



## The economic value of cloud services in Australia

2019

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The adoption of cloud services by businesses in Australia has resulted in a cumulative productivity benefit to the economy of **\$9.4 billion** over the last 5 years.



**42%** of businesses in Australia are using paid cloud.



Drivers for moving to cloud services:

- improving customer service (38%)
- keeping up with competitors (38%)
- seeking to adopt innovative technology (34%)



So how do we tap into this before it's too late?

The most cited challenges in moving to cloud services are:

- skills (37%)
- legacy systems (37%)
- cost (35%)



**78%** of users have reported improvements in productivity since using cloud services. **48%** have seen an increase in IT staff, and 41% in non-IT staff since cloud adoption.



Business use of cloud services by industry:

- information, media and telco: 64%
- mining: 53%
- healthcare and social assistance: 45%
- retail trade: 42%

# Contents

Executive summary	4
1 Australia's cloud journey	6
2 Business benefits of cloud	9
3 Business drivers for adopting cloud	12
4 Cloud's economic value	16
5 Overcoming cloud challenges	20
6 What's next for cloud?	24
References	26
Our people	27



# Executive summary

In the last five years, cloud services have emerged as a new driving force for Australian business. Cloud services are changing business models, facilitating a more innovative and dynamic way of working, and are a foundational technology unlocking the next wave of technologies, from artificial intelligence to the Internet of Things and robotics.

The cumulative productivity benefit of the adoption of cloud services by Australian businesses has already been estimated to be in the order of \$9.4 billion over the last 5 years.

This contribution to GDP is equivalent in magnitude to the Australian government's total IT spend in the 2016/17 financial year. This is notable considering cloud is only one of many digital technologies and government spending is only a fraction of the total expenditure by business.

Importantly, the productivity gains for business do not necessarily result from a reduction in jobs. 48% of businesses using cloud services reported an increase in IT staff and 41% reported an increase in non-IT staff since using cloud services. For around half of users, employment remained unchanged, and only 10% and 7% of businesses saw decreases in IT and non-IT staff respectively.

## A significant opportunity

Cloud uptake is growing rapidly. 42% of businesses are using paid cloud<sup>1</sup> (ABS 2019) compared with 31% in 2015-16 (ABS 2017).

But Australia is still at the beginning of its cloud journey, both in terms of the share of businesses using cloud services, and the sophistication of their use. As these evolve, cloud-based innovation will have a growing impact for businesses across the Australian economy.

Businesses are most likely to be using cloud services for software applications and data storage. Around one third of businesses noted they were using cloud services for customer relationship management, invoicing and/or marketing, and 29% were using cloud services for storage.

More than half (57%) of users have been using cloud services for less than three years (Deloitte Access Economics 2018). Yet already more than three-quarters (78%) of users have reported improvements in productivity since using cloud services. These benefits may arise from consolidating capital infrastructure, running analyses more efficiently or streamlining processes.

Larger businesses, and those in the information technology, professional services and finance, are driving uptake of cloud services. In 2018, 76.4% of businesses with over 200 employees were using cloud services compared with 35.5% of businesses with four or fewer employees (ABS 2019).

Cloud services will also have a foundational role in enabling next wave technologies through its agility in processing large volumes of data, the availability of existing products and services, and scalability facilitating global deployment.

Developments and take-up of technologies ranging from machine learning to voice enabled assistants and blockchain will be highly dependent on the capabilities of cloud services. As these use cases evolve, cloud based innovation will have a growing impact for businesses across the Australian economy.



## About this study

Deloitte Access Economics was commissioned by Amazon Web Services (AWS) to analyse the economic value of cloud services in Australia.

The analysis is based on publicly available information, consultations with AWS customers, and a survey of over 500 Australian businesses currently using at least one cloud platform.

The survey was designed to develop an understanding of business use of cloud services, the drivers for adopting cloud, the impacts on business operations, as well as perspectives on benefits and challenges.

The survey sample included respondents from all industry sectors, a range of business sizes (from less than \$1 million in revenue to over \$500 million in revenue), and years of operation (less than 1 year to more than 10 years). The survey was fielded by Research Now in July 2018.

<sup>1</sup> Defined by the Australian Bureau of Statistics as paying for IT services used over the internet to access software, computing power, or storage capacity.

In this report, Deloitte Access Economics has explored business use of cloud services in Australia. Informed by publicly available information, consultations with AWS customers, and a survey of over 500 Australian businesses currently using at least one cloud services platform, this report explores the value of cloud services to businesses through considering drivers for adopting cloud services, the benefits and challenges of cloud use, and cloud's value to the economy as well as its future uses.

### Making the most of cloud

The benefits of cloud services are clear. From a technology perspective, more than half of cloud users identify savings as the major driver of adoption. Cloud services also enable businesses to be agile and elastic – accessing and scaling resources up and down as required.

For example, Seven West Media broadcasted the 2018 Gold Coast Commonwealth Games using AWS Elemental. Seven also achieved its biggest live streaming day in 2017, setting a new Melbourne Cup record for the network, with 350,275 concurrent live streams, representing 22% growth from 2016. A key part of the Seven Network's Digital Infrastructure is powered by the AWS Cloud, which supports the network's ability to scale up to meet audience demand, even as viewership numbers climb quickly or unexpectedly. Cloud services ensure the network can accommodate unprecedented viewership traffic safely and securely, preserving a high-quality audience experience.

Data storage also remains a key technology driver for adopting cloud services, with 29% of businesses citing this in their top three reasons. There are also benefits from changing or refining business models.

From a business strategy perspective, adoption of cloud services is driven by a desire to improve customer service and remain competitive in the market.

Cloud services also enable innovation, which is core to the operations of all businesses to improve efficiency, relevance and competitiveness. For example, businesses can leverage cloud services to quickly expand product and service features, tailor offerings to individual customer preferences, and make evidence-based decisions on products and markets.

The cost of cloud services vary by frequency and volume of use, allowing for flexibility in operational costs and the ability to scale as required without paying to maintain spare capacity. This has opened up the power of technology to smaller businesses, where previously only larger businesses with significant initial capital investment in processing power could harness these capabilities.

Airtasker, a Sydney-based startup, has benefited from the ability to absorb growth opportunities and traffic spikes, rather than being restricted because of technical capabilities.

### Overcoming cloud challenges

Adopting cloud services is not in and of itself enough to achieve productivity gains. Almost a quarter of businesses did not experience productivity benefits from adopting cloud services, or were not sure if they had. And 90% of businesses report challenges in the transition to cloud services, including in educating staff, changing over from legacy systems, and costs.

Cloud's ability to change how a business is run can be dramatic. In adopting cloud services, businesses need to go beyond considering technical feasibility and potential cost savings to understand also the potential need for a new operating model and the associated implications. As such, it is important that businesses have a cloud strategy and change management plan when adopting cloud services.

Understanding the potential challenges will assist in their transition. These can include financial reporting challenges, the need for technical skills, and cyber security. Without a plan to optimise operations, businesses will not maximise the benefits of moving to cloud services.

This highlights the importance of having a clear cloud services strategy for the best chance of success, including plans to streamline operations and educate staff, to maximise the benefits from transition.

# 1 Australia's cloud journey

In the last five years, cloud services have emerged as a new driving force for Australian business. Cloud services are changing business models, facilitating a more innovative and dynamic way of working, and are a foundational technology unlocking the next wave of technologies, from artificial intelligence to the Internet of Things and robotics.

While the term 'cloud' has been used to describe distributed computing for over 20 years, recent years have seen a marked shift in the way businesses have been using cloud services. Businesses are progressing from being 'on the cloud' – using cloud technology for application hosting and data storage – to operating 'in the cloud' – using cloud-native applications and on-demand computing power (AWS, 2018). There is now an emerging class of business changing and refining their business models around cloud services.

Australia is still at the beginning of its cloud journey. There has been a rapid take-up of paid cloud computing by businesses, more than doubling between 2013-14 and 2017-18 (from 19% of businesses to 42% of businesses) however, this is still the minority (ABS 2019). More than half (57%) of users of cloud services have been using it for three years or less (Deloitte Access Economics 2018). There is significant scope for a greater share of businesses firstly to use cloud services, and also to deepen the sophistication of these operations.

Australia is still at the beginning of its cloud journey: 42% of businesses are using paid cloud computing

## 1.1 Business use of cloud services

The use cases for cloud services vary across industries, and this affects their likelihood of adopting these services. It is not surprising that the information, media and telecommunications industry is currently the greatest user of cloud services, with 64% of businesses in this industry reporting adoption of cloud in 2017-18 (ABS, 2019).

