

**Teaching and  
Learning**

**Campus  
Administration**

**Research**

# Evolution of Cloud in Education

*Independent research undertaken by Vector Consulting*

Commissioned by Cisco

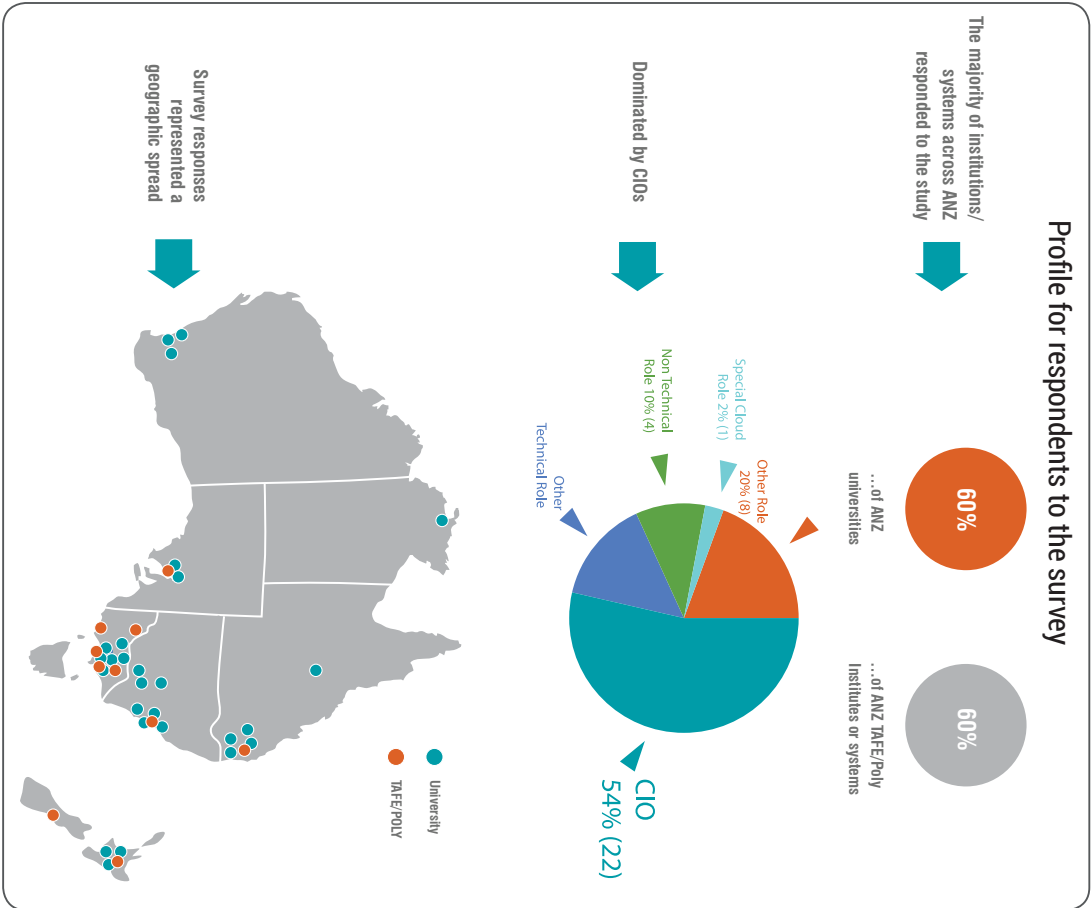
Report Author: Brad Davies



# About the study

Higher education and training providers are frequently early adopters of new technology, in part because they serve particularly technologically demanding cohorts in the form of students and researchers.

Vector Consulting was commissioned by Cisco Australia and New Zealand to better understand the role and impact of cloud in higher education and training. For the purposes of this report, 'cloud' is predominantly focused on infrastructure as a service or cloud-based infrastructure. The study included desktop research, targeted interviews and a comprehensive survey, which forms the basis for this report. The survey was distributed electronically to Australian and New Zealand institutions to better understand their current views about where cloud was having the most impact and how they were planning for cloud. The survey was in field for two weeks and all individual responses were provided.



# The changing landscape for institutes and systems

## Perfect storm of rising expectations, changing business models and constrained funding

The higher education and vocational training sectors are facing a perfect storm of challenges driven by changes in society and the economy at a domestic and global level. Students, researchers and staff expect to consume technology easily and instantly but budgets for technology are being squeezed by reduced government funding.

