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Realising a cloud-enabled economy in New Zealand:

How cloud drives economic and societal impact through businesses

2023

By 2030, businesses can deliver greater societal value in a cloud-enabled New Zealand

Across key sectorsⁱ this opportunity is expected to represent:

\$1.5 billion combined annual productivity benefits unlocked through cloud-enabled businesses in healthcare, education, and agriculture

This represents a 37% increase on current levels



300,000 people in New Zealand employed by cloud-enabled businesses within healthcare, education, and agriculture

5 million virtual health consultations supported by cloud-enabled businesses



400,000 school students engaging in online learning via cloud-enabled businesses

1 in 3 farms using precision agriculture technologies supported by cloud-enabled businesses



Current values are annual 2022-2023 values based on the latest available data.

i. Key societal sectors are healthcare, education, and agriculture.

Source: Accenture research (see global report appendix for methodology).

Overview

Smaller businesses (all businesses excluding those with 250 employees or more)¹ are a major driver of economic performance. In New Zealand, these businesses collectively account for over 99% of all businesses, 70% of employment, and one-third of GDP.^{2,3,4} These businesses are also a major source of innovation and disruption in the economy, leveraging old and new technologies to fill gaps in the current market, and bringing new products and services to bear.

By allowing users to procure on-demand, scalable IT products and services over the internet or private network, cloud technology has driven economic and societal benefits by creating new business models, reducing costs, and supporting new opportunities for entrepreneurs and startups. According to the Organisation of Economic Cooperation and Development (OECD), 56% of all businesses across New Zealand now utilise at least some basic form of cloud technology, although adoption rates of more advanced technologies, such as artificial intelligence (AI) and machine learning (ML) remain low, at approximately 13% of businesses. Cloud technologies have most profoundly impacted smaller businesses and startups by allowing them to start, operate, and scale their organisation more effectively.

The use of cloud technology by businesses is expected to become increasingly ubiquitous, advanced, and mature. With continuous advancements in technology and the decreasing costs of cloud services, businesses will have access to an even wider range of scalable and cost-effective technology solutions across functions, occupations, and industries. We refer to this potential future state as the “cloud-enabled economy,” a future characterised by high levels of overall cloud adoption across New Zealand businesses. It is anticipated that under this scenario, 90% of all businesses would adopt at least a basic level of cloud technology. For many businesses, however, this represents only the beginning of their cloud journey. As businesses tap into advanced cloud functionalities, such as AI, data analytics, and serverless computing, they can foster innovation, streamline operations, and customise consumer experiences at scale. These advanced uses can unlock new revenue streams, encourage innovation and the creation of new business models, and enhance competitiveness, collectively underpinning the future of the digital economy.

By 2030, a cloud-enabled New Zealand economy is expected to deliver even greater societal impact by supporting businesses to produce innovative new products and solutions or augment their existing operations. Within the societal sectors of health, education, and agriculture, this annual contribution is expected to reach \$1.5 billion, a 37% increase on the current contribution.⁵ By 2030, cloud-enabled businesses are expected to support five million virtual health consultations, 400,000 school students to access online education, and one in three farms access more efficient and sustainable farming practices in New Zealand. Cloud-enabled businesses are also expected to be pivotal in developing a more sustainable future and designing digital finance solutions that help to support better financial inclusion and wellbeing.

¹ This report refers to businesses as those with fewer than 250 employees. This corresponds to the term “micro, small, and medium enterprises (MSME) used by both the Organization for Economic Cooperation and Development (OECD) and the United Nations (UN). All modelling in this report refers to businesses of this size, see Box 1 for explanation.

² NZ.Stat (2022), Enterprises by business type and employee count size 2000-2022.

³ OECD (2021) SME and entrepreneur outlook

⁴ New Zealand Government (2022) Unleashing business potential across New Zealand

⁵ All monetary values in this report are quoted in New Zealand dollars unless otherwise specified.

Although these benefits are substantial, the opportunities of the future cloud-enabled economy will not eventuate without immediate action. To unlock this potential, New Zealand businesses, industry, and government will need to urgently collaborate to foster the continued adoption and maturity of cloud technology usage. Businesses can help to achieve a cloud-enabled economy by:

- identifying how cloud technology can be embedded within their business and developing a strategy that is cloud-led to help them scale and deliver greater impact; and
- developing a plan for transitioning off legacy systems and training employees to leverage the benefits of cloud technology.

All levels of government across New Zealand can support businesses to accelerate the path to a cloud-enabled economy by:

- prioritising cloud education and training as appropriate, both in tertiary education and in the workforce
- incentivising digital uptake along with cloud adoption and maturity for businesses, to ensure innovation can continue unimpeded; and
- leading by example by adopting cloud technology and promoting cloud-first policies across all public sector organisations, to provide confidence for businesses to adopt cloud.

1 The cloud-enabled economy

Cloud technology has changed the way many businesses operate, particularly for smaller businesses (businesses with between 1 and 250 employees)⁶, by enabling them to scale quickly, reduce costs, reach global markets, and access a range of technology resources that were previously unattainable.

Box 1: Defining the businesses examined in this report

This report examines the role of cloud-enabled businesses and startups in contributing towards improved societal outcomes in New Zealand. In particular, this report focuses on smaller businesses as it is part of a global research project investigating the impact of cloud on micro, small, and medium enterprises (MSMEs), as defined by the Organisation of Economic Cooperation and Development (OECD). The OECD defines MSMEs as those with fewer than 250 employees.

1.1 Cloud technology enables the digital economy

Cloud technology refers to the provision of on-demand IT products and services delivered over the internet or a private network.⁷ This involves housing digital resources from centralised servers owned and operated by cloud service providers, reducing the need for individual businesses to procure and maintain physical hardware. Outsourced technology provides greater flexibility to support businesses through the early stages of the business lifecycle by:

- reducing overheads and time to market
- providing greater ability to scale up or down depending on business demands
- offering specialised technology solutions
- increasing computational power of ordinary devices; and
- enhancing security and resilience.⁸

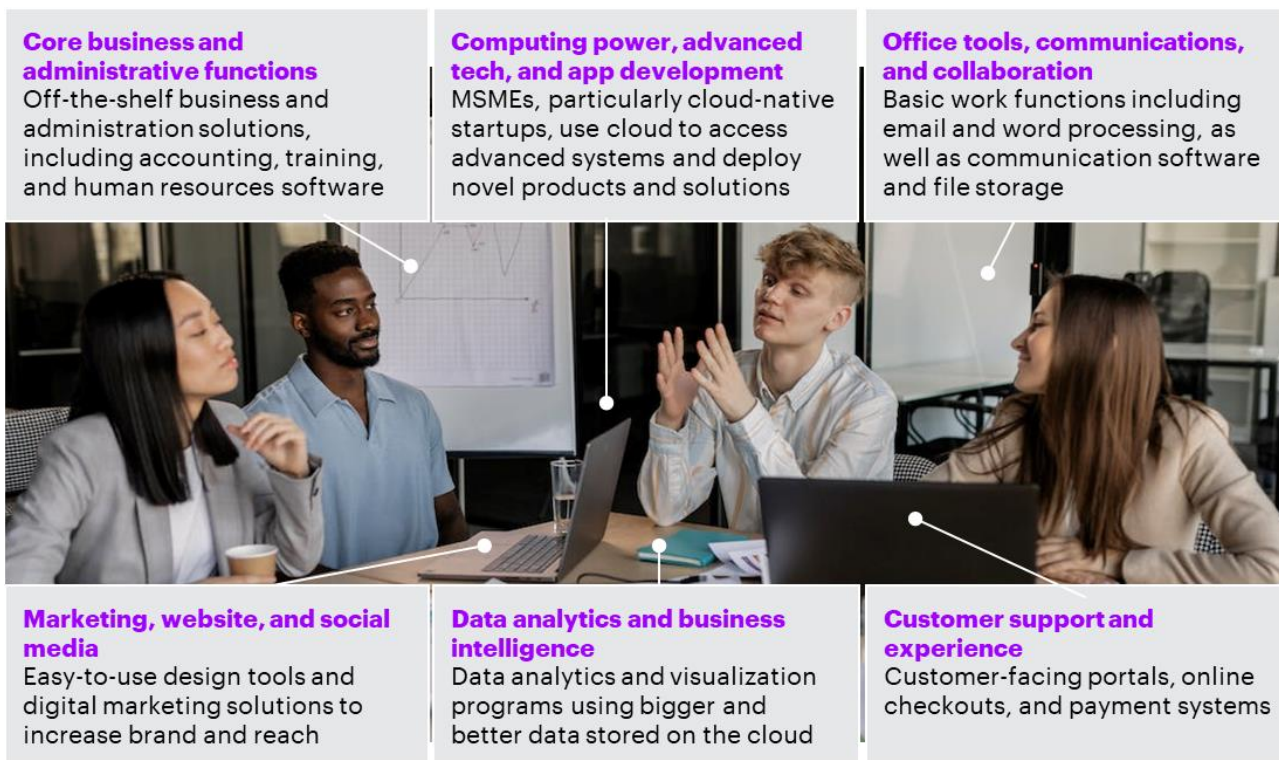
By promoting shared resources, cloud has fundamentally changed the way that individuals and businesses interact with technology, with the number of potential applications of cloud technology far eclipsing simple, remote data storage. Most applications, platforms, and smart products have some functionality facilitated by cloud technology as shown in Figure 1. Having access to on-demand functionalities supports businesses to start, operate, and scale more efficiently and effectively.