The professional, scientific and technical services, financial and insurance services, and mining industries are the next biggest users of cloud services.

Around a quarter of businesses in the agriculture, forestry and fishing, and transport, postal and warehousing industries are currently using cloud services. While current applications may be less relevant for their operations, there is scope for this to increase in future years. With decreasing costs of sensors and monitoring, there may be strong use cases for analysis of large data sets in these industries to optimise operations and logistics.

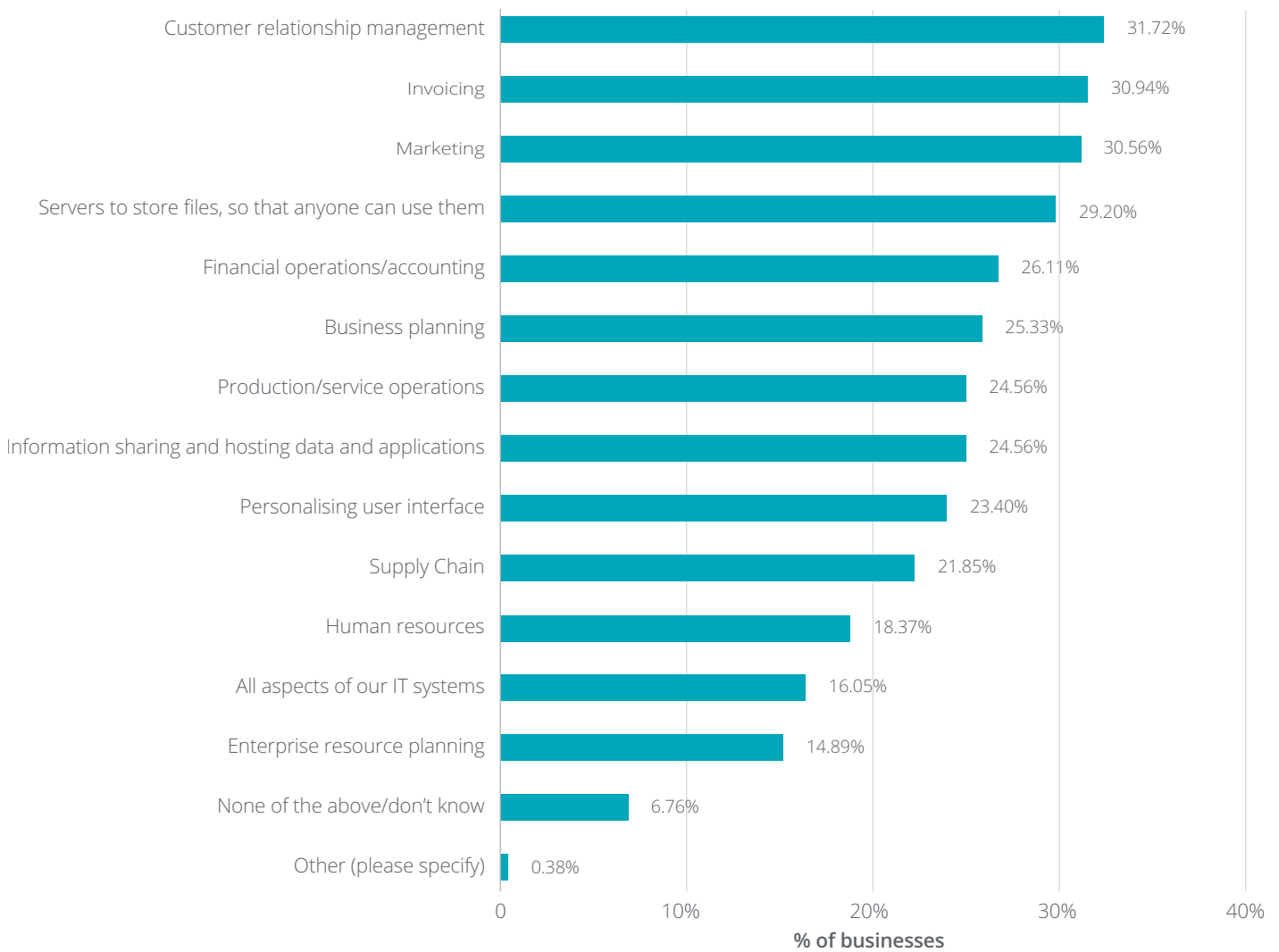
**The economic value of cloud services in Australia**

Businesses are most likely to be using cloud services for software applications and data storage. As shown in Figure 1.1, around one-third of businesses noted they were using cloud services for customer relationship management, invoicing and/or marketing, and 29% were using cloud for storage.

To some degree, these are basic uses of cloud services, reflecting the early stage of cloud use by businesses in Australia. There is significant scope for cloud services to be used for more advanced purposes, including hosting bespoke applications, enterprise resource planning, or enabling next-wave technologies. These can enable changing business models and improved efficiencies in line of business operations and their supply chain.

Half of businesses are using cloud services for between 2 and 5 business applications, and a further 27% are using cloud services for one application.

**Figure 1.1.** Business use of cloud services



Source: Deloitte Access Economics and Research Now, 2018



Larger businesses (200+ employees) are more likely to be currently using cloud services than smaller businesses. 76.4% of larger businesses reported using cloud services in 2017-18, compared with 35.5% of those with 0-4 employees (ABS 2019).

IDC (2017) reported that large businesses (500-999 employees) will see the fastest growth in investment with a five-year CAGR of 23.2%. While purchase priorities vary somewhat depending on company size, the leading product categories include customer relationship management (CRM) and enterprise resource management (ERM) applications in addition to server and storage hardware.

The most popular cloud services technology application for small and medium enterprises (SMEs) tend to be web-based emails, files sharing and cloud-based software. (ACMA, 2014) The ACMA research reports 44% of SMEs actively used cloud technology as at May 2013.

Deloitte Access Economics' previous research has found that smaller businesses can be less likely to see a need for cloud-based software, while the more complex operations of larger businesses may justify the need for more advanced systems (DAE 2018). On the other hand cloud services are enabling 'cloud-native' startups as low and flexible operating costs lower barriers to entry in business and provide an environment to innovate and 'fail fast' while perfecting their business model.

Both large and small businesses have the potential to benefit from use of cloud services. Larger businesses have the benefits of scale in adopting new technologies, though small businesses may be better placed to innovate without legacy systems or other constraints.



### Looking forward

Most businesses are not yet using cloud services, and there are two key directions where future growth is expected. In the coming years, more businesses will adopt basic uses of cloud, and existing users may use cloud services for a greater number of applications or more advanced workloads.

## 2 Business benefits of cloud

Business users of cloud services overwhelmingly identify benefits from its use – on average, only 5% of businesses surveyed by Deloitte Access Economics did not identify benefits. 95% of businesses were neutral, agreed, or strongly agreed with a range of benefits including the ability to scale in response to the market, the agility to experiment and innovate quickly, and helping prepare the business respond to future challenges and business needs.

Cloud services also enable businesses to produce outputs more efficiently or achieve benefits not previously considered possible. These benefits are closely linked through the ability to meet market demand in a timely and cost efficient manner. Deloitte's international research shows 67% of Fortune 100 companies have a cloud-based innovation centre to use disruptive technologies to improve business operations, product offerings, and customer experiences (Deloitte Insights 2017), with innovation being a top priority for these companies. These benefits are not limited to these businesses, but also extend to government bodies, academia, industry associations and start-ups in partnership with these innovation centres.

This chapter explores:

- how cloud services have changed the way technology is consumed, particularly by smaller businesses; and
- how it has removed constraints on data storage and analytics, with particular relevance to more established businesses.

### 2.1 Changing the way technology is consumed

The cost of cloud services vary by frequency and volume of use, allowing for flexibility in operational costs and the ability to scale as required without paying to maintain spare capacity.

This has opened up the power of technology to smaller businesses, where previously only larger businesses with significant initial capital investment in processing power could harness these capabilities.

Airtasker, a Sydney-based startup, was conscious of the need for scalable capabilities. Tim Fung, Airtasker CEO noted, "if there's one thing critical for a startup – it's being able to make sure that you can serve your users to absorb growth opportunities." Prior to transitioning to an AWS solution, Airtasker were generally fearful of traffic spikes, mainly caused by media exposure, as they would suffer performance issues and once went down completely. Since transitioning, the company has not been restricted because of its technical capabilities.

