Azure offers security services that are much cheaper than rivals because some of those services are **even included at no cost.**

I've done IT for 24+ years and it's **predominantly been Microsoft** based for me, done other things too but my authentication systems have always been Microsoft since 1998 - the backbone has always been Windows, the desktop has always been Windows, realistically that is the way the world is.

In 2000 we migrated from Lotus to Microsoft Exchange because there were not many options on the market. From that moment we are **basically trapped** … moving all that data would be a risk and a huge project.

Microsoft also **bundled a load of cloud credits** into our enterprise agreement, so you get to **start for free** and have reduced cost of certain services if you consumed a certain amount of Azure workloads. They **incentivized it financially** as well as making it easy to do. You have a lot of data already there; it's **easier contractually** as already have contracts in place with Microsoft and we benefit from **nationally agreed rates** working in public sector.

Context Consulting

AWS is viewed as a technology leader as well as offering good value archiving, but is also seen as aggressively commercial (1)

Advantages +

- Considered as having an **excellent technical offering** for IaaS and PaaS, with strong reliability and better analytics, tools and AI functionality
- Highly **flexible and scalable** offering
- **Flexible commercial** approach, less 'lock-in' to long contracts than MS
- Offer very competitive **data archiving** with Glacier
- Generally perceived to be **better value** than Microsoft
- Provide **redundancy** for those otherwise tied into Microsoft environments
- More appealing for developers and hence **desirable for hiring and retaining talent**
- A **great option for companies** with no Microsoft legacy

Weaknesses –

- Perceived as being **overly salesy and pushy** in commercial dealings
- **Not especially communicative** or helpful in terms of supporting customers
- **Struggle to convince** customers rooted in Microsoft environment around integration issues
- **Limited personal interaction** / relationship available to smaller companies

AWS is viewed as a technology leader as well as offering good value archiving, but is also seen as aggressively commercial (2)

We look at the Big three Microsoft, Amazon and Google. We know and love Microsoft because they have been there for ages, and we look at AWS as **probably a better platform from an IaaS and PaaS perspective**. I think they do it better at a technical level.

In my ranking Microsoft would get a score of 7 out of 10, and Amazon would get a score of 9 out of 10 because their **service is bulletproof**.

I have the feeling that if you are a large organisation with ambitions, the **best platform would be AWS**, but we are not yet at that level.

Amazon, are actually incredibly flexible. You know, you can scale things up and down with them. They **don't tend to want to tie you into really long contracts.**

AWS accounts for 10% of our cloud presence. We chose AWS because the cost of using their **Glacier storage services was very economical**. The service provided by AWS is correct and we have no complaints.

AWS was great, we were at a crossroads about 12 months ago when we didn't know which platform to use for our data analytics side, so we gave both data and asked what it would look like in their world – **AWS's response was poor,** this explains the split being more Azure than AWS.

Because of the relationship with AWS and **judging from their overly salesy behaviour**, I think they **would not be cooperative** if we wanted to stop using their cloud. Switching from one company to another would include data migration fees.

We have had services with AWS for 3 years, and others based on Azure, and the information has to go back and forth, and it doesn't work as well as you might expect. I **don't know if AWS is being totally honest** because they say the problem is Microsoft's and not AWS's. I have the feeling that instead of listening and trying to solve a problem, **AWS is always trying to sell something.**

Its just **impossible to get hold of anybody at AWS**. You have to put like a put ticket in and then you have to kind of go through all these motions and it's incredibly frustrating. Customer service seems to have been thrown out the window.

Google is perceived to have advantages as a PaaS provider, although also perceived to have less breadth than Azure or AWS

Advantages +

- Despite lower share overall, a small number of major firms are **strongly pro-Google;** they **impress** these companies with their proactive approach
- Their **sales relationships** and **client focus** are strong
- They act as a **proactive 'challenger'**
- The ability to **flex capacity** and ensure **availability** are key strengths
- Considered more open with **higher interoperability**
- Considered **more of a PaaS player**, with specific strengths around areas such as AI and analytics
- Viewed as a **fast-emerging** challenger by some

Weaknesses –

- Perceived to lack the **breadth of offering** provided by Microsoft and AWS, with much fewer services
- Microsoft-centric companies voice concerns over **integration challenges**
- Perceived by some interviewees as being **more suited to start-ups** rather than established enterprises
- Some **challenges around finding talent** skilled in GCP environments
- Criticised as being overly **"sticky" and expensive** when customers want to leave
- Some express **privacy concerns** and the perception that not all data on GCP can be guaranteed to be housed in the EU

Google is perceived to have advantages as a PaaS provider, although they are considered to have less breadth than Azure or AWS

We have worked with Google for 4-5 years. Google was the first one and it was surprising how cheap it was to run - can hold a huge amount of data in their managing app. The ability to flex capacity was a benefit.

We buy direct from Google - engagement with them was brilliant - that is where the ability to innovate came from.

There was a vested interest from both parties. We would have account directors and senior people from Google Cloud we were communicating with on a regular basis to push forward the things we could do differently. We would go to them and say we have this new information and asking them what we could do with it. They would give us engineering support and might help with building something; they would have ideas from other clients and ask us whether we want to try it.

Google is not out of the question; they are a clear third at the moment but could be a viable option if necessary.

We didn't even put Google on the table, which is interesting when we were talking to the retailers. When you think back on it, I wonder why we didn't we do that. At the time it was a switch between AWS and Microsoft, so Google never really came into the conversations. That may also be because CDW, our MSP, don't really push Google as much.

With Google, we rightly or wrongly have a view of it mainly being for Big Data and for maybe co-development related to having all your data in one place and being smart about different tools that can analyze different parts of that.

When we were choosing a cloud provider, we didn't even consider Google to be honest. We did a bit of messing around with them early on, but it was quite a natural movement for us because we were so Microsoft heavy to start with.

Smaller players fail to make it onto the radar for most, while a range of concerns mean they struggle to be selected by those that consider them

- What is surprising is that **so few companies have even considered** looking beyond the big players for their cloud infrastructure
  - Some feel there is no need to do so, given the **strength of the hyperscalers**
  - Others **lack any awareness** of the existence of smaller players, or sense of urgency to investigate

I don't know enough about smaller providers to know the benefits. It's on my to do list to look at other providers but it **never gets to the top of that list**.

You're **only talking Google, Amazon, and, and Microsoft, aren't you?** You could then come down to some of the smaller players, but we're always going to stick with those three, just because of the global nature of what we do.

It **was easy and natural for the company to switch to Microsoft**, and I didn't really research small vendors. **Nutanix** was evaluated but they offered a hybrid on-premise and cloud service, and the company wants a pure cloud service.

It has **not occurred to us** to look at offers from smaller suppliers because whenever we need something **Microsoft has a good product** that meets our needs.

Context Consulting

When considering the idea of selecting a smaller player in more detail, the risks typically outweigh the benefits

There are several reasons why IT teams hesitate to seriously consider smaller suppliers

Considered a riskier choice than established players – compared with the familiarity and trust of the 'Big 3'

Worries around finding staff or suppliers able to support niche platforms

Concerns over the robustness of their products, support, security standards, where they host their data etc.

Public sector organisations feel constrained in being able to do this (i.e. due to lack of framework agreements etc.)

Large providers bend over backwards to support large private and public sector organisations

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And relatively few arguments to look beyond the leading providers

Potentially can offer something new and differentiated … but need to prove themselves on VFM, security etc.

Likely to be more flexible and willing (e.g., on commercials, customisation of offers) than large players

4.3

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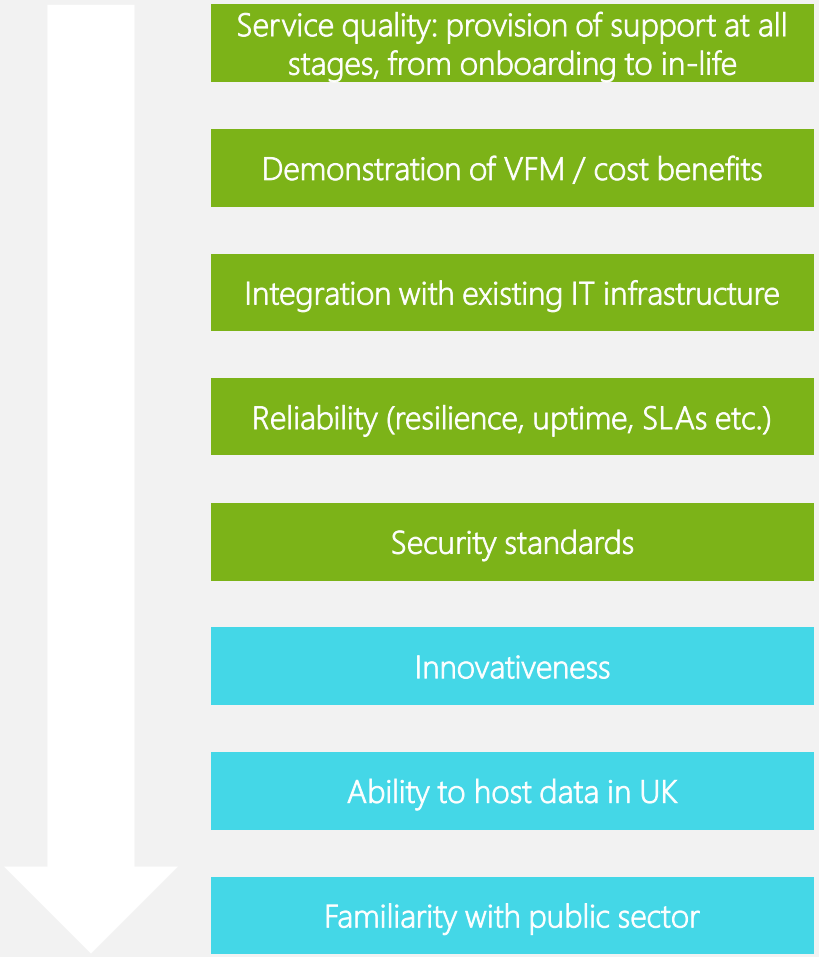
Supplier selection criteria

Service quality, value for money, integration with existing IT and security are among the key selection criteria for cloud providers



- Three factors which weighed heavily in consideration can be collectively summed up as **'peace of mind' factors**:
  - the ability to deliver support at all stages of the journey, not least in the onboarding phase;
  - bulletproof **resilience levels**, and **state-of-the-art security** credentials
- While the need to demonstrate cost advantages is important, this was often perceived in terms of **VFM / ROI** rather than being lowest cost
- Another key requirement was the ability to **seamlessly integrate with existing IT** including business applications, middleware, dev tools, BI etc.
- A smaller set of respondents emphasized the importance of **innovativeness**, (e.g., leading AI and analytics capabilities), and this is **more relevant to PaaS** than IaaS customers
- **Data sovereignty** is very important to a subset of companies
- A knowledge and **familiarity with the public sector** (as well as being on relevant frameworks) is a key consideration, with respondents emphasising the complexities of working in this space

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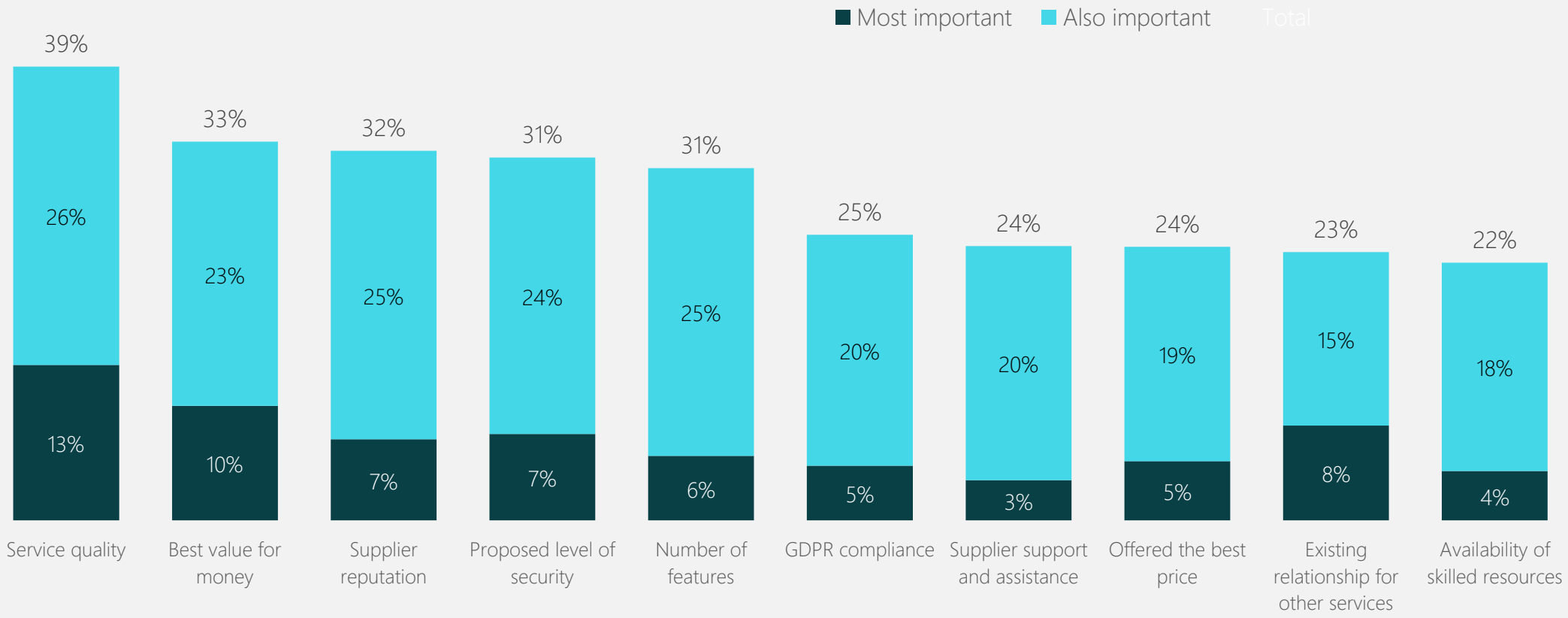
Service quality is the most important reason for choosing cloud suppliers, followed by value for money (1)

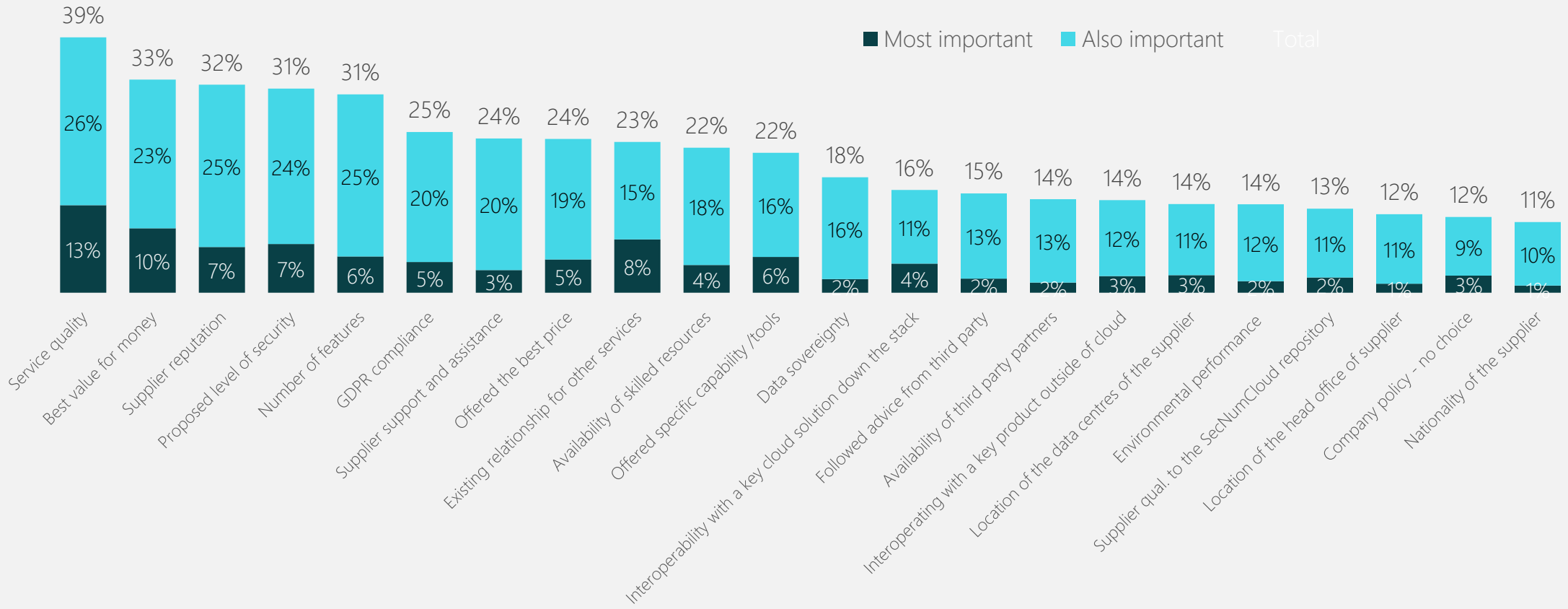
Reasons for choosing providers – all suppliers TOP 10



Q25. What are the reasons you chose [PROVIDER] for IaaS/PaaS? Base: all supplier selections (Net average across supplier) n=1,536 records
Q26. And which of these was the main reason you chose your supplier?

Service quality is the most important reason for choosing cloud suppliers, followed by value for money (2)

Reasons for choosing providers – all suppliers (all)



Q25. What are the reasons you chose [PROVIDER] for IaaS/PaaS? Base: all supplier selections (Net average across supplier) n=1,536 records
Q26. And which of these was the main reason you chose your supplier?

For 5 of the top 6 providers, service quality is the main reason for choosing; Supplier reputation key for Azure and VFM for AWS, Google and BT

Reasons for provider choice by provider (top 6 providers and top 6 reasons)

	Microsoft Azure	AWS	Google cloud	Oracle cloud	IBM cloud	BT
1	Service quality	Service quality	Service quality	Service quality	Service quality	Best value for money
2	Supplier reputation	Best value for money	Best value for money	Proposed level of security	Proposed level of security	Service quality
3	Proposed level of security	Proposed level of security	Number of features	Supplier reputation	Supplier reputation	Existing relationship for other services
4	Best value for money	Number of features	Supplier reputation	Availability of skilled resources	Number of features	Supplier reputation
5	Number of features	Supplier reputation	Proposed level of security	Best value for money	Best value for money	Proposed level of security
6	Existing relationship for other services	Offered the best price	Supplier support and assistance	Number of features	Supplier support and assistance	Supplier support and assistance

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Q25. What are the reasons you chose [PROVIDER] for IaaS/PaaS? Base: Microsoft Azure (n=404), AWS (n=243), Google Cloud (n=265), Oracle Cloud (n=100), IBM Cloud (n=168), BT (n-102)

4.4

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Number of suppliers:
Sole vs. multi-cloud approaches

While multi-cloud is considered the smart way to go, most organisations interviewed have a sole (or effectively sole) cloud approach

Multi-cloud approach considered the smart play

- Seen as most resilient approach and the best way to keep both 'sharp' commercially

But most companies interviewed had sole vendor approach, while others have 90%+ with one

- Invariably Microsoft is the main provider
- Limits the amount of management needed

Large firms especially aware of overreliance on one supplier and are considering mitigations

- Interviewees tacitly assume that vendors don't want to make it easy to maintain a dual cloud approach – e.g., levying egress fees
- Often this is seen as a decision for the future

We are **consciously choosing a split model** – splitting core functionalities across the – as a risk management piece. It massively helps to have both Azure and AWS to get the best pricing and service

We've considered multi-cloud and started to look at **AWS to spread our risk** so that we can switch automatically. We have just **begun that journey**.

We **have all our eggs in the Microsoft basket but that is foolish to do**. It would be much more sensible to split across Amazon as well. I don't have a strong view on that yet and that I guess that's what we need to collectively **come to a view on in a few years**.

There are trials ongoing to look at how seamlessly we can engage with others because we are **interested in multi cloud**. If Microsoft goes bang, we **don't want all our eggs in one basket**. We're all in with Microsoft in terms of IaaS and PaaS, but we do have enterprise systems that back off to mainly AWS.

Switching cloud providers for us wouldn't be a very big problem, but one of the issues with changing providers is that **we would surely have to pay an exit fee.**

Context Consulting

Public cloud not considered the only solution, while some suggest that on-premise is regaining appeal, to work alongside cloud

Private clouds and co-located set-ups provide sensible alternatives

- Frequently, these are contracted via a VAR or MSP who provide expertise on, and tools for, optimisation and cost control/reduction

On-premise IT isn't going away fully, and some suggest it may even be coming back

- Many plan to keep some on-prem where the costs and technology makes sense
- Some are keeping on-prem for strategic reasons of resiliency, to not rely entirely on external providers
- Some report returning workloads back to on-prem, mainly for cost reasons

I have seen CTOs increasingly look at ways to migrate things back in-house to on-prem, because it's increasingly easy to do this. Also, more providers are now offering co-location solutions because the barriers to entry have decreased.

The direction of travel is not only one way. Some workloads are returning to on-prem. Keeping at least some on prem is strategically smart.

Some companies are going back to on-prem, especially among larger firms with the skills to manage that. I feel companies need to make sure they are not stranded in the cloud and retain the ability to return some workloads to on-premise.

I'm keen to maintain on prem for specific use cases where it can be much cheaper [than public cloud]. We want to work with cloud, take advantage of what they offer and learn from everyone, but I'm not going to burn bridges so that we can go back to on-prem when it suits us.

I feel we've reached a peak in cloud adoption and that many companies are now starting to bring workloads back to the private cloud and/or on-prem. That's bound to happen once companies really realise how hard they're getting hit with high costs and also by badly architected solutions. Companies are increasingly aware of the value of doing on-prem work as this allows then them to maintain flexibility.

Companies using multi-cloud do so primarily for functionality, for commercial reasons, and to a lesser extent for resiliency

Functionality – Firms using multi-cloud setups often do so in order to access the maximum benefit from available solutions

- Azure was most usually encountered overall, especially among less specialized users of IT
- However, rivals such as AWS and GCP are sometimes considered better in terms of analytics, tools and AI, and so may be specified by solution developers
- Others have inherited multiple platforms via acquisitions
- For the minority who see technology as part of their strategic advantage and key to their product/service offering, investing in multi-cloud and open architectures with high interoperability makes strategic sense

Commercial – having relationships and staff trained in multiple clouds reduces lock-in risk

- A common reason for firms aiming at a multi-cloud architecture is specifically to provide leverage when negotiating contracts
- Others simply follow the old adage of "not putting all your eggs in one basket" and thereby ensuring flexibility to adapt and switch in the future

> I'm considering adding GCP to the multi-cloud mix, but not because I'm really interested in using them. I'll bring them in even if just for a very small piece just to give me more leverage against Microsoft and AWS the next time we negotiate renewals.

Resiliency – a multi-cloud approach for back-ups are not currently widespread due to high costs

- The use of public clouds for resiliency is limited by on-prem and private clouds being the preferred back-up solutions due to ease and lower costs
- Some regulated industries (i.e. financial services) are required to have data replicated across multiple public cloud providers

> Having replication across clouds would be ideal but isn't really feasible right now. Technically it could be done but the costs of moving so much data in and out all the time would quickly multiply, and it's just so easy and cheap to keep doing it on-prem.