⁶ The definition of businesses used in this report is taken from the OECD (2023) and covers enterprises with businesses between 1-250 employees. The choice of this terminology as opposed to small to medium business or enterprise (SMB or SME) which are more common in New Zealand is to ensure consistency with global report and modelling.

⁷ AWS (2023), What is cloud computing?

⁸ Accenture societal impact survey (2023), n = 562.

Figure 1: End-to-end cloud applications for New Zealand businesses

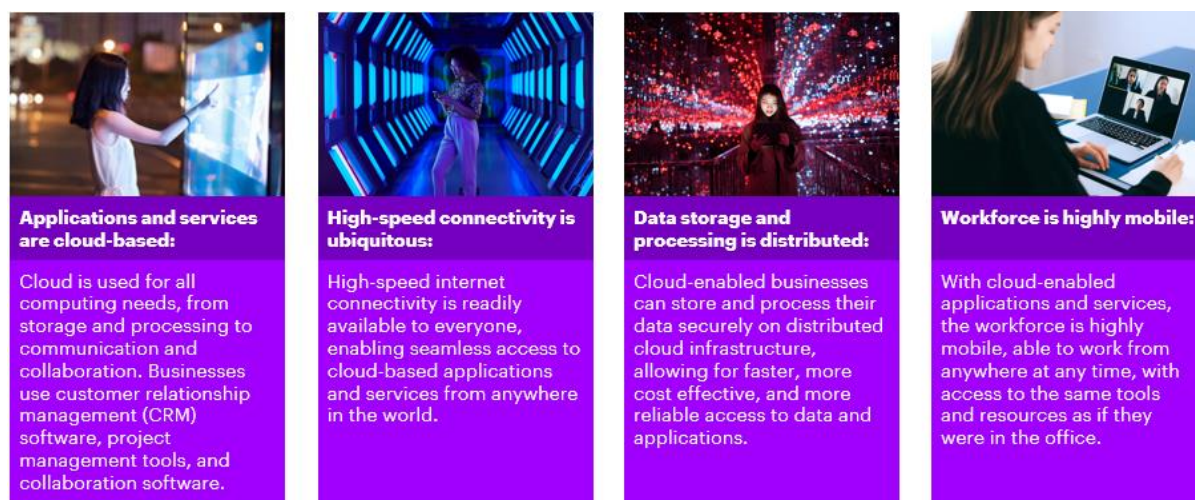


Source: Accenture

1.2 Achieving a cloud-enabled economy can unlock significant economic and societal potential

With continuous advancements in technology and the decreasing costs of cloud services, economies will continue to experience a wave of digital disruption and productivity as businesses find more ways to produce novel, new products and solutions or augment their existing operations. We refer to this potential future state as the “cloud-enabled economy,” a future characterised by high levels of cloud adoption; based on an assessment of cloud industry forecasts, this report expects 90% of all businesses will adopt at least a basic level of cloud technology in a cloud-enabled economy. As cloud technology applications mature, a cloud-enabled economy would increasingly involve digital applications and services being cloud-based, high internet speed and connectivity, cloud-enabled data storage and processing, as well as a mobile workforce (see Figure 2).

Figure 2: Characteristics of a cloud-enabled economy



Source: Accenture

1.2.1 The spectrum of cloud adoption

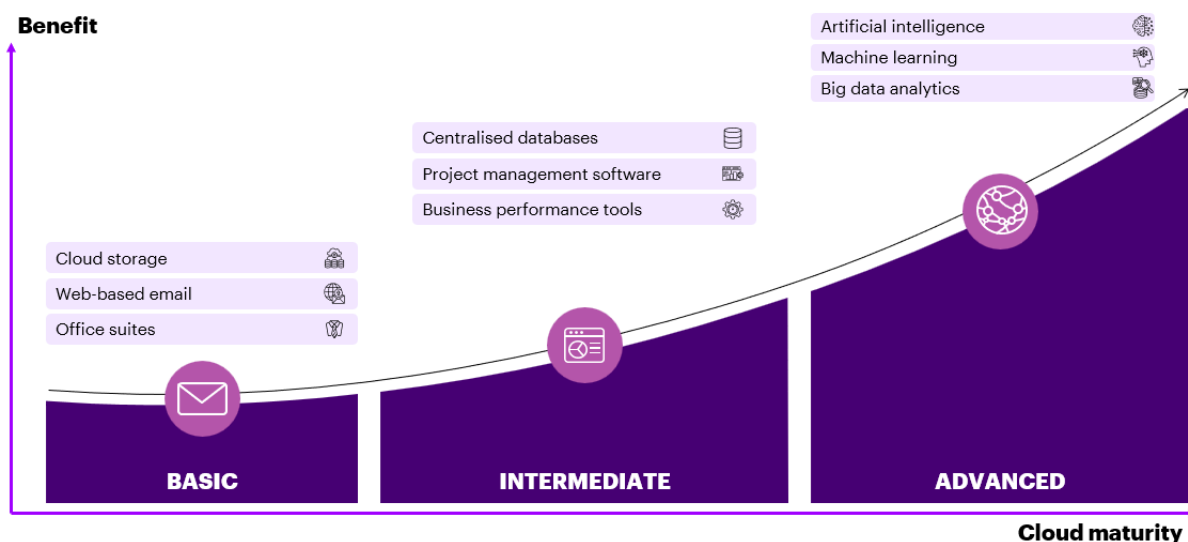
The definition of cloud technology adoption used in this report is consistent with the OECD, and refers to the share of businesses that purchased cloud services⁹ as a proportion of all businesses, across all levels of maturity.¹⁰ However, cloud technologies have a range of applications across a suite of business functions that mean that the use of cloud technology can be considered on a spectrum of maturity or sophistication as shown by the figure below, which includes:

- **Basic adoption:** user-friendly solutions designed for everyday tasks. These solutions typically do not require specialised technical knowledge to operate and primarily serve to simplify and enhance common digital activities. These include simple cloud-based storage solutions, web-based email services, and collaborative office suites.
- **Intermediate adoption:** applications and platforms that cater to more specialised needs but still largely consist of off-the-shelf products with intuitive interfaces. Such tools include customer relationship management, enterprise resource planning, project management tools, developer platforms, and cloud-based databases.
- **Advanced adoption:** highly specialised cloud applications and cutting-edge technologies tailored for expert tasks. This category encapsulates machine learning and AI platforms, big data analytics tools, IoT platforms, serverless computing, container management systems, and advanced security and compliance tools.