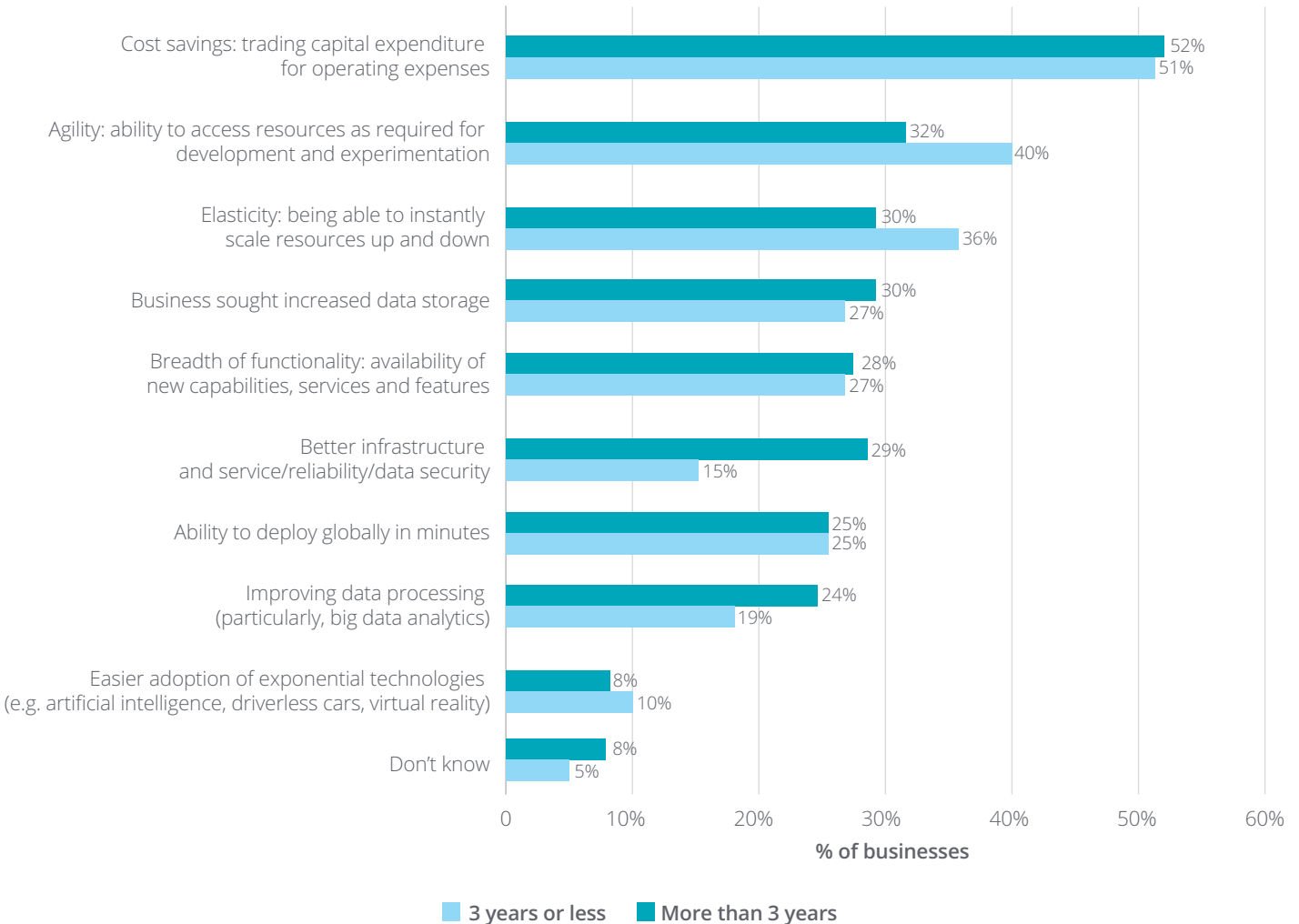
The ability to scale has effectively lowered entry costs for businesses, also allowing startups to test business ideas without the need for significant capital investment. Business models can be tested in real time and can 'fail fast', allowing innovators to constantly work on refining and improving rather than only testing mature prototypes (Deloitte, 2014). Indeed, lower costs are most likely to be cited in businesses' top three technology drivers for adopting cloud services (see Figure 2.1).

Cloud services have enabled innovation and growth in startups and accelerators seeking not just storage but more advanced cloud services, including big data collection and analysis, image recognition, and artificial intelligence capabilities. Figure 2.1 shows that younger businesses are more likely to cite agility for experimentation and elasticity enabling scalability as technology drivers for adopting cloud services. This finding is echoed by research from Gartner (2015) that notes businesses are increasingly relying on cloud services to fulfil their aspirations to be more agile and elastic, and respond to market changes.

For example, a business can purchase image or voice recognition APIs (application programming interfaces), which include a set of protocols and tools ready to build the product, rather than needing to start from scratch. This ability to take native capabilities off a platform and experiment in high velocity is enabling a wave of innovation.

This unprecedented rate of innovation has led to the emergence of 'unicorns' – technology startups valued at over \$1 billion – many enabled by leveraging cloud technology in fundamentally new ways. Xero and Atlassian are examples of cloud-native unicorns that have gone global. The Deputy case study on page 11 highlights another example of a successful innovation journey for a business that started up on cloud services.

Figure 2.1. Technology drivers for adopting cloud services, by business age



Source: Deloitte Access Economics and Research Now, 2018

The cost of cloud services vary by frequency and volume of use, opening up the power of technology to smaller businesses and startups.



**Looking forward**  
 Adopting cloud services will enhance business scalability and agility. These improvements will influence changing business models and impact on the competitive environment more broadly.



### Deputy – cloud native innovation

Deputy is a comprehensive workforce management solution that helps businesses of all sizes better manage their shift-based team. Employees can use the platform to clock in, request and swap shifts, or seek time off with their manager's approval. Managers can automatically generate rosters to reflect real business needs, with guaranteed coverage and compliance requirements. The platform integrates with a variety of payroll and point of sale (POS) software, to automatically calculate staff costs and identify times of peak demand to assist with rostering respectively.

The platform is 'cloud native' – it was built on AWS Cloud from the beginning with a strong focus on mobility. The platform is designed to be used on phones, tablets and smart watches. Cloud services help sync data between devices, enabling platform users to switch as required. To enable this, Deputy has been cloud native from the time it launched in 2008. All information and processing runs on the cloud.

Using cloud services is not, in itself, innovation, but can facilitate the ability to innovate by making it easier to develop new features – getting new products in the hands of customers faster. For instance, Deputy used Amazon Rekognition application programming interfaces (APIs) to develop a facial recognition tool to identify when employees are present, rather than having to clock in. This service supports Deputy's purpose: making sure the right people get paid at the right time. Deputy has also integrated Amazon Alexa support to allow users to interact with the platform using their voice.

As a cloud native business Deputy has faced the problem that the software it interacts with is not always fully cloud-enabled. For instance, point of sale (POS) providers are usually not on the cloud due to the need to minimise latency at the point of sale. Deputy has had to use middleware to take this local data and integrate it with their services. New services such as AWS IoT Greengrass allow devices to run locally then later sync to the AWS Cloud, addressing issues of latency, however, integration with systems that are not cloud-enabled is an ongoing challenge.

*Source: Deloitte Access Economics consultation with Deputy*

### 2.2 Removing data constraints

Until recently, information technology resources have often been restricted by capital investment, costly to build and maintain, and have required ongoing capital investment to support new initiatives and experimentation. Figure 2.1 shows that established businesses are turning to cloud services to improve infrastructure, and to seek better service, reliability and data security. They are also looking for improved data processing, particularly related to data analytics.

Data analytics costs have previously been a barrier to testing prototypes and innovating, as there is a high cost of failure. Cloud services have lowered costs of data storage and data analytics, and hence lowered the risks of experimentation.

In some cases, it has become cheaper to learn from experimentation than attempting to conduct more systematic analysis. This reflects a situation where the learnings from 'failed' experiments outweigh the costs of failure, and represent a new approach to solving business problems.

## 3 Business drivers for adopting cloud

For many years, decisions around the adoption of digital technology, including cloud services, for specific applications or for all core business operations, have been the responsibility of IT decision makers. Now, the decision is increasingly seen as part of business strategy.

The trends in enterprise adoption of cloud services range from building new applications on the cloud, to migrating existing applications, to moving business-critical applications and data centres to the cloud, and through to moving all-in to cloud services.

This chapter explores the business technology drivers for adopting cloud services as well as key considerations for the transition.

Nearly a quarter of respondents see cloud services playing a role in changing business models

### 3.1 Business drivers

From a business strategy perspective, adoption of cloud services is driven by a desire to improve customer service and remain competitive in the market (see Figure 3.1). Nearly 40% of respondents see this as a benefit to their customers directly or indirectly, and these are important reasons as they present practical measures for cloud application.