## Organisational agility is now a competitive advantage

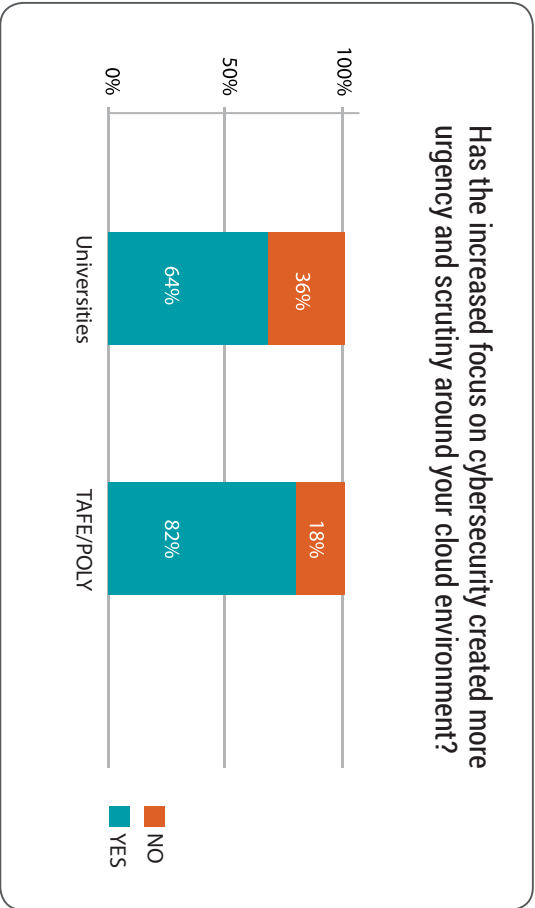
The only feasible way institutions can do more with the same or less resources is to transform their businesses and innovate processes, business models and delivery platforms. To do that, institutes need to be more agile, efficient and responsive. The mantra in universities, TAFEs and polytechnics is not just about taking cost out of their operations but taking complexity out so they can scale up or down quickly and be flexible to changing needs and business models.

## Institutes have two primary levers to improve performance and differentiate: digital and innovation

Student outcomes, research impact and commercial returns are the higher-order goals of education and training institutions. Consultations with higher education and training executives stress that it's the outcomes that matter, not the technology. But in 2018 the technology does matter. The vast majority of disruption occurring in the education and training sector is being driven, one way or another, by technology. It is influencing how learning content is created and consumed, how datasets are accessed and analysed, how researchers collaborate, how operating models drive efficiency, how systems talk to sensors and how economies and labour markets are reconfigured.

Cloud is one of a number of technologies that is having a profound impact on the competitiveness, relevance and effectiveness of education and training institutions. The study revealed that scrutiny of cloud was also being influenced by growing concerns around cyber security and fact that the training of cyber security talent is now a major market for universities and TAFEs. This theme has been explored deeply as part of the Cisco's international study tours in vocational education and training.

Figure 1 : The focus on cybersecurity is materially impacting scrutiny on cloud planning and budgets



# Imperatives for institution technology

In researching this report it was necessary to understand what was driving universities and TAFE institutions to invest in technology. The consultations revealed a mix of business and technology outcomes that were being sought across the sector. In summary, institutions' technology investments are being driven by the need to:

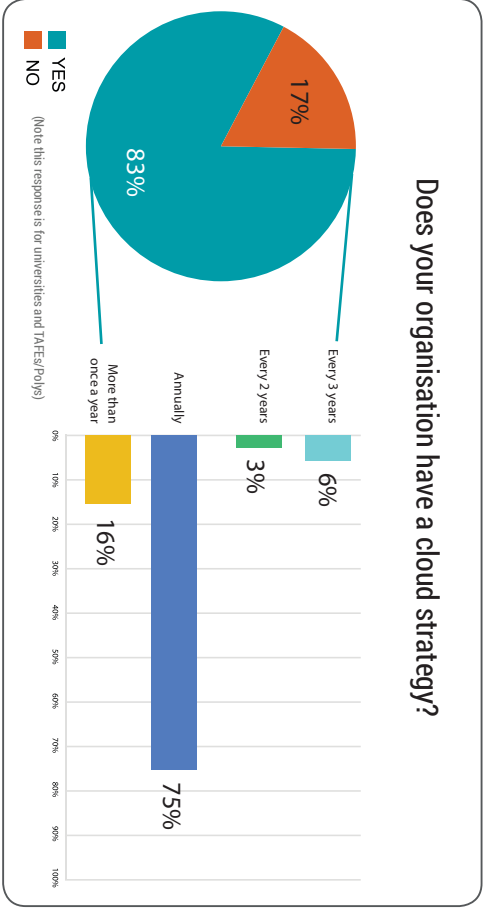
- Deliver high quality and continuous service to students, staff and researchers
- Maximise application performance including legacy applications
- Provide a comprehensive range of solutions to fit any learning style, budget or IT environment
- Improve ease of use that minimises the need for training and human interventions
- Automate and simplify where possible and appropriate
- De-risk deployment of new technologies and ensure ease of integration
- Secure vital assets including virtual assets, data and systems
- Scale for growth opportunities in online student market and new business models (See quote below in relation to the magnitude and importance of scale):

*"The demand for higher education will grow from 160,000,000 to 410,000,000" students*  
– Lev Gonick, CIO of Arizona State University at the 2018 Cisco Higher Education Study Tour