⁹ Cloud computing as part of this definition includes information and communications technology (ICT) services that are provided over the internet or a private network to access servers, storage, network components and software applications

¹⁰ OECD (2023), OECD Going Digital Toolkit

Figure 3: Spectrum of cloud maturity and example applications

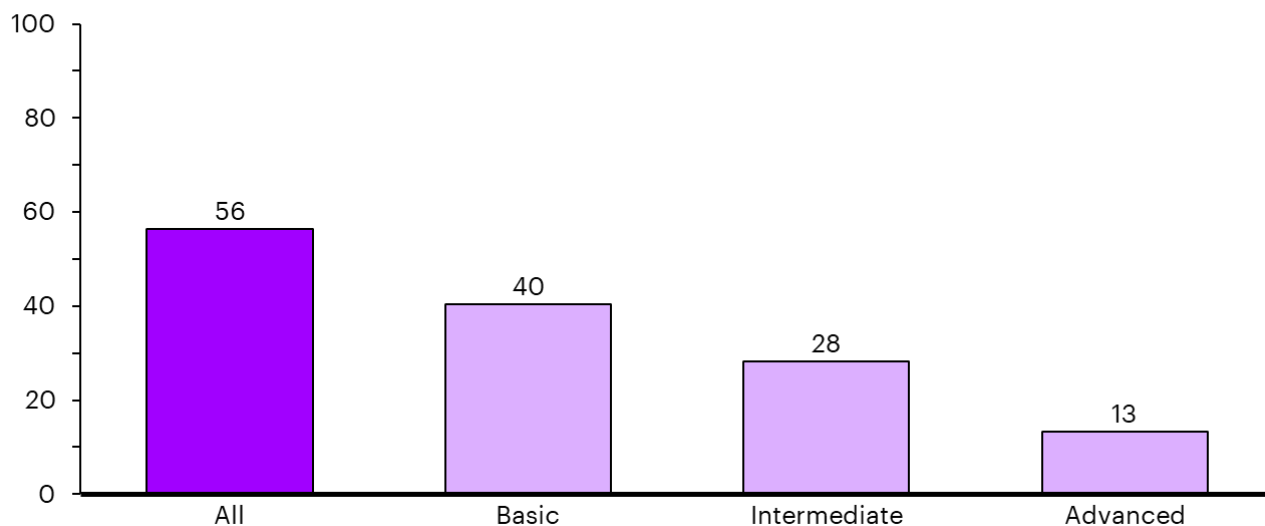


Note: Applications above are examples of types of uses for each of the levels of maturity. The lists are not exhaustive. Source: Accenture.

The rate of cloud adoption across New Zealand varies considerably depending on the technology types. The OECD reports that 56% of businesses use at least a basic level of cloud technology in their business, although intermediate and advanced adoption rates are far lower with 28% and 13% of businesses, respectively (see Figure 5).

Figure 4: Cloud adoption by sophistication, all New Zealand businesses (2022)

% of all firms adopting cloud technology



Source: OECD (2023)

1.2.2 Advanced cloud usage unlocks the potential for emerging and innovative technologies

As the global economy increasingly digitises, the need for businesses to increase their cloud maturity is becoming increasingly pertinent. Businesses that fail to leverage the scalability of cloud solutions may not only forfeit the ability to compete more effectively with fewer fixed IT

costs, but may also pass up more sophisticated data analysis tools, more secure safeguards for digital assets, streamlined compliance with international regulations, and advanced technology applications (such as AI). For many businesses to maintain their competitive edge in a dynamic, cloud-enabled economy, the sophistication of their adoption will need to evolve and adapt with the technology according to their specific needs.

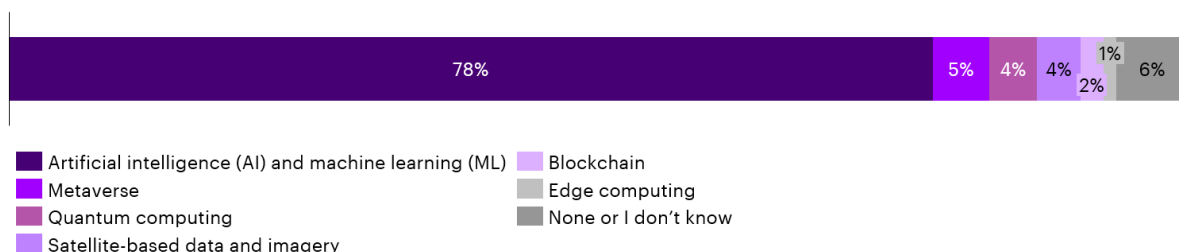
Embracing advanced cloud adoption also allows businesses to select from a variety of innovative and cutting-edge technologies to meet their unique business needs and secure a competitive edge in the market. Cloud has increased the viability and proliferation of a wide range of tools, business models, and technologies that, together with cloud, generate societal and economic impact. Advanced applications of cloud include:

- artificial intelligence (AI), encompassing generative AI
- machine learning (ML)
- internet of things (IoT); and
- edge computing.

These examples form a growing list of advanced technologies that have become accessible to a wider base of users through cloud technology (see Appendix D of the global report for a full description of each technology supported by cloud).¹¹ Of these technologies, generative AI is experiencing the most rapid and dramatic growth. Over the next 10 years generative AI is expected to grow at an annual average rate of 27%, globally.¹² Generative AI, in particular, is disrupting and enhancing businesses’ processes, accelerating innovation, and facilitating greater speed and creativity across a variety of industries. Businesses and employees are experimenting with generative AI to create content that supports a range of tasks from writing text and code to generating images.¹³ As shown in Figure 5, 78% of businesses across a range of countries and industries identified AI (including generative AI and natural language processing (NLP)) and ML as the technologies most likely to have a significant societal impact in 2030.¹⁴ Generative AI could be used by cloud-enabled businesses for a wide variety of applications, such as helping medical professionals analyse patient data and testing results to inform decision making, or generating practice exam questions and content with instant feedback available to support individualised learning pathways.

Figure 5: Technologies supported by cloud creating the most significant societal impacts in 2030

Average % of cloud-enabled MSMEs across several industries that believe a technology supported by cloud will be the most significant in creating societal impacts in 2030



Source: Accenture societal impact survey (2023), n = 562. ‘Artificial intelligence and machine learning (ML)’ includes subsets generative AI and natural language processing (NLP).

¹¹ Damian Mazurek, (2023), Leveraging Cloud-based AI/ML Services to elevate your business.

¹² Precedence Research (2023), Generative AI Market size to hit USD 118 Bn by 2032

¹³ AWS (2023), Generative AI on AWS.

¹⁴ Survey responses were from businesses working in healthcare, education, agriculture, finance, and sustainability.