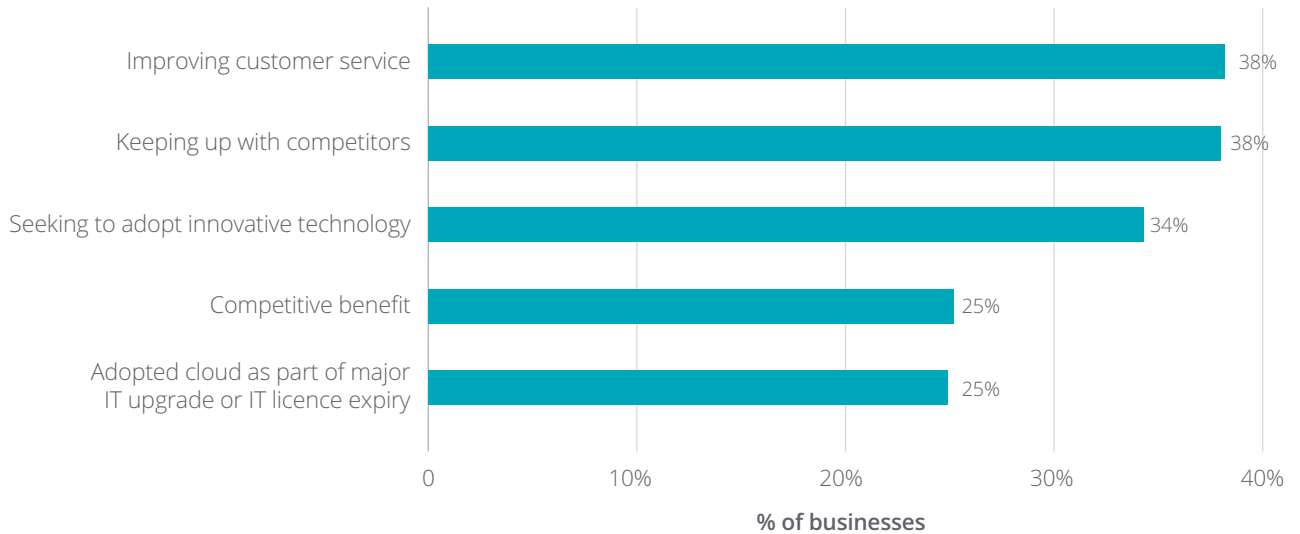
The third most cited reason for adopting cloud services is a business desire to adopt innovative technology. Innovation is no longer just the realm of research and development organisations, but is core to the operations of all businesses to improve efficiency, relevance and competitiveness. For example, businesses can leverage cloud services to quickly expand product and service features, tailor offerings to individual customer preferences, and make evidence-based decisions on products and markets.

24% of respondents see cloud services playing a role in changing business models, which is notable given its relatively small share of total digital expenditure and that it has only been available for around a decade.

### 3.2 Technology drivers

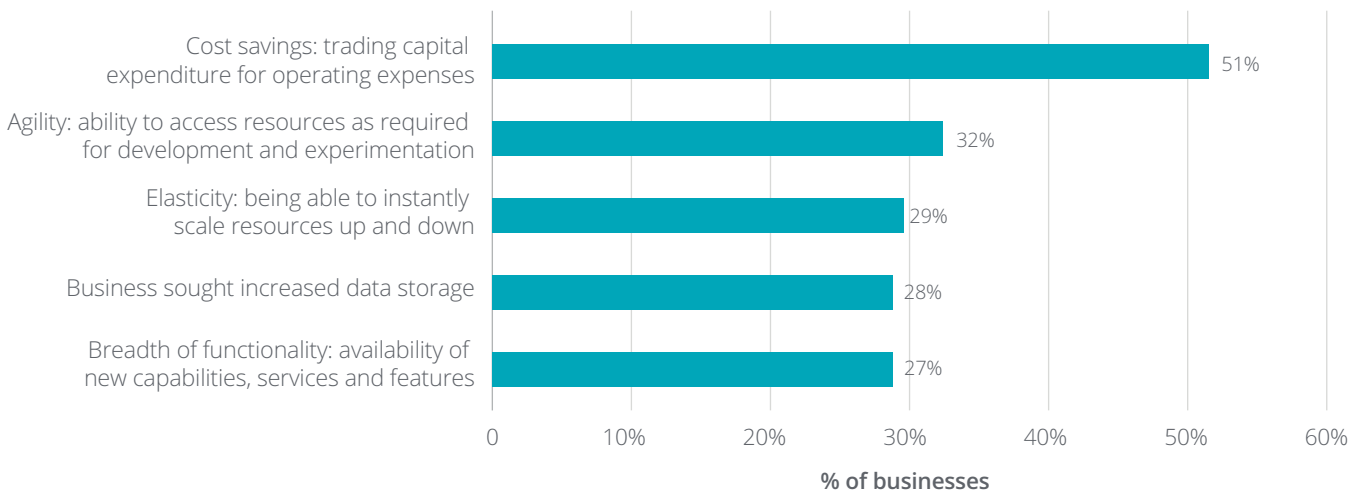
From a technology perspective, more than half of users identify the major driver of cloud services adoption as cost savings (see Figure 3.2), specifically being able to replace capital investment with operating expenditure. Without cloud services, businesses that are not using their IT infrastructure at full capacity still incur costs in maintaining the infrastructure as well as rent for the floor space of the data centre. Since many cloud services charge users based on usage, businesses can realise cost savings by not paying for spare capacity. This can potentially increase operational expenditure, but can result in a lower total cost of operations.

Figure 3.1. Business drivers of cloud services adoption



Source: Deloitte Access Economics and Research Now, 2018

Figure 3.2. Technology drivers of cloud services adoption



Source: Deloitte Access Economics and Research Now, 2018

However, not all businesses have been able to capitalise on this benefit yet. It is important for businesses to realise that moving to cloud services alone is not sufficient to achieve these cost savings. An optimised cloud strategy is required to ensure that these savings are maximised – otherwise businesses can instead see their costs increasing. The International Data Corporation’s (IDC, 2018) CloudView 2017 Survey found that only 11% of respondents believed that they have an optimised cloud strategy.<sup>2</sup>

Deloitte Access Economics’ survey shows that business experiences have varied since using cloud services. Around 24% of businesses reported a decrease in technology capital expenditure and/or operating expenditure, compared to around 38% of businesses reporting no change and 33% reporting these expenditures had increased.

Analysis of this data by size of business shows the average changes to both technology capital expenditure and operational expenditure appear positively correlated – with businesses more likely to either report increases or decreases in both their capital and operating expenditure, as opposed to increases in only one category of expenditure.

<sup>2</sup> Defined as “Business Outcome Business innovation and transformation through organization and partners, with clear understanding of true cost and value.”



### nib – improving customer service using cloud services

In late 2017 nib launched Australia's first health insurance chatbot: 'nibby'. The bot relies on AWS artificial intelligence technology (AI) to assist members with their health insurance inquiries.

Unlike many other chatbots, nibby is fully integrated into nib's web and contact centre platform, which allows members to transition easily to the right sales or claims consultant as a member's query becomes more complex and offer assistance during key customer service moments.

nib's Chief Information Officer, Brendan Mills, says nibby is part of the next generation of customer service. "As the newest member of our customer service team, nibby allows members to access the information they need at a time that suits them, without having to wait for a consultant."

And because it uses AI, it will get smarter and more intuitive over time. "As nibby builds its knowledge bank it will be able to respond to an infinite number of member enquiries, supplementing existing employees and freeing them up to deal with more complex issues."

Being built on Amazon Lex, an AWS Machine Learning service, means nibby is able to use the advanced deep learning functionalities of natural language understanding (NLU) to recognise and capture the member's intentions. The chatbot continuously taps into this knowledge to further improve and better understand variations of member enquiries.

Since launch, nibby has handled more than 50,000 member interactions, with an 85% success rate, saving 1,500 hours of consultant handling time. And nibby has been expanded, now operating in New Zealand and supporting nib's Group operations including international students and workers' businesses.

And nibby is just one example of NIB's use of AWS Cloud. "We're also looking to use AI to improve operational efficiencies and augment our existing teams for smarter decision making in areas such as member retention, claims and fraud detection" says Mills.<sup>3</sup>

Larger businesses (in terms of revenue) were most likely to report increases in both operating and capital costs since adopting cloud services. However, it is important to note that growing companies can experience increasing costs but also be increasing profitability and/or productivity.