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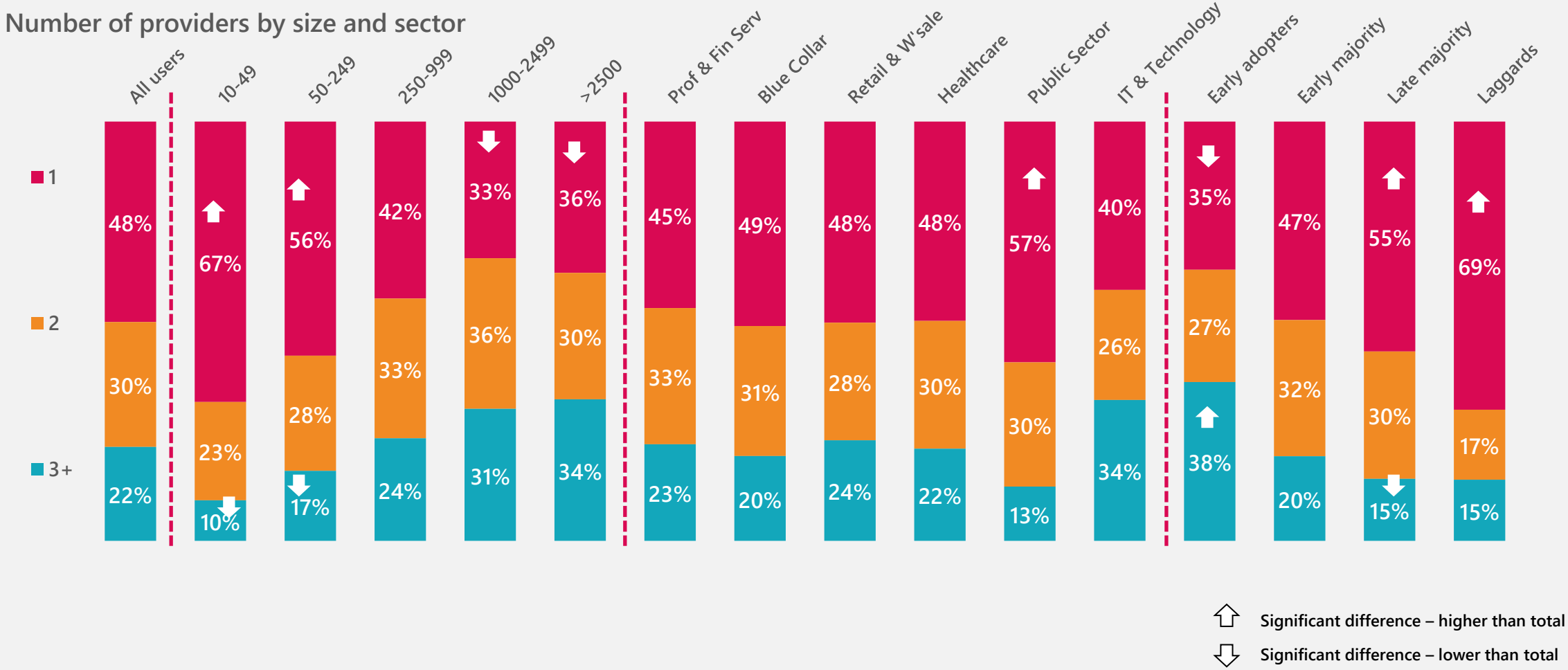
Overall around half of companies surveyed in this study are using just a single provider, and nearly a quarter have 3 or more providers

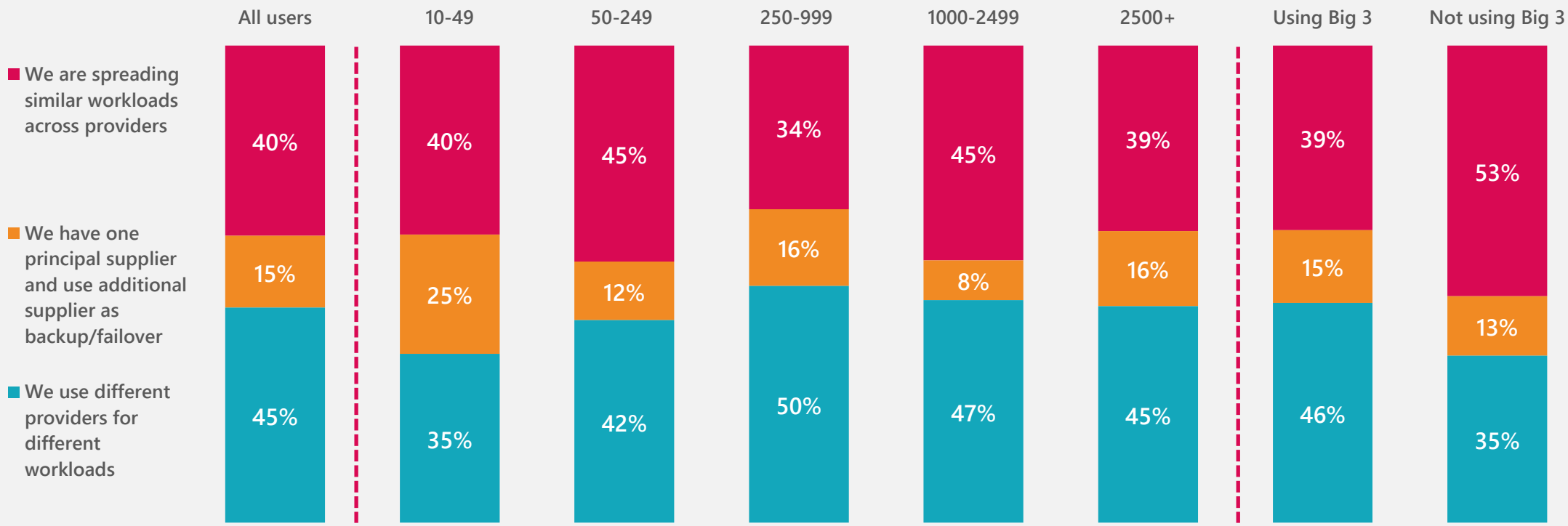


Context Consulting

Q23. Which of the following cloud providers do you use currently for IaaS and PaaS? Number of providers used Base: All users (n=880); Early adopters (n=198), Early majority (n=399), Late majority (n=239), Laggards (n=51); 10-49 employees (n=149), 50-249 emp (n=242), 250-999 emp (n=238), 1000-2499 emp (n=89), >2500 emp (n=171); Prof & Fin Serv (n=203), Blue Collar (n=205), Retail & Wholesale (n=125), Healthcare (n=83), Public Sector (n=110), IT & Technology (n=122)

Among multi-cloud users, we see a mix of those keeping workloads separate across different providers, and those who are spreading similar workloads across providers

Number of providers by size and sector



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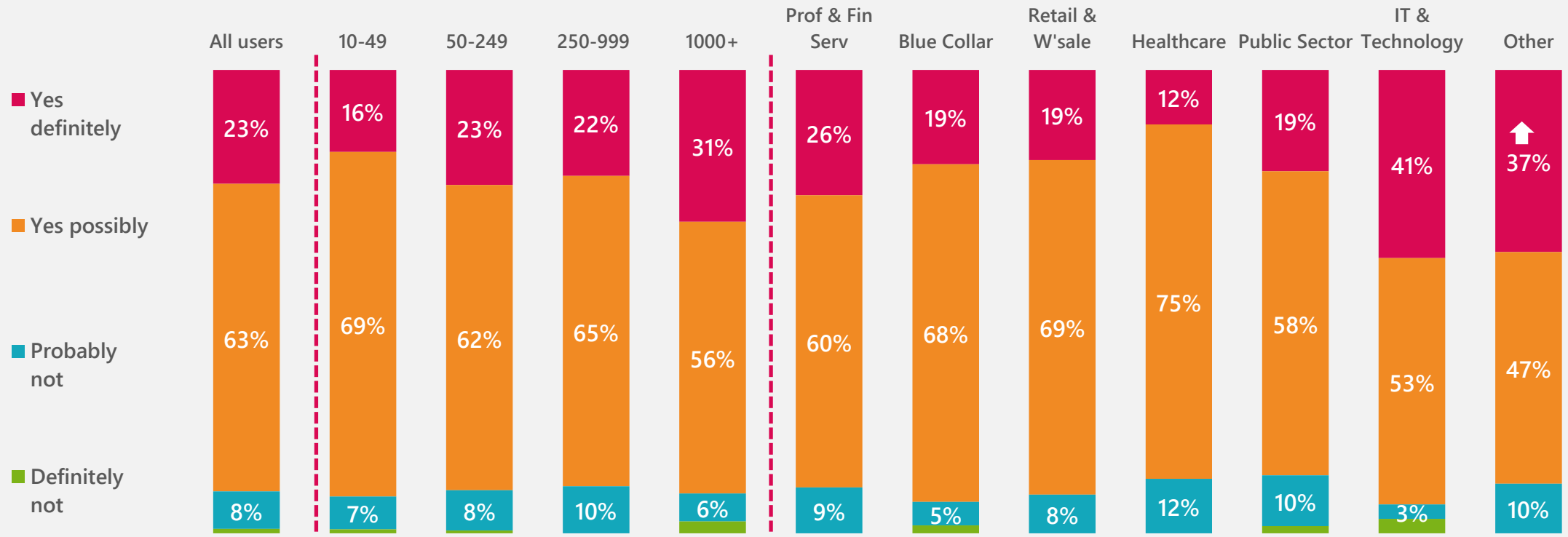
Q29: Which of the following best describes the way you manage your multi-cloud architecture? Base: those using more than one provider (n=459); 10-49 employees (n=48), 50-249 emp (n=106), 250-999 emp (n=137), 1000-2499 emp (n=60), >2500 emp (n=108); Net using Big 3 (n=419), not using Big 3 (n=40)

Most companies who are currently using only one provider are open to using a multi-cloud architecture in the future

Consideration of multi-cloud architecture in the future by size and sector



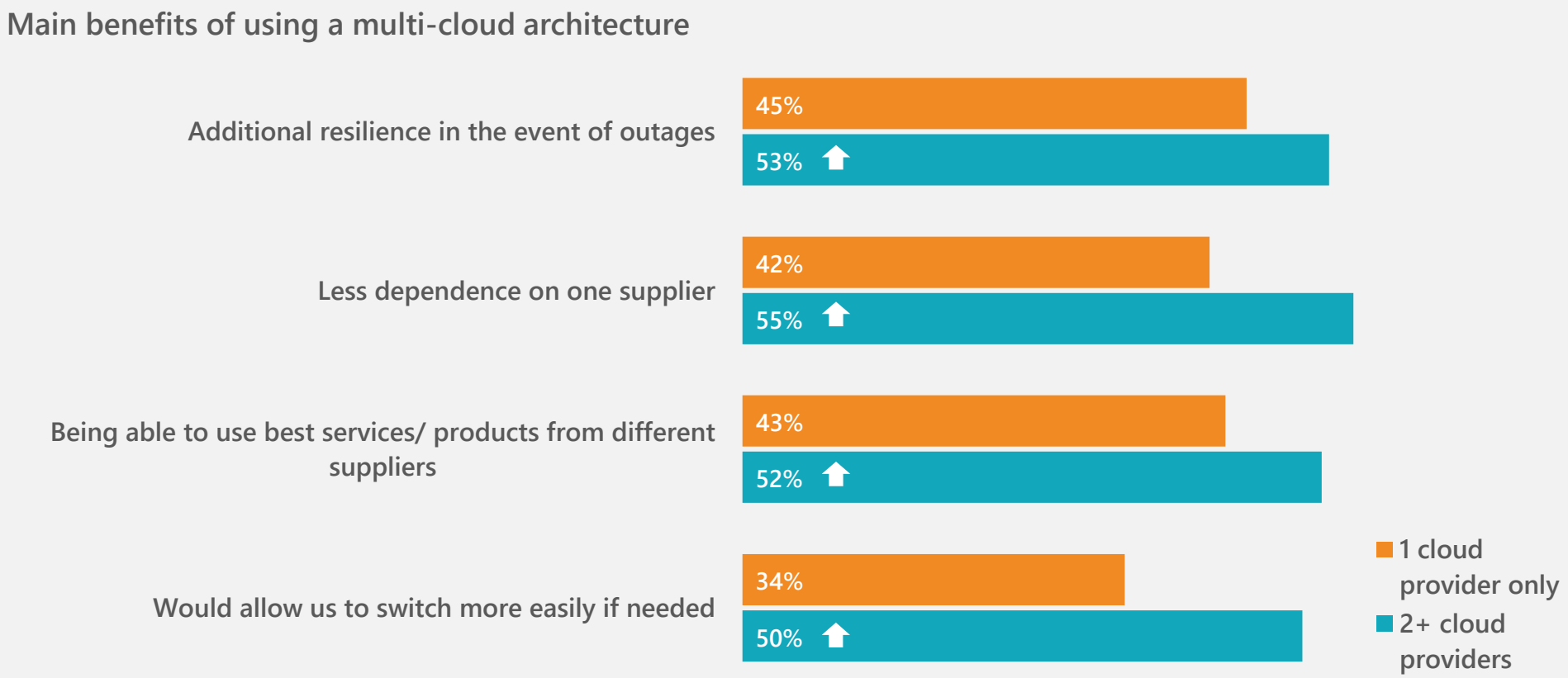
Significant difference – higher than total

Significant difference – lower than total

Q30: Would you consider using multi-cloud architecture in the future? Base: those using one provider Total (n=538); 10-49 employees (n=122), 50-249 emp (n=172), 250-999 emp (n=122), 1000-2499 emp (n=41), >2500 emp (n=81); Prof & Fin Serv (n=117), Blue Collar (n=127), Retail & Wholesale (n=75), Healthcare (n=52), Public Sector (n=73), IT & Technology (n=64)

Context Consulting

Multi-cloud users are more likely to think there are benefits to this approach, including resilience and reduced dependence on one supplier

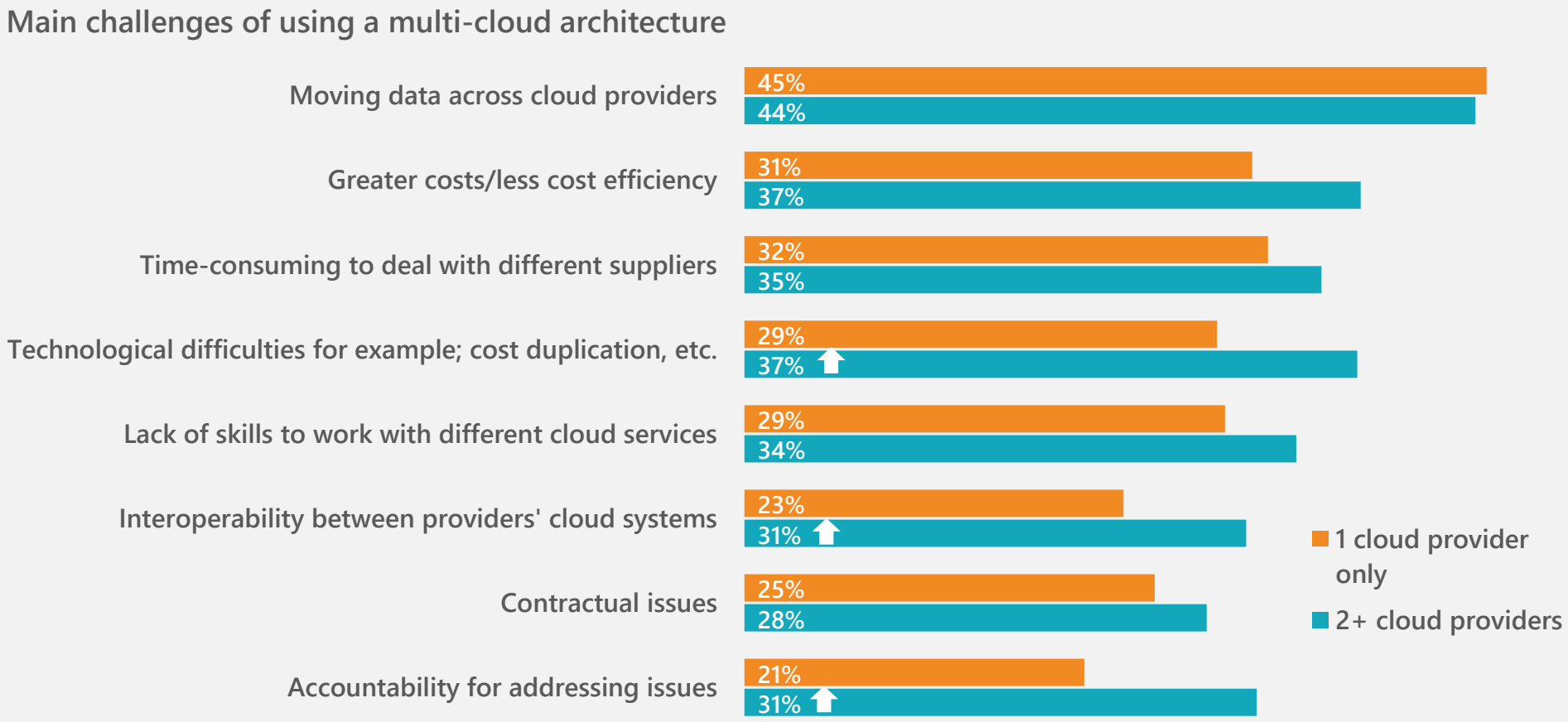


⇧ Significant difference – higher than total

⇩ Significant difference – lower than total

Q32. What do you see as the main benefits of using a multi-cloud architecture? Base: those using multi-cloud (n=459), those using one provider only (n=421)

Those currently using multi-cloud are more likely to see challenges with technical difficulties, interoperability and accountability



Q31. What do you see as the main challenges of using a multi-cloud architecture? Base: those using multi-cloud (n=459), those using one provider only (n=421)

Companies face many obstacles to adapting a multi-cloud model, and especially one that is integrated

Limitations to, or lack of, interoperability	▪ Most customers would like to integrate services from multiple clouds but the challenge of making multiple clouds work in an integrated way is an obstacle. A minority have not experienced significant obstacles to a somewhat integrated multi-cloud set-up but these companies tend to be smaller and have simpler tech requirements. ▪ Limitations to Interoperability are especially relevant in regard to Microsoft - limitations are not strictly imposed but stem from the difficulties of making the Microsoft stack work with a non-Azure cloud. Others also pose interoperability difficulties, with Google being considered to be the most open.
Data egress fees	▪ Significant and often unexpected, with firms often charged egress fees, even between different tenancies of the same provider. Usage fees are often not transparent, and unpredictable. Improvements in cost control and usage monitoring tools and cost reduction are being seen more recently. Organisations in the healthcare sector can incur high egress fees as healthcare records including imaging are large. Some respondents also expressed concerns about data ingress fees, though these are likely to be historical, as vendors now all have zero ingress fees
Cost & time required to train or hire staff able to work with cloud infrastructure services of different cloud providers	▪ The primary obstacle for smaller companies and this is especially relevant beyond Microsoft and AWS, with relatively small talent pools available skilled in other providers' clouds.
Nature of workload or applications to be run across cloud providers	▪ Significant for 'Microsoft shops' – the nature of their tech stack makes Azure really the only viable option. ▪ Less significant for companies less reliant on MS who find this to a driver to multi-cloud. ▪ AWS and GCP are preferred for new development vs. Azure for production and on-going workload.
Need to materially reconfigure data and applications	▪ Significant for many but not all as many use Azure for MS applications, and others for non- Microsoft. ▪ Different languages and terminologies contribute to making reconfigurations difficult, with some arguing in favour of setting standards to make this easier.
Costs of replicating cloud infrastructure services across different clouds	▪ Most are not looking to multi-cloud for replication, doing this mostly on-prem, but definitely would be an obstacle if they wanted to start to use multi-cloud for replication. ▪ Related to data egress/ingress fees which make replication across clouds too expensive to even consider.
Commercial practices (e.g., specific licensing requirements, discounts linked to exclusive use of a specific services)	▪ Considered part of doing business, though complaints are frequent around the lack of transparency into pricing, lack of predictability and comparability in pricing, and renewal price hikes. ▪ Exclusivity is not a result of contract terms, but rather more a symptom of the lack of interoperability.

5

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Contracts and purchase process

5.1

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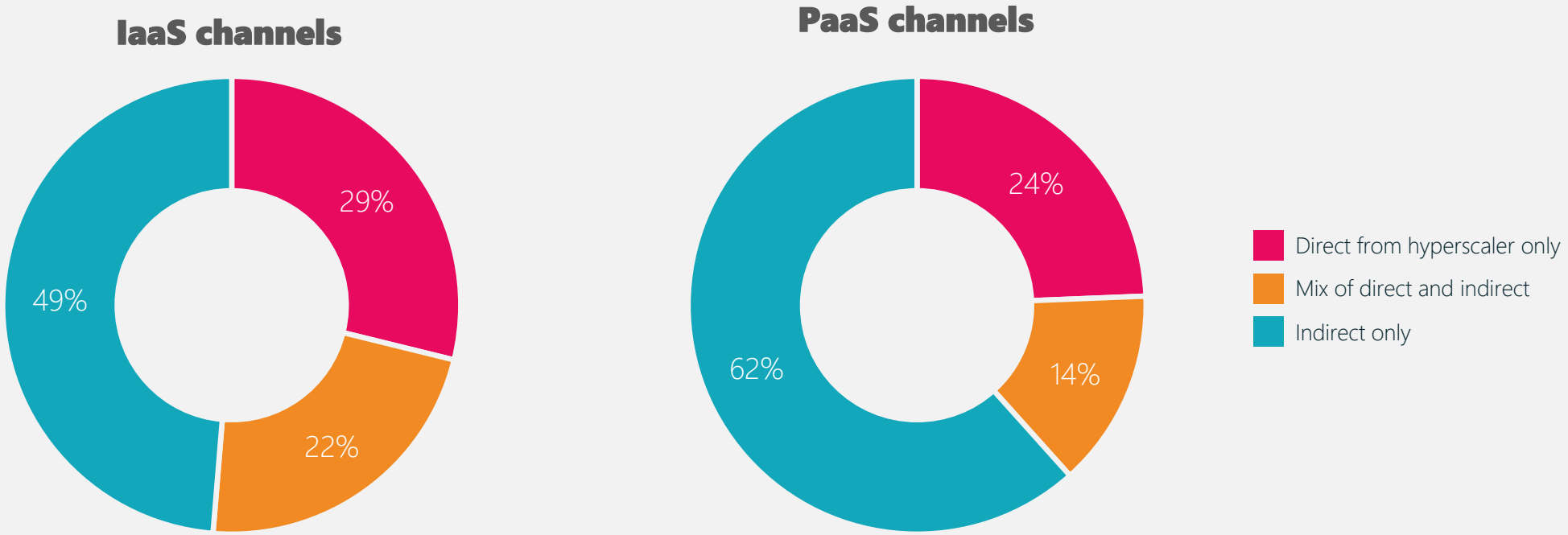
Contracts and purchase process: Direct vs. indirect purchasing

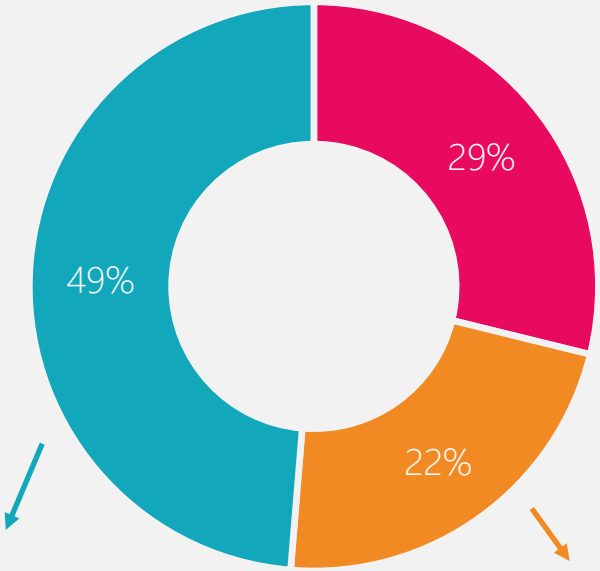
For both IaaS and PaaS, most of the companies surveyed are using indirect purchasing channels



Q33. Do you buy IaaS/PaaS directly from hyperscalers (e.g. AWS, Microsoft or Google) or via a third party? Base: IaaS users (n=690), PaaS users (n=550)