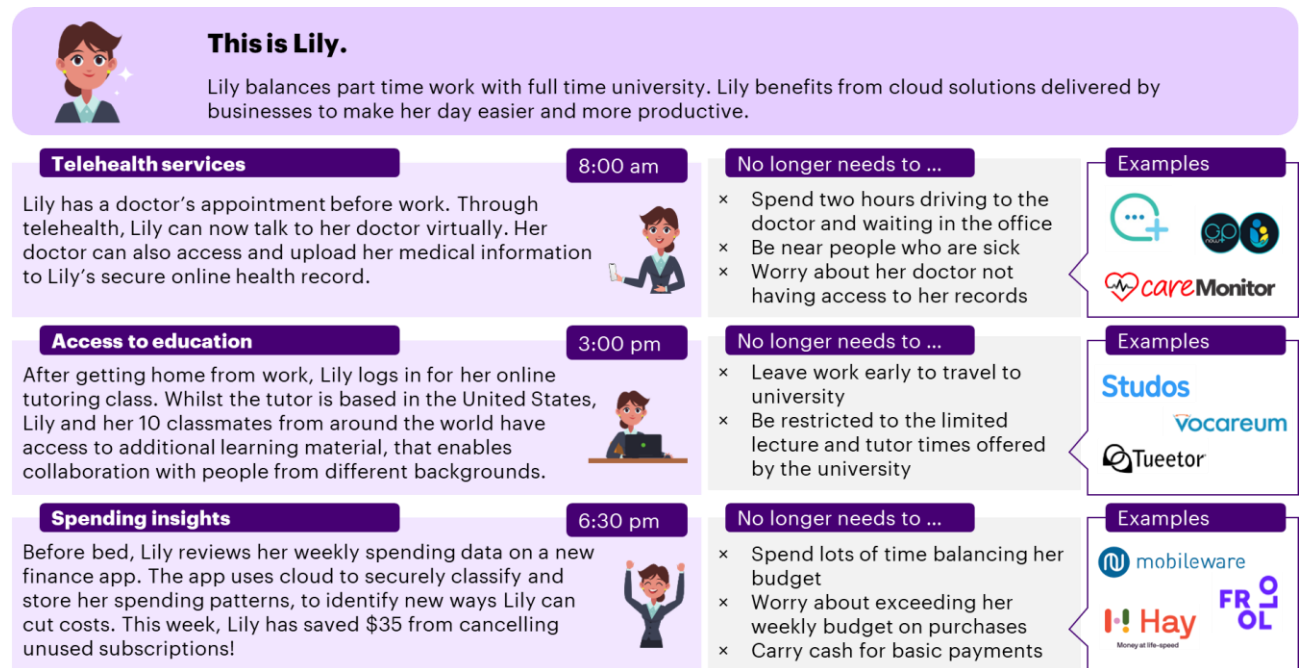
1.2.3 A more productive, cloud-enabled economy offers societal as well as economic benefits

While the opportunity to scale and grow businesses has a clear impact on economic activity (see Chapter 2), in many cases businesses can also create a positive societal impact. Cloud has opened up a range of emerging technologies that are underpinning a new wave of digitally-led innovation to address some of society’s most pressing, global issues. Cloud technology offers businesses new ways to produce and commercialise technological solutions that generate positive societal benefits, in addition to economic benefits, across a range of industries. Although this list of industries is not exhaustive, the estimation of the societal impact of cloud technology is focused on the following industries:

- healthcare
- education
- agriculture
- finance; and
- sustainability and disaster response.¹⁵

While these industries are not the only ones that are impacted by cloud technology, they face increasingly complex challenges that could lead to less equitable societal outcomes if they do not adapt and harness the benefits offered by cloud technology. These industries are also directly linked to the UN Sustainable Development Goals (SDGs), particularly the overarching objectives of improved healthcare (Goal 3), education (Goal 4), and economic prosperity and equality (Goal 9 and 10).¹⁶ Figure 6 demonstrates through a stylised cameo how cloud technology supports access to these industries for individuals through digitisation.

Figure 6: The impact of cloud-enabled businesses on individuals



Notes: Examples include Businesses and startups using cloud solutions from AWS case studies
Source: AWS¹⁷

¹⁵ The report chose to focus on these industries since most societal impact case studies reviewed fell into one or more of these industries. These labels also benefit from matching the economic modelling data as they are taken directly from the International Standard Industrial Classification (ISIC).

¹⁶ United Nations (2023), Sustainable development goals.

¹⁷ AWS (2023), Customer Success Stories.

2 Unlocking a total \$1.5 billion in productivity benefits within key societal sectors

Smaller businesses (those with fewer than 250 employees) are a major driver of economic performance in New Zealand, accounting for about 99% of all businesses, 70% of employment, and one-third of GDP.^{18,19,20} Cloud technology is helping to create and scale businesses (see Chapter 1), the impact of which can be identified in overall, aggregate economic performance. The impact of further cloud adoption and maturity on aggregate economic output is estimated with a novel economic model, based on analysing current data that captures the relationship between adoption and economic activity. In Chapter 3, this analysis is taken to the next level of granularity, assessing how much of this impact can be attributed to key societal sectors of healthcare, agriculture, and education.

Box 2: Modelling the economic potential of a cloud-enabled economy

This research estimates the impact of cloud on economic productivity at the country level using data from the OECD to capture the relationship between cloud adoption rates and GDP (controlling for capital and labour inputs). A full explanation of the modelling approach, data, and outputs can be found in Appendix A of the global report.

Cloud technology use and investment in New Zealand has grown steadily in recent years, particularly as a result of the COVID-19 pandemic. As of 2022, 56% of businesses in New Zealand use at least basic cloud technologies, although adoption of more intermediate and advanced applications is lower (see Section 1.2.1). Early adoption in New Zealand was mostly by large businesses and multinationals, with smaller business only recently embracing more formal digital strategies.²¹ The forthcoming launch of cloud data centres in New Zealand is expected to raise awareness and increase local speeds. Continued investment from New Zealand industries and government is required to continue realising the benefits of the cloud-enabled economy.



Annual productivity benefits unlocked by cloud-enabled businesses in key societal sectors are expected to reach \$1.5 billion by 2030



300,000 people in New Zealand are expected to be employed by cloud-enabled businesses in key societal sectors by 2030

¹⁸ NZ.Stat (2022), Enterprises by business type and employee count size 2000-2022.

¹⁹ OECD (2021) SME and entrepreneur outlook

²⁰ New Zealand Government (2022) Unleashing business potential across NZ

²¹ Ibid.

The productivity benefits of the cloud-enabled economy to New Zealand's societal sectors could be significant. Businesses in the healthcare, education, and agriculture industries in New Zealand are expected to unlock \$1.5 billion in combined annual productivity benefits by 2030, a 37% increase from \$1.1 billion currently.²² Under this scenario, it is estimated that 300,000 people would work at cloud-enabled businesses in these industries, which would be 9% of the total jobs in New Zealand, an increase from 6% currently. This reflects the increasing ubiquitousness of cloud technology in almost all forms of digital technology and occupations across the economy.

This modelling demonstrates the economic benefits of increasing cloud adoption as part of the cloud-enabled economy will be significant. However, the economic potential of cloud technology is poised to stretch well beyond 2030, as the advanced adoption of cloud by businesses becomes increasingly prevalent. Innovations such as quantum computing, augmented and virtual reality, and advanced AI algorithms will inherently rely on the cloud's vast storage and computational capabilities, ensuring that cloud services remain integral to the technological and economic landscapes of the future.

²² All monetary values are quoted in New Zealand (2023) dollars unless otherwise specified.

3 The societal impact of the cloud-enabled economy

Businesses that harness cloud technology do not only create economic value, they also have the potential to drive significant societal impact. We define “societal impact” in reference to the positive changes and improvements in outcomes facilitated by cloud technology in areas such as healthcare, education, and agriculture. By leveraging cloud technology, businesses can enhance the efficiency, affordability, and accessibility of services in these industries, enabling advancements such as virtual healthcare, online education, precision agriculture, financial wellbeing, and sustainable technology. These solutions will lead to improved social wellbeing and development throughout New Zealand.

3.1 Driving innovation and improving access to healthcare and life sciences

Basic and affordable healthcare is essential to achieving Goal 3 of the SDGs, which is to ensure healthy lives and wellbeing. However, cost, complexity, and distance often arise as barriers to accessing care, particularly for underserved or disadvantaged communities. Under a cloud-enabled economy, the New Zealand healthcare sector will benefit from innovative solutions that help to streamline and improve patient care and management, such as through virtual consultations, wearable monitoring devices, and smarter use of data. For example, cloud-enabled businesses are expected to support five million virtual health consultations per year by 2030, an increase of 65% from currently.²³ While virtual health consultations represent only one way that cloud-enabled businesses can support societal outcomes in healthcare, the combined productivity benefits of these businesses are expected to reach \$600 million in annual benefits by 2030 for the healthcare sector alone.