## How institutions are planning for cloud

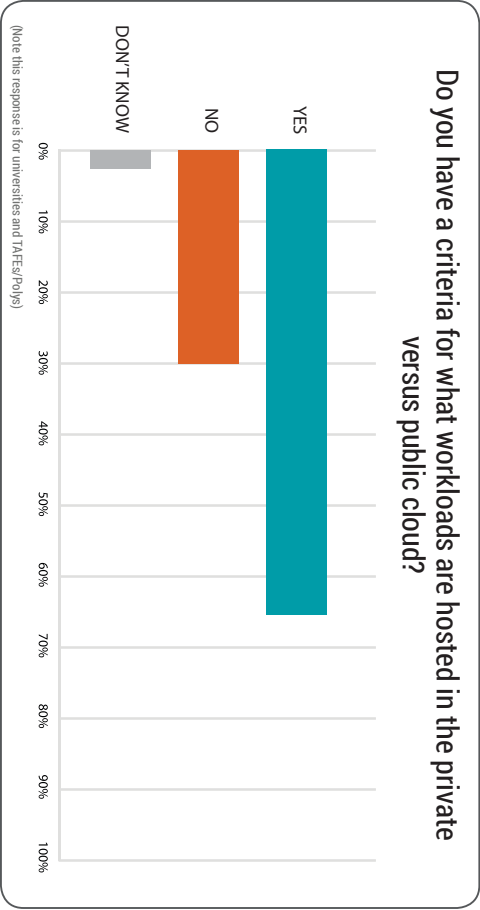
Cloud's importance has amplified as more services are being transferred to the cloud. While the existence of a cloud strategy does not prove anything of itself, it is a proxy for how much attention cloud receives within the broader digital and IT context. The vast majority (83%) of universities, TAFEs and polytechnics have a cloud strategy. What's more revealing is how often those strategies are revised. Three-quarters (75%) of institutions with a cloud strategy were committed to an annual refresh cycle while 16% updated their cloud strategies more than once a year, demonstrating how quickly cloud was evolving. At the other end of the spectrum, 6% of respondents updated their cloud strategy only every three years.

Figure 2: Prevalence of cloud strategies and refresh cycle



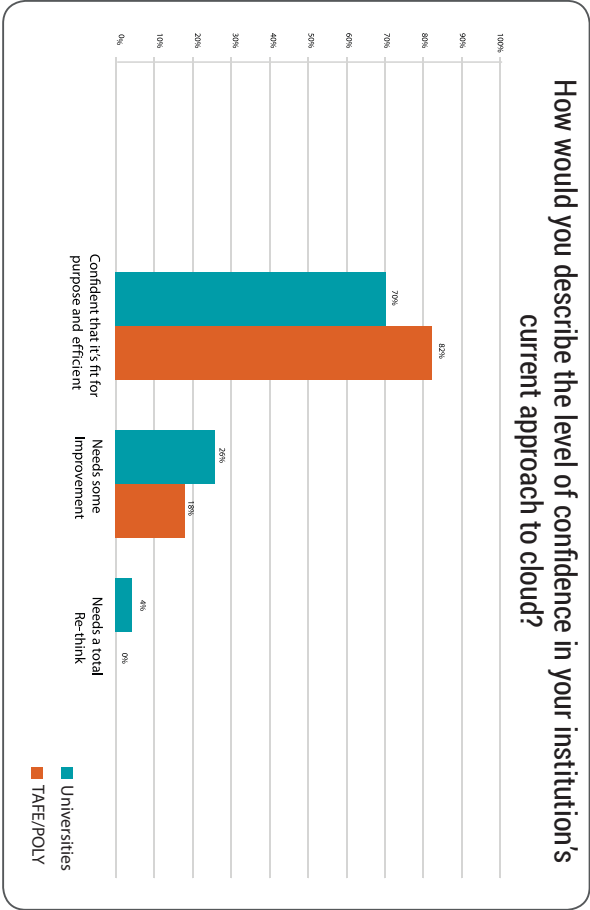
Despite 83% of institutions having a cloud strategy, only 65% of institutions defined the criteria for whether to host in a private versus public cloud environment.

Figure 3: Existence of a criteria for public versus private cloud decisions



The existence of a cloud strategy correlated strongly with an institution's confidence in its cloud environment. Most institutions (72%) were confident in their current approach, a quarter (25%) thought their approach needed improvement and 3% indicated their approach needed a total refresh. TAFE and polytechnic institutions were generally more confident in their approach than universities and none believed their approach needed a total re-think.