For those purchasing indirect only, telecoms providers are most used, while those using a mix are more likely to use an MSP or SI

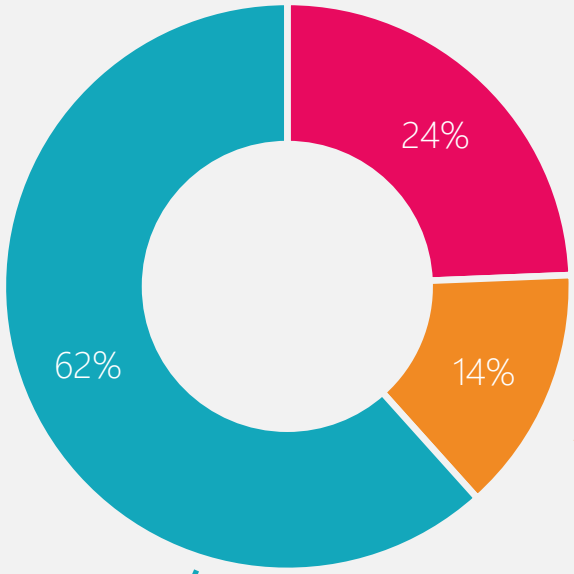
IaaS channels



46% telecoms
39% systems integrator
38% managed service provider

60% managed service provider
59% systems integrator
48% telecoms

PaaS channels



Direct from hyperscaler only
Mix of direct and indirect
Indirect only

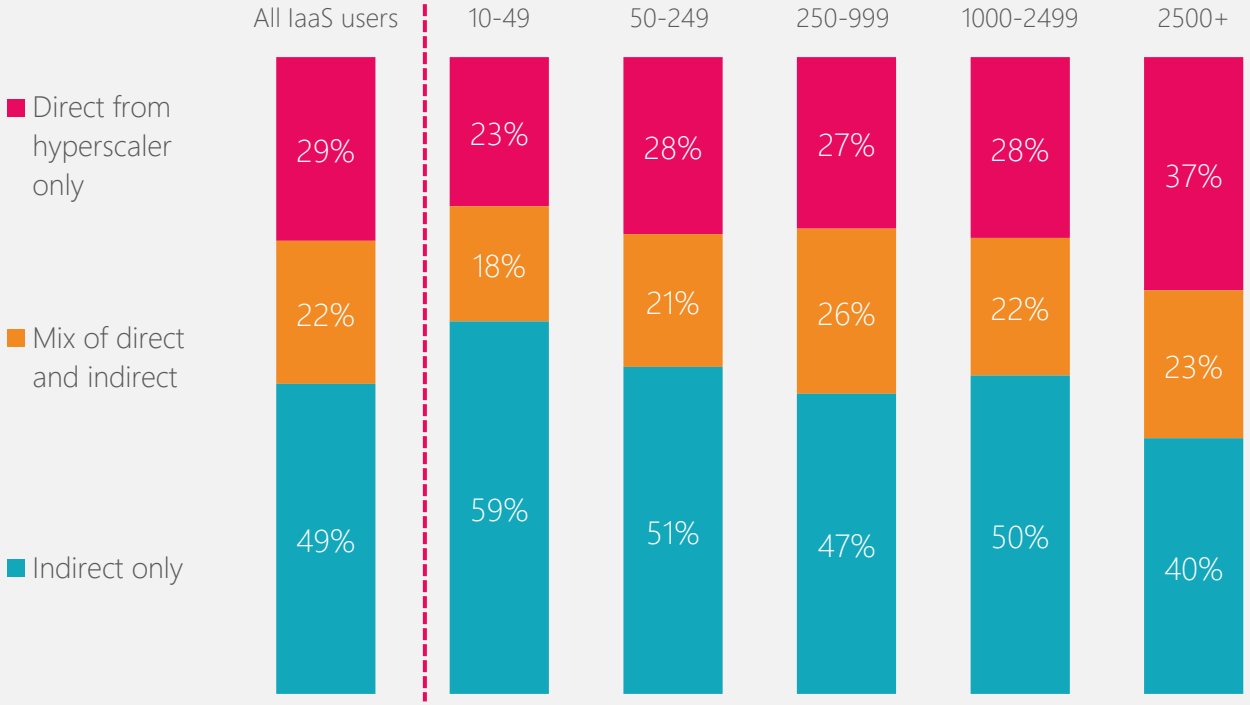
47% telecoms
46% managed service provider
36% systems integrator

60% systems integrator
58% managed service provider
52% telecoms

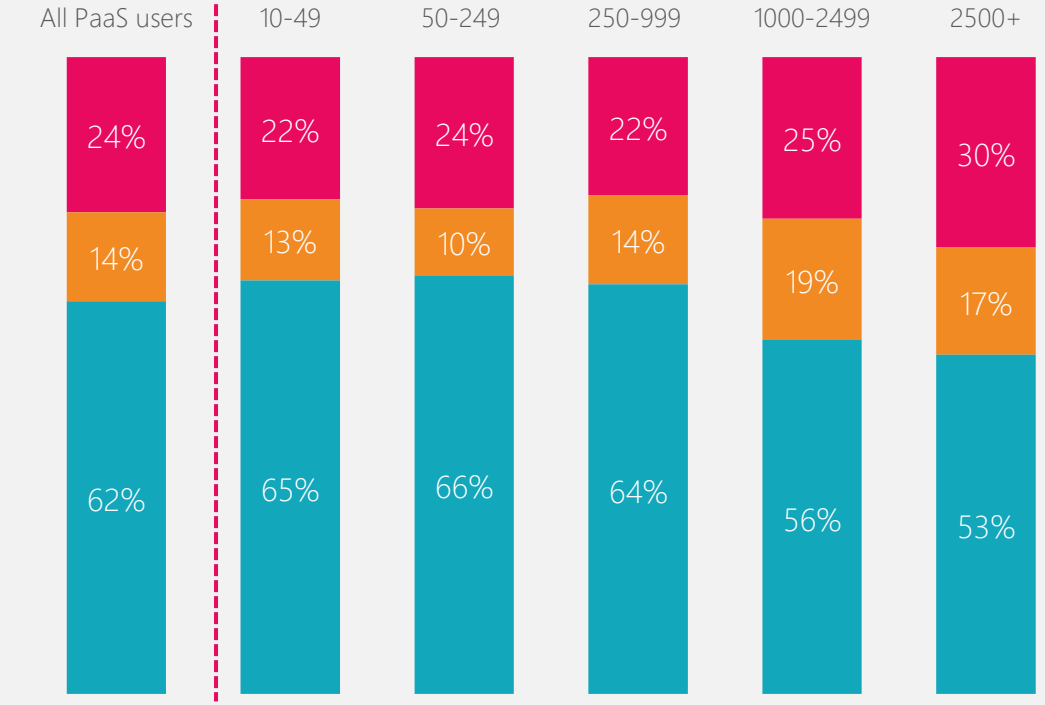
Q33. Do you buy IaaS/PaaS directly from hyperscalers (e.g. AWS, Microsoft or Google) or via a third party? Base: IaaS users (n=690), PaaS users (n=550)

For IaaS and PaaS, direct channels generally skew towards larger organisations – especially 2,500+ employee businesses

IaaS channels by size



PaaS channels by size



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Q33. Do you buy IaaS/PaaS directly from hyperscalers (e.g. AWS, Microsoft or Google) or via a third party? Base: IaaS users (n=690),10-49 (n=94), 50-249 (n=187) 250-999 (n=193), 1000-2499 (n=74), 2500+ (n=142). PaaS users (n=550)),10-49 (n=94), 50-249 (n=143) 250-999 (n=143), 1000-2499 (n=63), 2500+ (n=107)

Those purchasing cloud indirectly are largely highly satisfied by the benefits these intermediaries provide

Majority buy cloud via intermediaries

- Approximately **4 in 5 companies** interviewed purchase cloud via an intermediary, typically an MSP
- The 1 in 5 who go direct *only* were **larger private firms**, while others have a direct **relationship around 'strategic' topics** alongside a more day-to-day relationship with an indirect provider
- Public sector companies are **contractually required** through framework agreements to buy Microsoft cloud services via a channel partner
- Relatively few were buying via Systems Integrators and Telcos, with most buying from **smaller IT providers**

Very positive experiences reported of working with intermediaries

Without question, the experience of companies working with **MSPs is positive**

They tend to be **smaller, more responsive and 'human'** than the hyperscalers

Acting as a 'bridge', they are more **readily available** also

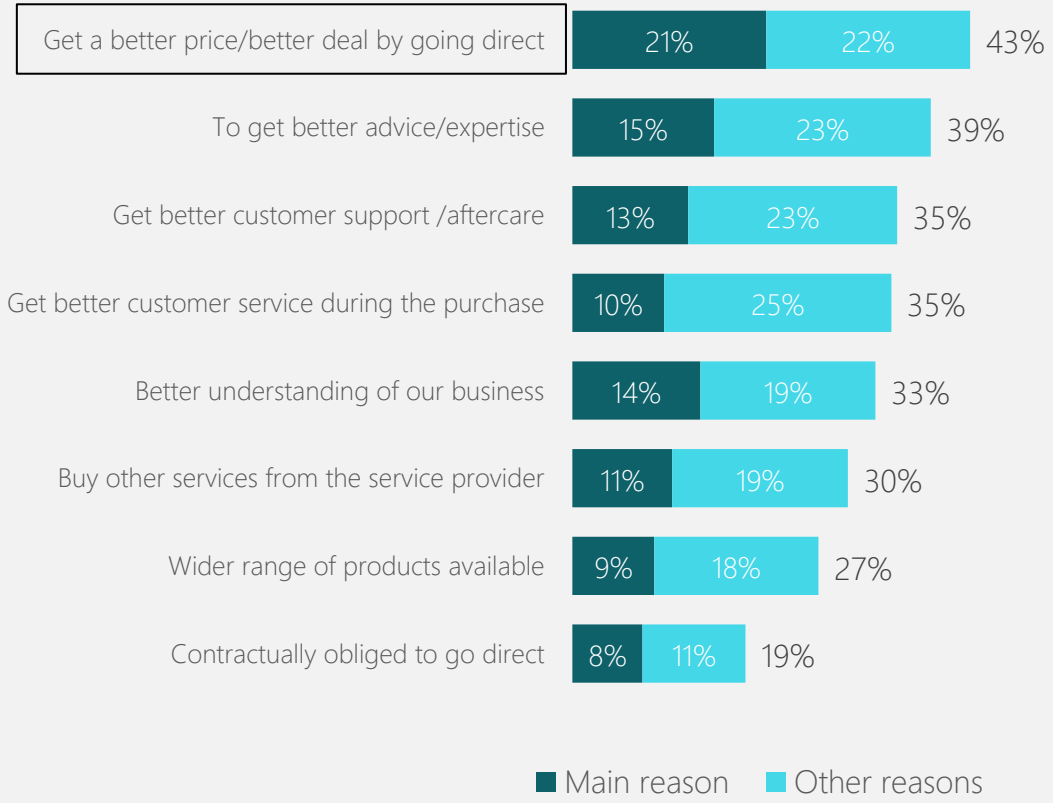
Specific benefits identified included:

- Deliver **added value expertise**, advice and consulting
- Provide more **responsive** service and support
- Can help end-customer to **manage costs**
- Can have **stronger culture fit with** smaller firms
- Help to deliver **scarce, highly qualified resource**
- May provide **niche, vertical sector knowledge**
- Can provide invaluable insight **across cloud platforms**

According to businesses surveyed, the top reason for purchasing through third parties is to get better advice, support and 'understanding'; by contrast, price is key for those buying direct

Reasons for purchasing through third party

Reasons for purchasing direct



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Q34. Why do you use a third party rather than going direct? Q35: And which is the main reason? Base: those buying through third party (n=663)

Q36. Why do you buy direct rather than going through a third party? Q37: And which is the main reason? Base: those buying direct (n=469)

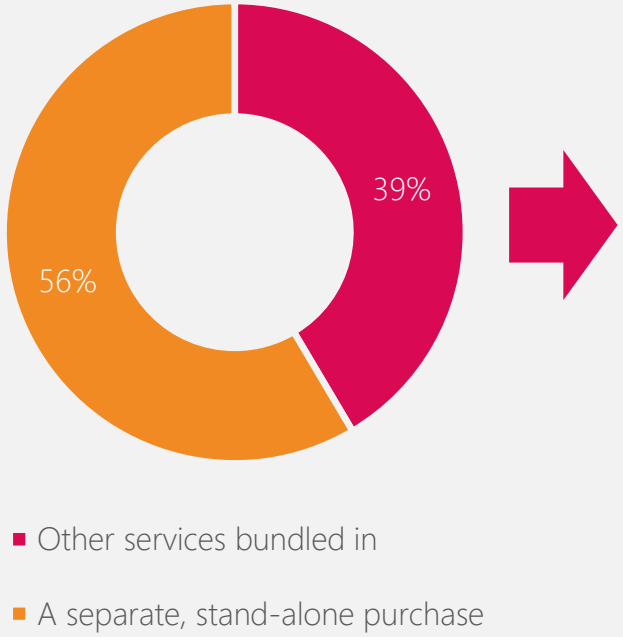
5.2

Please note that the views presented in this section are those of the respondents to our survey. They do not represent the views of Context Consulting or of Ofcom.

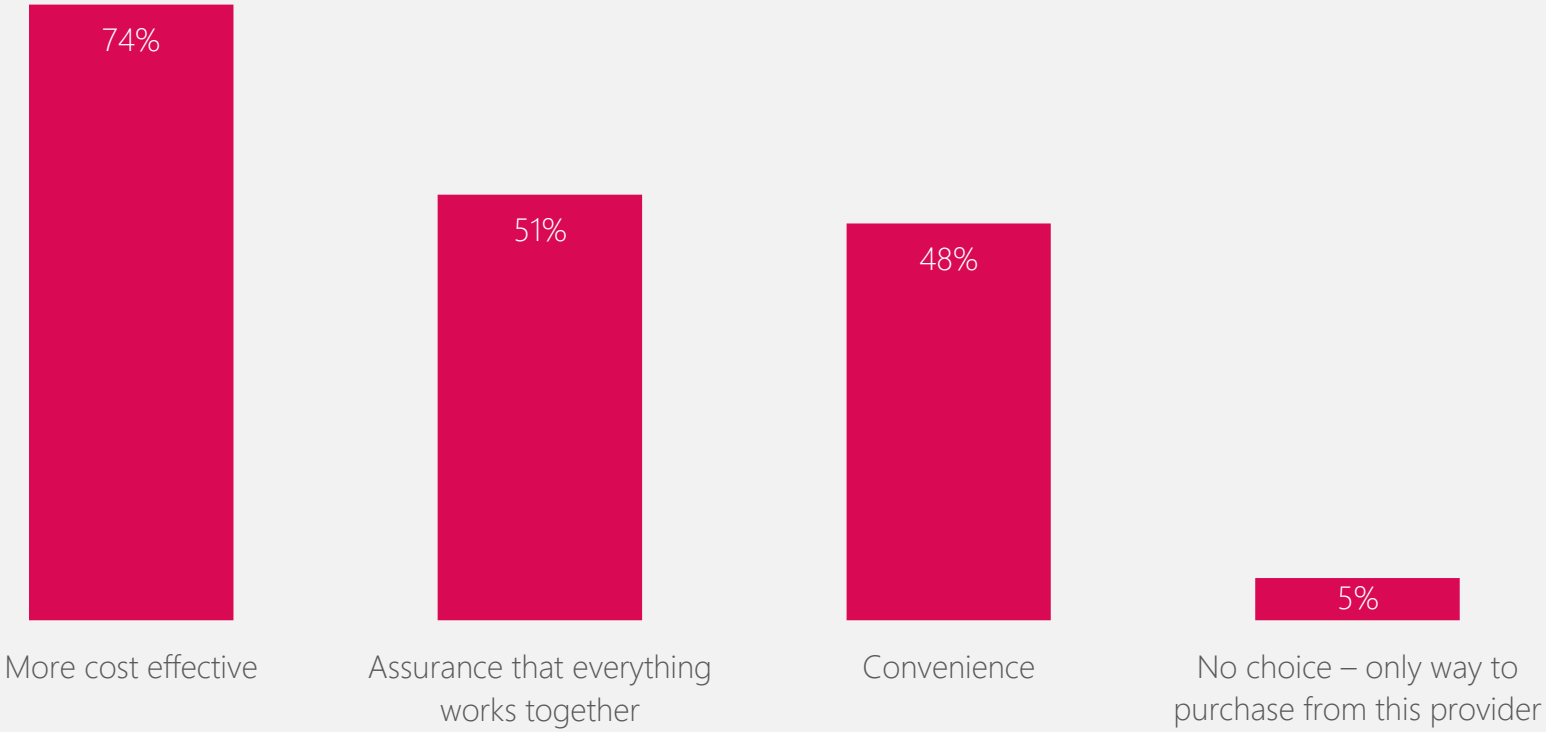
Contracts and purchase process: Marketplaces and bundling

4 in 10 of our sample purchased other services with cloud services. Most said it was more cost effective, and hardly any said they were obliged to do so

Purchase mode



Reasons for purchasing cloud in bundle



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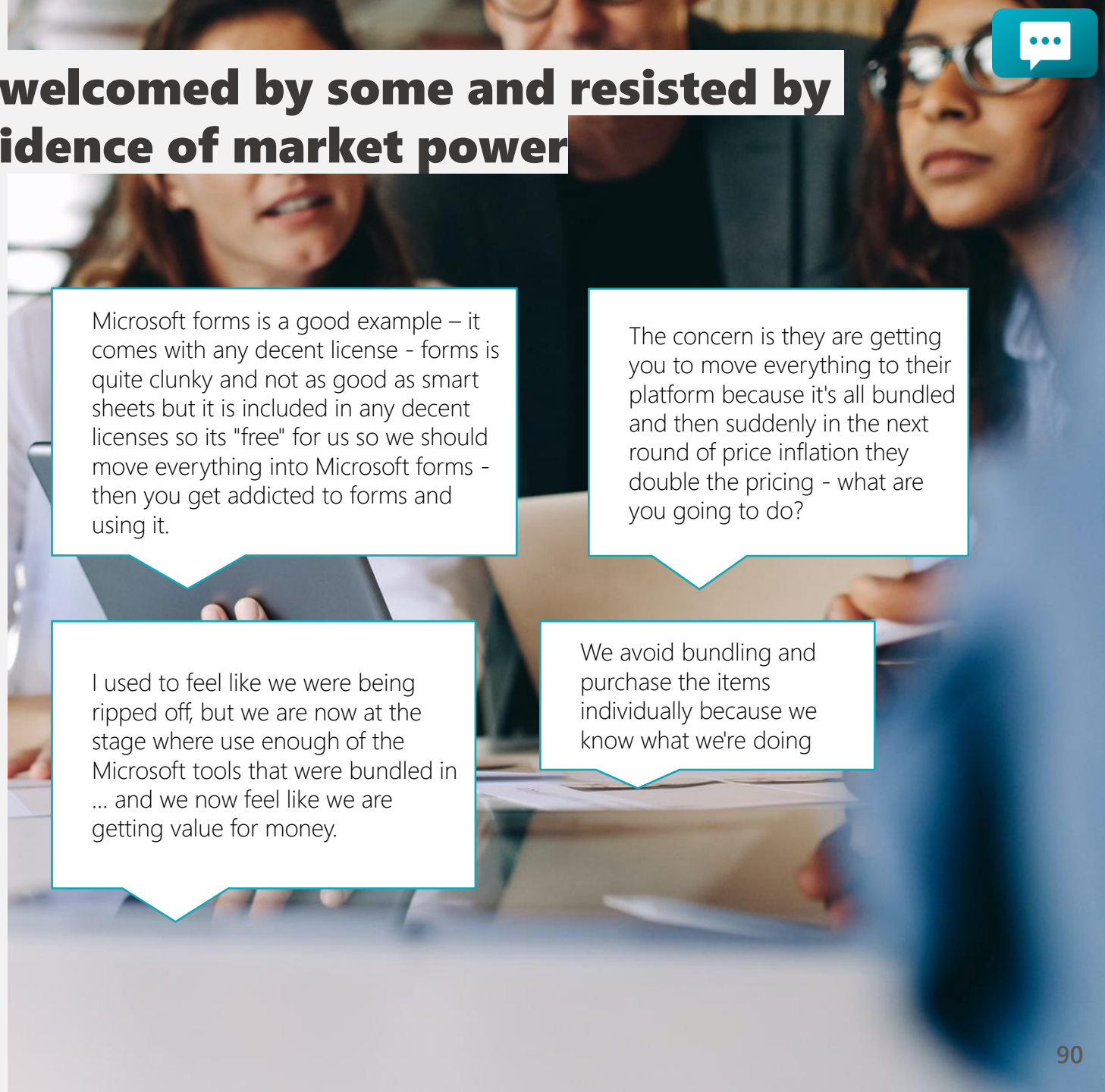
Q39. Is your contract / purchase of IaaS/PaaS cloud services separate from other IT purchases, or were other products or services bundled in with them (for example software licences or hardware inc laptops, servers)? Base: All users
Q40. Why did you purchase other products or services bundled in with your cloud purchase? Base: those purchasing bundle (n=489); Azure users (n=241); AWS user (n=160); Google users (n=167), not using Big 3 (n=99)

Bundling, is a polarising topic, welcomed by some and resisted by others, who see it as further evidence of market power

- We encountered users who are **buying bundled services**, particularly via Microsoft, and some are very positive about this
  - Enables them to get **better value** (e.g. they are able to utilise credits to obtain these)
  - Alleviates some of the **administrative complexity**
- However, others view this practice with **scepticism**
  - Feel forced to take **sub-optimal** components
  - Bundling can **happen by stealth**, with users unaware of what has been thrown in
  - Adds to the **risk of lock-in** felt by users overdependent on a vendors
  - Can **feel opaque** in terms of how much different components are really worth
  - These companies tend to **insist on selecting** what they want, rather than adopting by default
- Generally, the **larger and 'savvier' firms** are more likely be sceptics, while smaller firms are more likely to view this approach positively, focusing on the convenience



Microsoft forms is a good example – it comes with any decent license - forms is quite clunky and not as good as smart sheets but it is included in any decent licenses so its "free" for us so we should move everything into Microsoft forms - then you get addicted to forms and using it.

The concern is they are getting you to move everything to their platform because it's all bundled and then suddenly in the next round of price inflation they double the pricing - what are you going to do?

I used to feel like we were being ripped off, but we are now at the stage where use enough of the Microsoft tools that were bundled in … and we now feel like we are getting value for money.