These findings are interesting, as an optimal application of cloud services for business should result in a decrease in capital expenditure and increase in operational expenditure, where operational expenditure will fluctuate in line with actual usage. This highlights the importance of establishing a cloud services strategy to maximise benefits – if legacy systems are not phased out as cloud services usage increases, businesses run the risk of duplicating capital costs.

Other technology drivers for adopting cloud services include agility – accessing resources as required, enabling them to develop and test business ideas quickly. Cloud services allow incremental steps in an automated environment with dynamic data requirements, and the ability to experiment and 'fail fast' to learn and adapt. Data storage also remains a key technology driver for adopting cloud services, with 29% of businesses citing this in their top three reasons.

The following case study shows how Fugro Roames achieved both cost savings and increased effectiveness through use of cloud services.



### Looking forward

While one of the key objectives of adopting cloud services is reducing business costs, it is likely that further efforts are required to decrease capital expenditure to deliver on the cost-saving potential.

<sup>3</sup> Sources: nib (2017), nib launches Australia's first health insurance chatbot, available at: <https://www.nib.com.au/nib-news/media/2017/12/nib-launches-australia-s-first-health-insurance-chatbot>; nib (2018), Nibby celebrates one year of improving nib members' experience, available at: <https://www.nib.com.au/nib-news/media/2018/11/nibby-celebrates-one-year-of-improving-nib-members-experience>.



### Fugro Roames – scalability benefits from cloud services

Fugro Roames is a condition assessment and asset intelligence service provided by Fugro, the “world’s leading, independent provider of geo-intelligence and asset integrity solutions for large constructions, infrastructure and natural resources”.

Roames provides a virtual world asset management platform, enabling power utilities to monitor their assets remotely and optimise their performance. The inspection is performed through remote sensing, using large-scale spatial data capture using a LiDAR and camera sensor platform from light aircraft and processed at scale using cloud computing capabilities and services deployed globally in Europe, United States and Asia Pacific. This platform enables an accurate and engineering-grade 3D simulation environment of power assets, landscapes, other infrastructure and vegetation.

The Roames virtual asset management platforms enables electrical distributors to inspect their assets from their computers, providing a complete and detailed picture of the health of their network. By allowing companies to detect potential risks to an asset prior to failure the platform can significantly decrease the cost of asset management.

One example of this benefit for electrical utilities is the significantly lower cost to prune vegetation closer to ground rather than when it has grown near (and often close to touching) power lines. Virtual asset management can identify vegetation encroaching over time so that it can be cut before it becomes more expensive and riskier to treat. The Roames services contributed to the Queensland-based utility Ergon Energy being able to optimise its annual vegetation management budget from \$100m to \$60m (AUD).

Cloud services has given Fugro a key advantage through the ability to scale up services in response to client needs, and expand the Roames service from Australia to operating internationally.

Cloud technology also enabled a rapid response to the needs of the wider community. In 2017 Cyclone Debbie struck Queensland, leaving around 65,000 people without power. Fugro immediately mobilised aircraft to inspect the affected areas which needed to be processed quickly to provide situational awareness to disaster response teams. At its peak, the platform was performing over 120,000 read requests per second in the cloud processing database. With the ability to rapidly increase the scope of its inspection service, Roames was able to identify downed poles and wires in under 12 hours, supporting faster power restoration and compared to a slower manual (and at higher risk to field staff) inspection effort.

Scott Carpenter, Fugro Global Cloud Architect, notes a key lesson from the transition to the cloud: “companies cannot expect to simply shift their services to the cloud and get instant savings: they need to invest in optimising their architecture for running in the cloud.”

It took the team two years of focus and investment to migrate to cloud services. They needed to completely restructure their system to run in a scalable environment. Off-the-shelf software designed to run on desktops or in data centres often proved insufficient for the cloud because their licensing assumed the software was running on physical hardware, and were not designed for scaling in High Performance Computing (HPC) environments. However, in enabling international expansion and the means to rapidly respond to client needs, the investment return of moving to the cloud more than outweighed the transition costs.

*Source: Deloitte Access Economics consultation with Fugro Roames*



# 4 Cloud's economic value

The benefits of cloud services extend beyond individual business benefits to a broader value to the economy, including productivity benefits enabled by digital technology.

Digital technology has had transformational impacts across the economy, making life easier, affecting business models, efficiency, employment and living standards, and a share of these impacts is attributable to business use of cloud services.

Productivity measures the ratio between the volume of outputs and inputs. An increase in productivity reflects a more efficient use of labour and capital resources in producing goods and services. At the business level, productivity can be seen through cost or time reductions or staff working 'smarter'. In the economy, productivity includes increased efficiency as well as better products or services.

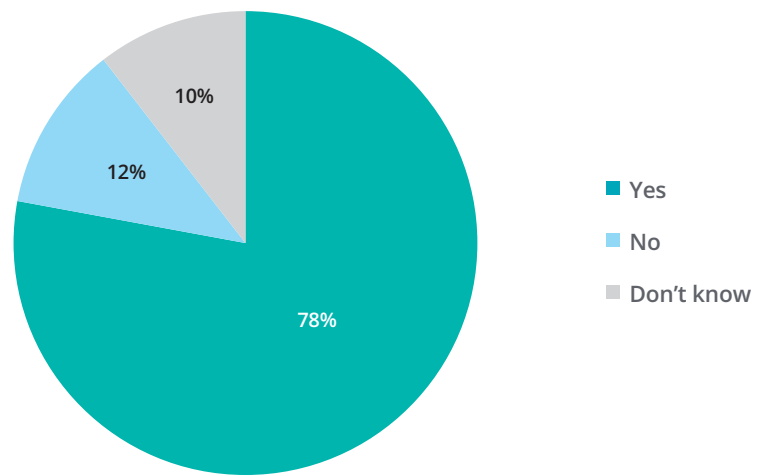
This chapter examines and quantifies these productivity and economy-wide benefits.

## 4.1 Productivity and employment benefits

The majority of business users of cloud services have reported productivity benefits. Figure 4.1 shows that more than three-quarters (78%) of users reported improvements in productivity since using cloud services.

Businesses that reported benefits estimated an average productivity increase of 29.6%. These productivity benefits could have arisen from consolidating IT infrastructure, such as reducing data centre expenditure.

**Figure 4.1.** Have you experienced an overall productivity benefit since using cloud technology?



Source: Deloitte Access Economics and Research Now, 2018

For other parts of the business, the productivity benefits may reflect a reduction in the time required for data analysis, automated processes or streamlined records management systems across offices. The productivity benefits may apply to specific projects where productivity gains are measured in terms of costs, or new opportunities which could not previously be activated.

78% of users reported improvements in productivity since using cloud services



### Looking forward

Cloud services have been responsible for a significant productivity benefit to the economy to date. With greater sophistication and take-up of cloud applications, further benefits are expected.



The realised productivity benefits for businesses may also reflect a competitive advantage over other businesses. For example, Amaysim, an Australian mobile service provider, operates entirely on cloud services, which has improved its flexibility, agility and performance. In five years, it has grown to be the fourth largest independent mobile services provider and the largest Mobile Virtual Network Operator (MVNO) in Australia, with more than 700,000 customers.

It is important to recognise that not all businesses have benefited in the same way. Almost a quarter of businesses did not experience productivity benefits or were not sure if they had. This highlights the importance of having a clear cloud strategy for the best chance of success, including plans to streamline operations and educate staff, to maximise the benefits from transition.

For example, in the absence of a strategy, a business may maintain a duplicative legacy system after moving to cloud services, holding them back from realising the potential capital expenditure benefits.

Alternatively, a piecemeal move to cloud services for some systems and not others may mean business operations have not been optimised. Staff training can also help unlock productivity benefits after moving to cloud systems.

The productivity gains for business do not necessarily result from a reduction in jobs. 48% of businesses using cloud services reported an increase in IT staff and 41% reported an increase in non-IT staff since using cloud services. For around half of users, employment remained unchanged, and only 10% and 7% of businesses saw decreases in IT and non-IT staff respectively.

However, the reasons for changes in staff numbers can vary; businesses may be growing and taking on more staff, transitioning between business models or unable to free up resources for other reasons.

However, it is important to recognise that while total staff numbers may have grown, there may have been shifts in individual roles to facilitate this expansion. This may have impacts for particular teams or individuals redeployed to different tasks.

#### 4.2 Value to the economy

The productivity benefits of cloud services extend beyond the bottom line for individual businesses, and should be recognised as an important driver of Australia's economic growth.