Figure 4: Confidence in institute's cloud environment

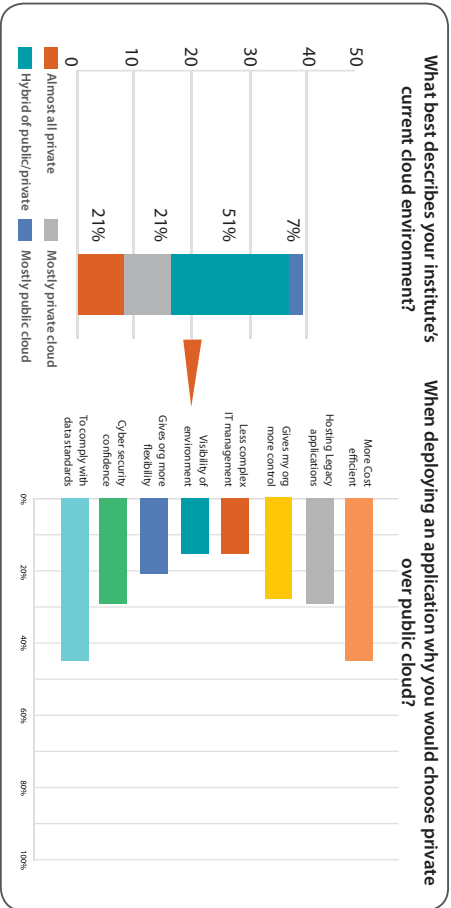


# Preferred institutional cloud environments

Cisco's business strategy is geared towards facilitating and supporting multi-cloud environments. This recognises that for most organisations – education and training institutes included – the choice of public or private is not always an either/or scenario. More than half of all institutions described their **cloud environment as mostly private (51%), hybrid (21%) or mostly public (7%) – i.e. multi-cloud.**

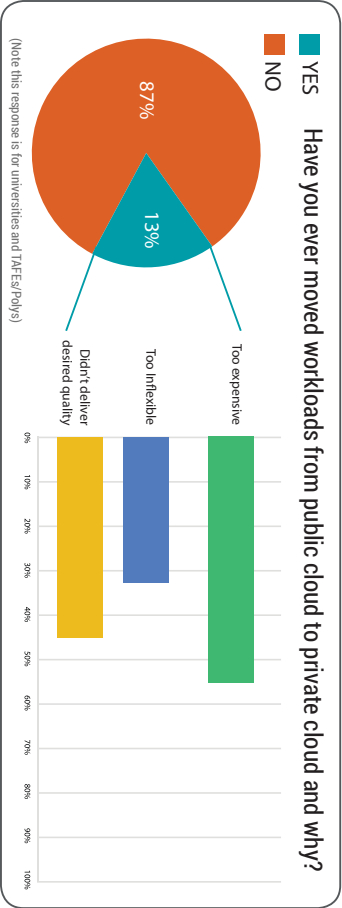
A fifth of respondents (21%) described their cloud environment as being almost exclusively private. This is not surprising given institutions need to manage a broad range of legacy applications, the scrutiny placed on data protection and the fiscal environment. When asked why they would select private over public cloud there were a number of resounding sentiments (in order of preference). Private cloud was seen as better able to comply with internal or external data standards, more cost-efficient, more secure and better equipped to host legacy applications (of which there are many).

Figure 5: Profile of cloud environments and perceived benefits of private cloud



Institutions reported that they didn't always get their cloud decisions right the first time, with 13% of institutions having initially moved substantial workloads to the public cloud only to reverse the decision later. The two most common reasons for transferring the workloads back to private cloud were cost (56%) said it was because public cloud was too expensive) and poorer service levels.

Figure 6: Movement of workloads from public back to private



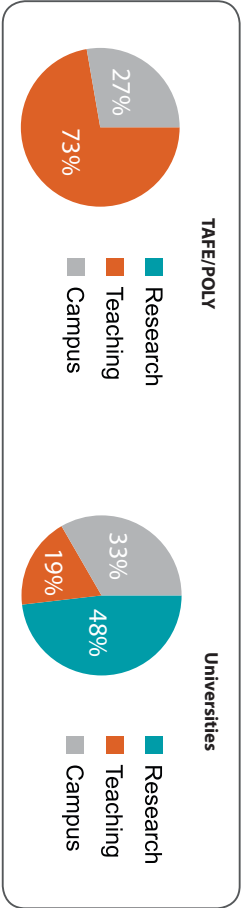
# The value of cloud to education and training institutions

Cloud technologies are impacting all aspects of university, TAFE and polytechnic operations. One of the objectives of this study was to understand where cloud – particularly in relation to infrastructure – offered greatest value.

For universities the greatest impact of cloud was in relation to research (48% of respondents nominated this as the area of highest impact). Cloud was considered a fundamental capability for universities to provide researchers with access to the tools they needed, effectively and efficiently access and store data and intellectual property, and ensure services were both available and highly secure. For universities the second-greatest impact of cloud was to support campus operations and administration. This likely reflects the increased interest in digital campuses and the Internet of Things, where campuses are being transformed into living labs by using sensors and networks to harvest new sources of data. Teaching and learning was a distant third, with only 19% of respondents reporting it as their top area of impact.

The responses from TAFEs and polytechnics were markedly different. No TAFE or polytechnic nominated research as the top area of impact even though many undertake applied research. Most interesting was the fact cloud was seen as three times more valuable in teaching and learning than campus operations – a direct contrast with university views.

Figure 7: Where cloud will have the highest impact



Specific findings in relation to research, teaching and learning, and campus operations are detailed in subsequent pages.

# Value of cloud in teaching and learning

Every aspect of teaching and learning is being impacted by technology. This includes what students learn – including a major focus on Science, Technology, Engineering and Maths (STEM) – how students learn and how students think. Universities, TAFEs and polytechnics are constantly looking for ways to evolve pedagogy to reflect how people learn in their social lives: real-time, collaborative and experiential.