Impact on healthcare in the cloud-enabled economy by 2030



\$600 million in annual productivity benefits unlocked through cloud-enabled businesses in the healthcare sector, an increase from \$440 million currently

5 million virtual health consultations supported by cloud-enabled businesses, a 65% increase from 3 million consultations currently



Note: Estimates for the number of virtual health consultations produced through market size estimates (see Appendix C of the global report) and are calculated separately to the GDP contribution. Current values are annual 2022-2023 values based on the latest available data.

The flexibility and scale provided by cloud allows businesses to innovate and produce technology solutions that improve healthcare in a range of ways (see Figure 7). Cloud-based software applications can help to streamline administrative tasks, creating efficiency for

²³ Remote health consultations can also be supported by telephone or through large cloud-enabled businesses.

healthcare providers. Well Revolution is a medium-sized business based in New Zealand utilising cloud technology to enable people to access doctor’s consultations quickly without needing an appointment, and to facilitate prescriptions to be sent electronically within minutes to pharmacies.²⁴ Healthcare providers can use cloud technology to support informed patient healthcare decisions, helping providers to collaborate and easily share patient information, and assisting them to take insights from large amounts of data to make treatment personalised and tailored. Technologies supported by cloud, particularly generative AI, also have significant potential to change the healthcare industry, from the delivery of healthcare to administrative functions. Businesses can use generative AI to support clinical decision making, helping medical professionals analyse data more accurately, along with supporting efficiency in research and development.²⁵

Figure 7: How cloud enables businesses to deliver improved outcomes in healthcare



Source: Accenture interviews and research^{26,27,28,29,30}

3.2 Improving access to engaging and personalised education

New Zealand has historically performed well across educational outcomes, however in the past decade this trend has reversed with literacy rates and standardised test scores of New Zealand students declining.³¹ In 2022, a report released by Education Hub, a not-for-profit

²⁴ Well Revolution (2023).

²⁵ WE Forum (2023), How will generative AI impact healthcare?

²⁶ Eze et al. (2020), Telemedicine in the OECD: An umbrella review of clinical and cost-effectiveness, patient experience and implementation.

²⁷ OECD (2021), Laying the foundations for artificial intelligence in health.

²⁸ OECD (2019), Health in the 21st Century: Putting Data to Work for Stronger Health Systems.


²⁹ OECD (2021), Empowering the health workforce to make the most of the digital revolution.

³⁰ OECD (2023), The COVID-19 Pandemic and the Future of Telemedicine.

³¹ Emile Donovan (2022) Why literacy rates are falling in NZ schools


research institution, found that by the age of 15, two out of five children are just meeting or failing literacy standards.³² Education services offer a potential remedy to falling education outcomes by utilising cloud technology to make education more equitable, accessible, and engaging across all education levels. Under a cloud-enabled economy, businesses in education are expected to unlock \$430 million in annual productivity benefits by 2030. Through supporting the education industry, cloud-enabled businesses are expected to facilitate 400,000 school students and 1 million adults in New Zealand to receive online learning by 2030.

Impact on education in the cloud-enabled economy by 2030



\$430 million in annual productivity benefits unlocked through cloud-enabled businesses in the education sector, an increase from \$310 million currently

400,000 primary to high school students using online education via cloud-enabled businesses, a 33% increase from 300,000 students currently



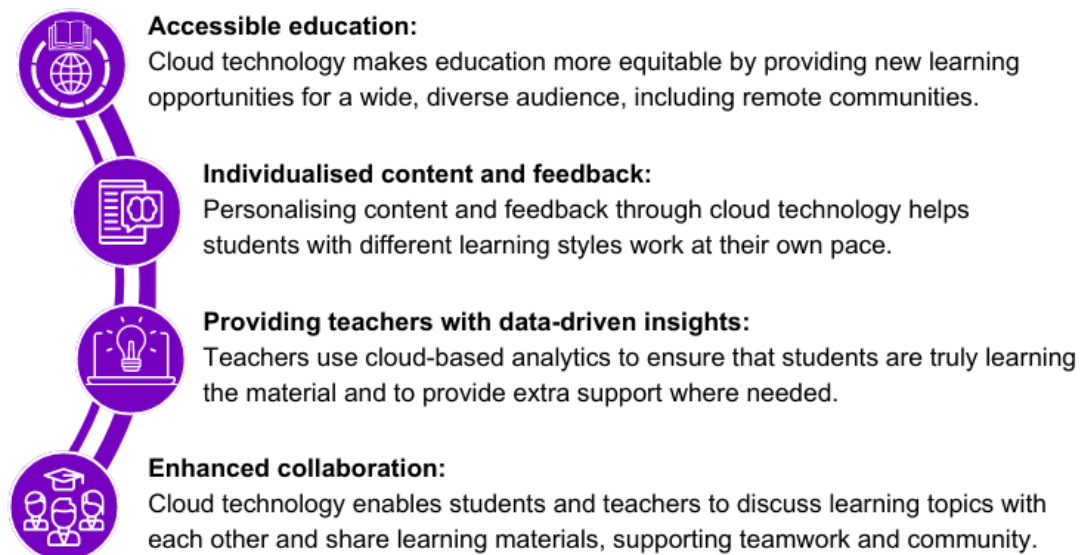
1 million adults accessing education via cloud-enabled businesses, a 230% increase from 300,000 adults currently

Note: Estimates for the number of students and adults accessing cloud-based education produced through market size estimates (see Appendix C of the global report) and are calculated separately to the GDP contribution. Current values are annual 2022-2023 values based on the latest available data.

By helping to support teaching and learning, innovative businesses within a cloud-enabled economy can make the future of education more engaging, accessible, and impactful (see Figure 8). Students and adults will be able to learn in a more collaborative environment, as cloud technology supports them to interact and share content more readily. Educators are also utilising cloud-based learning analytics to monitor the quality, safety, and security of online learning environments.

³² Education Hub ([2022](#)) Now I don't know my ABC

Figure 8: How cloud supports Businesses to improved access to quality education



Source: Accenture interviews and research^{33,34,35}

Cloud-enabled businesses are introducing advanced analytics into the classroom, helping to personalise learning for each individual student, therefore creating a more meaningful, impactful educational experience for them. Personalised content and feedback can help students with different learning styles work at their own pace. Education Perfect is a New Zealand business using cloud to provide tailored online learning pathways for students (see Case Study below).³⁶ AI, particularly generative AI, has the potential to be particularly useful in helping educators provide differentiated learning pathways based on the needs of individual students.^{37,38}

³³ OECD (2021), OECD Digital Education Outlook 2021: Pushing the Frontiers with Artificial Intelligence, Blockchain and Robots.

³⁴ UNESCO, (2021), AI and education: guidance for policymakers.

³⁵ OECD (2021), OECD Digital Education Outlook 2021: Pushing the Frontiers with Artificial Intelligence, Blockchain and Robots.

³⁶ Education Perfect (2023).

³⁷ World Economic Forum (2023), Can AI improve education? Here are 4 potential use cases.

³⁸ Stanford University, Human-Centered Artificial Intelligence, (2023) AI Will Transform Teaching and Learning. Let's Get it Right.

Education Perfect's cloud-based platform equips teachers with the content, insights, and time they need to deliver personalised learning and boost student results.



Industry:
Education



Size: <250
employees



Locations: Over 50 countries,
including New Zealand and Australia

Education Perfect is a cloud-native, education platform started in 2007 (then known as Language Perfect) by two brothers, Craig and Shane Smith, looking for a better way to learn foreign vocabulary. They identified that to achieve the best outcomes for students, teachers needed to differentiate teaching and learning to cater to individual student needs. However, educators rarely have the content, insights, and time they need to do this effectively and with ease. They aimed to solve this problem by creating an online suite of effective learning, assessment, and analytics products. After the rapid success of the platform with language subjects, 'Language Perfect' rebranded to Education Perfect in 2013, expanding across all core subjects in the primary and high school curriculum, including math, English, and science. More than **3,000 schools** currently use Education Perfect covering **50,000 teachers** and over **1.2 million students**.