Developments in digital technology have had a notable impact on economic growth in recent years. Digital technology is evolving fast, and it is challenging to estimate precise impacts over time. Estimating cloud's contribution to these benefits can be even more challenging.

While businesses that reported benefits from cloud services estimate an average productivity increase of 29.6%, the benefits cannot be simply scaled across all businesses currently using cloud services or extrapolated across the economy.

Firstly, the cited benefits apply to a range of projects across businesses of different sizes and operating in different industries. For some, the benefits will be realised in cost-out, while other businesses may find themselves better placed to capture new opportunities or achieve more efficient growth.

Not all of these benefits are scalable or repeatable and may reflect low-hanging fruit in streamlining operations.

Further, the benefits realised by businesses include competitive benefits achieved by those at the forefront of technology adoption and innovation. Through new applications, businesses may be able to increase their market share at the expense of their competitors. As the cloud journey progresses, industry productivity as a whole may increase, but marginal benefits per business will decrease.

To estimate the benefits of cloud services to the economy, we leverage recent research on the productivity increases associated with greater adoption of digital technology. In this research Qu, Simes and O'Mahony (2017) estimate that digital technology contributed to a 6.6% increase in Australia's GDP in the decade to 2014.

We estimate cloud's share of digital benefits through considering expenditure on cloud services relative to all digital technology, which allows us to consider the order of magnitude of potential benefits.

Deloitte Access Economics estimates that the adoption of cloud services by Australian businesses has resulted in a **cumulative productivity benefit to the economy of \$9.4 billion over the last 5 years**. Further detail on the approach is provided in the following box.

This contribution to GDP is equivalent in magnitude to the Australian government's total IT spend in the 2016/17 financial year. This is notable considering cloud services is only one of many digital technologies and government spending is only a fraction of the total expenditure by business.

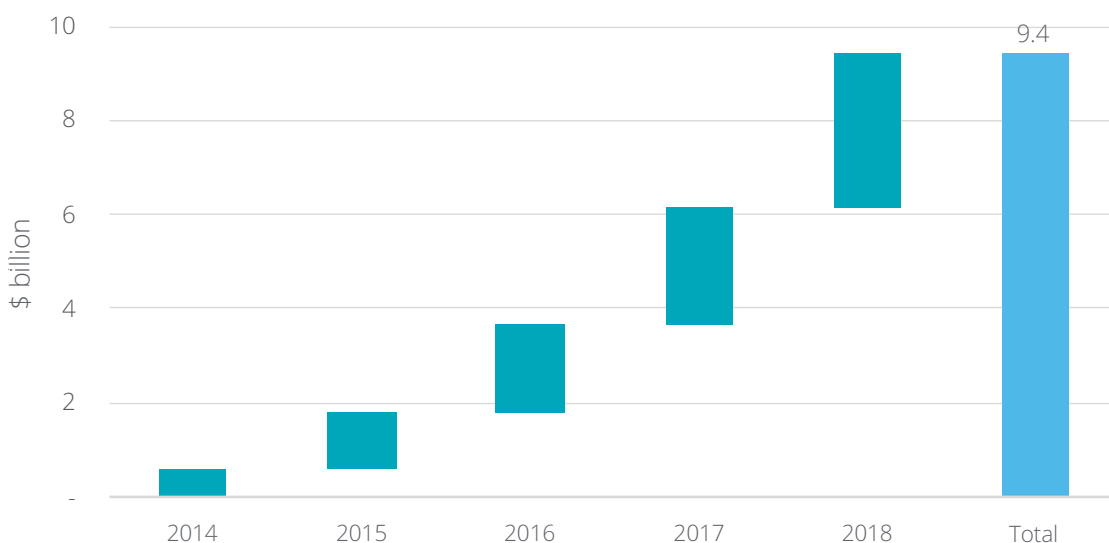
It is also important to recognise that Australia is still at the beginning of its cloud journey. As the proportion of businesses using cloud services increases, and as the sophistication of cloud use matures, it is likely that Australia will experience an even greater economic and productivity dividend.

For example, Gartner (2018) forecasts Australian cloud services expenditure will reach \$7.7 billion by 2021, representing approximately 60% growth in real terms in the next three years, with the potential for benefits to rise commensurately.

AlphaBeta Advisors (2018) identify opportunities for new digital innovations in Australia in sectors such as digital agriculture, data-driven urban management and smart exploration and production, with the potential to deliver \$315 billion in gross economic value to the economy over the next decade. ACS (2018) identifies the potential for the Internet of Things, enabled by cloud services, to increase productivity in industries such as construction, manufacturing, health and mining.

The adoption of cloud services by Australian businesses has resulted in a cumulative productivity benefit to the economy of \$9.4 billion over the last 5 years

Figure 4.2. Cumulative productivity benefit



Source: Deloitte Access Economics, 2018



### Estimating the benefits of cloud services to the economy

To estimate the benefits of cloud services to the economy, we consider the share of productivity improvements over time which can be attributed to use of cloud services.

Productivity measures the ratio between the volume of outputs and inputs. An increase in productivity reflects a more efficient use of labour and capital resources in producing goods and services. At the business level, productivity can be seen through cost or time reductions or staff working 'smarter'. In the economy, productivity includes increased efficiency as well as better products or services.

The individual firm benefits of productivity are potentially significant. As evidenced by the survey results, 78% of firms report increases in productivity, and these firms report an average productivity increase of 29.6%. Yet 71% of firms reported increases in costs or no cost saves.

Other studies also find significant productivity benefits from cloud systems. In 2018 research for Salesforce, for example, Deloitte Access Economics found that businesses using Customer Relationship Management (CRM) software earn 28% more revenue than businesses using paper, spreadsheet or no system.

This analysis of cloud leverages recent research on the productivity increases associated with greater adoption of digital technology. Digital technology has had transformational impacts across the economy, affecting business models, efficiency, employment and living standards, and a share of these impacts is attributable to business use of cloud services.

Quantifying the economy-wide benefits of cloud computing is more than an arithmetic exercise. Some improvements in productivity will translate to an economy-wide gain through improving the overall efficiency of firms, resulting in a flow-on benefit for consumers and improved living standards (Productivity Commission 2017). On the other hand, some productivity improvements will result in higher profits for some businesses adopting innovative technology, at the expense of technology 'laggards' (Weir 2018). As such, the net productivity impact will be much more modest.

Qu, Simes and O'Mahony (2017) consider how digital technologies drive economic growth, and estimate that digital technology contributed to a 6.6% increase in Australia's GDP in the decade to 2014.

In considering the benefits of digital over a 5-year period, we apportion a productivity benefit for each year between 2014 and 2018 (inclusive). The dollar value of this benefit is estimated by multiplying each years' cumulative productivity increase by real GDP per capita and total population.

The approach taken to estimate cloud's share of digital benefits uses expenditure on cloud services as a share of expenditure on IT as a proxy. This implicitly assumes that expenditure is correlated with the technology's value, and hence its productivity benefit to businesses. Apportioning a share of productivity gains to cloud is challenging because different investments have different returns, but also because of the interaction between technologies. For example, mobile devices, telecommunications services, websites and cloud are all required to work together to deliver productivity enhancing benefits. Expenditure can provide a conservative proxy for value where substitutes are available (for example between devices, service providers and data processing and storage). However, in a quickly evolving technology environment with inertia in business change, the benefits can be higher than those reflected by expenditure alone.

Based on 2018 estimates of Australian cloud services spending from IDG and Australian IT spending from Gartner, we estimate that cloud's share of expenditure is 5.45%.

This value is used to estimate cloud's share of digital benefits per year, and these values are summed for a cumulative value over the 5-year period (see Figure 4.2).

Deloitte Access Economics estimates that the adoption of cloud services by Australian businesses has resulted in a cumulative productivity benefit to the economy of \$9.4 billion over the last 5 years.

# 5 Overcoming cloud challenges

While the benefits of cloud services are easy to articulate, only 42% of Australian businesses use paid cloud computing (ABS 2019). More than half of businesses have not yet taken the first step, and may be held back by education, or skills.

As with most major changes in business, transitions are rarely seamless. While those that have moved to cloud have generally experienced benefits (78% of users report productivity benefits), there have been challenges along the way, and these present valuable insights for those considering a move to cloud services.

This chapter details the challenges experienced by businesses in transitioning to cloud services and other considerations including financial reporting, technical skills, copyright and use of data, and cyber security. These are all considerations for businesses in adopting cloud services, and need to be addressed in a sound cloud strategy.