Figure 8: Impact technology can have on learning

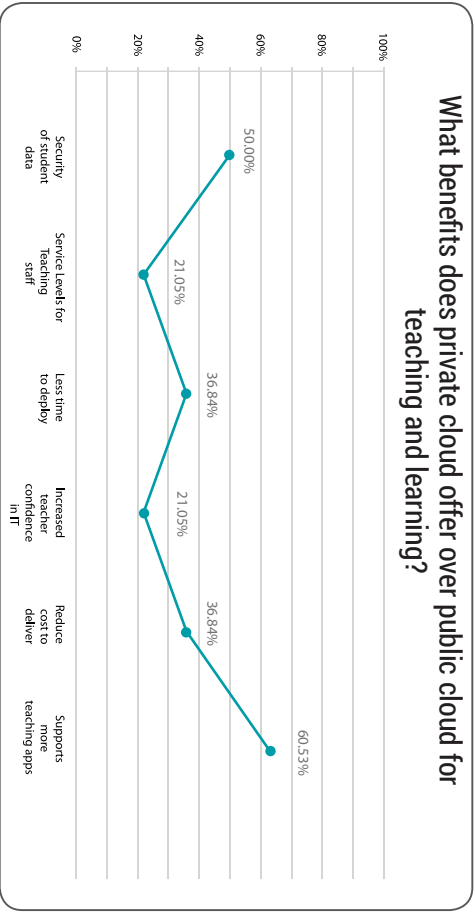




Respondents were asked about the role cloud played in teaching and learning and why there was such a strong tendency towards private cloud for infrastructure and tools related to teaching and learning. While Cisco is a multi-cloud provider, and therefore agnostic about what types of cloud are deployed, it was interested to understand the rationale for cloud choices. Figure 9 demonstrates the major advantages of private cloud for teaching and learning are:

- Capacity to support a greater number of teaching and learning applications, including legacy systems (60.5%)
- Improved security of student data (50%) and compliance with internal and external data standards
- Reduced time to deploy (37%) and reduced cost to deliver (37%)

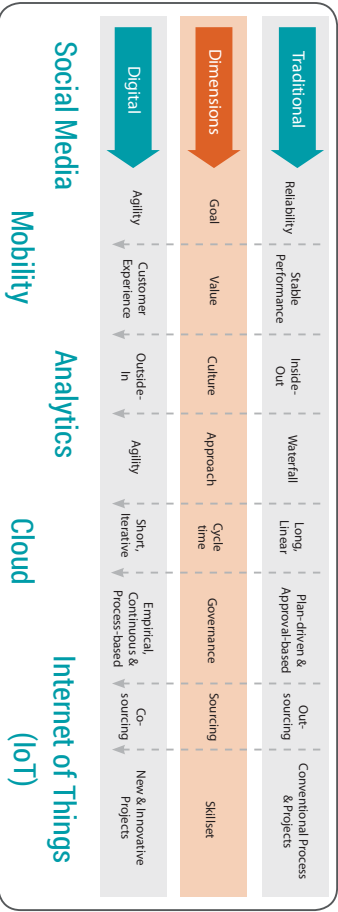
Figure 9: Benefits of private cloud in teaching and learning



## Value of cloud for campus administration

The transformation of university and TAFE campuses has been acute. Australian education and training providers are among the most technologically progressive globally, equalled only by their equivalents in countries such as Singapore, Israel and Denmark. The Internet of Things (IoT), in particular, is starting to have a profound effect on how institutions digitise their own campuses. Beyond that the entire process of enrolling, engaging and supporting students is now data-driven and digital. The way that institutions - including the technology function - operate has also been changed by digital in fundamental ways. The impact of cloud, IoT, analytics and mobility, among others, continues to gain momentum. The focus has moved from reliability to agility, from administrative efficiency to customer experience, and so on (see Figure 10).

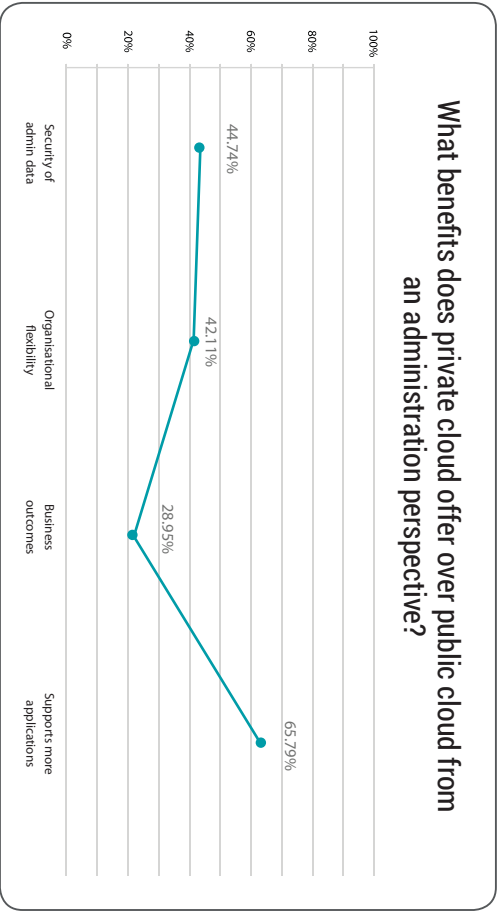
Figure 10: How digital technologies, including cloud, are changing the way institutions operate