"Our team of qualified educators have developed a centralized repository of more than 40,000 individual resources for teachers assign in accordance with individual students' needs. Not only that, but our cloud-based algorithms suggest and support tailored learning pathways for students through a convenient, on-demand platform. By leveraging the cloud, we were able to scale our content development and expand into new markets, having the ability for educators around the world to easily access our content authoring tools."

Emma McAllister, Chief Operating Officer.

Education Perfect is designed to support and enhance teaching practices by equipping teachers with the tools they need to maximise student engagement, track growth, and differentiate learning. 87% of teachers agree that Education Perfect has reduced the teaching load for tasks such as marking,



and 96% agree it provides data and insights that improve their teaching practice. Furthermore, schools using Education Perfect score, on average, **4.4%-6.7% higher on standardised tests (NAPLAN) than schools who don't**, controlling for other factors.

Being a cloud-native small business, cloud has been essential to the success of Education Perfect. Without cloud, Education Perfect indicated the company would have been unable to expand so rapidly from a small, language-learning tool in New Zealand to an international, multi-disciplinary education platform in a matter of years. Cloud is the only feasible technology solution that supports the spikes in demand over the course of a day and also enabled Education Perfect to respond quickly to COVID-19, offering free tutoring and adding **500,000 new users during months of lockdowns from March to June 2020**.

Education Perfect is also looking to the future. As well as planning for further international expansion they are working hand in hand with their community of teachers to re-imagine their platform. Harnessing emerging technologies, such as AI, and the latest pedagogical best practices, they are committed to continuously optimising their pathways to student learning.

Source: Accenture Consultations; Education Perfect (2023), Empowering and effective: How digital learning can support every learner to achieve their potential; Grattan Institute (2022), Making time for great teaching: How better

3.3 Developing smarter and more sustainable farming practices

As the fourth largest industry group and provider of roughly one in seven jobs across New Zealand, the agriculture sector is a significant contributor to the economy.³⁹ Technologies and services pioneered by cloud-enabled businesses are being used by the agricultural industry in New Zealand to support smarter, more efficient, and more sustainable farming practices. These technologies support the agricultural sector by employing sophisticated and connected monitoring devices that provide better, real-time data about crops, livestock health, and resource consumption (referred to as “precision agriculture”).^{40,41} By 2030, it is anticipated that precision agriculture practices such as these that are supported by cloud-enabled businesses will be in operation in one in three farms across New Zealand. Under a cloud-enabled economy, the combined annual productivity benefits unlocked through cloud-enabled businesses in the agricultural sector is estimated to reach \$430 million by 2030.

Impact on agriculture in the cloud-enabled economy by 2030



\$430 million in annual productivity benefits unlocked through cloud-enabled businesses in the agriculture sector, an increase from \$310 million currently

1 in 3 farms using precision agriculture supported by cloud-enabled businesses, a 190% increase from 1 in 9 farms currently



Note: Estimates for the number of farms using precision agriculture produced through market size estimates (see Appendix C of the global report) and are calculated separately to the GDP contribution. Current values are annual 2022-2023 values based on the latest available data.

Precision agriculture is only one way that cloud supports the agricultural sector under a cloud-enabled economy. On top of smarter, data-driven farming practices, business technology solutions can help automate vehicles and equipment, support business-to-business (B2B) and business-to-customer (B2C) sales and cashflow through specialised cloud software, and reduce wastage and resource use (see Figure 9). As adoption of cloud technology incorporates more advanced applications, technologies such as AI and ML could further enable the use of more accurate real-time data analytics for precision agriculture, including through analysing crop and satellite images, with generative AI conveying these insights to farmers for decision making.^{42,43}

³⁹ Ministry for Primary Industries (2023).

⁴⁰ FAO (2022), Leveraging automation and digitalization for precision agriculture: Evidence from the case studies.

⁴¹ Precision agriculture is the practice of utilising data and other information to improve the resource use efficiency, productivity, and sustainability of agricultural production.

⁴² World Economic Forum (March 2021), Artificial Intelligence for Agriculture Innovation.

⁴³ World Economic Forum (January 2021), How AI will solve agriculture’s water efficiency problems.

Figure 9: How cloud supports smarter, more sustainable agricultural practices



Source: Accenture interviews and research^{44, 45}

3.4 Improving financial access and wellbeing

The digitisation of the finance sector has led to a wave of disruption, increased competition, and new types of products and services that better service customers.⁴⁶ Alongside the rapid adoption of smart devices, a critical part of the proliferation of digital finance options has been cloud technology that supports fast and secure methods of transferring financial information, and enables swift, secure access to that information.⁴⁷ As such, cloud-native businesses in the finance industry (referred to as fintechs) represent one of the fastest growing markets in the world, expected to rise from US\$134 billion in 2022 to US\$557 billion globally by 2030 – more than a 400% increase.⁴⁸

Impact on finance in a cloud-enabled economy by 2030



1 in 4 people globally using financial services supported by cloud-enabled businesses

Globally, **15%** of surveyed cloud-enabled businesses working with the finance sector help budget-constrained customers or small businesses better manage their finances



⁴⁴ OECD (2022), The digitalization of agriculture: A literature review and emerging policy issues.

⁴⁵ World Bank (2021), What's Cooking: Digital Transformation of the Agrifood System.

⁵³ OECD (2020), "Digital disruption in banking and its impact on competition".

⁵⁴ Ibid.

⁴⁸ Vantage market research (2023)

Source: Accenture societal impact survey (2023), n = 188. Based on global results across 12 countries.

The rise of fintech mobile apps has not only seen an increase in the number of financial services companies, but also a boost in convenience and access, individual autonomy over financial decisions, better access to information, and tighter security frameworks. According to the Accenture societal impact survey, by 2030, one in four people globally are expected to be using financial services supported specifically by cloud-enabled businesses.⁴⁹ Globally, 15% of cloud-enabled businesses working with the finance sector are expected to be helping budget-constrained customers or small businesses to better manage their finances.^{50,51} The features of a cloud-enabled financial services sector have distinct societal advantages attached, including greater financial inclusion, wellbeing, and prosperity. The ways in which cloud technologies have most profoundly enabled a digital financial services sector are included in Figure 10.

Figure 10: How cloud-enabled Businesses support improved financial autonomy and access



Source: Accenture interviews and research

For many countries, a cloud-enabled financial services sector is not far away, with many businesses already incorporating or exploring the use of cloud-supported technologies, such as AI and ML, to improve outcomes for consumers across a range of applications.⁵² A sample of businesses operating in the global financial services space indicated that the most common areas for these businesses to be active were in providing digital banking and budgeting or financial management tools.^{53,54} The improvements in societal outcomes most often attributed to these businesses were increased affordability of services, improved financial literacy and education, and fraud detection.^{55,56} AI has the potential to unlock even greater individual financial wellbeing in a cloud-enabled economy by allowing customers to automate more elements of personal finances.⁵⁷ For example, the possibility of integrating AI

⁴⁹ Accenture societal impact survey (2023), n = 188.

⁵⁰ Accenture societal impact survey (2023), n = 188.

⁵¹ Based on the number of cloud-enabled businesses currently supporting this outcome.

⁵² IMF (2021), Powering the Digital Economy: Opportunities and Risks of Artificial Intelligence in Finance.

⁵³ Accenture societal impact survey (2023), n = 188.

⁵⁴ Based on the services that cloud-enabled businesses are currently delivering.

⁵⁵ Accenture societal impact survey (2023), n = 188.

⁵⁶ Based on the number of cloud-enabled businesses currently supporting this outcome.