## 5.1 Transition challenges

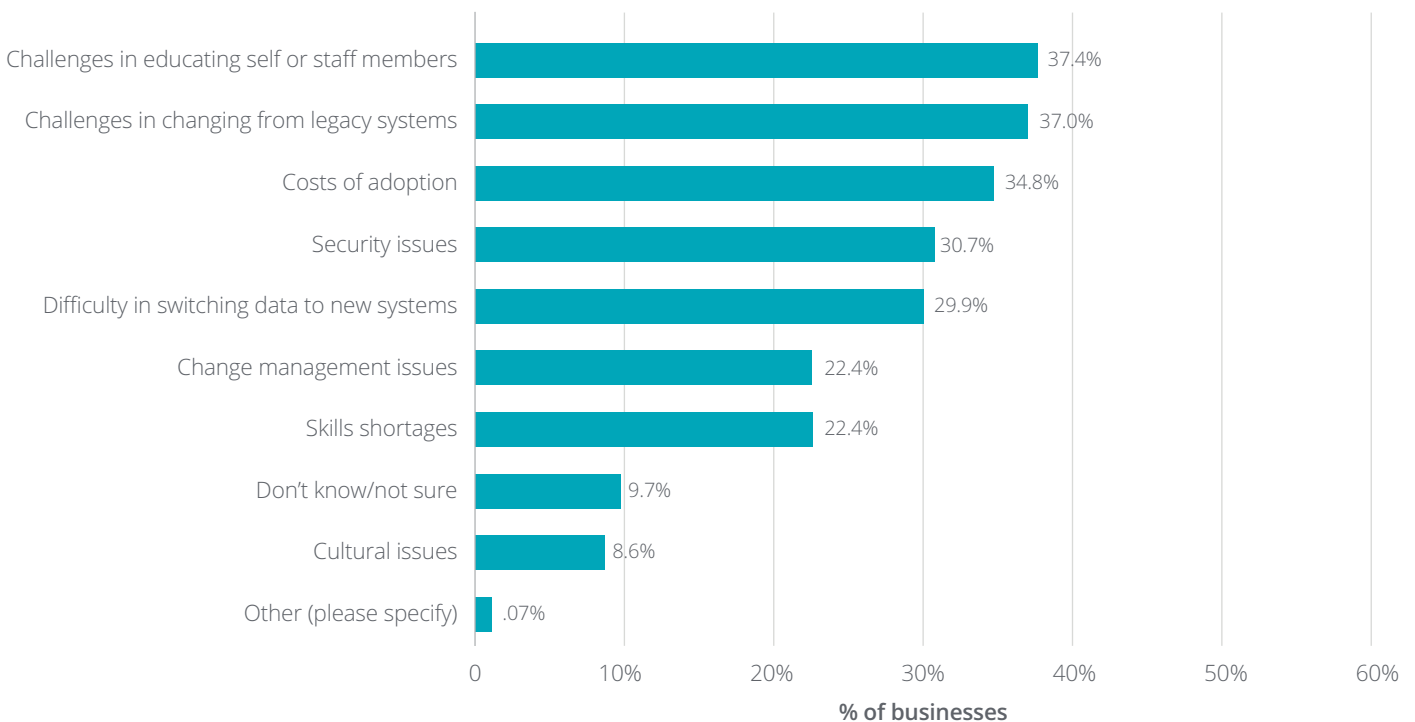
If a business is not 'cloud native', it has made a transition to the cloud from previous systems and operations. For businesses that have undergone a transition, 90% reported challenges in doing so (71% reported facing between up three challenges, and 19% reported more than three challenges).

As shown in Figure 5.1, the challenges most likely to be experienced relate to educating staff members, changing over from legacy systems and the costs of adoption, each cited by over one-third of businesses. Understanding these challenges can help businesses better prepare a transition, by investing in education, planning systems changeovers and having a strategy to optimise capital and operating costs.

## 5.2 Financial reporting challenges

As previously noted, cloud costs are directly aligned with usage, enabling business to forgo large initial capital outlays by substituting operating cost. Businesses, including finance teams and investors, need to be aware that this can change how the nature of how a business appears to be operating in quite substantial ways.

Figure 5.1. Business challenges/objections in transitioning to cloud services



Source: Deloitte Access Economics and Research Now, 2018

Consultations conducted for this research detailed the case of a company that had recently undertaken a large-scale transition to cloud services. This company had large capital costs and low operating costs, and reported performance through Earning before Appreciation, Depreciation and Amortisation (EBITDA). However, the adoption of cloud services flipped this dynamic. The company experienced increasing operating costs and a falling EBITDA, which caused concern to its investors. This emphasises that adoption of cloud services is not just a technical decision, but a financial one too.

Cloud services' ability to change how a business is run can be dramatic. In adopting cloud services, businesses need to go beyond considering technical feasibility and potential cost savings to understand also the potential need for a new operating model and the associated implications.

### 5.3 Technical skills

As the use of cloud services increases in businesses and across industries, the demand for information and communications technology (ICT) workers with cloud-related skills is also rising. The need for digital skills is both a business and policy consideration.

Analysis of LinkedIn data from 2016 found that the top technical skills demanded by employers hiring new ICT workers included IT infrastructure, web programming and cloud computing. Cloud and distributed computing skills were in the top 20 skills possessed by ICT workers who moved jobs (Deloitte Access Economics, 2017).

According to a LinkedIn (2016) report, many of the top 10 ICT occupations with the most LinkedIn job advertisements reflect emerging areas and skills. For example, an OpenStack Java/AMQP developer role relates to cloud computing development work.

The increase in use of cloud-based software means that occupations outside of IT also increasingly require employees to have better digital skills. For example, accounting software and services such as the cloud-based Xero mean that accountants need to continually develop their ICT skills in order to remain up to date with the latest technological developments (Deloitte Access Economics, 2016).

Further, tasks such as creating mobile applications, incorporating data analytics and developing cloud networks are increasingly embedded into business processes rather than being exclusively performed by ICT workers (Deloitte Access Economics, 2015).

There is a role for government to work closely with industry in addressing the need for technology skills through education policies, investment and skilled migration programs.

There is a role for government to work closely with industry in addressing the need for technology skills through education policies, investment and skilled migration programs.

#### 5.4 Cyber security

As more business activity occurs online, the security of information is increasingly important for businesses. Effective cyber security can reduce the risk of cyberattacks for a business, and protect the personal and financial information of its customers.

Between February and June 2018, there were 305 official notifications of data breaches by organisations involving personal data reported to the Australian Information Commissioner. The report shows that 59% were the result of criminal attacks.

Businesses need to be aware of cybersecurity, and can improve this through implementing security measures such as multifactor authentication and encryption systems. It is also important for businesses to identify and use a cloud services provider with strong security features.



#### Looking forward

There are some challenges to drive an increase in use of cloud services across Australia. Some of these, such as transition and financial reporting challenges, can be addressed at the business level, while technical skills, regulation and cyber security are broader economy-wide challenges.



## NAB – running cloud training

NAB is one of Australia's largest financial institutions, and is currently in the midst of a three-year, \$4.5 billion transformation, implementing broad scale technological change in an effort to become a 'simpler and faster' bank for customers. According to NAB Chief Technology & Operations Officer, Patrick Wright, cloud technology is a critical enabler of this broad goal: "Customers are demanding seamless, digital experiences and we need to be ready to deliver".

The shift to cloud services has been driven by a number of benefits – moving with speed, procuring servers quickly, taking the mundane work away from developers, keeping customers happy, and reducing cost, according to NAB executive general manager for infrastructure, cloud, and workplace, Steven Day.

As part of this transition, the bank is transitioning to be 'serverless', instead relying on cloud services for all computing functions. According to Day, this has meant a "more agile environment", as serverless lends itself very well to a microservices architecture, a key pillar of NAB's technology strategy. Developers are building and performing change on very small components, meaning that a failure in one part of the system is isolated, and the rest of the environment is not impacted.

Day says that one of the main benefits has been the enhanced reliability of IT systems, and this has helped get buy in from senior staff. "One of our priorities is to improve our technology resilience. Using serverless will help us improve our resilience as we de-couple our environments from monolithic applications using microservices, helping to minimise the spread of the impact of any system issues we encounter, and hopefully minimising the disruption to customers by limiting the impact of any issue."

Another key benefit has been cost reductions. "Typically we see 30 to 40 per cent run cost reduction from moving workloads to cloud," says Wright.

But the move hasn't been easy. The demand for skills, in particular, pose a challenge for many businesses moving to cloud. But NAB is overcoming this by launching its own 'NAB Cloud Guild', which has given more than 5,000 employees the opportunity to develop skills in cloud computing. The program was launched in April 2018, and a year later there are already close to 500 AWS accredited employees at NAB.