The tendency towards private cloud for administrative functions was also explored with respondents, who cited two main reasons for their preference:

- Capacity to support more applications, including legacy
- Increased security of administrative data

Figure 11: Benefits of private cloud for administrative functions



## Value of cloud for research

As noted earlier, the value of cloud for universities is particularly acute for research. This is driven by a number of factors, not least the sheer volume of data now available for collection and analysis. Research disciplines such as bio-informatics, genetics and quantum computing are generating unprecedented volumes of data that needs to be searchable, retrievable and most importantly secure. This will continue with improvements in computing power coupled with lower cost compute.

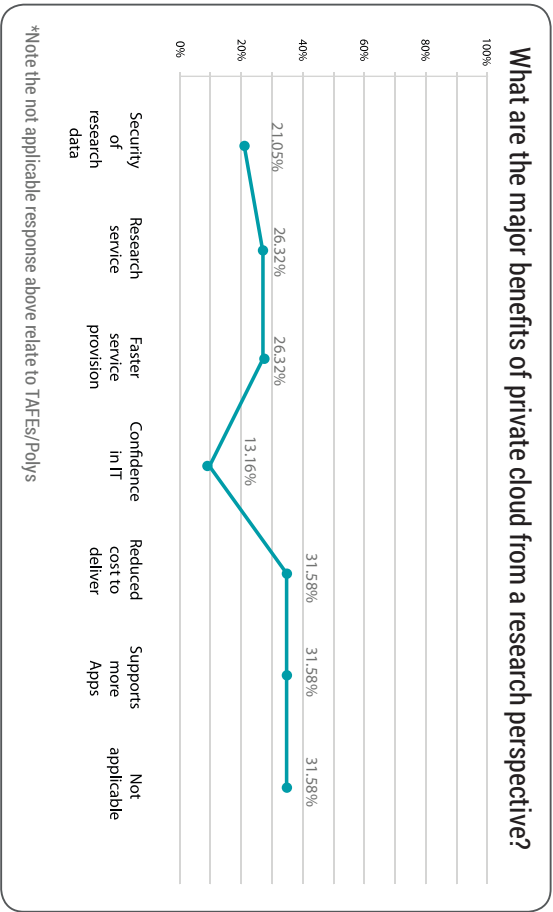
The multi-disciplinary and multi-geography nature of research makes cloud a natural choice. But the ease of use and accessibility of cloud also has perverse consequences, including creating the potential for shadow IT at the individual researcher level. As described in Figure 12, one of the major challenges for universities is providing researchers with cloud services that are easy to consume and procure but also highly secure and cost-effective.

Figure 12: Research-related issues in relation to cloud

Issues that need to be managed	Implications for technology
<ul style="list-style-type: none"><li>• Strict rules in relation to data sovereignty</li><li>• Researchers buying what's easy, not necessarily what's appropriate and secure</li><li>• High cost of cloud-vendor lock-in</li><li>• Balancing value for money with ease of use</li><li>• Challenges getting visibility of cloud users and usage</li><li>• Integrating data that is distributed across multiple cloud providers and infrastructures</li><li>• Ensuring high levels of cyber security</li></ul>	<ul style="list-style-type: none"><li>• Need to make consumption easy within parameters</li><li>• Need to evolve commercial models so researchers are using invoices rather than PAYG credit cards to procure cloud</li><li>• Providing a mechanism to allocate quotas to users/user groups with warnings around consumption in real time</li><li>• Use of applications (e.g. Cisco's App Dynamics) to better understand how applications are used so the cloud environment can be better architected</li></ul>

The bias towards private cloud is also acute in relation to research (recognising that all but 7% of respondents nominated either a private or hybrid cloud environment in their institution). The benefits of private cloud were much more evenly distributed for research than teaching or campus administration. Major call-outs included private cloud's advantages in relation to delivery cost and capacity to support more applications.

Figure 13: Benefits of private cloud in research



# Where institutions and training systems turn for advice about cloud

One of the most surprising findings from the study was the lack of a single source of 'authority' in relation to cloud. This possibly reflects a number of factors:

- The speed at which technology changes and therefore the amount of advice required
- The crowded nature of the cloud market
- The intersection between the similarly crowded cyber security market and cloud
- The fact that no single viewpoint is sufficient for institutions to make decisions

When asked who institutions turned to and trusted for advice on cloud it was specialist consulting firms and in-house expertise that had the greatest currency. Service providers, infrastructure vendors and application vendors commanded similar levels of trust to large consulting firms. A major issue is understanding the commercial implications of cloud before making major decisions. Other challenges include internal capability, keeping pace of technology change and improving visibility of what's going on in their own cloud environment.