We avoid bundling and purchase the items individually because we know what we're doing

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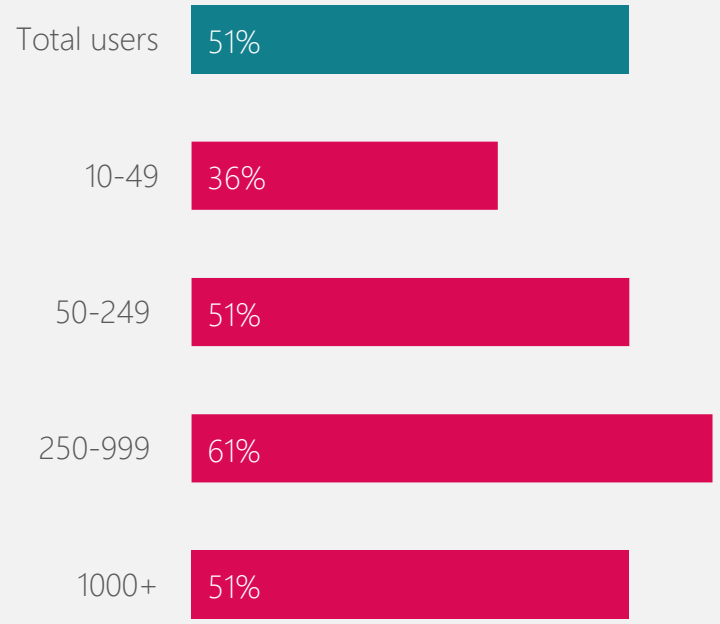
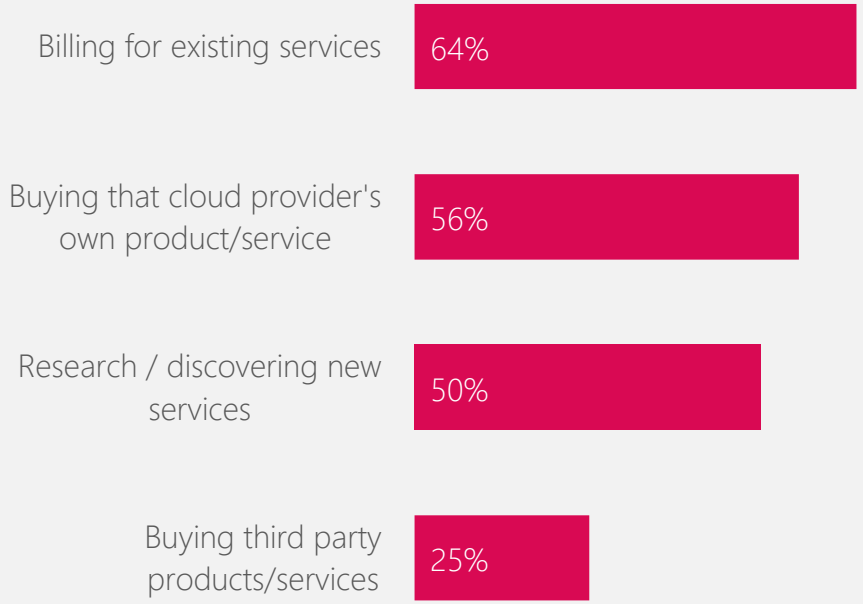
Around half of businesses surveyed are using the cloud provider's marketplaces to settle payments, buy products or research new services

Using cloud provider's marketplaces by size of org



Purposes of using cloud providers marketplaces



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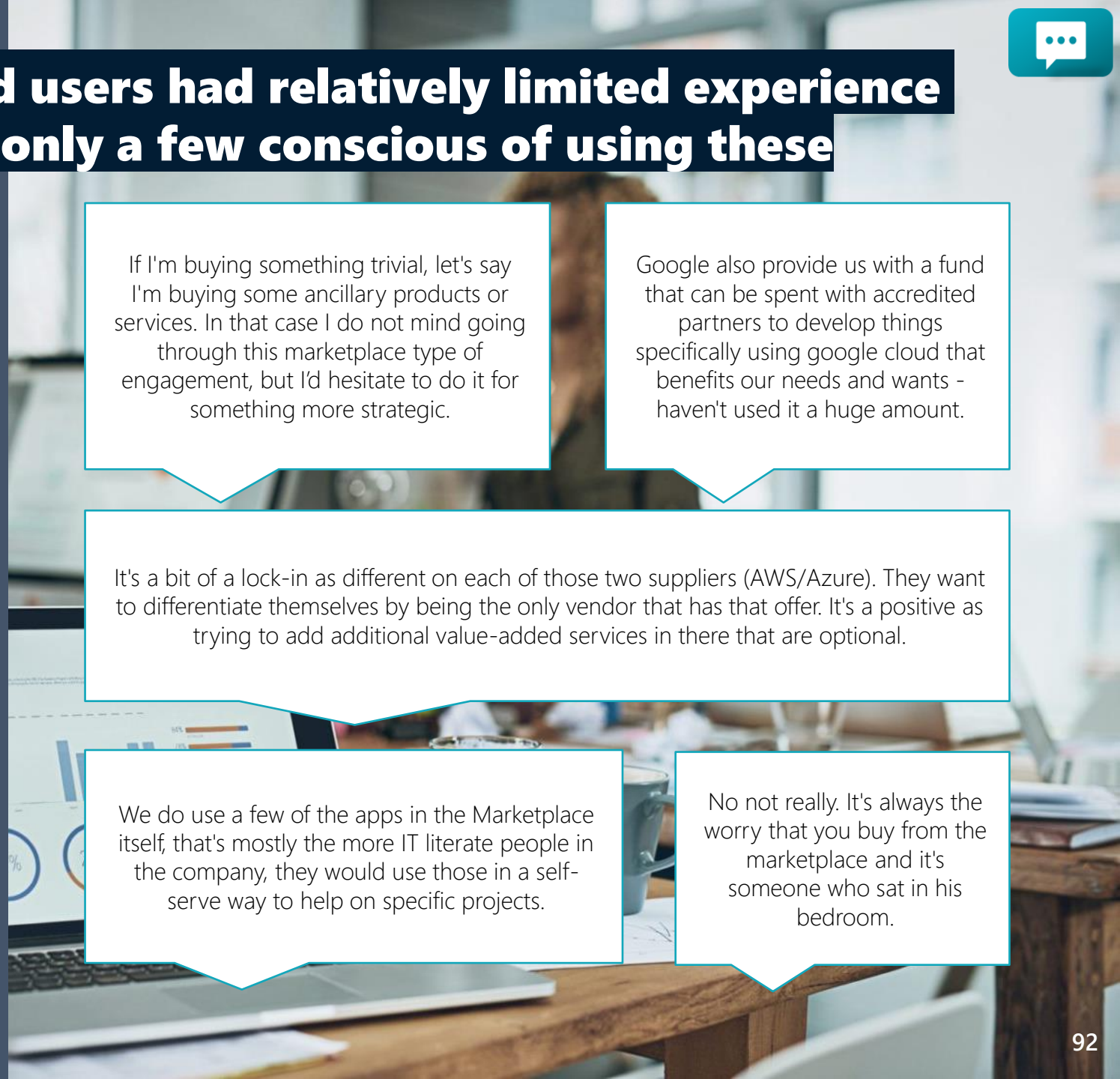
Q45: Do you use your cloud providers' marketplaces (for example AWS Marketplace, Azure Marketplace) to buy software and services? Base: all users (n=889)
Q46. For which of the following purposes do you use your cloud providers' marketplace? Base: all using marketplaces (n=452); Big 3 users (n=372), Other users (n=80)

Our qualitative research found users had relatively limited experience of vendor marketplaces, with only a few conscious of using these

- A limited number of respondents were sufficiently engaged with marketplaces to comment and provided a mix of views
  - When buying relatively 'tactical' tools the marketplace can provide a convenient source
  - The fact tools are certified by vendors adds reassurance
  - While the ability to buy quickly, without needing to add a new supplier, is also a plus
- However, some are more wary, and see this as an extension of reliance / lock-in described previously
  - Others question the quality of what is available, and cite the limited number of reviews



> If I'm buying something trivial, let's say I'm buying some ancillary products or services. In that case I do not mind going through this marketplace type of engagement, but I'd hesitate to do it for something more strategic.

> Google also provide us with a fund that can be spent with accredited partners to develop things specifically using google cloud that benefits our needs and wants - haven't used it a huge amount.

> It's a bit of a lock-in as different on each of those two suppliers (AWS/Azure). They want to differentiate themselves by being the only vendor that has that offer. It's a positive as trying to add additional value-added services in there that are optional.

> We do use a few of the apps in the Marketplace itself, that's mostly the more IT literate people in the company, they would use those in a self-serve way to help on specific projects.

> No not really. It's always the worry that you buy from the marketplace and it's someone who sat in his bedroom.

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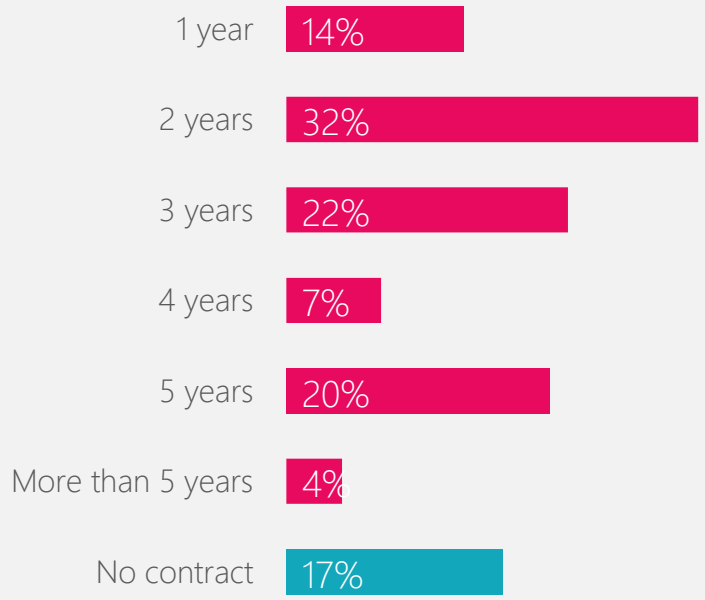
5.3

Please note that the views presented in this section are those of the respondents to our survey. They do not represent the views of Context Consulting or of Ofcom.

Contracts and purchase process: Contracts and costs

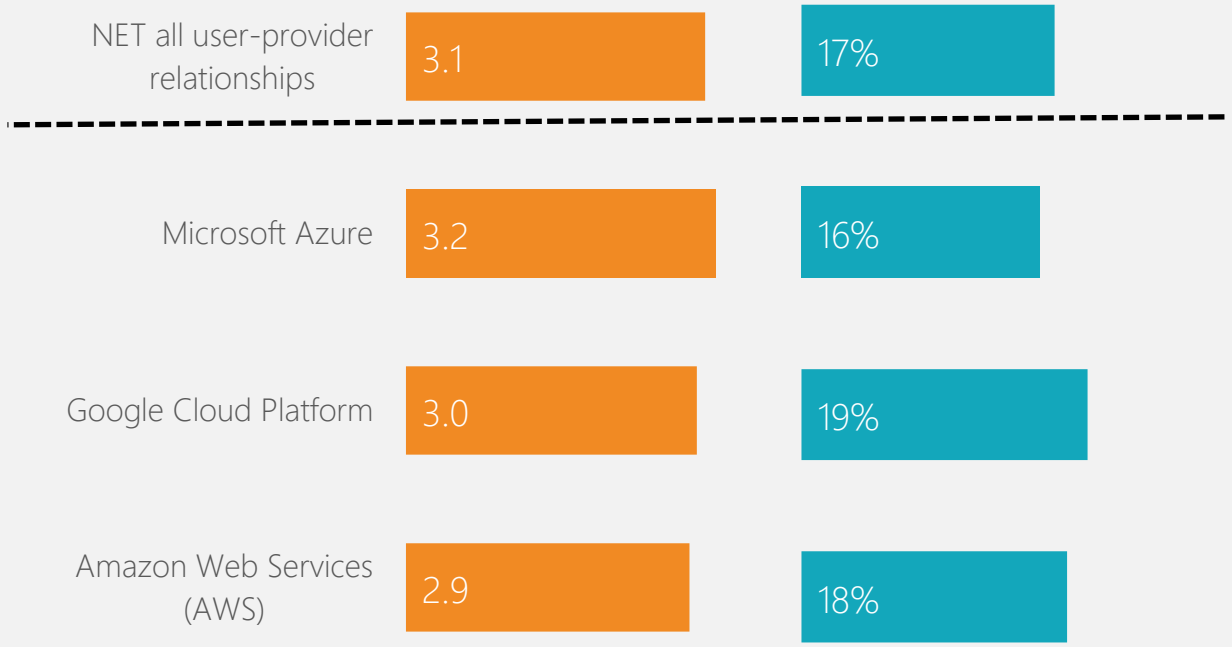
The most common contract lengths are 2-3 years, with similar durations for the major providers according to business surveyed for this study

Length of contract



Average length of contract by provider

No contract, PAYG



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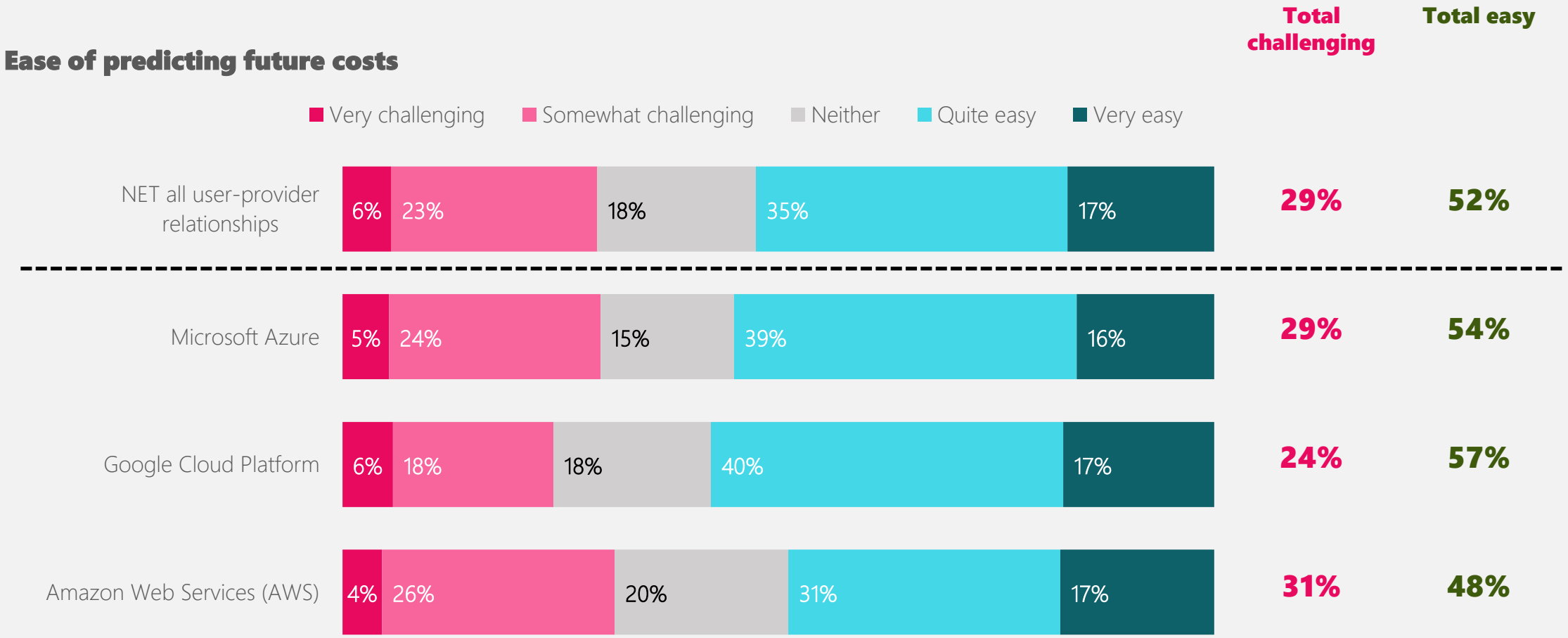
Q38. What length of contract do you have with your current provider of cloud for IaaS/PaaS? Base: All brand average (n=1,683 records), Microsoft (n=419), AWS (n=269), Google (n=281)
Note that the NET all user-provider relationships figure is based on all responses to questions about all suppliers. Respondents were asked Q38 about each provider they were using.

In 1 in 3 IaaS/PaaS user-provider relationships the customer finds it difficult to accurately predict the future costs of cloud computing, similar across providers



Q41b. How easy or challenging do you find it to accurately estimate your future costs with these providers? Base: All brand average (n=1,683 records), Microsoft (n=419), AWS (n=269), Google (n=281)
Note that the NET all user-provider relationships figure is based on all responses to questions about all suppliers. Respondents were asked Q41b about each provider they were using.

Experience of actual versus planned costs is an emotive topic, with decision makers feeling that it is more difficult to manage than need be

Greater transparency in costs is desired, as the pay-per-use model means costs can escalate fast, in ways that are not entirely clear to users

As a result, accounting for cloud computing is a major challenge; this is especially true in the public sector, which struggles with OpEx models

IT leaders often pick up the bill, but don't have the ability to control usage (e.g., in heavy usage departments such as digital marketing)

Vendors have not been seen as good at helping customers to manage costs, even if they have provided tools for this purpose

Many of those we interviewed call for transparency over costs, while managing costs causes challenges, especially in the public sector

Greater transparency in costs is desired, as the pay-per-use model means costs can escalate fast, in ways that are not entirely clear to users

It's the unknown because they're **charging for throughputs, and I don't know what my throughput's going to be** month on month. We can band throughput so we can say this is the threshold, but if I break through that threshold, then I'm getting a bigger bill.

The only thing that is prohibitive is you **must be careful of costs**. You can roll costs **through the roof** and not know straight away. We have been very cautious about this. Just from rolling out test environments on Azure our latest bill was £2000 higher a month. It's **hard to gauge** how much to put away for the month for the costs and that restricts us.

I do feel that it **still is a little bit Wild West** - it just feels like you never really know what your costs are with the cloud. And it **doesn't feel fair**. It just feels a bit unclear. Unless you are quite a big company really built for forecasting and you've got all the supporting software, it's quite difficult to predict.

As a result, accounting for cloud computing is a major challenge; this is especially true in the public sector, which struggles with OpEx models

Before you probably would spend £50K plus or minus a 10% contingency. Now the finance people are, how much is it going to cost this month? And we're like, well, it **could be £30k and it could be £70k** and they're not happy with that. We can't work like that.

It's very difficult, you know, back in the good old days, **you knew where you stood with your physical infrastructure** and even with your virtual infrastructure, you knew where you stood, you knew your outlay was, say, £50k.

There is a financing problem because **industry prefers the OPEX model** but most of the money we get is through a CAPEX model.

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IT leaders face internal challenges in managing the consumption of cloud computing, while vendors could do more to help manage costs

IT leaders often pick up the bill, but don't have the ability to control usage (e.g., in heavy usage departments such as digital marketing)

If you let people randomly store whatever they want and process it in any way they want then **that is a blank cheque**. Have to monitor it; have to have a skill set cloud accounting and have people monitoring it. Can't pay for cloud with capital which is a drawback to some organisations that are capital rich but revenue poor.

I get all the bills for our AWS usage, but **I don't see exactly who is doing what** when they are doing it. You can have a team like the digital team or analytics and BI who go off and do their own thing, and **later I have to pick up the tab**. You lose control if you're not joined up.

Vendors have not been seen as good at helping customers to manage costs, even if they have provided tools for this purpose

There is a tool provided by MS and you can put in the configuration you've got, and it will tell you the costs to run that and whilst you can say that is good you **need to have a PhD to work it out**. Azure is complex and has so many options!

With the online calculator for Azure - you could have multiple components you need to pump in for each machine and then if you have 15 machines, all of them different, you **could spend days trying to work out the costs** on the calculator.

However, others feel more positive around this and feel relatively in control of costs, at least now that they have implemented changes

IT teams readily admit a need for better internal discipline around how cloud capacity is used, managed, switched off etc.

We looked at our Azure today for computing and data, it was £45K a month. I remember the business case said that we would turn off a bunch of services when we moved to Azure and that we'd spin up and spin down when we didn't need it. But the problem is we would forget it's there, or we get too busy.

Costs can go up if you're not actively managing files to stop accumulating things you don't need

A number of firms have proactively implemented measures to deliver this control, and report being able to control bills better

Once you are familiar with it you can look at how you can tune that up; we've written various scripts that turn things on and off to optimize our costs - that's probably knocked off 20% off our costs. We could only do that by knowing about our costs.

It's more the technical team being careful enough with what they're doing and leaving stuff switched on that they probably should have switched off. It's a very different mindset, isn't it?.

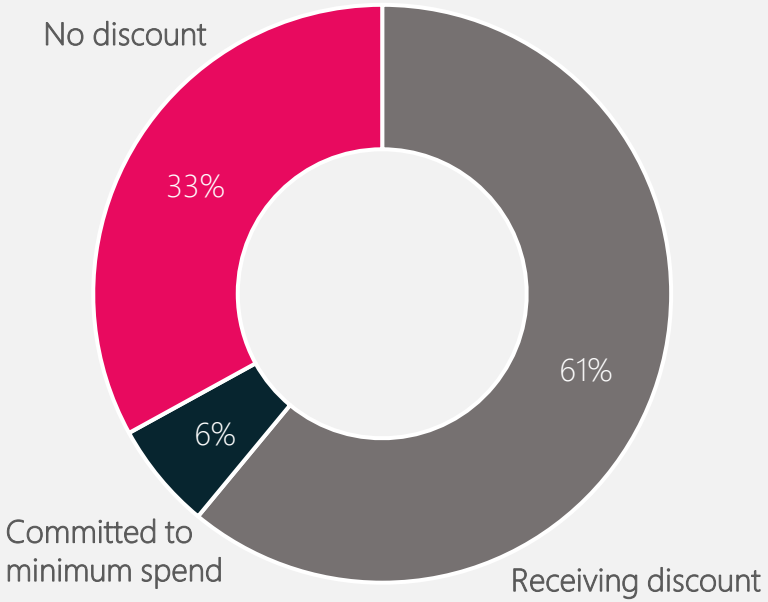
Others are using (or seeking to use) external consultants to help with cost management

We're looking at a way around that by employing a third-party service to point technology at the cloud and say you haven't used that for X years or that looks like a duplicate. That service tends to pay for itself quickly because it's so easy to lose control.