⁵⁷ Crunchbase (2023) How the future of personal finance is self-driving money

to perpetually monitor and screen for more competitive fees or financial products for consumers holds enormous potential to improve financial health.⁵⁸

3.5 Supporting the achievement of sustainability objectives

Developing the tools and technologies that will support a more sustainable future is one of the most pressing global challenges, but also one filled with enormous economic potential. Businesses can use cloud-enabled technologies to directly reduce environmental impact, with innovations such as more efficient resource usage and smarter waste management. According to the Accenture societal impact survey, by 2030, one in five businesses globally are expected to be using services provided by cloud-enabled businesses to directly address their climate and sustainability objectives, such as through energy or emissions monitoring and reduction.⁵⁹ And it's not only businesses using these services; across the world, cities and towns are increasingly turning to cloud-based technology solutions provided by businesses to achieve a range of sustainable outcomes.^{60,61} Globally, 15% of businesses providing services to achieve sustainability goals involved enabling "smart cities", such as optimising traffic flows or waste removal more efficient, and enabling the tracking or reduction of electricity usage.^{62,63,64,65}



Source: Accenture societal impact survey (2023), n = 66. Based on global results across 12 countries.

Although sustainability objectives cover a broad range of social issues from pollution and waste collection to traffic congestion and energy usage, the solutions supported by cloud-enabled businesses could help societies leave less of an impact on the environment. Some of the ways that businesses could support individuals and businesses to meet sustainability objectives are shown in Figure 11.

⁵⁸ Crunchbase (2023) How the future of personal finance is self-driving money

⁵⁹ Accenture societal impact survey (2023), n = 66.

⁶⁰ IDC (2023), Smart Cities.

⁶¹ IDC (2021), The Next Frontier: AI and Digital Twins in Smart Cities.

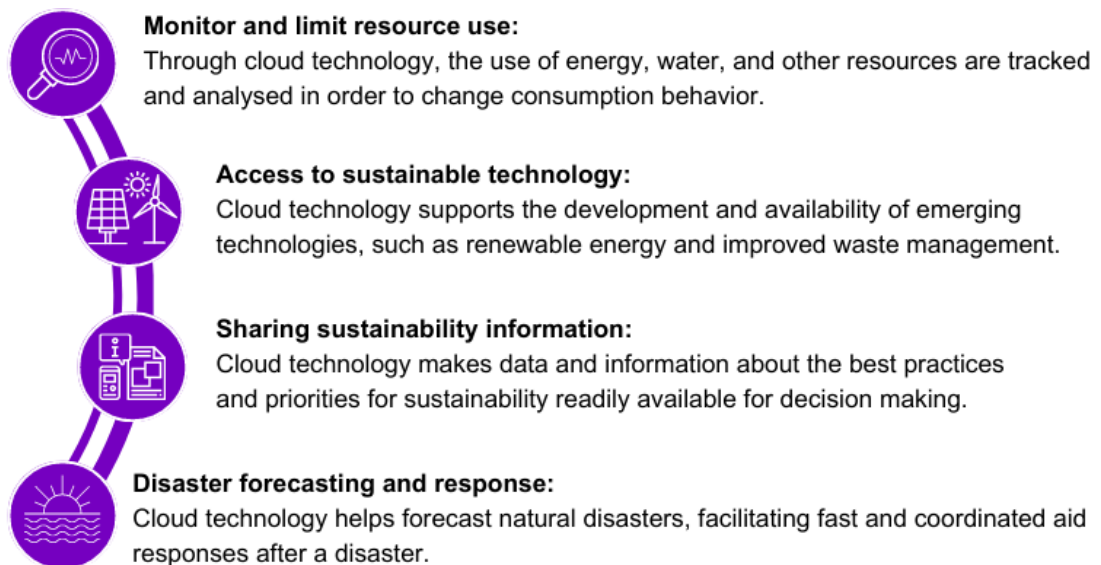
⁶² Accenture societal impact survey (2023), n = 66.

⁶³ Based on the number of cloud-enabled businesses currently supporting this outcome.

⁶⁴ AWS (2023), Building Smart Cities with AWS Cloud.

⁶⁵ OECD (2021), Measuring smart city performance in COVID-19 times: Lessons from Korea and OECD countries.

Figure 11: How cloud-enabled Businesses support humanity to manage environmental impact



Source: Accenture interviews and research.

According to the Accenture societal impact survey of global businesses, cloud technologies have already enabled these businesses to provide smarter resource management and usage, access to sustainable and renewable technologies, carbon footprint monitoring, and sustainability information.⁶⁶ Through these sustainable solutions, global businesses are helping to support wider sustainability goals including more efficient use of energy and water, improving waste management, supporting better air quality, and increasing the availability of renewable energy.⁶⁷

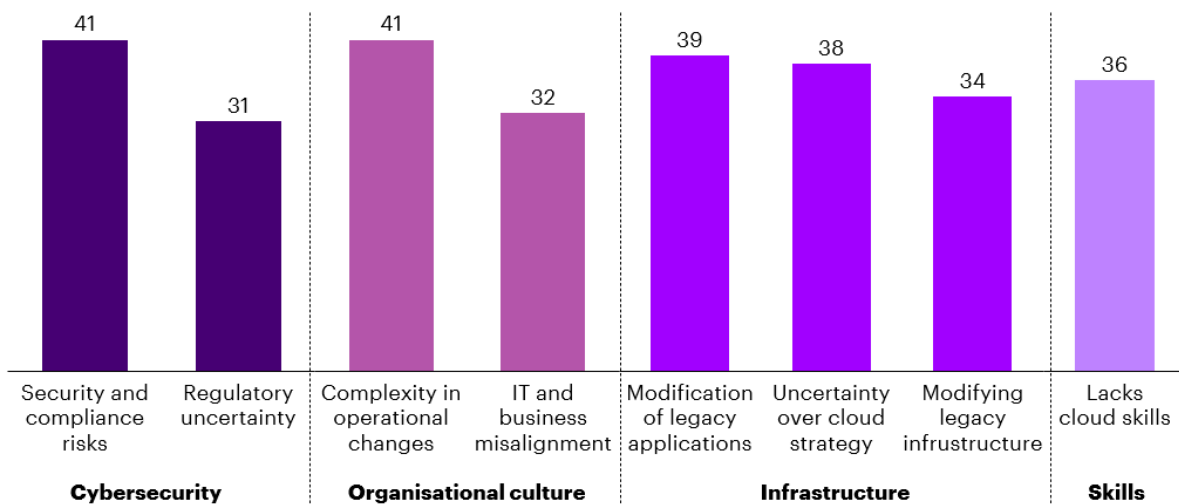
⁶⁶ Accenture societal impact survey (2023), n = 66.

⁶⁷ Accenture societal impact survey (2023), n = 66.

4 Achieving the cloud-enabled economy

With businesses across New Zealand at starkly different points along the adoption spectrum, New Zealand’s path to a cloud-enabled economy involves a combination of increasing sophistication and further encouraging greater levels of overall adoption. However, barriers to adoption remain despite the potential upside. A survey of global business leaders, conducted by Accenture, shows that persistent barriers to adoption in developed countries, like New Zealand, continue to concern cybersecurity, reluctant organisational cultures, insufficient infrastructure (e.g., hardware and software) or difficulty transitioning, and digital cloud skills (see Figure 12).

Figure 12: Primary barriers to cloud uptake
% of respondents listing barrier in top three responses



Source: Accenture (2023). Global survey responses from 2022, n = 800.

To address each of these complex challenges, businesses should evaluate individual barriers in their business to identify specific security, IT resources, organisational culture, and skills required to be successful. This will help businesses to develop holistic cloud solutions, optimised and scaled to improve performance, and reduce costs. Figure 13 provides an overview of the five key steps businesses can follow to achieve this, and how each of the four barriers are addressed along the process.