The training program, run in collaboration with AWS, allows employees to build their cloud skills in five key areas: architecture, security, development, operations and big data. Courses range from three to five days, and are available for everyone from graduate to senior staff.

And NAB is still in the process of moving further along the cloud journey, with a goal of moving 35% of all its applications to cloud services by the end of 2020.

<sup>4</sup> Sources: Australian Financial Review (2018), NAB looks to cloud power as it enters AI era, available at: <https://www.afr.com/technology/cloud-computing/nab-looks-to-cloud-power-as-it-enters-the-ai-era-20180812-h13v56>; NAB (2018), NAB launches cloud guild to develop AWS skills, available at: [https://news.nab.com.au/news\\_room\\_posts/nab-launches-cloud-guild-to-develop-aws-skills/](https://news.nab.com.au/news_room_posts/nab-launches-cloud-guild-to-develop-aws-skills/); ZDNet (2018), NAB's Cloud Guild giving in-house AWS training to combat skills shortage, available at: <https://www.zdnet.com/article/nabs-cloud-guild-giving-in-house-aws-training-to-combat-skills-shortage/>; ZDNet (2019), Banking on serverless at NAB, available at: <https://www.zdnet.com/article/banking-on-serverless-at-nab/>.



## 6 What's next for cloud?

Basic uses of cloud services simply involve replacing physical infrastructure with virtual equivalents. On the other hand, cloud services also have a foundational role in enabling next-wave technologies through its agility in processing large volumes of data, the availability of existing products and services, and scalability facilitating global deployment.

Cloud services enable a range of operations and applications, and is expected to become more ubiquitous in coming years as the costs of collecting data decline and the volumes of data exponentially increase.

Improvements in low-cost sensors and cheaper computing power have made it easier than ever before for businesses to collect data on all aspects of their operations, and cloud services will be in high demand as businesses seek to gain insights and streamline processes based on these ever-increasing volumes of data.

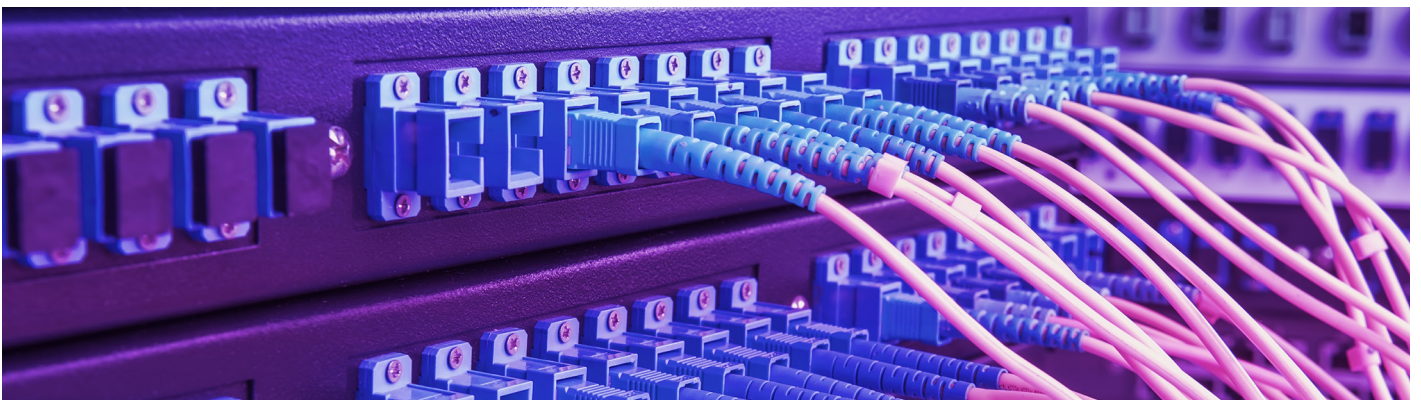
Cloud services also provide tools for businesses to leverage, so that companies can direct their focus on innovative and value adding uses of the technology rather than replicating the existing technologies. Further, businesses will not need to focus on upgrading their own technology over time, while still remaining at the cutting edge.

For example, a company may want to develop a facial recognition security feature for its users. Previously, this might have meant building facial recognition algorithms from scratch. Now the company can start with a cloud-based facial recognition product that has already benefited from the input of billions of images to inform its algorithm.

Just as most computer-users are not experts in the underlying physical infrastructure of a computer, developers can use cloud services without becoming experts in the underlying technology, focusing on their area of speciality. For instance, data scientists can use machine learning from cloud services to improve their understanding of data without becoming a specialist in developing machine learning algorithms.





This chapter explores the next-wave technologies enabled by cloud services.

Cloud services have a foundational role in enabling next-wave technologies



### 6.1 Emerging technologies

Cloud services are a foundation for a range of emerging technologies including artificial intelligence, machine learning, robotics and the Internet of Things.

 <p><b>Artificial intelligence and machine learning</b></p>	<p>The development of AI and cloud services are closely linked. Cloud services have enabled huge data sets to feed into AI and machine learning algorithms. Moreover, cloud services have the ability to expand the capability of businesses to utilise AI.</p> <p>Creating a sophisticated AI from scratch requires considerable time and skill. Businesses may have an innovative idea that requires AI, but not enough programmers to bring that idea to reality. With cloud services, businesses can leverage existing work done to develop AI, focusing instead on innovative applications.</p>
 <p><b>Drones</b></p>	<p>Drones have made it easier than ever to quickly and safely gather rich visual data. Cloud services can be used to analyse this data. The potential impacts on industries are wide ranging.</p> <p>For instance, farmers can use drones to capture images of crops, and cloud-based algorithms can detect areas for the farmers' attention. In America, drones are being used to capture images of skyscrapers and cloud technology is being used to process these images, savings workers from having to perform potentially dangerous physical inspections (Madigan, 2018).</p>
 <p><b>Robotics</b></p>	<p>The rise of robotics is increasing automation in businesses. AI is improving the capability of robots to accomplish sophisticated tasks rather than just simple, repetitive, manual jobs.</p> <p>This will have major implications across industries. For instance, cloud services can power autonomous vehicles, reducing incidents and increasing efficiencies relative to human drivers.</p>
 <p><b>Blockchain</b></p>	<p>Blockchain is a distributed ledger verified by a network, using cloud processing to enable transactions without the need for an intermediary third party.</p> <p>Best known for its use as a cryptocurrency, the technology has far-reaching implications beyond money. For instance, companies could build a distributive ledger of skills that verifies employee's qualifications, reducing CV fraud (Ahmed, 2018).</p>
 <p><b>Internet of Things</b></p>	<p>The Internet of Things refers to capability of objects to connect to the internet, enabling them to talk with each other in smart ways. Cloud services enable the processing of the large volumes of data from these devices.</p> <p>For examples, the oil and gas company Woodside Energy has installed 200,000 sensors in its LNG site, which measure temperature and pressure. Each sensor is connected to cloud services, enabling the company to run 3 million data calculations per day to forecast potential problems (Chanthadavong, 2016).</p>

The use of cloud services in enabling these technologies is expected to grow in coming years. A Deloitte Access Economics survey of small-to-medium sized business found 40% expect to incorporate machine learning and other new technologies within their business operations in the next five years.

Visy, having experienced productivity benefits through cloud services in improving application performance, enhancing customer experience and reducing time to market, is now exploring the emerging technologies enabled by cloud services.

Visy is considering the use of technologies such as data analytics, machine learning, artificial intelligence and the Internet of Things to enable it to further innovate and achieve productivity and other core business benefits.

As the takeup of cloud services increases and its use cases evolve, cloud-based innovation and more integrated use of cloud within businesses will have a growing impact across the Australian economy.



#### Looking forward

Cloud is a foundational technology, and its impact on businesses will deepen in coming years as emerging technologies are adopted and further innovations are developed.

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# Our people



**John O'Mahony**

**Partner**

T. +61 2 9322 7877

E. joomahony@deloitte.com.au



**Kevin Russo**

**Partner**

T. +61 3 9671 6768

E. krusso@deloitte.com.au



**Ric Simes**

**Senior Advisor**

T. +61 2 9322 7772

E. rsimes@deloitte.com.au



**Michelle Mountford**

**Associate Director**

T. +61 2 9322 7146

E. mmountford@deloitte.com.au



**Jenny Kang**

**Economist**

T. +61 2 9840 7059

E. jenkang@deloitte.com.au

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## Contact us

### Deloitte Access Economics

ACN: 149 633 116  
225 George St  
Sydney NSW 2000  
Tel: +61 2 9322 7000  
Fax: +61 2 9322 7001

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