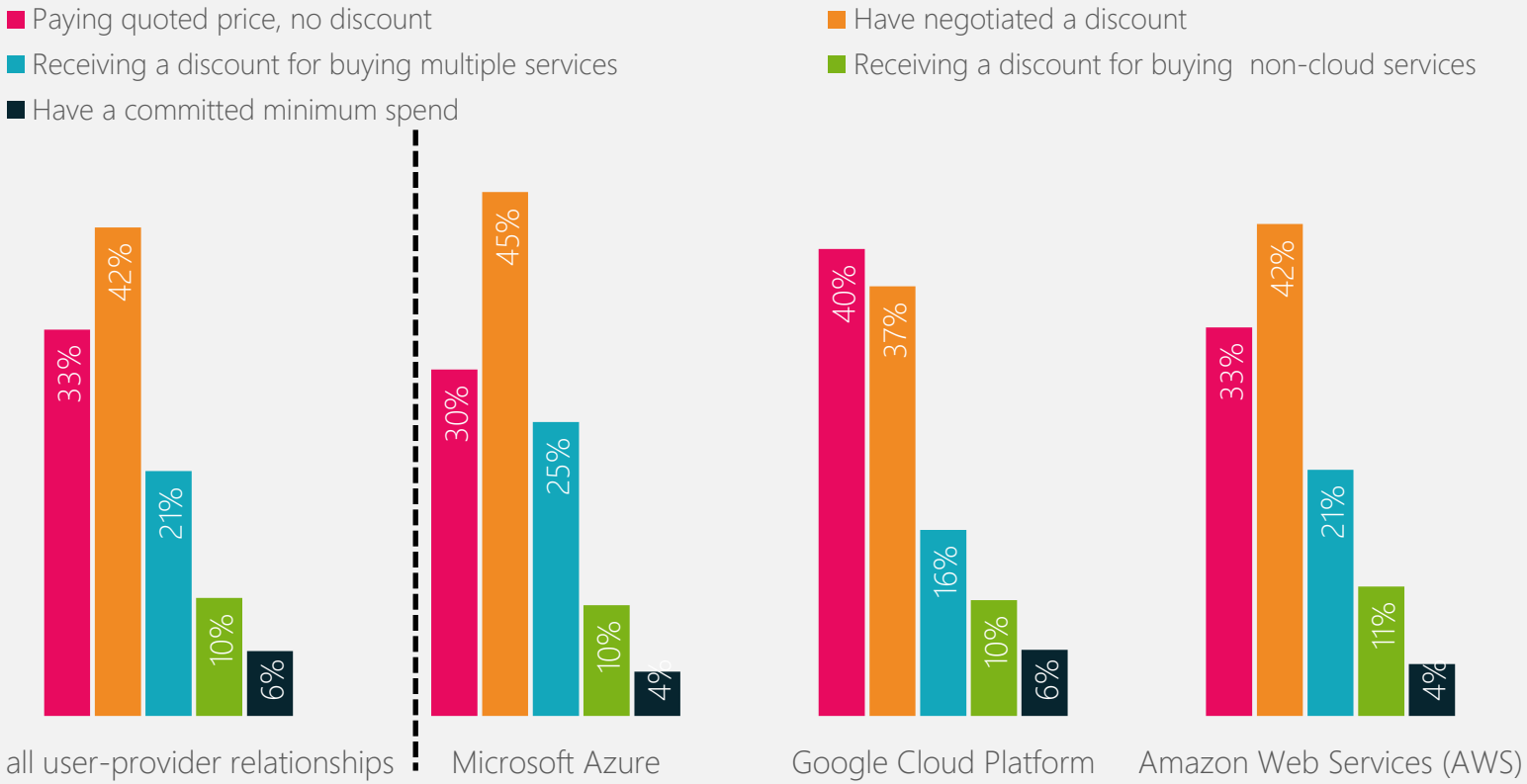
Overarching training needs to happen to make sure we are using it in the right way and not wasting money. We are going to work with a third-party AWS partner to make sure we are using it efficiently to reduce spend

Most users surveyed are receiving discounts of some sort; Azure users are less likely to pay quoted price and more likely to receive discounts

Contract feature – discounts and minimum spend



Contract features, by provider



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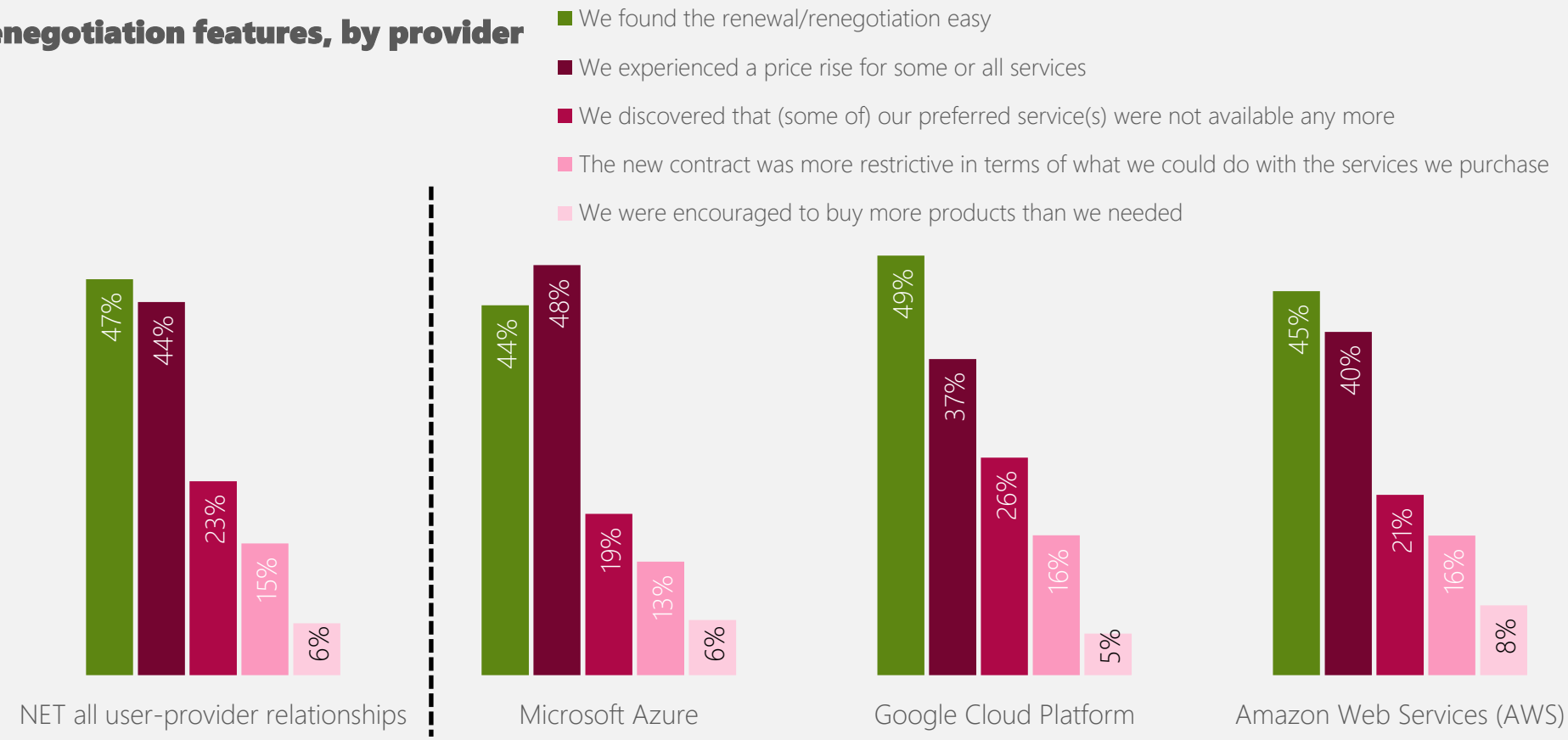
Q41. Please say which of the following apply to the prices and contracts you have from the providers you are using. Base: All brand average (n=1,683 records), Microsoft (n=419), AWS (n=269), Google (n=281)

Almost half of Azure users surveyed in this study experienced price rises when renewing, more than with AWS and Google

58%

Is the proportion of cases where customers have renewed or renegotiated a contract with their current supplier(s)

Renegotiation features, by provider



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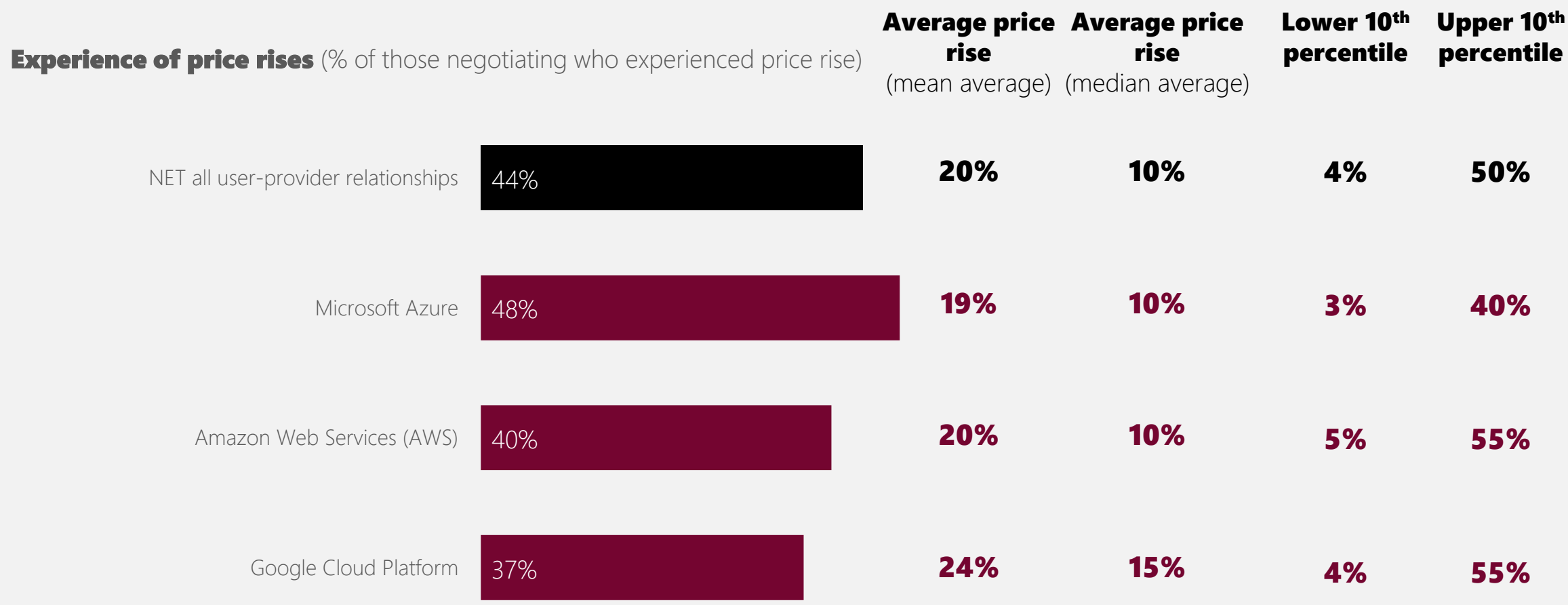
Q42. Have you renewed or renegotiated a contract with the suppliers you are currently using? Base: All brand average (n=1,683)
Q43. Which of the following applied when you negotiated or renewed your contract? Please select all that apply.. Base: All brand average (n=968 records), Microsoft (n=232), AWS (n=146), Google (n=164)

Price rises are relatively common and can be steep, with average increases around 20% being experienced across leading vendors



Q44. You said you experienced a price rise. Please estimate by how much overall did the price rise?
Base: All brand average (n=425 records), Microsoft (n=112), AWS (n=59), Google (n=61)

6

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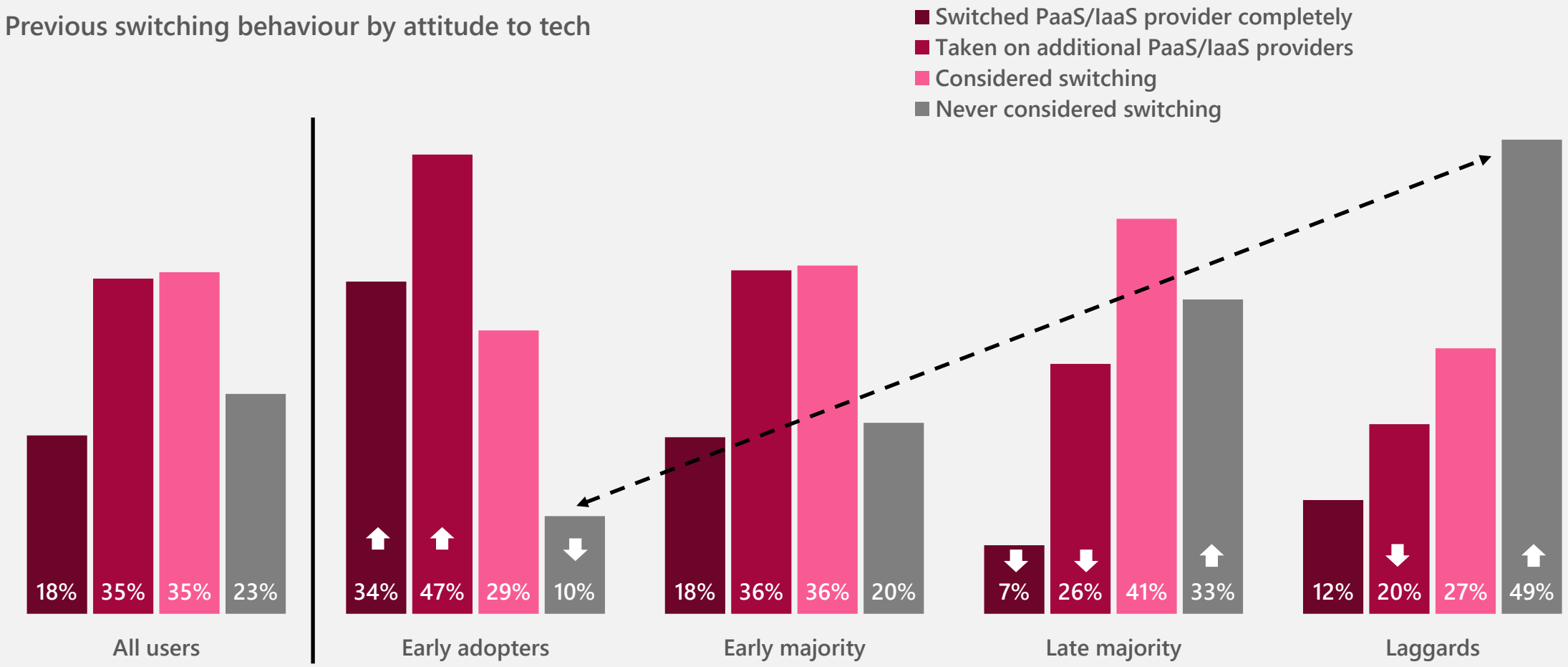
Service and supplier switching

6.1

Please note that the views presented in this section are those of the respondents to our survey. They do not represent the views of Context Consulting or of Ofcom.

Extent and experiences of switching

Around 1 in 5 firms surveyed in this study have switched IaaS / PaaS provider, while over a third have added additional providers; both are driven by early adopters



Significant difference – higher than total

Significant difference – lower than total

Q47. Have you ever done the following? Base: All cloud users (n=889); Early adopters (n=198), Early majority (n=400), Late majority (n=240), Laggards (n=51). * NB. Tech adoption stage descriptors in the left-hand side chart are based on responses to Q67. Which of the following best describes your company's attitude to investing in new technology for your business? Respondents were asked which of these four categories best describes the company's attitude to investing in technology.

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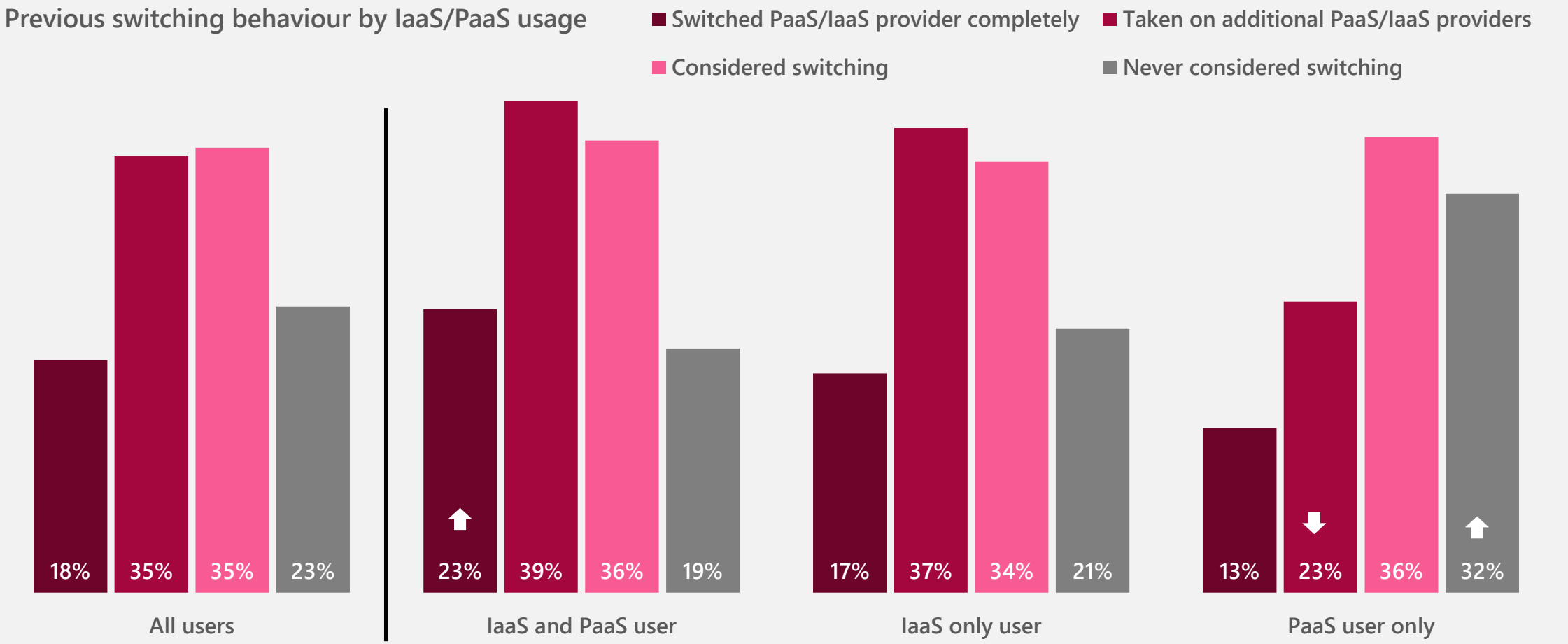
Those who use <u>both</u> IaaS and PaaS are most likely to have switched. Those only using PaaS are less likely to have considered switching

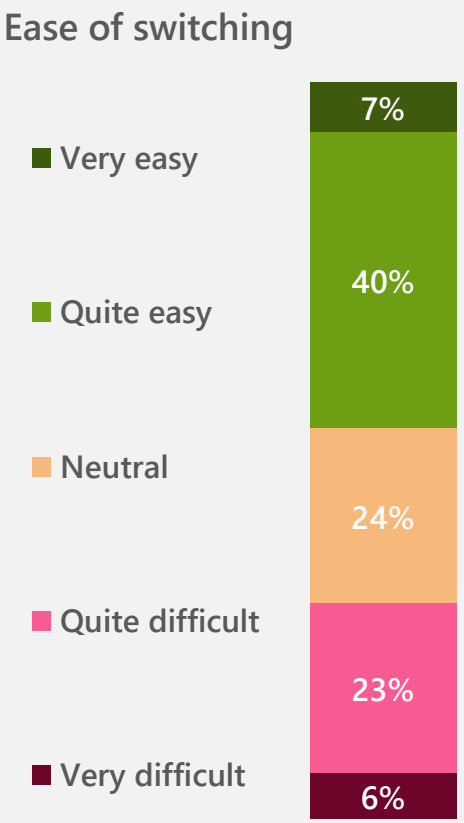


Q47. Have you ever done the following? Base: All cloud users (n=889); IaaS and PaaS user (n=351), IaaS user only (n=339), PaaS user only (n=199)

Some of those who in our study who said they have switched found it easy, but a significant minority experienced difficulties

18%

Have switched provider completely



Price, security and improved features were the key reasons for switching provider

[To get] better features and greater value for money whilst providing enhanced flexibility

[We were] incurring incredibly high price increases, a drop in performance and lack of communication from the previous provider.

The price kept increasing and we also had security concerns

We wanted a cheaper price in general plus more tools for my business

They offered better features at more affordable prices.

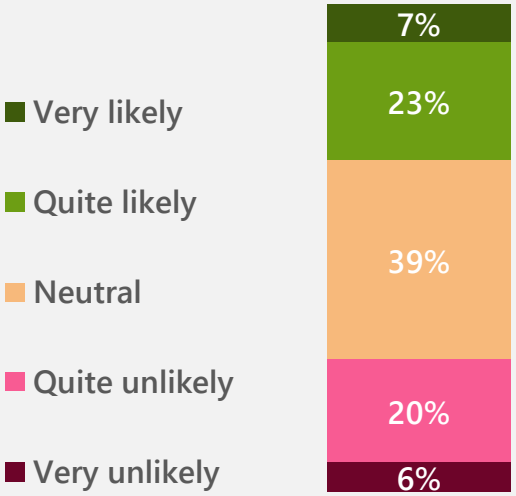
Wanted to try out new providers and to de-centralise things

Q48: How easy or difficult was it to switch to a new provider? Base: those who have switched provider completely (n=164)

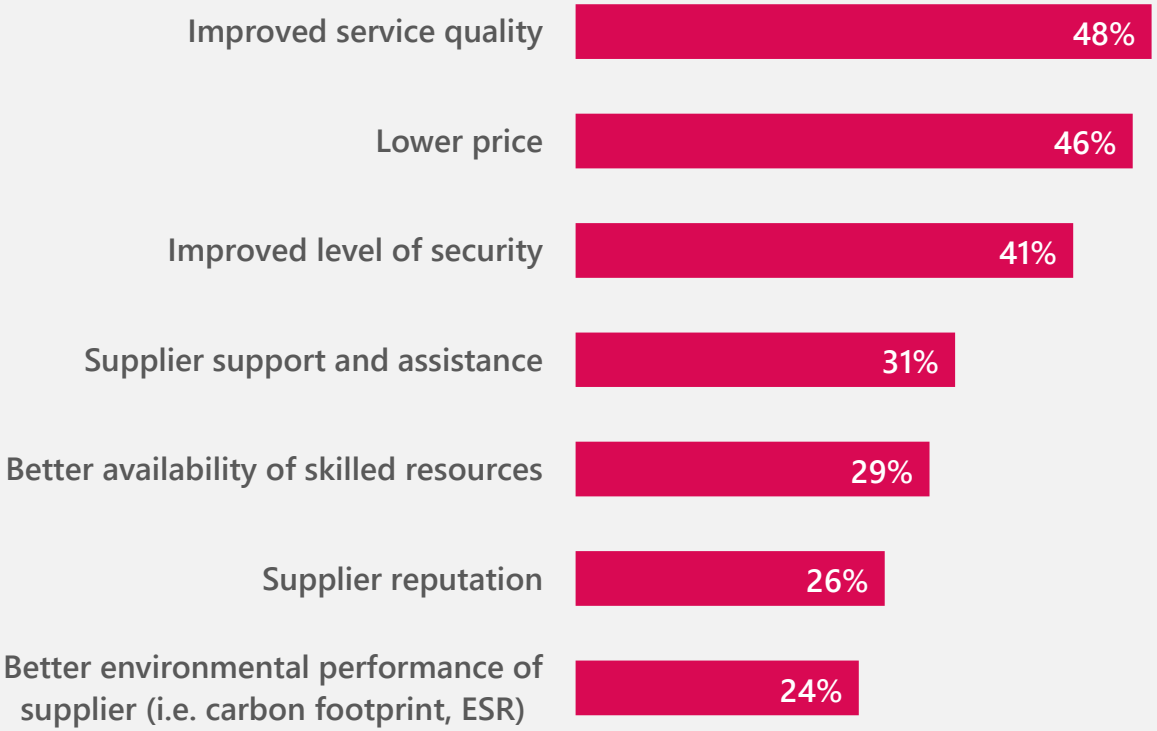
Nearly a third in the sample feel they are likely to switch in the future, triggered by improved service quality, lower prices or better security

82% Have never switched

Likelihood of switching in future



Triggers that would prompt switching



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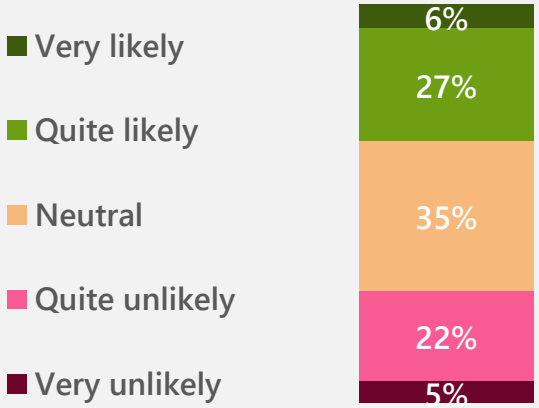
Q47: Have you ever done the following? Base: IaaS/PaaS users (n=889)
Q51: How likely are you to completely switch to a different provider for IaaS/Paas in the future? Base: Those who have not switched (n=725)
Q54. What would prompt you to completely switch to a different provider for your PaaS/IaaS services? Base: all users (n=889)

A third of those who haven't yet added a provider are likely to do so, enticed by a better price, service or security

65%

Have not added a new provider

Likelihood of adding provider in future



Triggers that would prompt adding new supplier

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Q47: Have you ever done the following? Base: IaaS/PaaS users (n=889)
Q55: How likely are you to add a different provider for IaaS/Paas in the future to use alongside your current one(s)? Base: Those who have not taken on additional IaaS/PaaS providers (n=581)
Q56. What would prompt you to add a different provider for your PaaS/IaaS services alongside your current one(s)? Base: all users (n=889)

However, our qualitative research suggests that much of the switching found in our survey might be examples of switching from data centres to IaaS/PaaS rather than between IaaS/PaaS providers

The qualitative research process uncovered limited evidence of switching …

- We encountered few if any examples of organisations **switching away** from one of the hyperscalers
- The switching we found was typically from a **data centre to an IaaS / PaaS environment**
- In some cases, firms were **adding additional platforms** (e.g., bringing AWS onboard alongside Azure)
- It is still **relatively early** in the adoption journey for most companies, and they are evaluating progress rather than looking to make significant changes
- In most cases, firms are still **on the way in, not out**, of their IaaS / PaaS environments
- Switching tends to be done with a relatively **small portion of data and workloads,** moving from one minority provider to another
- **PaaS is considered to present greater technical challenges** from a switching perspective compared with IaaS. However, in practice, both PaaS and IaaS can be difficult to switch from.