Figure 13: Steps for businesses to accelerate cloud maturity

■ Cybersecurity
 ■ Infrastructure
 ■ Skills
 ■ Organisational culture

Steps	Description	Barriers addressed			
1 Identify how cloud can streamline strategic goals	<ul style="list-style-type: none"> Identify how cloud solutions can meet your goals Identify a cloud partner that can help navigate the process Examine case studies of how businesses have used cloud to transform their business and create impact Interview employees to determine which barriers are preventing these systems and/or processes from being introduced or optimised at the firm level 				✓
2 Evaluate industry and government support	<ul style="list-style-type: none"> Examine the New Zealand government’s cloud policies and programs offered by industry to address firm-specific barriers and accelerate cloud maturity This could include R&D tax credits from the New Zealand government, or sponsorship programs for startups run by cloud providers such as AWS 	✓	✓	✓	✓
3 Educate all employees	<ul style="list-style-type: none"> Support employees to upskill in cloud, and utilise training from cloud providers where relevant Identify specific skill shortages to focus their training 	✓		✓	✓
4 Review data security arrangements	<ul style="list-style-type: none"> Review data security arrangements from the cloud provider and determine whether additional internal policies are required Review security features of cloud and best practice data policies Simplify and harmonise policy across the business, with clear guidelines for different functional applications of cloud 	✓			
5 Create a whole-of-business cloud migration strategy	<ul style="list-style-type: none"> Evaluate the costs and benefits of alternative strategies to determine a whole-of-business solution that meets business goals Businesses should prioritise solutions which deliver the greatest net benefit in the medium to long term Determine the scale and complexity of the cloud infrastructure required Businesses with less cloud experience could consider enlisting cloud partners such as consultants to achieve this 	✓	✓	✓	✓

Source: Accenture

4.1 Strong policy support to address structural barriers and incentivise business cloud adoption

The New Zealand government has already begun to implement strategies that address these barriers to adoption. This includes investing further in infrastructure by developing a Five Year Spectrum Outlook to improve digital connectivity across all of New Zealand, and support the roll-out of 5G.⁶⁸ The New Zealand government is also actively setting an example for business by updating the government public cloud-first policy in 2023, releasing explicit guidance that government organisations should:

- adopt public cloud services in preference to traditional information and communications technology (ICT) systems; and
- avoid investing in on-precise ICT infrastructure unless information meets specific criteria.⁶⁹

Despite this progress, there are still lessons that could be learnt from overseas experience that may further support higher and more sophisticated cloud adoption in businesses across New Zealand (see Figure 14). These involve increasing financial incentives to reduce cloud costs of businesses, such as Australia’s incentives enabling small business to claim a deduction of 20% for qualifying digital expenditure up to \$100,000, focusing on ensuring digital connectivity to 5G services across New Zealand by making spectrum use more efficient, and providing clear messaging for businesses around the importance of cloud adoption.⁷⁰

⁶⁸ Radio Spectrum Management (2022), Five Year Spectrum Outlook.

⁶⁹ New Zealand Government (2023), Meet Cabinet’s requirement for public cloud

⁷⁰ Australian Taxation Office (n.d.), Small business technology investment boost and skills and training boost.

Figure 14: Global best-practice examples of cloud adoption policies

■ Cybersecurity ■ Infrastructure ■ Skills ■ Organisational culture

Policy	Key existing support	Future policy	International policy examples	Barriers addressed				
Invest in digital infrastructure	New Zealand has the fastest internet in Oceania due to investment into optic fibre and is developing a Five-Year Spectrum Outlook to help enable 5G. New Zealand has announced the assignment of 3.30-3.34 GHz for regional broadband, and the Interim Māori Spectrum Commission will receive 100 MHz of spectrum.	Continued investment into regional and rural areas, particularly through focusing on spectrum allocation and licensing and enabling satellite internet connections, would improve speeds to facilitate cloud. Pursue highly targeted initiatives to enable connectivity and support digital connectivity for rural Māori communities, including a focus on ensuring Māori communities have access to spectrum.	 Unites States' spectrum allocation ranges from 9 kHz-275 GHz frequency bands, one of the largest total spectrum allocations globally, and is developing a National Spectrum Strategy to further improve access to spectrum	<table border="1"> <tr> <td>✓</td> <td></td> <td></td> <td></td> </tr> </table>	✓			
✓								
Invest in cloud skills and training	New Zealand has multiple programs, such as the Digital Boost initiative providing free digital skills training courses to businesses, including on cloud. New Zealand also has a Digital Technologies Industry Transformation Plan, which includes a focus on enhancing the skills needed for digital technologies.	Continued collaboration with industry to deliver cloud training programs, especially for businesses, along with a director of digital skills within government to manage and coordinate digital skills initiatives. Align NCEA (National Certification of Educational Achievement) and wider NZQA (New Zealand Qualifications Authority) qualifications frameworks with industry certifications, increase the use of the SFIA framework (Skills Framework for the Information Age) to support workforce planning, and increase the availability of entry-level public sector digital apprenticeships.	 Australia's National Cloud Computing Strategy includes a focus on cooperation with industry and educators to enhance cloud training  Australia's Public Sector Digital Traineeship program provides opportunities to improve digital skills and gain qualifications with public sector employment  Australia has the goal of 1.2 million technology-related jobs by 2030, providing clear leadership for the industry  Brazil's Digital Transformation Strategy (E-Digital) includes partnerships with industry and educators to provide cloud training and certifications	<table border="1"> <tr> <td></td> <td>✓</td> <td>✓</td> <td>✓</td> </tr> </table>		✓	✓	✓
	✓	✓	✓					
Harmonise data privacy policy across regions	New Zealand's Privacy Act was introduced in 2020 and has suitable privacy controls including for cross border data flows.	Remain committed to being a digital free trade leader and work with the international community to harmonise policy and promote cross border data flows to support digital sectors.	 The international community could work together in forums such as the G7 or G20 to harmonise data policies.	<table border="1"> <tr> <td>✓</td> <td></td> <td></td> <td></td> </tr> </table>	✓			
✓								
Incentivise cloud adoption and maturity	New Zealand provides R&D tax credits to incentivise innovation, although cloud is not specified as a deductible expense.	Improve eligibility clarity of existing incentives and provide continued ongoing support for businesses to reduce the cost of transitioning to cloud and encourage innovation.	 Australia's incentives enable small businesses to deduct 20% of the cost of digitising, including cloud which is specified as a deductible expense	<table border="1"> <tr> <td></td> <td>✓</td> <td>✓</td> <td>✓</td> </tr> </table>		✓	✓	✓
	✓	✓	✓					
Improve cloud-first policies	New Zealand has a Cloud-First policy, requiring departments to consider cloud services first after a risk assessment.	Continue to intensify government cloud adoption and provide clear messaging and leadership around the benefits of cloud for innovation and productivity to provide confidence for the commercial sector, including businesses, to also adopt cloud.	 United Kingdom's Cloud-First policy (2013) is a whole-of-government, public cloud-first approach that outlines clear guidelines and procurement policies for departments	<table border="1"> <tr> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> </tr> </table>	✓	✓	✓	✓
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Source: NZ Government,⁷¹ Australian Government,⁷² Federal Government of Brazil,⁷³ Future of Privacy Forum,⁷⁴ GDPR EU,⁷⁵ Coos, A.,⁷⁶ Deloitte,⁷⁷ Mcguire Sponsel,⁷⁸ NZ Government,⁷⁹ UK Government⁸⁰; Australian Taxation Office⁸¹, FCC⁸², Radio Spectrum Management^{83,84}, NTIA⁸⁵, NZ Tech⁸⁶

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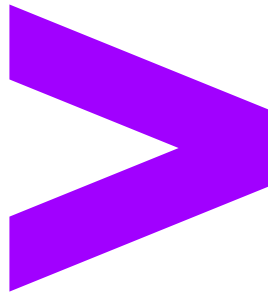
⁸² FCC (n.d.), Radio Spectrum Allocation.

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