Figure 14: Trusted advisors on cloud

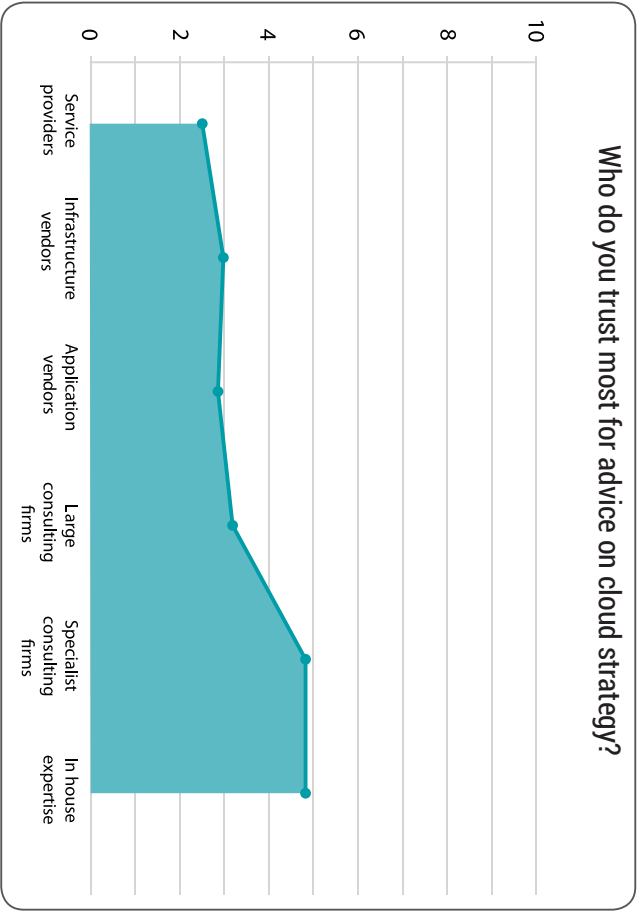
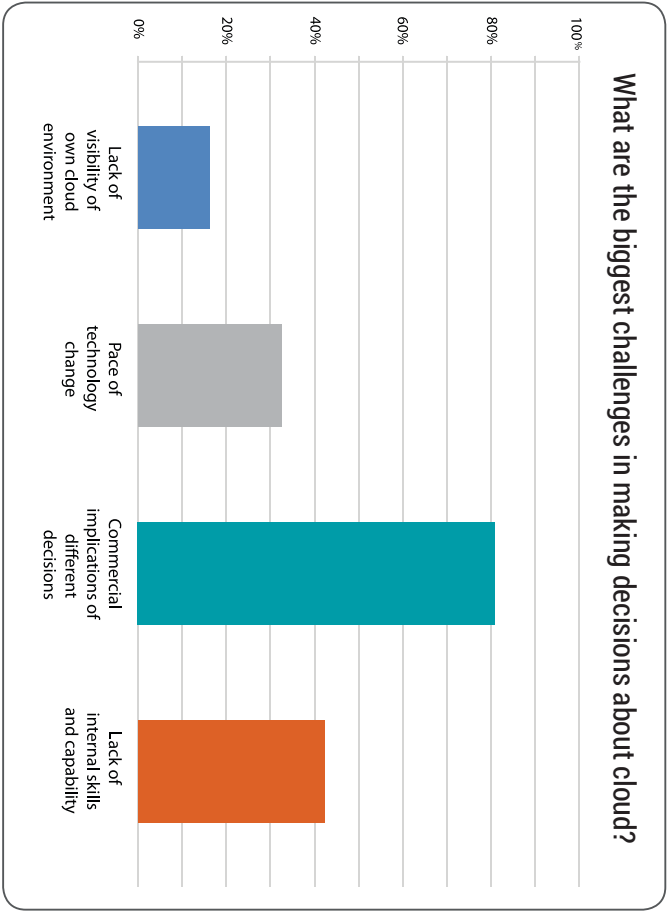