… together with limited desire to do so

- There is **huge inertia** preventing a switch and companies are eager to **avoid the disruption** this would entail
- Switching typically happens as a **last resort** because the provider failed in both account management and technical aspects
- As mentioned already, most decision-makers acknowledge that a **de facto lock-in exists**
- However, this is primarily a function of **internal factors** rather than **provider-imposed restrictions**

> *We are stuck, **held hostage but we are willingly stuck**! The cost to move and **disruption to move is significant**. Moving to cloud is a **one-time thing** and if Microsoft moved in a direction that didn't work for us, we would look to **slowly migrate away** and build up infrastructure elsewhere, but gradually, one application at a time.*

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Given this inertia, something very significant would need to happen to prompt a switch away from a cloud platform …

A massive price hike

This would need to be very substantial to overcome to costs of switching, or else an incredible deal were provided by a competitor

Very unsatisfactory technical performance

Specifically, this could include major outages and unreliability, or failing to meet SLAs repeatedly

Account management and support failure

A complete breakdown of support and account management relationships

Significant security concerns

Perhaps the most tangible example of what would force a switch, in the case of a provider being massively compromised

To reduce dependency on one supplier

This could be for both technical and / or commercial reasons

Again, less likely to force a switch away rather than the addition of new providers

Competitive commercial concerns

This has come up, in the case of companies working with competitors to AWS, where customers raised objections

This is not about something trivial. We'd need to be really angry about something for us to switch

We only switched because we didn't have any other choice. We did not find the previous provider met our needs, both in terms of Account Management and technically.

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Even in the case of a price hike, respondents are adamant that this would need to be drastic to force a switch

Price hike would need to be major to overcome to perceived pain of switching

It'd have to be not just a little bit cheaper; it'd have to really be worth switching over, looking at the whole cost of moving. There's a risk in moving anything. As long as we're happy with the service and the price is right there's little drive to move, but if the price was considerably better elsewhere, we'd look at moving.

I think any kind of commercial saving would be offset with the cost it would take to move.

The Dell cloud was very expensive, and we switched to Azure for the price and because most of our systems were already based on Microsoft.

Moving 45 APIs was a real challenge. I felt that our value-added reseller sugar-coated the switch to so we wouldn't second guess it. We ended up having to rewrite a lot of stuff from scratch, and didn't anticipate all the egress fees. Overall, costs more than doubled. I wouldn't switch again unless it were back to a private cloud where it's easier to predict and control.

The reason for switching from VMWare to Azure was that it offered security services that are much cheaper, because some of those services are even included at no cost. Another reason for the change is that we wanted to eliminate the dependency on VMWare as a service provider.

Price wise, it's probably not going to save enough money compared to the time and the money it would cost to move everything over; definitely not worth the cost saving.

Principal reasons to switch are strategic rather than technical, to reduce dependency on suppliers and to improve commercial terms

To reduce dependency on one supplier

We'd like to move to a multi-cloud environment for **resiliency**. However, the provider would have to ensure UK data sovereignty, security standards, and availability, so we're pretty unlikely to move from MS any time soon.

We are likely to move more to different cloud providers, but not to move what is already with one provider to another. **Adding not replacing.**

Competitive commercial concerns

If clients turned around and said **we won't work with you if you're on Microsoft** because it has been hacked so much, I don't think we would ever look to change so pretty much locked in!

Let's imagine **Microsoft were sold to [non-NATO based] investors and controlled by a foreign body**, then we'd have to switch. Or let's say they've doubled their price, or they did something quite drastic on their pricing models. But we're very risk adverse.

We were going down the AWS route at the beginning when we had to go to a bigger cloud provider. But a lot of our clients are the **big retailers** like Tesco and Walmart. When you tell them we're using AWS, they all suck their teeth because **they don't like giving money to Amazon.** **So, we evaluated Azure** to see if we could match the capabilities of AWS, and as we saw that Azure is ok and alleviates those concerns, it's a no brainer.

The companies interviewed that have actually switched generally encountered higher obstacles and costs than expected

In most cases, the experience was more challenging and much more expensive than anticipated

- Though the quantitative results suggest switching did not present great difficulties, the qualitative interviews tell a different story
- Many did not foresee data egress fees, only realising they were in the contract after having incurred them
- Costs overall were difficult to predict
- Downtime did not enter into the calculations
- Staff re-skilling was more difficult and time-consuming than anticipated, and the impact to productivity during the adjustment period was underestimated

> It was not as smooth as expected. Downtime was a big issue! We operate 24/7, and though we had only 48 hours of downtime, that is a lot of money to us! Talent was also an issue. We rely on partners to limit that risk but there's a talent war which they also suffer from. Talent scarcity impacts the whole eco-system.

A lack of experience meant that many of the switchers interviewed felt they were 'flying blind'

- Standardised migration pathways and best practices are lacking, meaning that companies lack clear guidelines
- Limited prior knowledge of how to avoid the pitfalls such as adopting more open approaches to solution architecture, avoiding hard coding, use of containers / integration layers
- PaaS poses particular challenges, as companies become more embedded than in case of IaaS and use multiple tools
- For some specific apps and services, firms resorted to building from scratch rather than migrating
- A minority commented that their VAR seemed to be overly confident and sugar-coated the switch experience
- Some expressed regret at the decision to switch, and state that if faced with the decision again, would either stay with the incumbent or migrate to a private cloud

6.2

Please note that the views presented in this section are those of the respondents to our survey. They do not represent the views of Context Consulting or of Ofcom.

Barriers to switching

Among barriers to switching are perceived effort, skills issues and dependency on ecosystems, with limited upside anticipated (1)

Perceived effort of switching is massive

Skills issues is a major barrier, for several reasons

Limited perceived upside, tempered further by risk aversion

Dependency on associated products and ecosystem

Data management concerns

Lack of a considered exit strategy

A minority are concerned about egress fees / vendor charges

In the Public Sector, some worry about inability to change / lack of control

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Among barriers to switching are perceived effort, skills issues and dependency on ecosystems, with limited upside anticipated (2)

Perceived effort of switching is massive

- Many firms consider the effort needed to migrate cloud provider as a barrier
- In many cases, the initial migration from on-premise to public cloud was more time consuming than anticipated

Skills issues is a major barrier, for several reasons

- The need to completely shift to a new environment made staff hiring and retraining an especially imposing obstacle
- Finding staff skilled in more than one cloud environment is rare and re-skilling is very difficult

Limited perceived upside, tempered further by risk aversion

- Limited perceptions of the potential upsides of switching between cloud providers
- This is especially true of IaaS, which is considered less differentiated than PaaS
- Potential downside risks often serve to deter switch

Dependency on associated products and ecosystem

- Most apps and services have been developed in ways that use short-cuts and take advantage of the architecture / code of one cloud, making it nearly impossible to migrate without massively updating.

Cost prediction is very hard, and the most dangerous part of the picture. You have assumptions about data quantity, data growth, archiving, etc., but it's easy to fall into the trap of estimating less than you actually end up using because you don't know what apps you will use, especially PaaS, which is pay-as-you-go.

If the company has quickly adopted cloud in an expedited fashion, without really optimising how they've built their applications, then they find it really a challenge from to move. It's a bit scary when they realise that an application is a bit rusted up, it's not really well architected in the first place, and moving it is going to require a major overhaul.

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Among barriers to switching are perceived effort, skills issues and dependency on ecosystems, with limited upside anticipated

Perceived effort of switching is massive

We would bring in a partner to do it, but our involvement would be massive - probably 7-8 people full-time for 12 months on the project plus the third party wanting several hundred thousand …

In terms of lock in, having seen the amount of effort it takes from moving from one to another, (not by design, just how it is) - it's a major exercise to migrate everything that might take a couple of years.

Skills issues is a major barrier, for several reasons

The barrier to change would be that right now with Microsoft everyone works correctly, and we do not find the benefit of changing.

A slightly hidden barrier is skills - the AWS environment is a bit different from MS environment as different tool; might lock yourself in from that as those are the skills you have invested in for your technical staff.

Limited perceived upside, tempered further by risk aversion

It's like any service switch – nervousness about breaking something, business continuity etc. – same sort of process as changing network providers or print. But maybe a bit more skin in the game for cloud.

If somebody said I could save £400k by switching, I would potentially save around £100k but could upset/disrupt people by switching - what have I achieved and what's the point?

Dependency on associated products and ecosystem

Moving away from Azure would be hard as we use more and more Azure-specific services, esp. PaaS and SaaS based services making it more difficult to move.

The main barrier would be integration issues because with Azure we believe we are able to control everything in that big pot – it just gives us slightly less likelihood of problems and compatibility issues.

Secondary barriers to switching are nonetheless significant

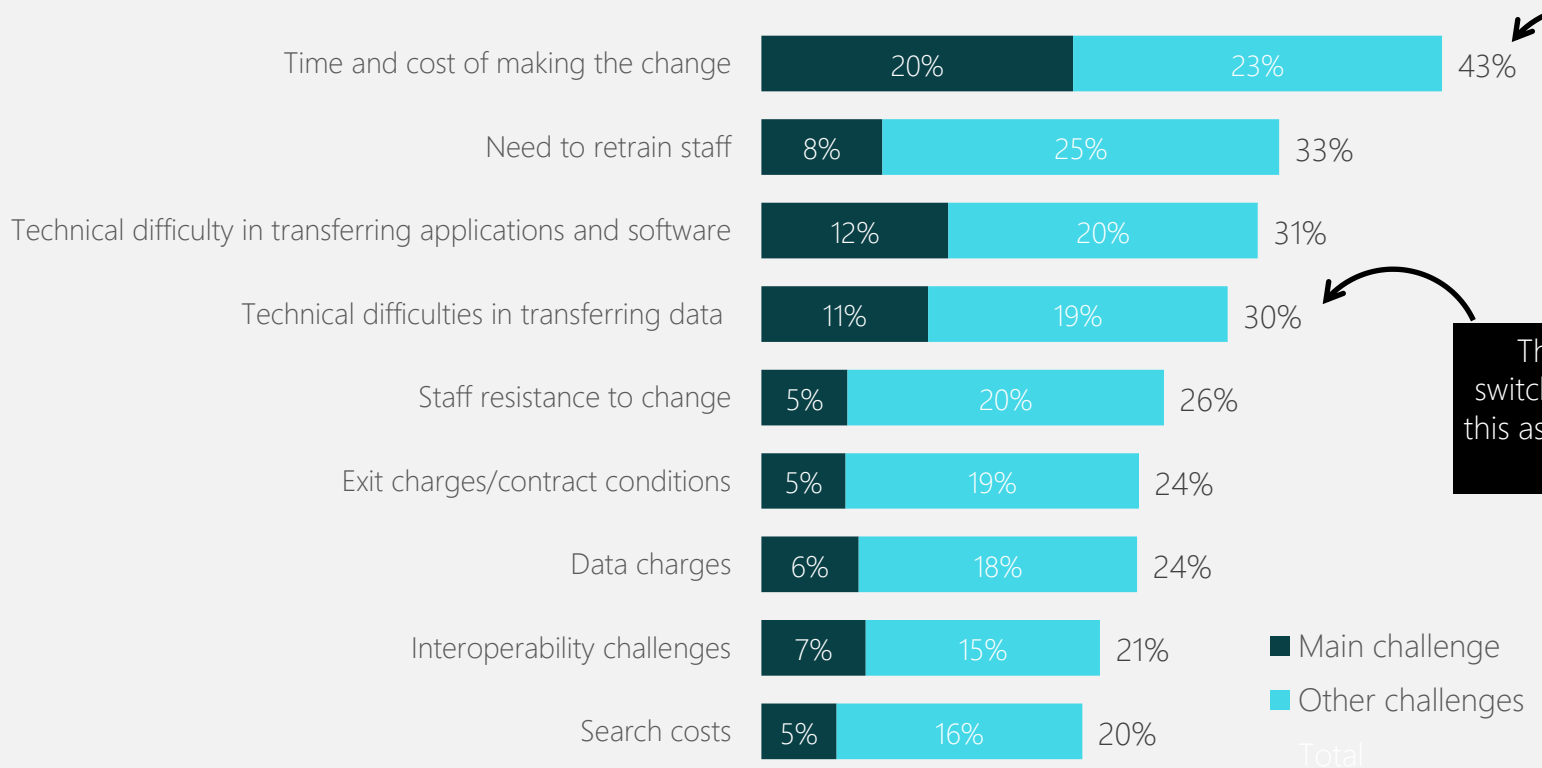
Data management concerns	Lack of a considered exit strategy	There is concern about egress fees / vendor charges	In the Public Sector, some worry about inability to change / lack of control
▪ Anticipated challenge of receiving data from existing provider and time needed to deal with this ▪ Potential need to build new integrations and APIs ▪ Administrative hassles are also anticipated by some	▪ Few organisations have seriously considered, much less planned, for such a switch ▪ A sign of the relative immaturity of firms in their cloud journey (still on the way in, not out!)	▪ The total cost of switching was difficult to predict requiring estimations for data quantity, fees, archiving, app use and staffing, compounded by a lack of expertise on both clouds to compare TCO	▪ Public sector respondents state they lack direct control over their cloud supplier arrangements ▪ Administration issues including governance and assurance processes could also be time consuming

Secondary barriers to switching are nonetheless significant; nearly all are internally driven rather than being 'created' by vendors

Data management concerns	Lack of a considered exit strategy	A few (not all) are concerned about egress fees / vendor charges	In the Public Sector, some worry about inability to change / lack of control
We'd have the pleasure of getting our data back from AWS and then we'd have to reengineer all the integrations that are already in place.	We're very aware we don't have an exit strategy and it's probably always a good idea to have one. I think we're kind of dipping our toe in the water a bit on this, so no, we've not really talked about that.	We have not encountered barriers when it comes to changing providers. Hypothetically if we wanted to switch from MS in the future, I think Microsoft charges an egress fee for data.	I think that would probably be at the highest level of [the organisation], so way above my pay grade, and outside the organisation will be the relationships that exist.
If we need to build a new API or new integration, in that case that might be quite time-consuming and expensive for us. So, that is another potential blocker.	That's a common failing. When people go changing, they don't always understand in-depth what it is they're changing, they haven't done their homework.	Because of the relationship with AWS and judging from their overly salesy behaviour, I think they would not be cooperative if we wanted to stop using their cloud. Switching would include data migration fees.	Getting a new supplier means an entire new assurance process and new paperwork and stuff like that. So, no one wants to do that.

Perceived time and cost of making the change are the main barriers to switching provider completely among our sample

Perceived challenges of switching provider completely (main challenges shown)



This is more of a concern to those who have not considered switching (55% see it as a challenge) than to those who have switched (34%)

Those who haven't considered switching nearly twice as likely to see this as a challenge (39%) as those who have switched (22%)

Q52. What do you see as the challenges of completely switching to a different provider for your PaaS/IaaS services?
Q53: And which of these is the main challenge? Base: all users (n=889)

Internal staff issues are important challenges to switching for those who've not switched or taken on new suppliers

Perceived/experience challenges of switching provider completely (top 5)

	Switched IaaS/PaaS supplier completely	Taken on additional IaaS/PaaS providers alongside current	Considered switching but didn't switch	Not considered switching
1	Time and cost of making the change	Time and cost of making the change	Time and cost of making the change	Time and cost of making the change
2	Technical difficulty in transferring applications and software (i.e. apps portability)	Technical difficulty in transferring applications and software (i.e. apps portability)	Need to retrain staff	Need to retrain staff
3	Need to retrain staff	Need to retrain staff	Technical difficulty in transferring applications and software (i.e. apps portability)	Technical difficulties in transferring data (i.e. data portability)
4	Search costs	Interoperability challenges	Technical difficulties in transferring data (i.e. data portability)	Technical difficulty in transferring applications and software (i.e. apps portability)
5	Would not be able to access mission critical services and applications from other cloud providers at a reasonable cost	Data charges	Staff resistance to change	Staff resistance to change

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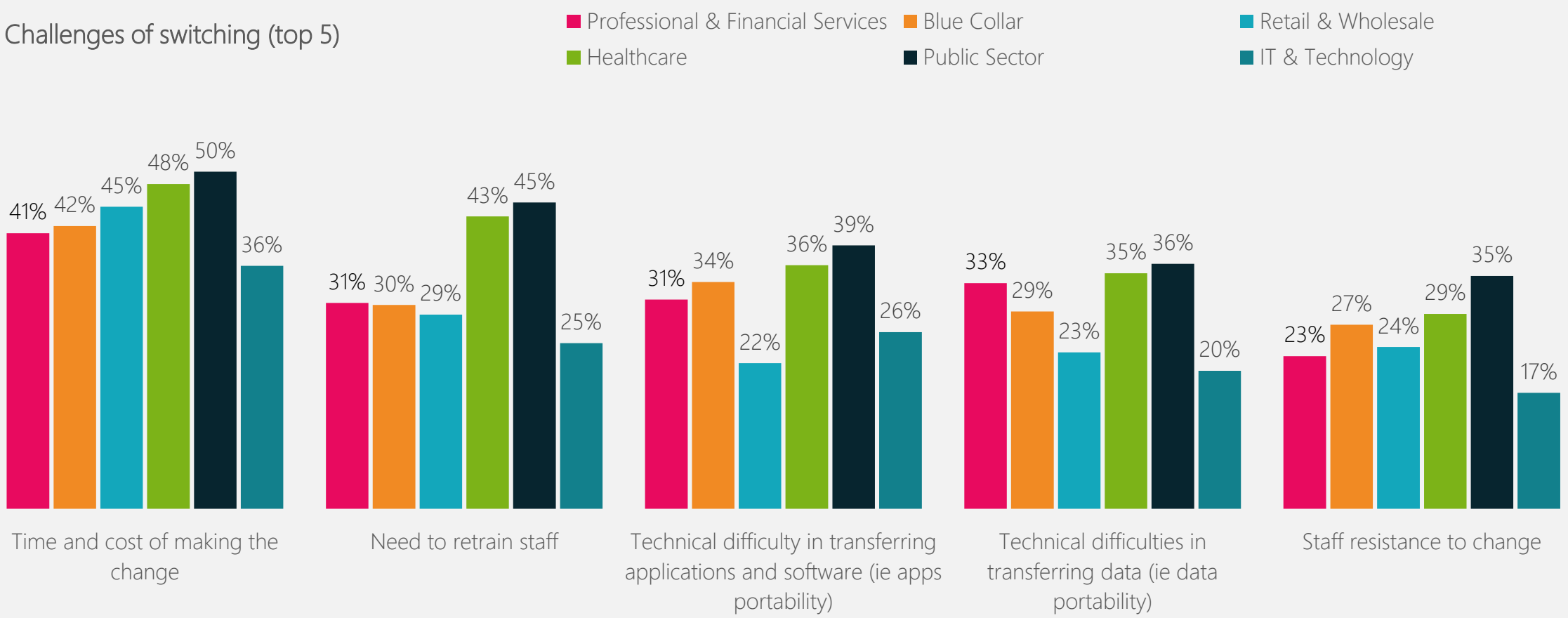
Barriers to switching PaaS/IaaS service supplier are apparent, albeit with some variations across industry sectors



Q52. What do you see as the challenges of completely switching to a different provider for your PaaS/IaaS services? Base: Prof & Fin Serv (n=203), Blue Collar (n=205), Retail & Wholesale (n=125), Healthcare (n=83), Public Sector (n=110), IT & Technology (n=122)

7

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Customer attitudes to competition in the cloud market

7.1

Please note that the views presented in this section are those of the respondents to our survey. They do not represent the views of Context Consulting or of Ofcom.

Perceptions of competition in the cloud computing market

Users of cloud computing services have very different perspectives on the effectiveness of competition in the sector

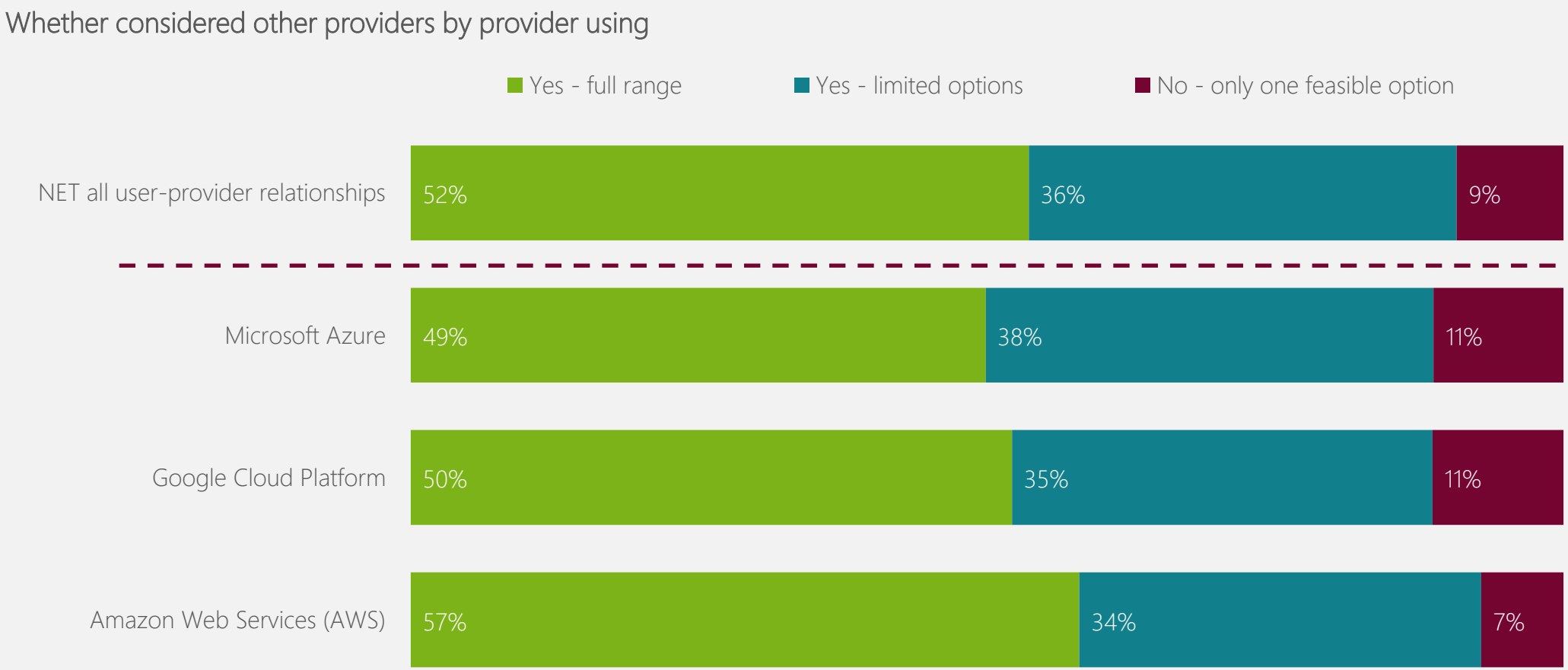
Some are broadly satisfied

- AWS and Microsoft are perceived to be large and stable suppliers offering cloud computing services which meet needs
- While a two-horse race, this is nonetheless competition, and they 'keep each other honest'
- Customers see them being proactive and flexible
- Some are seeing new competitors start to emerge
- Google is seen as an emerging player with strengths in PaaS / AI, but is still a distant third
- Oracle, SAP and smaller players, are rarely mentioned, with on-prem and private clouds being the primary alternatives to the big public cloud providers
- There is also a degree of 'blissful ignorance,' especially among smaller and less sophisticated firms

While others have serious concerns

- Microsoft and AWS are too powerful for many respondents, who feel beholden to these vendors
- The lack of competition is singled out by some, who would welcome more varied competition
- The lack of UK-hosted players is noted by a few
- Even among some who are happy today, there is concern the 'big two' will start to squeeze customers
- These express the view that the situation will become worse and not better

Very few businesses felt they had no choice of provider when they made their selection of cloud computing provider



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Q27 Did you consider other providers at the time you selected [current provider]? Base: Net all brands (n=1,536 records), Microsoft Azure (n=404), AWS (n=243), Google (n=265)

A good proportion of respondents are relatively sanguine about the competitiveness of the market

We knew that Azure or AWS would do the job. We didn't have any concerns that one would be better than the other. There are differences perhaps in the way they are managed and the ease in what they are managed, there's differences perhaps in the recruiting skills in the same way that there is always a challenge in recruiting people with Cisco skills - they are more expensive because there is more demand.

I believe that the market for suppliers is changing. A few years ago, when we first did our research there were only three real suppliers, but now other smaller suppliers are appearing.

You think to yourself Google, Amazon, Microsoft aren't going to go bust. There's a safety to them as well. They are strong.

There is limited choice, but there is choice; it's not like AWS or nothing. It's a little bit like the hardware, if you look at what we do in terms of hardware platforms, it's like Cisco or Aruba or nothing. But it absolutely goes back to you, and you never get fired for buying IBM.

At the moment market is competitive and they are keeping themselves honest. Microsoft are driven to help you to get in there and to get you to stay there by giving you value-added services.

There's healthy competition in the market - to a considerable degree it is a duopoly but there is still healthy competition as the alternative is very strong and competitive. Google is not out of the question; clear third at the moment but could be a viable option if necessary.

I think the pool of potential providers is quite correct. There are two or three companies that can offer a very good service. There are the best-known ones such as Microsoft, Google and Amazon, but there are also small ones like Ionos.

I think it's always going to be the three major players. I guess you don't have huge choice, but it's never been an issue for us

Context Consulting

Others express disquiet about the lack of competition in the market and the impact this has on customers … and a feeling it will get worse

I think longer term it's **going to become even more of a closed market** as even more companies that haven't embraced cloud-working will eventually start to move over and will only move over to Microsoft or AWS.

We need ten Amazons, not one. I'm not a fan of monopolies and duopolies, **there's going to be a problem because once companies are hooked**, Microsoft and AWS will jack up the prices down the line. There's a problem coming for sure.

I think **if anything the field will narrow** and there will be fewer players, like there are in other markets like hardware. The big players can offer things that the smaller players can't.

There are two large companies that have **cornered the market**. And when a small player begins to gain traction, they are bought by one of those two, so there will continue to be an absence of medium-sized players.

I have no complaints. It's working fine for me, but obviously I don't think it's **not good to see a duopolistic situation anywhere**, but there will just be two winners in this whole cloud.

There is competition in appearance, but **in reality, there is no competition**. It is true that there are several companies that offer cloud services, but the overall environment is Microsoft and that makes everyone end up with Microsoft, and they dominate the market.

Microsoft and AWS are too powerful in the view of some interviewees, who feel beholden to these vendors, even if things appear ok right now

We know there's a big landscape out there, but **we only look at Microsoft and Amazon Web Services** that that's the two we're only seriously considering for several reasons.

If you wanted to do a competitive tender, you'd be **very quickly falling off a cliff to find your third and fourth tender.** You then very quickly get into people that are offering you something that looks a lot more like a hosted, managed service than pure cloud.

I don't see how in that space you can compete with the big guns and make money from it. I see it as a **very closed market** at the minute.

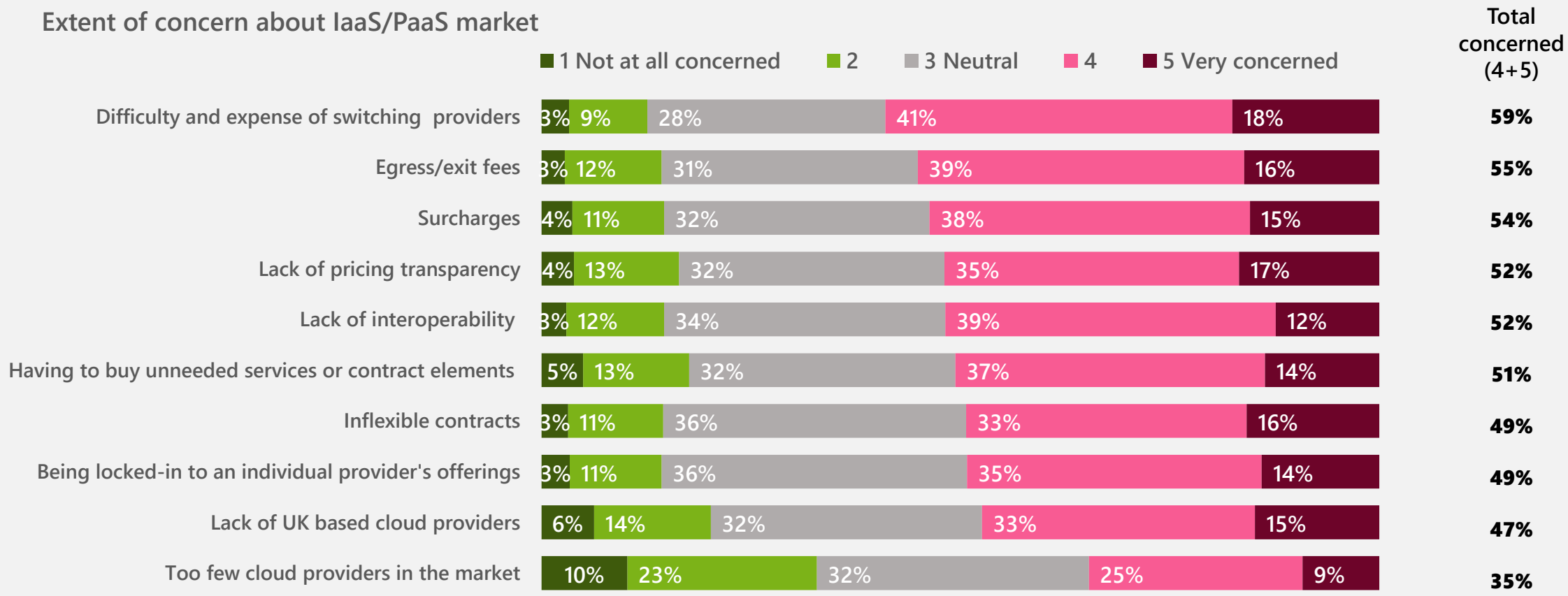
There's certainly one or two players who have **massive market dominance** because of the volume of investment they've had to make. They make Google look small, these two.

Is there real choice where I can switch easily to another provider like I can with broadband? No, because these services and systems are so complex. We are **very much beholden to Microsoft.**

I used to use Rackspace back in the days. Obviously, there's Amazon, as a big player. But **apart from these three, I wouldn't be able to recommend anything**. I don't really think about the choice as Azure are so good.

It's not a major issue for us that there aren't other providers out there but if other providers were there and competed well with Microsoft then it would keep their prices down which would help us. **We all want competition in place to keep Microsoft honest**. We want the benefits of a competitive market but don't want to switch from Microsoft.

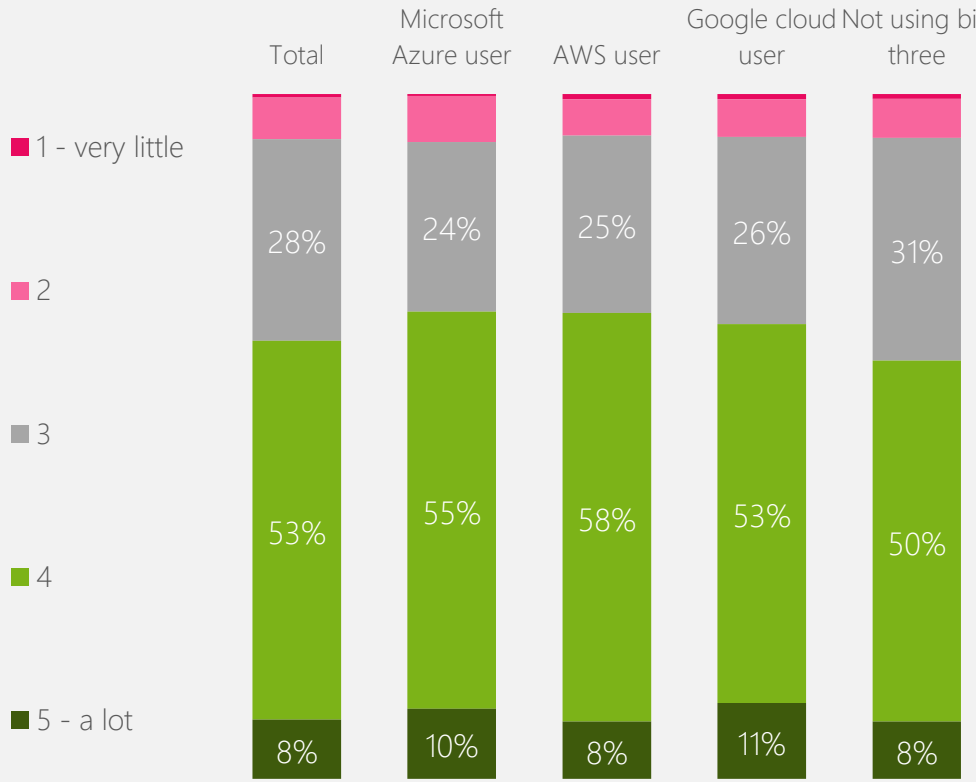
Businesses surveyed are concerned about various aspects of the way the cloud market works – difficulty and expense (including egress fees) are key



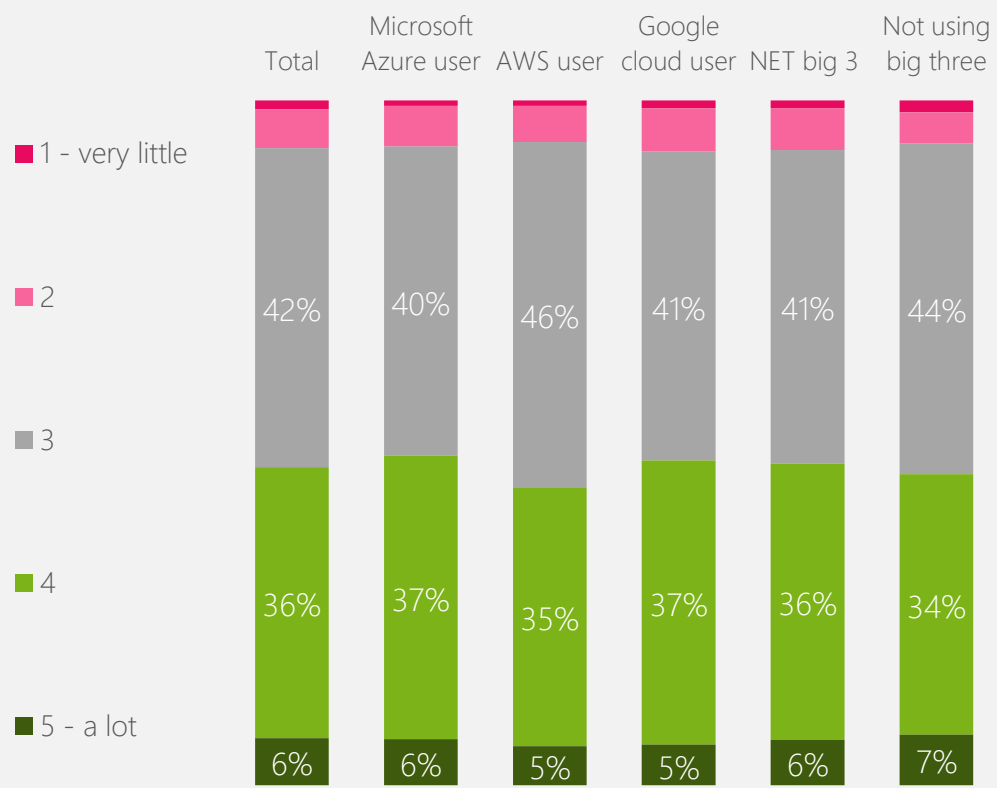
Q63. How concerned are you and your company about each of the following aspects of the IaaS/PaaS market? Base: total (n=1004)

A majority of businesses surveyed believe there is competition in the market for IaaS services, but fewer believe this was case in PaaS

Perceived competition in the IaaS market



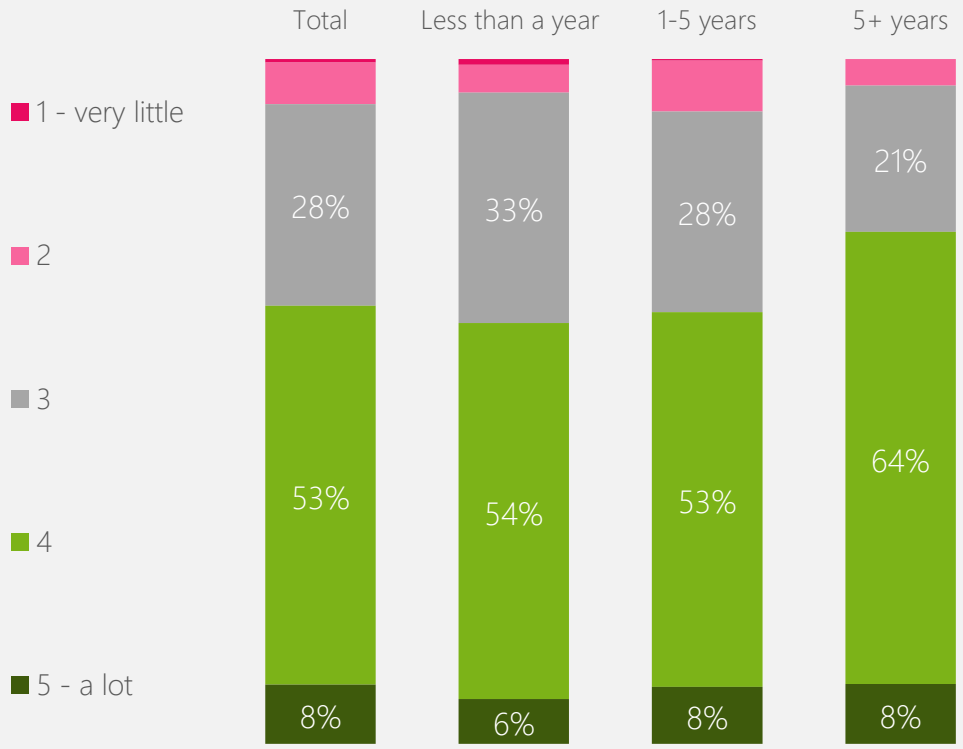
Perceived competition in the PaaS market



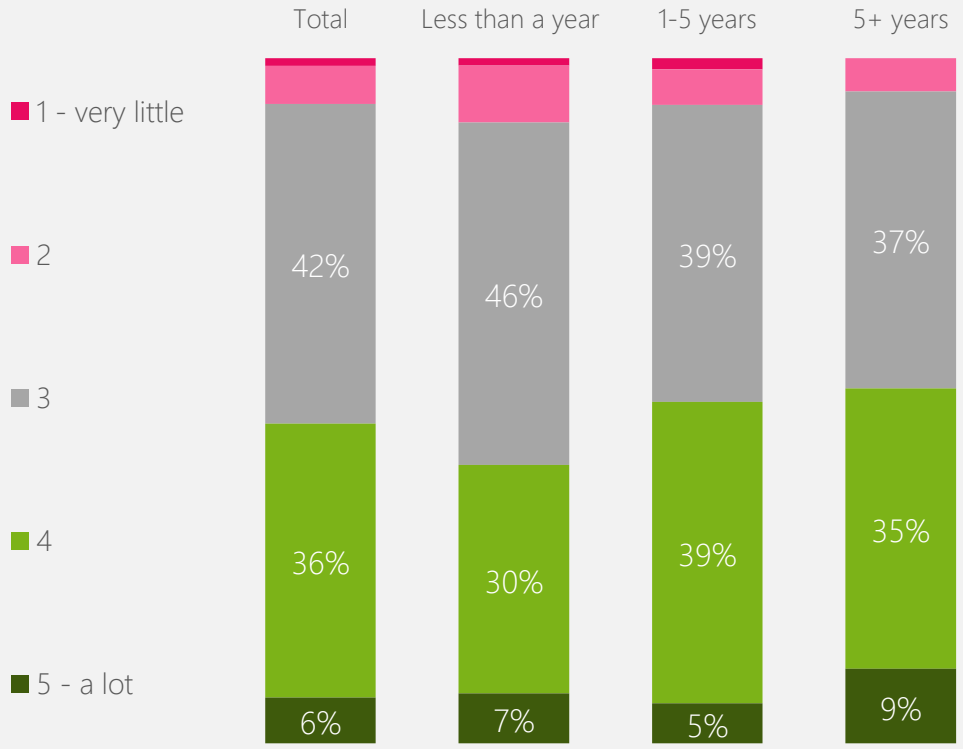
Q57: Overall, how much competition do you think there is in the market for cloud IaaS services?
Q60: Overall, how much competition do you think there is in the market for cloud PaaS services?
Base: All (n=1004); Azure user (n=419), AWS user (n=269), Google user (n=281); IaaS/PaaS user not using big 3 (n=314)

Those who've used IaaS for a longer period of time think there is a good deal of competition in the cloud market, but less so in PaaS

Perceived competition in the IaaS market



Perceived competition in the PaaS market



Q57: Overall, how much competition do you think there is in the market for cloud IaaS services? Base all IaaS users (n=690), <1 year ago (n=125), 1-5 years ago (N=458), 5+ years ago (n=107)
Q60: Overall, how much competition do you think there is in the market for cloud PaaS services? Base all PaaS users (n=550), <1 year ago (n=105), 1-5 years ago (N=347), 5+ years ago (n=98)

Some respondents in our qualitative research told us they are contacted by multiple providers, with a range of offers and pricing initiatives and hence perceive competition to be strong

There are not just one or two main suppliers these days there are multiple who competing in a similar space.

We are often approached by various third parties offering us incentivised deals

There are over 8 providers that are reputable

The technology from the vendors is the same, and the competition is mainly in professional services.

There's lots of different IaaS companies to choose from with varying pros and cons

There have been a lot of price cuts recently which means there must be incredible competition

I think we'll see more competition in the market because it's the main place to store info and data. We cannot rely on just our own storage anymore as there is so much we have to store these days.

There are a lot of good companies and services to choose from and it took us time to review them all and see which was best for our business needs

Wide variety of providers offering competitive prices. Providers are regularly investing in becoming more technologically advanced and to stand out.

There are so many out there with different features that are better or worse then others

I can name at least 15 providers

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Some respondents feel there are fewer suppliers than they would like and that they lack a full degree of choice

Because the big companies dominate the market unfortunately

Having researched potential providers to switch to, more through curiosity, it was increasingly difficult to find a high number of competition.

I have not heard of many providers, and all my peers and colleagues use the same providers as us

It seems like providers are more focused on gaining 'clean' customers (that is, those who are starting to use Cloud largely for the first time), rather than focusing on established customers of other providers who would need expensive and difficult migration of services from an existing provider to a new provider. That is, providers become less interested when they know you already have some Cloud services with another provider, this results in less competition.

For the size of our effort there seem too few. I accept that there are lots of upcoming providers we could invest in, but we are a risk averse organisation

I don't think it's as developed yet as it will become.

It's dominated by a few big players only and there are large barriers to entry for others

Only a limited number of suppliers are really tip top in their approach to running and the cost of the services and as such there is very little variation in their pricing structure.

Sounds like a cartel to me, sometimes

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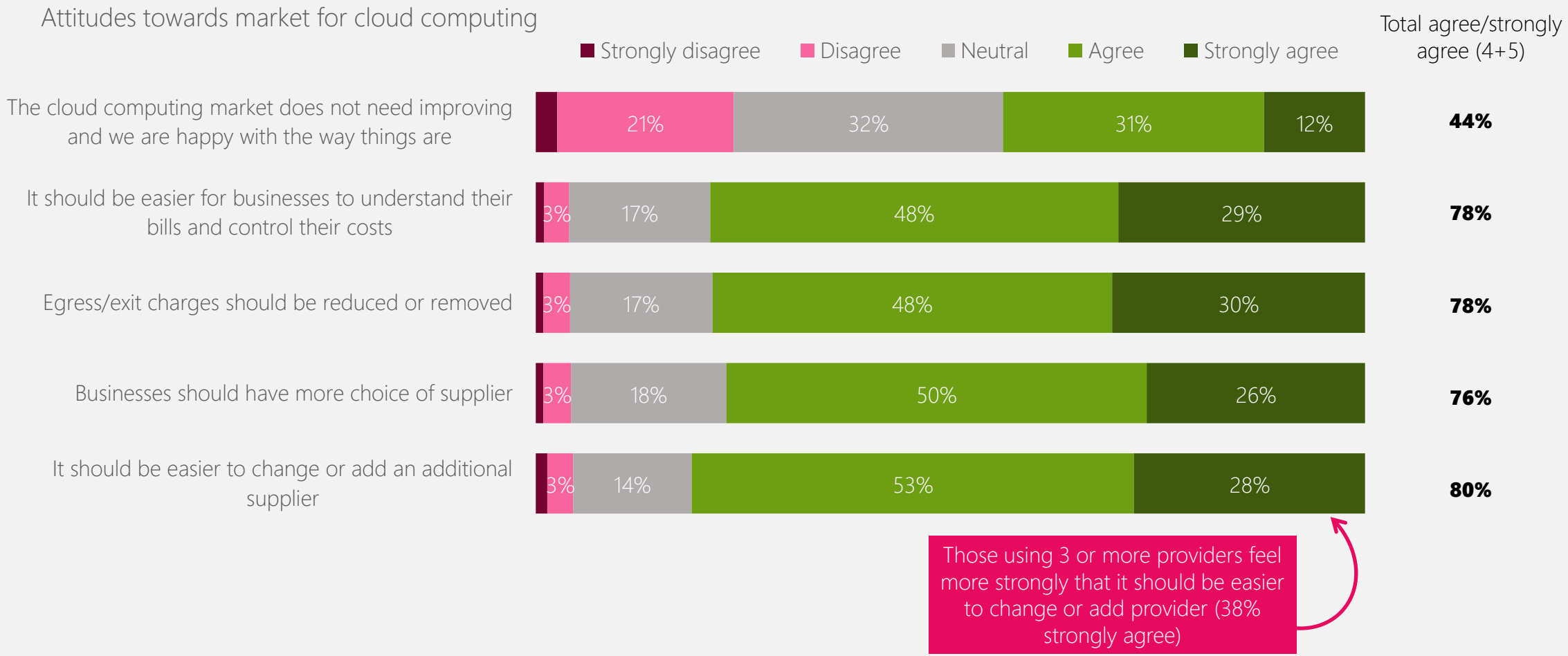
A majority of businesses believe the cloud computing market could be improved, especially around billing transparency, fees and choice



Q65. To what extent do you agree with the following statements about the market for cloud computing? Base: All (n=1004)

7.2

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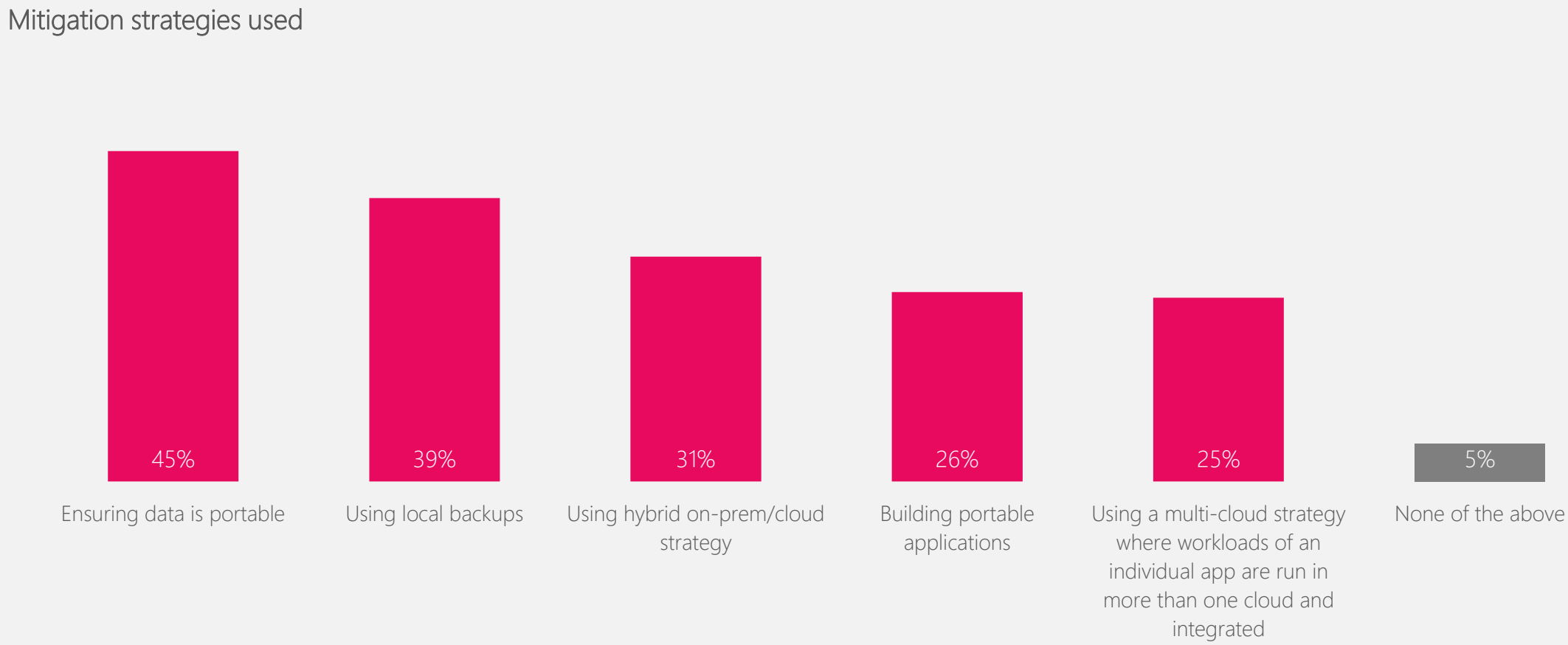
What are organisations doing to mitigate concerns?