Figure 15: Challenges related to cloud decisions



# Roadmap for cloud

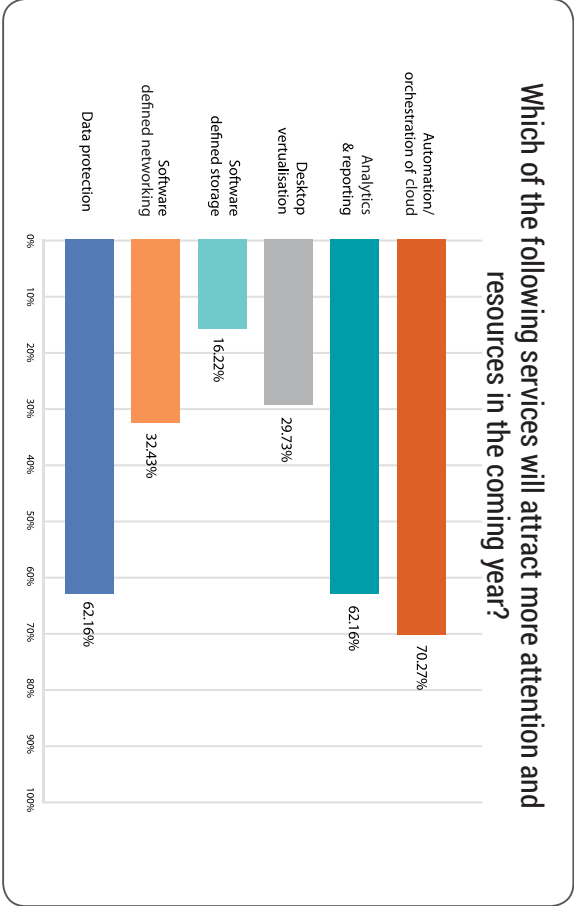
The logical question on many institutions' minds in relation to cloud is: where to next? Research undertaken separately by Cisco and captured in Figure 16 indicates that very few organisations (11%) have fully optimised their cloud environment, leaving significant room for improvement and need for investment. Conversely more than a third (37%) across all industry sectors described their adoption of cloud as 'ad hoc'.

Figure 16: Optimisation of cloud services



The precise nature of future investments was also explored as part of the study. Institutions were asked to rank a broad range of cloud services in terms of the level of attention and resourcing they were likely to receive in the coming year. Automation and orchestration of cloud attracted most interest (70%), then data protection services (62%) and analytics/reporting (62%).

Figure 17: Where institutional resources and effort are likely to be directed

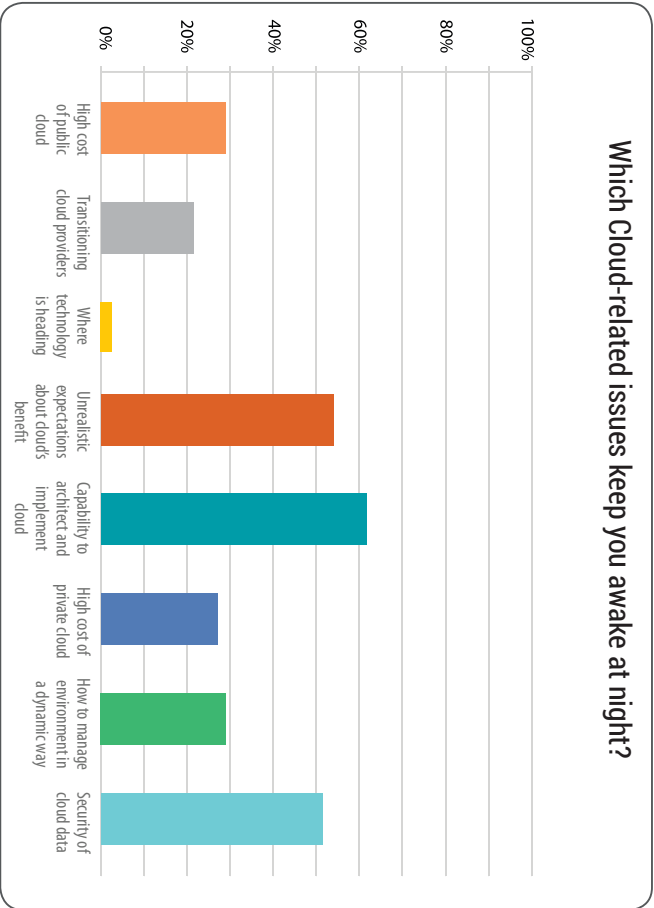


# What's keeping executives awake at night

The natural end point for a study such as this is unresolved issues. Institutions were asked to nominate the issues that were keeping them awake at night. The findings reveal an array of issues spanning the spectrum of finance, human resources, technology and business process. A number of issues stand out for both the extent to which they are shared and for what they reveal about life in a contemporary education or training institution. They include:

- Unrealistic expectations about cloud's benefits from stakeholders (primary cost reductions)
- Difficulties sourcing the capability to architect and implement cloud
- Securing data hosted in the cloud

Figure 18: Major issues for institutions



# Conclusions

## The future is multi-cloud, with a preference for private cloud

Despite cloud environments being mostly private (51%), hybrid (21%) or mostly public (7%) there is a strong bias towards private cloud. This is driven by advantages around cost, flexibility and capacity to support legacy applications. The major question for institutions is less about which cloud and more about how to maintain controls and visibility across a range of clouds.

## Security has to be embedded in the cloud

The relationship between security and cloud is becoming stronger. Scrutiny on cloud decisions is largely driven by the renewed focus on cybersecurity. Embedding security in infrastructure is increasingly common so threats can be detected early and responded to quickly.

## The commercial implications of cloud decisions are not well understood

Despite advice from multiple sources (including independent advisors) institutes and systems still view the commercial side of cloud as a black box. Institutes reported not knowing what the true costs (or potential savings) would be until after services had been deployed – i.e. when it's too late. In some scenarios workloads were transferred from public back to private cloud because it was too expensive but also because it didn't deliver the desired outcomes.

**Cloud is now a strategic tool in education and training and a prerequisite for delivering student, staff and researcher value.**



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