Most organisations surveyed have taken some action to mitigate the potential for cloud lock-in – ensuring data portability is the biggest

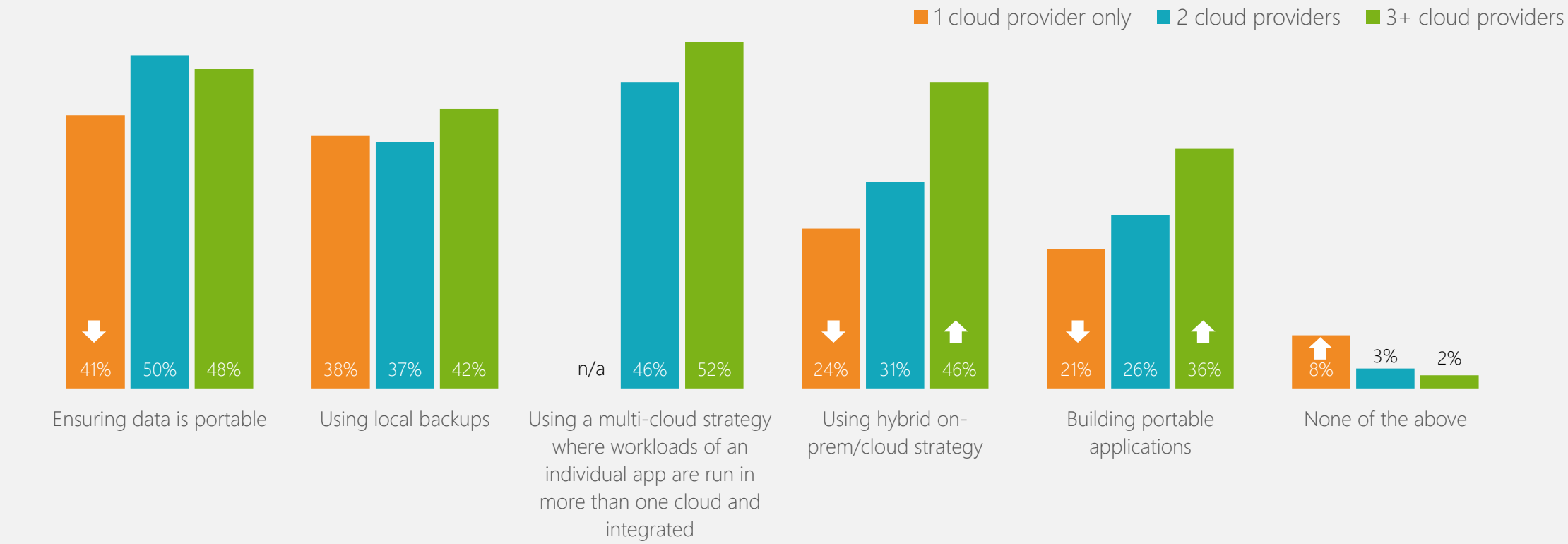


Q64. What actions, if any, has your company taken to mitigate the potential for cloud lock-in? Base: All cloud users (n=889)

We note that some respondents said they are 'using a multi-cloud strategy where workloads of an individual app are run across different clouds and integrated'. This group of respondents includes a mix of customers keeping workloads separate across different providers, customers who are spreading similar workloads across providers and customers who use their secondary providers for back-up purposes. As such, we consider this response is unlikely to refer solely to a specific multi-cloud architecture.

Among our sample, those with three or more cloud providers employ a greater range of mitigation strategies

Mitigation strategies used by number of providers used



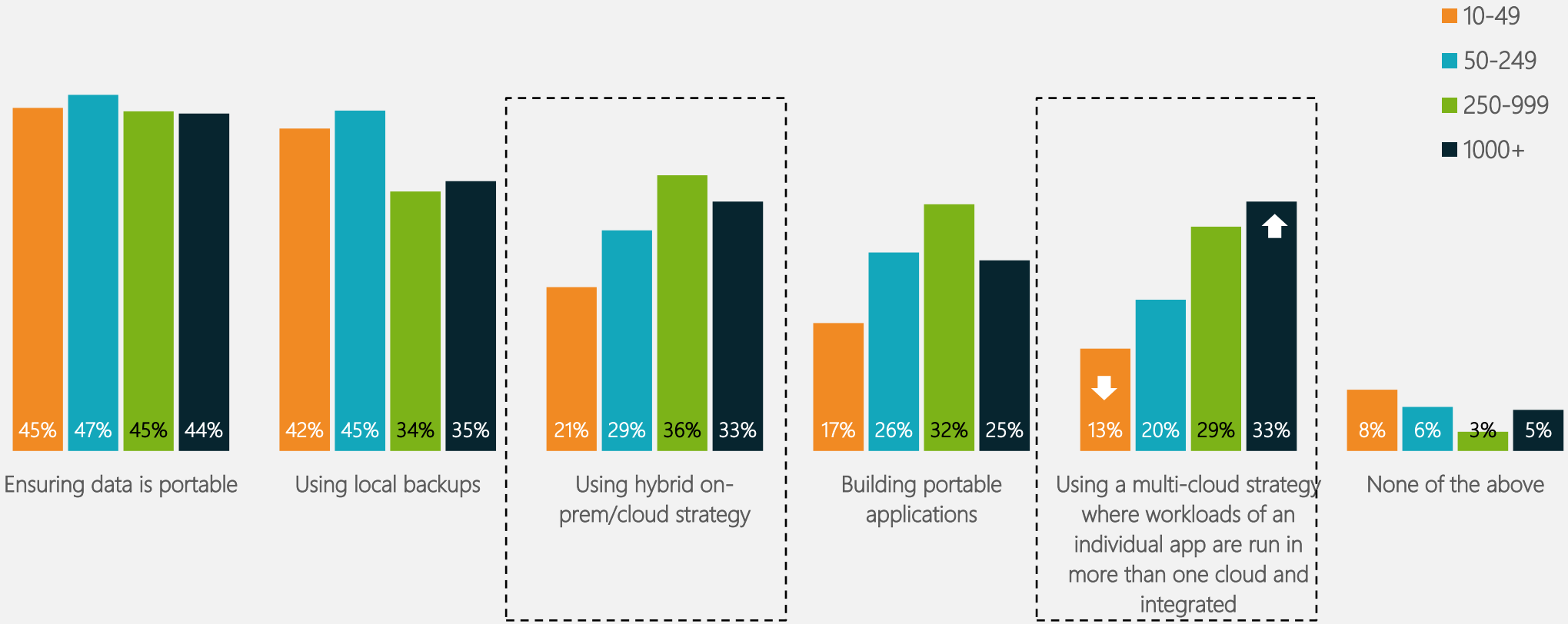
Q64. What actions, if any, has your company taken to mitigate the potential for cloud lock-in? Base: 1 provider (n=421), 2 providers (n=262), 3+ providers (n=197)

⇧ Significant difference – higher than total

⇩ Significant difference – lower than total

Portable data is used as a mitigation strategy across company sizes while a multi-cloud or hybrid approach is more widely used in larger firms

Mitigation strategies used by size of organisation



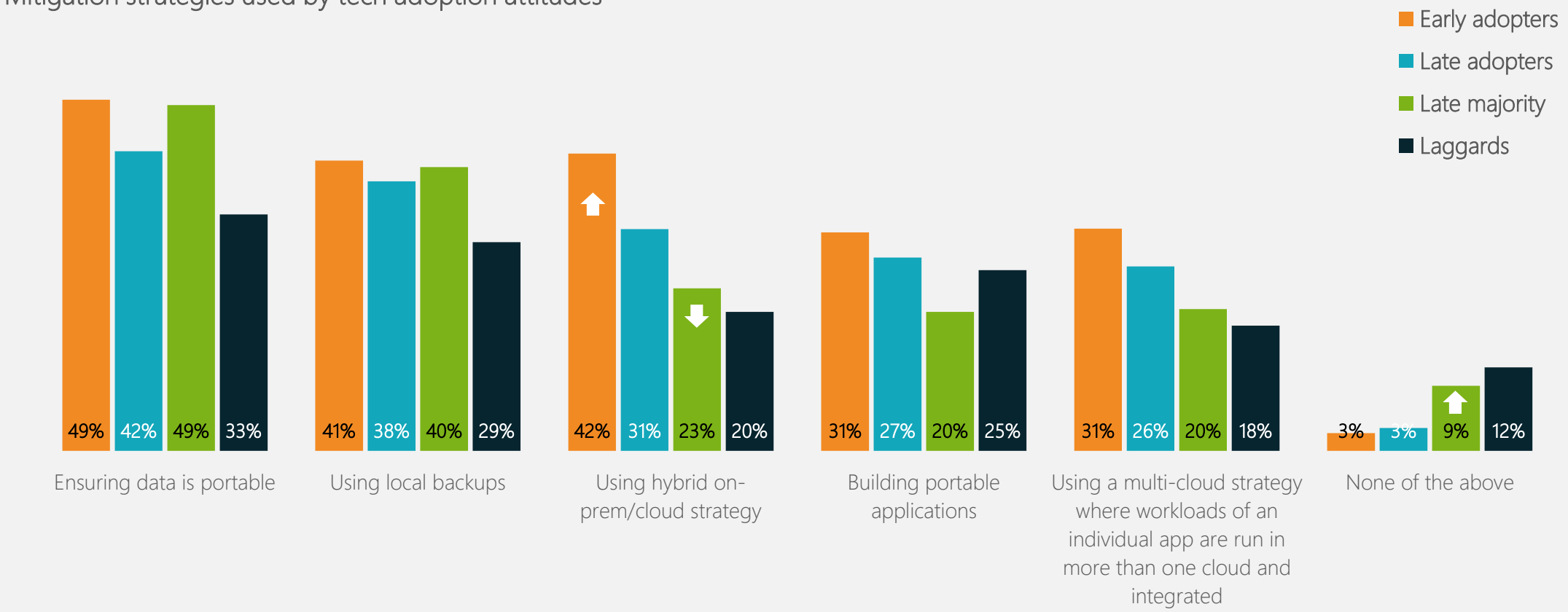
Significant difference – higher than total

Significant difference – lower than total

Q64. What actions, if any, has your company taken to mitigate the potential for cloud lock-in? Base: IaaS/PaaS users; 10-49 emp (n=149), 50-249 emp (n=242), 250-999 emp (n=238), 1000+ emp (n=260)

Early adopters more likely to use a hybrid strategy as mitigation

Mitigation strategies used by tech adoption attitudes



Significant difference – higher than total

Significant difference – lower than total

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Q64. What actions, if any, has your company taken to mitigate the potential for cloud lock-in? Base: IaaS/PaaS users; Early adopters (n=198), Early majority (n=399), Late majority (n=239), Laggards (n=51);

Some companies interviewed would welcome limited doses of remedies to help increase competition and curtail bad experiences

A few suggest a helpful push for smaller players

- Many would welcome policies designed to help smaller players gain a foothold in the market
- However, while this sounds great in theory, many struggle to see how this would work in practice
- Some actually prefer to see only two or three highly stable and reliable providers, hoping that with fewer players interoperability will be more easily achieved

The majority of firms seek greater transparency in pricing, and better tools for cost monitoring and control

- Increased transparency around pricing and being able to predict and monitor costs.
- Mitigation of frequent changes in pricing models which can include steep price hikes.
- Caps on unexpected costs, especially on data egress fees, both between providers, and between tenancies within a provider
- Caps on usage fees and measures to automatically disconnect users during inactivity
- Measures and tools to monitor and optimise usage and costs

Companies are simply not always aware, in part because of immaturity, but also the total cost of ownership is hard to understand when you are new to the cloud. It's common to be burned by all the charges. That is when third party consultants can be effective to help move data around more efficiently.

Azure and AWS are trying to help and have come out recently with tools to manage costs better, but most companies have turned to using third parties to optimise cloud use. Smaller companies, especially, have less bargaining power and knowledge and so really need those tools.

Education, and dissemination of best practices are key remedies that are currently sorely lacking

Education on best practices would be welcome

- Education is needed on best practices on how to monitor and reduce costs, including how to engage with cloud providers, architect solutions in optimal ways, and train IT teams on how to avoid unnecessary usage fees
- Similarly, best practices are needed for adopting multi-cloud, architecting solutions to ensure that switching is a viable option, and generally on how to avoid lock-in. This includes education on open approaches to architecting, avoiding hard coding, developing via integration layers, etc.
- Another suggestion is education and training of developers to work more effectively in multi-cloud environments so that re-skilling is easier and skill sets can be more readily transferred

It depends on how you architect things in the first instance. If you do hard-coded integrations and point-to-point connections, this makes it hard to move apps. If you use a more advanced approach with integration layers, like the Azure integration layer, you can separate the target from the source, so it is more portable, and it is a more powerful way to do the enterprise architecture.

Companies are being hit by high costs, but they are also suffering because of badly architected solutions. There is a lack of understanding of how to skilfully build the solution for multi-cloud and for potentially switching.

We've developed expertise in the 'smart design' of apps, architecting in open ways that make it possible to develop and have things work across clouds. And if in the future we wanted to switch we could because we have it designed the right way.

Many argue that standards around interoperability and openness are the most essential elements needed

The need for standardised migration pathways for switching and openness standards for multi-cloud was stressed

- Many argue that the main overarching need is for **standards to ensure greater interoperability** and **make switching a more viable option**
- Some referenced regulations that have been implemented around consumers being able to easily **port their phone numbers, utilities or bank accounts**
- While it is understood that cloud providers seek to find ways to differentiate themselves with unique features and services, a **core set of standard options** could be established in order to facilitate comparisons between providers and switching
- Standards around security guarantees are also lacking

Lots of cloud consultancies are providing advice due to the lack of standard migration pathways. [Regulators] could implement a standard pathway in cloud like when you move electricity provider or bank account. It is a commodity, and you shouldn't have to pay through the teeth to move. Consultancies exist to help provide that smart advice, but that's only really open to large companies. Standard frameworks are needed to help companies work in a multi-cloud environment and know what they are signing up to over several years. There is a need for education because there are lots of traps and pitfalls. You have to be very careful! This is what [regulators] could help with.

Trying to get different clouds to work together is an absolute nightmare because the vendors don't talk to each other. The standards are all slightly different and that delayed our project by nine months. There was no clear pathway to enable integrations and collaboration, so we had to do it all ourselves. The problem with the commercial models of the vendors is that they are completely different and for deliberate reasons. Vendors don't want to make it easy to move outside their stack.

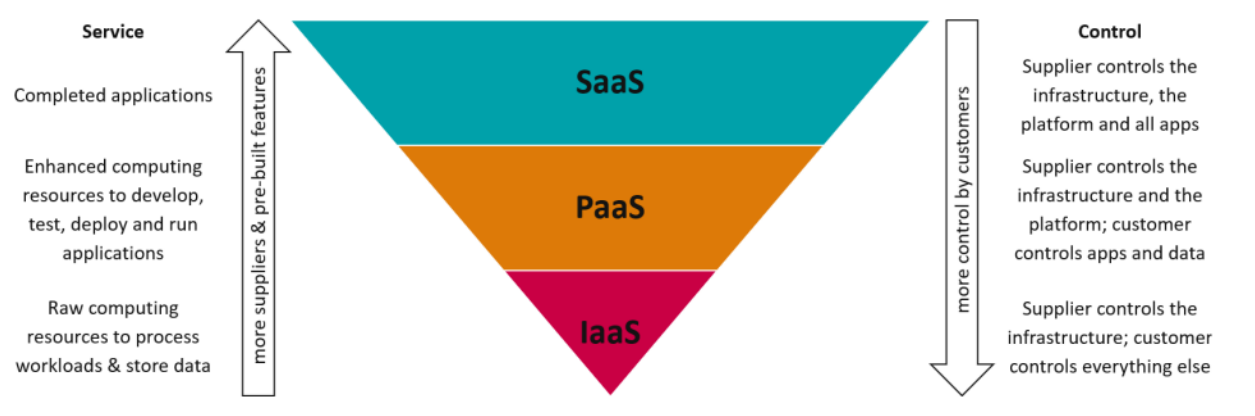
[Regulators] could push vendors to really enable interoperability in a way that users can freely move from one cloud to another, and allow that a specific app can be spread across clouds. This is similar to what happened in the networking world, where vendors like Cisco have had to phase out proprietary standards. So they compete on value-add, not exclusivity.

Appendix

Definition of Cloud Computing Service Models

IaaS, PaaS and SaaS are distinct cloud computing service models, offering different levels of control and ownership over IT elements

The Cloud Computing Stack

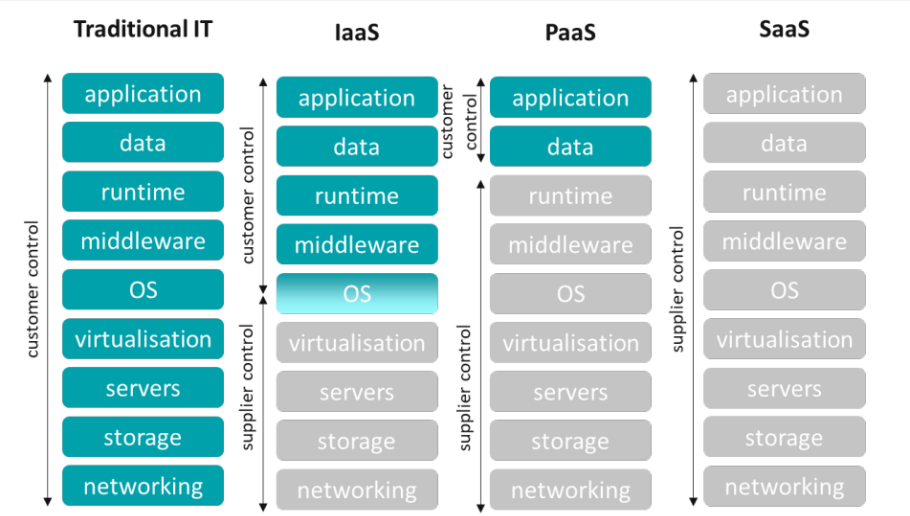


Cloud services provide access to computing resources on demand, via a network. The customer buys access to the computing resources as a service and typically does not own the underlying hardware and software. There are three key elements to this definition:

- Computing resources – these include hardware (servers and network equipment) and software (applications) which are used to process workloads and store data.
- On demand – the computing resources are available on a scalable and elastic basis. This typically involves the dynamic provision of virtualised computing resources. Users are often billed for the amount of resource used.
- Via a network – the transit of data to and from the cloud provider may be over the public internet or a private connection. This allows location-independent access to the cloud.

A simple introduction to cloud computing service models

Vertical stack for traditional IT and cloud computing



- The diagram on the left shows how each of the cloud service models varies in terms of **which IT layers are controlled** by customers and supplier.
- These models contrast with the **traditional IT model**, where customers are responsible for all layers of the 'IT stack'.
- This study is concerned with **IaaS and PaaS**, which are referred to collectively as **cloud infrastructure services**.
- The following slides provide **simple definitions** of IaaS, PaaS and SaaS.

Context Consulting

Infrastructure as a Service (IaaS): Simple definition

- Infrastructure as a service (IaaS) are cloud services that provide access to raw computing resources for processing workloads and storing data.
- These computing resources are in the form of servers and networking equipment owned and managed by the IaaS provider (and typically held on racks in a remote data centre).
- To allow and manage that access, IaaS also includes some necessary software, including networking (e.g. firewall) and virtualisation. The customer has the highest level of control over the cloud stack, including over the operating system, applications and data.
- Examples of IaaS include AWS EC2, Microsoft Azure Virtual Machines and Google Compute Engine – which can be used by business customers, for example, to store data and install software.
- IaaS should be distinguished from bare metal services, which offer access to dedicated servers with no or limited software installed (e.g. no operating system or virtualisation).

Platform as a Service (PaaS): Simple definition

- Platform as a service (PaaS) are cloud services that provide access to a virtual environment for customers to develop, test, deploy and run applications.
- These include application development computing platforms and pre-built application components and tools which customers can then use to build and manage full applications. Key types of PaaS services include, analytics, containers, machine learning and IoT (internet of things).
- The overall virtual environment and the underlying raw computing resources are typically owned and managed by the same cloud provider. However, the individual PaaS services (computing platforms, and/or pre-built application components and tools) may be supplied by the cloud provider or by independent software vendors (ISVs).
- The customer has less control over the cloud stack compared to IaaS: they still manage applications and data, but not the PaaS computing platform (including its operating system) or the pre-built application components and tools. Examples of PaaS products include AWS Elastic Beanstalk, Microsoft Azure DevOps and Google App Engine – which can be used, for example, to build SVoD services.

Software as a Service (SaaS): Simple definition

- Software as a service (SaaS) are complete applications hosted in the cloud. These cloud applications can be offered by the cloud provider that owns the underlying raw computing resources or by an ISV. The provider of the SaaS service manages all hardware and software.
- In general, most modern consumer- and business-facing applications are SaaS, including communications services (e.g. Gmail and WhatsApp), BVoD services (e.g. BBC iPlayer), productivity software (e.g. Microsoft Office 365 and Google Workspace) and customer relationship management software (e.g. Salesforce Sales Cloud).
- Estimates of the size of the UK market for SaaS vary given difficulties determining the boundaries of SaaS, but it is likely to be larger than public IaaS and public PaaS combined.